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The geochemical fingerprints, the anthropogenic impacts

and the plant essential nutrient contents

of the laurel forest in Tenerife

(Canary Islands, Spain).

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„In der lebendigen Natur geschieht nichts,

was nicht in der Verbindung mit dem Ganzen steht“.

Johann Wolfgang von Goethe

Keywords: Laurel forest, Tenerife, geochemical fingerprints, anthropogenic and geogenic impacts, plant essential macro-, and micronutrients, fallow agricultural areas, volcanic rocks, topsoils, ***Laurus novocanariensis*** roots and leaves.

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Kurzfassung

Der Lorbeerwald auf Teneriffa kann als sensitives Ökosystem betrachtet werden, in dem zahlreiche geochemische Prozesse mit regionalen und globalen atmosphärischen Einträgen kollidieren und interagieren. So werden beispielsweise die Lorbeerwaldböden durch unterschiedliche Gesteine, geogene Aerosole (bspw. Saharastaub), anthropogene Emissionen (bspw. PKW-Abgase) sowie durch sozioökonomische Veränderungen (bspw. erschließen neuer Äcker, Entstehung von Brachflächen) beeinflusst.

Schwerpunkt dieser Arbeit ist, einigen dieser geochemischen Prozesse und geogener bzw. anthropogener Einträge auf den Grund zu gehen und diese zu interpretieren. Dafür wurde der **Si-, Al-, Fe-, Ca-, Na-, Mg-, K-, Ti-, P-, Mn-, Sr-, S_{tot}-, C_{tot}-, Zr-, Ni-, Zn-, Cu-, Pb-, Mo-, Sb-, Cd-,** und **Hg-** Gehalt zahlreicher Gesteins-, Boden-, Wurzel-, und Blattproben ermittelt. Beprobt wurden insgesamt 26 Standorte auf der nördlichen Seite Teneriffas. Die Probenstellen befinden sich in abgeschiedenen Lorbeerwaldbereichen, erschlossenen und bei Touristen beliebten Waldgebieten (z.B Pico del Ingles), sowie auf brachliegenden Ackerflächen am Rand des Lorbeerwalds. Die Blatt- und Wurzelproben stammen von der Baumspezies ***Laurus novocanariensis***.

Das erste Ziel dieser Doktorarbeit ist herauszufinden, ob die Lorbeerwaldoberböden des Anaga-, Orotava- und Teno-Gebiets anhand typischer geochemischer „Fingerabrücke“ differenzierbar sind. Die Ergebnisse zeigen, dass die Oberböden des Orotava- Tals andere Sr/Ca-, Na/Ca- und Na/K- Verhältnisse als die Anaga- und Teno- Böden besitzen. Die geplotteten Gesteins- und Bodenergebnisse veranschaulichen zudem, dass die Gesteinsverhältnisse der Orotava-Probenstellen bis auf die obersten Bodenhorizonte abfärben und so einen geochemischen Fingerabdruck vom Gestein bis zum Oberboden hinterlassen. Ferner werden die ***L. novocanariensis***- Blätter durch die dazugehörigen Böden und Gesteine beeinflusst. Die Sr- und Ca-Ergebnisse verdeutlichen, dass nicht allein ein hoher Sr-Gehalt im Boden (bis zu 788,0 ± 46,0 µg/g Sr) für hohe Sr-Werte im Blatt entscheidend ist (bis zu 148,4 ± 8,7 µg/g Sr). Verantwortlich für erhöhte Sr-Blattgehalte ist vielmehr das richtige Sr/Ca-Verhältnis im Boden. Des Weiteren gibt es mehrere geplottete Elementverhältnisse, die bis auf ein paar wenige Standorte alle Probenlokationen von einander unterscheidbar machen (z.B Mg/Ni, Fe/Ti, Mg/Cu). Allerdings konnten aufgrund einiger Überschneidungen keine typischen Anaga- und Teno-Fingerabrücke ermittelt werden. Nichtdestotrotz ist es möglich, die unterschiedlichen Probenareale anhand bestimmter Element-zu-Element Verhältnisse von einander zu differenzieren. Beispielsweise haben die Bodenproben im Teno-Gebiet Na-zu-P -Verhältnisse von 1.2:1 bis 2.7:1, im Anaga-Gebiet - 1:1 bis 1:4.1 und im Orotava-Gebiet variieren sie von 3.8:1 bis 5.9:1.

Das zweite Ziel der Forschungsarbeit ist zu ergründen, ob Pb, Hb, Cd und Sb durch geochemische Prozesse oder durch anthropogene bzw. geogene Einträge in den Lorbeerwald eingebracht werden. Die Untersuchungen zeigen, dass Hg und Pb stellenweise in erhöhten Konzentrationen vorliegen, doch linear geplottete Elementverhältnisse lassen darauf schließen, dass beide Elemente durch geochemische Prozesse in die Oberböden und in die Blätter gelangen.

Beispielsweise kann man durch lineare Korrelationen erkennen, dass Hg und Pb mit Ca, Fe, Ti, Mn, Al und Zn im Oberboden miteinander verbunden sind. Eine klare Unterscheidung ob geochemische Prozesse oder geogene bzw. anthropogene Einträge für die gemessenen Sb- und Cd-Konzentrationen verantwortlich sind ist nicht möglich. Zwar weisen einige Ergebnisse darauf hin, dass beide Elemente anthropogen und geogen eingetragen werden, doch dies lässt sich anhand der erhaltenen Datensätze nicht eindeutig verifizieren. Die Ergebnisse verdeutlichen dennoch, dass das beliebte Anaga-Ausflugsziel „Pico del Ingles“ die höchsten Sb-, Cd- und Pb-Konzentrationen in den Bodenproben (bspw. bis zu 58,3 ± 4,2 µg/g Pb) und in den Blättern (bspw. bis zu 0,70 ± 0,03 µg/g Sb) vorweist.

Der dritte Arbeitsschwerpunkt geht der Frage nach, ob die Boden- und Blattproben der brachliegenden Ackerflächen sowie der Lorbeerwaldgebiete ausreichende Mengen an pflanzenessentiellen Nährstoffen enthalten. Durch den Vergleich aller Ergebnisse mit publizierten Nährstoffdaten wird deutlich, dass die Blatt- und Bodenproben über ausreichende und normale Mengen an K, P, Ca, Mg, S_{tot}, Fe, Mn, Zn, Cu, Mo und Ni verfügen. Einzig die ermittelten K-Bodenwerte liegen stellenweise etwas unterhalb der publizierten Daten. Deutliche Unterschiede existieren dagegen bei der Nährstoffverteilung zwischen Acker- und Waldböden. So besitzen die Ackerböden im Gegensatz zu den heterogenen Lorbeerwaldböden innerhalb der oberen 15 cm eine homogene Nährstoffverteilung. Des Weiteren sind Düngerrückstände auf den brachliegenden Ackerflächen nicht zu erkennen.

Abstract

The laurel forest ecosystem is a good example for an endangered and critical environment due to its interface position in which various geochemical processes collide and interact with regional and global impacts. For example, different volcanic rocks, geogenic aerosols (e.g. Saharan dust, sea spray), anthropogenically released emissions (e.g. air and car traffic, industrial and urban developments etc.) and socioeconomic changes (e.g. expansion of cropland and fallow agricultural areas) affect and interact with the pedological laurel forest interface and with the surrounding ecosystem.

The determination, interpretation and discussion of several geochemical processes and geogenic or anthropogenic impacts build the main content and scope of this research work. To achieve this goal, different kinds of samples are collected at 26 sampling sites on the northern slope of Tenerife, including volcanic rocks, soils, roots and leaves. The vegetation samples belong to the laurel forest tree species ***Laurus novocanariensis.*** The sampling sites spread over the main laurel forest areas (Anaga Massif, Orotava area, Teno Massif); remote forest areas, touristically influenced areas as well as former farmland near the border of laurel forest vegetation zone were given special attention. The geochemical composition determined for each sample consists of 22 elements (**Si, Al, Fe, Ca, Na, Mg, K, Ti, P, Mn, Sr, S_{tot}, C_{tot}, Zr, Ni, Zn, Cu, Pb, Mo, Sb, Cd, Hg**).

The first goal of research gravitates around the question whether it is possible to distinguish the Anaga, Orotava and Teno laurel forest topsoils from each other as to specific element ratios, which can be considered as typical geochemical fingerprints. The results reveal, that the Orotava topsoils

are distinguishable from the Anaga and Teno topsoils due to plotted Sr/Ca, Na/Ca and Na/K ratios and due to calculated element-to-element ratios (e.g. Sr-to-Ca, Na-to-K). The Orotava rocks affected even the uppermost soil horizons and it is clearly recognizable that the rocks and soils affect also the associated leaf samples. Orotava leaves, for example, contain the highest Sr levels of all samples (up to 148.4 ± 8.7 µg/g), but the Sr leaf contents depend not only on high Sr soil levels (up to 788.0 ± 46.0 µg/g), but on specific Sr/Ca soil ratios. Several other element combinations can almost be used as typical geochemical fingerprints, such as Mg/Ni, Fe/Ti or Mg/Cu ratios. However, various topsoil samples have a similar plotted or calculated element ratio, which makes it impossible to determine unique Anaga or Teno fingerprints. However, Anaga, Orotava and Teno topsoils are distinguishable from each other due to specific Na-to-P ratios. Anaga Na-to-P ratios, for example, range from 1:1 to 1:4.1, Orotava ratios from 3.8:1 to 5.9:1 and Teno ratios from 1.2:1 to 2.7:1.

The second research goal consists in answering the question whether the laurel forest ecosystem is affected by anthropogenic Hg, Pb, Cd and Sb impacts, focussing on the topsoils and the L. novo-canariensis tree species. In this context it is necessary to differentiate between anthropogenically and lithogenically affected element contents. The results reveal that the slightly enriched Pb and Hg topsoil levels are caused by natural geochemical processes. Linear trends indicate that Hg and Pb are associated with other elements, such as Ca, Fe, Ti, Mn, Al and Zn. The Cd and Sb levels are present in normal amounts, but it is not possible to determine whether natural geochemical processes or anthropogenic impacts caused the observed trends and area-specific differences. The most popular touristic area of the Anaga Mountains (Pico del Ingles) nevertheless contains always the highest Sb, Cd, and Pb topsoil (e.g. up to 58.3 ± 4.2 µg/g of Pb) and leaf values (e.g. up to 0.70 ± 0.03 µg/g of Sb).

The third research goal focuses on the essential nutrient contents of the laurel forest and the fallow agricultural areas. The soil and vegetation results of both areas are compared with each other and with reported nutrient levels in order to find out whether the laurel forest and the fallow agricultural areas contain sufficient nutrient levels. The results reveal that the sampling sites contain sufficient amounts of K, P, Ca, Mg, S_{tot}, Fe, Mn, Zn, Cu, Mo and Ni within their leaves and soils. Only the K soil levels are sometimes slightly below the reported nutrient ranges. The fallow agricultural nutrient levels are mostly within the range of the laurel forest levels and they are more or less homogenously distributed within the fallow agricultural topsoils. This is one of the main differences compared to the laurel forest areas. Soil fertilizer residues are not determined in the examined fallow agricultural topsoils.

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AGR = Fallow agricultural areas
C_{tot} = Total carbon
I_{geo} = Index of geoaccumulation
LF = Laurel forest areas
LOI = Loss on ignition
MDL = Method detection limit
S_{tot} = Total sulphur
SOC = Soil organic carbon

1. Introduction

Various small hiking paths traverse the main laurel forest areas in Tenerife. These small tracks lead to impressing viewpoints and remote areas within this humid subtropical environment. For those who hike through this pristine forest for the first time, the initial impressions must cause the feeling of travelling back in time. However, these extraordinary woods are not antique and outdated pieces of history in which time had stopped millions of years ago (Pott, 2005). They are rather a modern example for an endangered and critical environment due to their sensitive intermediary position in which numerous geogenic processes and innumerable regional and global geogenic and anthropogenic impacts collide and interact with the surrounding ecosystem. Considering the large variety, complexity, regionality and globality of these inputs and the fact that the laurel forest is facing environmental and ecological changes in the upcoming future, it is inevitable to gain an overview of these interacting processes.

In order to reach an impartial point of view, which is the key to making objective ecological interpretations and decisions for this subtropical ecosystem, it is important to simplify these processes and impacts by restricting oneself to the regional scale. In a general sense, the laurel forest soils are the interface between the lithosphere, atmosphere and hydrosphere. Considering the interactions and influences on a regional level, different rocks, climatic conditions, various geogenic aerosols (e.g. Saharan dust, sea spray), anthropogenically released emissions (e.g. air and car traffic, industrial and urban developments etc.) and socioeconomic changes (e.g. expansion of cropland and fallow agricultural areas) affect the pedological laurel forest interface (Fig.1).

The determination, interpretation and discussion of several geochemical processes and anthropogenic impacts build the main content and scope of this research work. To achieve this goal, different kinds of samples including volcanic rocks, soils and roots and leaves of the laurel forest tree species ***Laurus novocanariensis*** are collected at 26 sampling sites on the northern slope of Tenerife. The sampling sites spread over the main laurel forest areas (Anaga massif, Orotava area, Teno massif), especially considering remote forest areas, touristically influenced areas as well as former farmland near the border of laurel forest vegetation zone.

The determined geochemical composition for each sample consists of 22 elements (**Si, Al, Fe, Ca, Na, Mg, K, Ti, P, Mn, Sr, S_{tot}, C_{tot}, Zr, Ni, Zn, Cu, Pb, Mo, Sb, Cd, Hg**).

The **first goal of research** gravitates around the question whether it is possible to distinguish the Anaga, Orotava and Teno laurel forest topsoils (0 – 15 cm) from each other due to specific element ratios, which can be considered as typical geochemical Anaga, Orotava or Teno fingerprints. The research goal also focuses on the question, whether the soil parent materials affect the associated topsoils and whether the geochemical topsoil fingerprints are reflected by the surrounding vegetation. Therefore, various element combinations are plotted against each other (e.g. Na/K, Ca/Sr), in order to determine distinguishable trends, considering also the calculated element-to-element ratios (e.g. Na-to-K = 1:2).

The **second research goal** consists in answering the question whether the laurel forest ecosystem is affected by anthropogenic impacts, focussing on the topsoils and the *L. novocanariensis* tree species. In this context it is necessary to differentiate between anthropogenically and lithogenically affected element contents. Therefore, the topsoil and leaf contents are compared with appropriate geochemical background levels in order to determine natural conditions. The soil pollution degrees (I_{geo} Index) are calculated and the soil depth profiles are normalized in order to determine possibly enriched or polluted topsoils. In addition, the washed and unwashed leaf samples are compared with each other in order to trace element particles on the leaf surface.

The **third research goal** focuses on the essential nutrient contents of the laurel forest and the fallow agricultural areas. The soil and vegetation results of both areas are compared with each other and with reported nutrient levels in order to find out whether the laurel forest and the fallow agricultural areas contain sufficient nutrient levels. To get a realistic picture, the reported nutrient levels have to be suitable and considered as normal. The third goal also shall shed some light on the area-specific differences of the fallow agricultural areas, including influencing geogenic relations, fertilizer residues and the element distribution within the upper soil horizons.

The research work is structured as follows:
The **introductory section** concentrates on the fundamental biological, pedological, geological and geochemical background settings, which is necessary to achieve the main objectives. This includes, for example, the origin and the distribution of the laurel forest, reported information of laurel forest soils, the mineralogical composition of common Anaga, Teno and Orotava rocks, as well as geochemical background information such as the general anthropogenic or geogenic sources for affected soil contents. Furthermore, reported geochemical data ranges and the general functions and deficiency symptoms of plant essential nutrients are attached in the appendix, in order to provide comparable data ranges and background information.

The method section explains the several field, laboratory and analytical methods. This includes important topics such as sampling criteria, the analytical methods, the determination of the soil organic carbon content as well as the equations and formulas we employed.

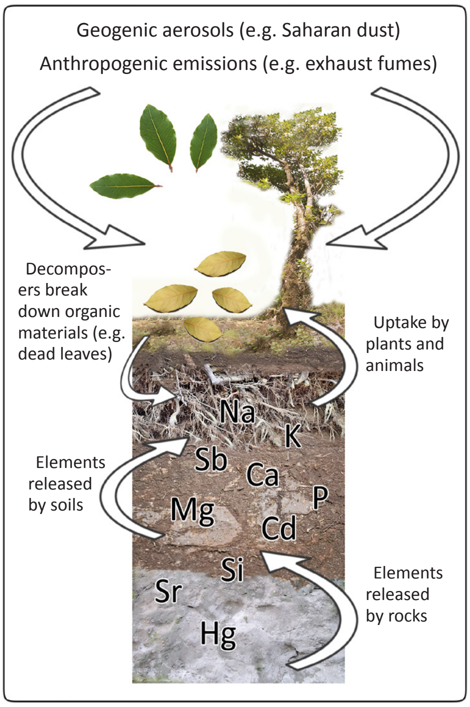


Fig.1 Considering the affecting interactions and influences in simplified terms, different geochemical processes and different kind of geogenic and anthropogenic sources supply the laurel forest ecosystem with various amounts of different elements. The determination, interpretation and discussion of several geochemical processes and anthropogenic impacts build the main work content of this research work.

The results section consists of the analytical results, including a general overview by mentioning minimum, maximum and mean values of the rock, soil, and vegetation samples, as well as detailed information about each sampling area.

The discussion section is divided into four subsections, starting with a discussion about the degree of rock alteration and the soil organic carbon levels, followed by the discussion of the three research aims, starting with the geochemical fingerprints. Summary and conclusion of each research goal are described at the end of each chapter.

The final conclusion section summarizes briefly the main discussion and interpretation results, followed by the references and the detailed appendix. The appendix consists of all analytical results, tables and additional figures.

1.1 Biological settings of the laurel forest

Currently, the European laurel forests exist on the mountainous islands of Macaronesia, which includes the Canary Islands, the Azores and Madeira (Höllermann, 1981; Pott, 2005; Arco Aguilar et al., 2010). The Canary Islands are a group of seven major islands, next to the hyper-arid coast of Northwest Africa (Sperling et al., 2004) (Fig.2 a). Three groups of islands can be differentiated according to their height: the more mountainous islands - Tenerife (3718 m a.s.l), La Palma (2426 m a.s.l) and Gran Canaria (1950 m a.s.l); islands of medium-height - La Gomera (1487 m a.s.l) and El Hierro (1501 m a.s.l); islands of low height – Lanzarote (670 m a.s.l) and Fuerteventura (807 m a.s.l) (Rothe, 2008) (Fig.2 a). There are significant extensions of laurel forests in the occidental islands of the Canarian archipelago due to suitable climatic conditions. This includes the islands El Hierro, La Gomera, La Palma and Tenerife (Salvande et al. 2006; Arévalo et al. 1999; Guerra, 1990).

For the present research work, the selected sampling sites are located in the main laurel forest or Monteverde areas of Tenerife (Fig.2 b). The terminus Monteverde has been established to differentiate between the Canarian laurel forest and other subtropical laurel typed forests (Pott, Hüppe & de la Torre, 2003). With approximately 2040 km^2, a length of 83 km and a width of up to 51 km is Tenerife the largest island of the Canary archipelago.

In Tenerife, distinct geomorphologic conditions developed a topographical barrier to low-level, moist trade winds, creating a toposequence of contrasting climatic conditions (Fernández-Palacios & de Nicolás, 1995) (Fig.3 a to e). The trade winds and the altitudinal zonation created 5 important vegetation zones in Tenerife, due to hypsometric differences (heights), variability of mean annual precipitation and mean annual temperature conditions, which represent the major determinants of the observed altitudinal vegetation patterns (Fernández-Palacios and de Nicolás, 1995; Pott, Hüppe & de la Torre, 2003; Sperling et al., 2004; Pott, 2005) (Fig.3 a to e).

The present study focuses exclusively on the laurel forest, which is a subtropical forest that exists due to relatively high humidity (precipitation ranging between 500 and 1000 mm/yr) and stable temperatures (mean of 12-16°C) (e.g. Fernandopulle 1976; Höllermann, 1981; Pott, 2005). The laurel forest consists of the ***Laurisilva***, which represents those laurel forest parts with the maximum complexity and biodiversity of laurel type tree species, and the Myrica-Erica formation (local name ***Fayal - Brezal***), which is generally a secondary stage of the ***Laurisilva***, except in the upper fringe of the fog-belt, between 1200 and 1500 m (Lausi et al. 1988; Pott, Hüppe & de la Torre, 2003). The dry climate conditions above 1200 m form a stable ***Fayal – Brezal*** community, marking the transition between the laurel forest vegetation zone and the savanna-like xerophytic formation (dominated by ***Pinus canariensis***) (Oberdorfer 1965; Wildpret & Arco, 1987) (Fig.3 d).

Once the laurel forest formed a continuous band along the length of Tenerife (Nascimento et al. 2009). However, the lower border of the laurel forest vegetation zone was more or less entirely converted for agricultural uses during the last centuries (Fernández- Palacios et al., 2004). Today, the laurel forest distribution is mostly limited to the northern slope of Tenerife, between 500 m and 1200 m a.s.l (Sperling et al. 2004) (Fig.2 b).

The main laurel forest areas are located in the Anaga Mountains, the Teno Mountains and the Orotava area (Fig.2 b). Parts are also found near Las Mercedes, Los Silos, Aqua García Mountain, Los Altos de La Matanza, La Victoria, and some parts in the municipality of Icod. Small areas exist also on the southern slope near Güímar.

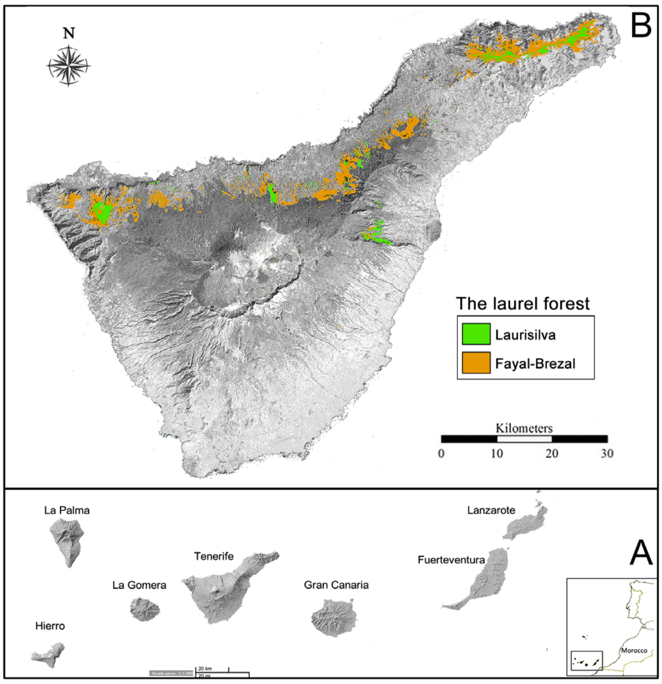


Fig.2 A) The Canary Islands are a group of seven major islands, next to the hyper-arid coast of Northwest Africa (Sperling et al., 2004) (shaded relief Maps from Grafcan 2013). B) The laurel forest distribution in Tenerife (Map after Naumann, 2008). The laurel forest consists of the *Laurisilva*, which represents those laurel forest parts with the maximum complexity and biodiversity of laurel type tree species, and the Myrica-Erica formation (local name *Fayal - Brezal*), which is generally a secondary stage of the *Laurisilva*, except in the upper fringe of the fog-belt (Lausi et al. 1988; Pott, Hüppe & de la Torre, 2003).

As already mentioned, the laurel forest is not an antique and outdated piece of history in which time had stopped millions of years ago (Pott, 2005). It is rather more a remnant of an initial vegetation, which developed further independently by adapting to new environmental conditions (Pott, 2005; Pott, Hüppe & de la Torre, 2003). The laurel forest originates from a formerly widely distributed Neogene oak-laurel community, which was well developed and distributed in the circum-Mediterranean region about 20 million years ago (Bramwell, 1976; del Arco Aguilar et al., 2010).

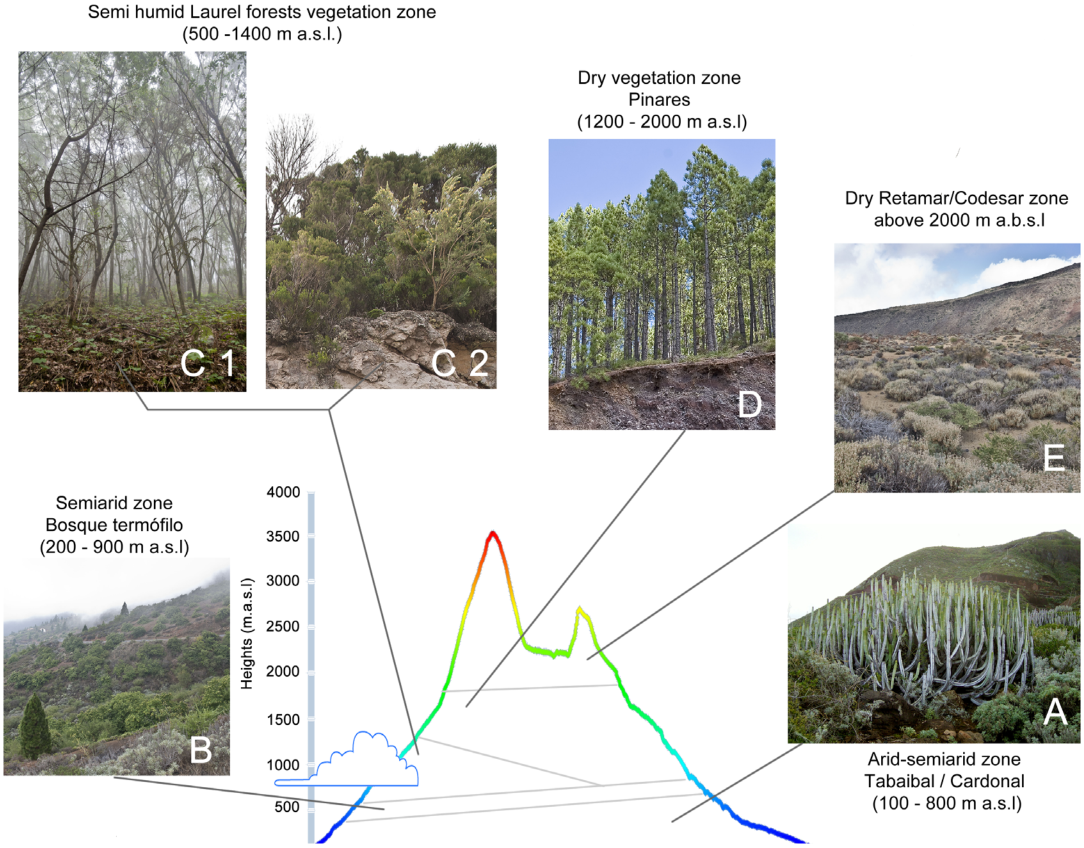


Fig.3 The trade winds and the altitudinal zonation created 5 important vegetation zones in Tenerife, due to hypsometric differences (heights), mean annual precipitation and mean annual temperature conditions (Fernández-Palacios and de Nicolás, 1995; Pott, Hüppe & de la Torre, 2003; Sperling et al., 2004; Pott, 2005). **A)** the arid-semiarid zone Tabaibal / Cardonal (100 – 800 m a.s.l) with mainly succulent plants (e.g. *Euphorbia canariensis* and *E. balsamifera*). **B)** The semi-arid zone Bosque termófilo (200 – 900 m a.b.s.l), with mainly thermophilic shrubland (e.g. *Mayteno canariensis*). **C)** The semi humid laurel forests or Monteverde vegetation zone (500 – 1400 m a.b.s.l.) with *Laurisilva* (**C1**) (e.g. *Laurus novo-canariensis*) and *Fayal-Brezal* (**C2**) (e.g. *Erica arborea* and *Myrica faya*). **D)** The dry vegetation zone Pinares (1200 – 2000 m a.b.sl.), with the main species *Pinus canariensis*. **E)** The dry Retamar/Codesar zone above 2000 m a.b.s.l, with mainly broom species. (Pictures, Heidak 2013; cross section from Grafcan, 2013).

The climatic conditions of the Miocene were characterized by regular summer precipitation (Höllermann, 1981). The increasing aridity and the sinking temperatures during the Pleistocene forced the laurel forests to migrate further southwards to coastal and mountainous areas with sufficient moisture supply (Pott, 2005).

During migration and resettlement, neogene relicts were mixed with several evergreen sclerophyllous tree species (deciduous trees) (Pott, Hüppe & de la Torre, 2003). In this context, particularly emphasized are the members of the families ***Lauraceae, Aquifoliaceae, Oleaceae, Myrsinaceae*** and ***Theaceae***. Today, the Canarian laurel forest consits of neogene relicts interspersed by new populations and representatives of the former Mediterranean area (e.g. ***Rhamnus, Ilex, Viburnum***) (Pott, 2005) (Fig.4 a to j). In ecological terms, the laurel forest lies between evergreen sclerophyllous forests (deciduous forests) of the winter rain areas and tropical montane cloud forest, which is the tropical counterpart of the sub-tropical cloud forest (Pott, 2005; Pott, Hüppe & de la Torre, 2003).

The laurel forest has less in common with the evergreen sclerophyllous forest than with the tropical montane cloud forest (Pott, 2005). Like many tropical tree species, the laurel forest trees show hardly any growth rings and posses only thin barks. Further similarities with tropical forests are the occurrences of epiphytic ferns and numerous types of mosses, which are hanging like garlands of branches and stems (Pott, Hüppe & de la Torre, 2003). Well-preserved parts of the laurel forest are composed of up to eighteen different tree species (Pott, 2005).

Fig.4 Laurel forest leaf types and fruits, according to Pott, Hüppe & de la Torre, 2003. a) *Persea indica*, b) *Laurus novocanariensis*, c) *Ocotea foetens*, d) *Apollonias barbujana*, e) *Ilex canariensis*, f) *Picconia excels*, g) *Rhamnus glandulosa*, h) *Myrica faya*, i) *Ilex platyphylla*, j) *Visnea mocanera*. (Picture from Pott, Hüppe & de la Torre, 2003).

Physiognomically relatively similar laurophyllic paleoendemic tree species are ***Persea indica*** (Lauraceae), ***Visnea mocanera*** (Theaceae), ***Appollonias barbajuna*** (Lauraceae), ***Heberdenia bahamensis*** (Myrsinaceae), ***Picconia excelsa*** (Oleaceae), ***Ocotea foetens*** (Lauraceae), ***Ilex canariensis*** (Aquifoliaceae) and ***Laurus novocanariensis*** (Lauraceae) (Pott, Hüppe & de la Torre, 2003) (Fig.5 a to h).

Other occurring tree species are ***Ilex perado*** ssp. ***platyphylla*** and ***Rhamnus glandulosa*** (Pott, Hüppe & de la Torre, 2003) (Fig.5 i to j). The leaves of all mentioned species are evergreen, leathery, and more or less wide and shiny (Pott, 2005). In addition, a large number of various ferns, mosses, fungi and other shade plants are flourishing in the tree shadow under diffuse light conditions (e.g. ferns like ***Adiantum reniforme***, ***Woodwardia radicans***) (Pott, 2005).

The most common occurring species of the laurel forest are ***L. novocanariensis***, ***P. excelsa*** and ***P. indica*** (Pott, Hüppe & de la Torre, 2003) (Fig.5 a, e, h). Under ideal growing conditions, the mentioned tree species can reach heights between 10 and 30 m (Pott, 2005). Dominant species in the Myrica-Erica formation (***Fayal - Brezal***) are heaths ***Erica scoparia***, ***Erica arborea***, ***Myrica faya*** and ***Viburnum tinus*** spp ***rigidum*** (Fig.5 k to n). Generally, important laurel forest tree species, which regularly occur within older regeneration stages of the ***Fayal – Brezal***, are ***L. novocanariensis***, ***A. barbujana, P. excelsa*** and ***R. glandulosa*** (Pott, Hüppe & de la Torre, 2003).

The laurel forest composition has been well described by many authors, but in the geochemically point of view the laurel forest is poorly analysed. Within the present research work the determined geochemical compositions of the analysed leaves and roots belong to the species ***L. novocanariensis*** due to the regularly occurrence within the laurel forest.

Fig.5 The figures a to h are showing the physiognomically relatively similar laurophyllic paleoendemic tree species, according to Pott, Hüppe & de la Torre, 2003. The figures i to j are showing other occurring tree species of the laurel forest (Pott, 2005). The figures k to n show the dominant species in the Myrica-Erica formation (*Fayal - Brezal*) (Pott, Hüppe & de la Torre, 2003) (Pictures from Pott, Hüppe & de la Torre, 2003; H2 from Heidak). **a)** *Persea indica* (Lauraceae), **b)** *Visnea mocanera* (Theaceae), **c)** *Appollonias barbajuna* (Lauraceae), **d)** *Heberdenia bahamensis* (Myrsinaceae), **e)** *Picconia excelsa* (Oleaceae), **f)** *Ilex canariensis* (Aquifoliaceae), **g)** *Ocotea foetens* (Lauraceae), **h1+2)** *Laurus novocanariensis* (Lauraceae), **h2)** The details show common occurring Domatien at the leaf veins, **i)** *Ilex perado* ssp. *platyphylla*, **j)** *Rhamnus glandulosa*, **k)** *Erica scoparia*, **l)** *Erica arborea*, **m)** *Myrica faya*, **n)** *Viburnum tinus* spp *rigidum*.

1.1.1 Fallow agricultural areas near the border of the laurel forest

Since the 16th century, Tenerife has been used for intensive, mainly export-oriented agriculture, whereby the natural landscape has been continuously altered (Günthert et al., 2011 a). Today, almost 1/4 of Tenerife is agriculturally affected (Günthert et al., 2011b). Since the beginning of mass tourism, Tenerife has been subject to a socioeconomic change from an agrarian to a service based society (Günthert et al., 2011a). This development has increased the expansion of infrastructure and leads to agricultural fallow land in higher areas (Günthert et al., 2011 a).

According to Günthert et al. (2011a), two types of agricultural areas exist today in Tenerife. They can be divided into a more developed and export orientated one (plantations) and a traditional second type for the local domestic market. Main crops (bananas and tomatoes) grown for export are mainly cultivated in greenhouses up to 300 m a.s.l. (Günthert et al., 2011a). Agriculture for the domestic market consists mainly of potatoes, wine grapes and fruit orchards (Günthert et al., 2011 a). These crops are primarily localised in a region between 300 - 800 m a.s.l. (Villa et al., 2003). The domestically used and often fallow agricultural areas are located at the border of the laurel forest or even within the vegetation belt (500 – 1000 m) (Günthert et al., 2011 a).

Especially mountainous areas on the northern slope of Tenerife, with suitable climate conditions have been influenced intensively by logging and harnessing of agricultural areas (Fernández- Palacios et al., 2004). The lower border (500 – 700 m) of the laurel forest vegetation zone was more or less entirely converted and transformed for agricultural uses due to the building of large terraces in order to develop flat surfaces (Günthert et al., 2011 a; Fernández- Palacios et al., 2004) (Fig.6 a). In order to gather information about the agricultural development of the last 40 years, a recent study classified satellite images from the last decades (cf. Günthert et al. 2011b). The utilised method detected former domestically used agricultural areas near the border of the laurel forest (Günthert et al., 2011b). Several of the detected locations are abandoned land since nearly 40 years. Some of these fallow areas are already densely populated by various kinds of plant species (Fig.6 b).

The possibly occurring vegetation species are ***E. arborea***, ***Pteridium aquilinum, Rubus, Rumex lunaria, Ulex europaeus, L. novocanariensis, Arlina salicifolia*** and ***Hypericum canariense***. (Landau & Kramer, 2012 per. comment during a sampling campaign). There are also fields existing with less

Fig.6 A) Large agricultural used terraces on the northern slope of Tenerife. B) Fallow agricultural area with dense vegetation. C) Fallow agricultural area with less dense vegetation. (Pictures, Heidak).

densely occurring species (Fig.6 c). These areas are much more exposed to changing weather conditions as the areas covered with a dense vegetation. Nevertheless, all fallow agricultural areas near the border of the laurel forest can be seen as potential areas for a natural resettlement of this ecosystem (Günthert et al., 2011b; Fernández- Palacios et al., 2004).

1.2 Pedological settings of Tenerife

Generally, there are twelve orders of Soil Taxonomy existing, which are classified by the USDA Soil Classification System. Worldwide, all soils can be assigned to one of these 12 orders (Soil Taxonomy Handbook Second Edition, 1999; Schaetzl & Anderson, 2005). The soil taxonomy system consists of a hierarchy of six levels (order, suborder, greater group, subgroup, family, series), which are comparable to the Linnean system used in biology to classify living things (kingdom, phylum, class, order, family, genus, and species) (Soil Taxonomy Handbook Second Edition, 1999; Schaetzl & Anderson, 2005). The soil orders are frequently defined by a single dominant characteristic, which affects the soil in that location, such as the prevalent vegetation (Alfisols, Mollisols), the type of parent material (Andisols, Vertisols), the climate variables such as the lack of precipitation (Aridisols) or the presence of permafrost (Gelisols), also the physical and chemical weathering properties (Oxisols, Ultisols), as well as the relative amount of Soil Profile Development (Entisols) (Soil Taxonomy Handbook Second Edition, 1999; Schaetzl & Anderson, 2005).

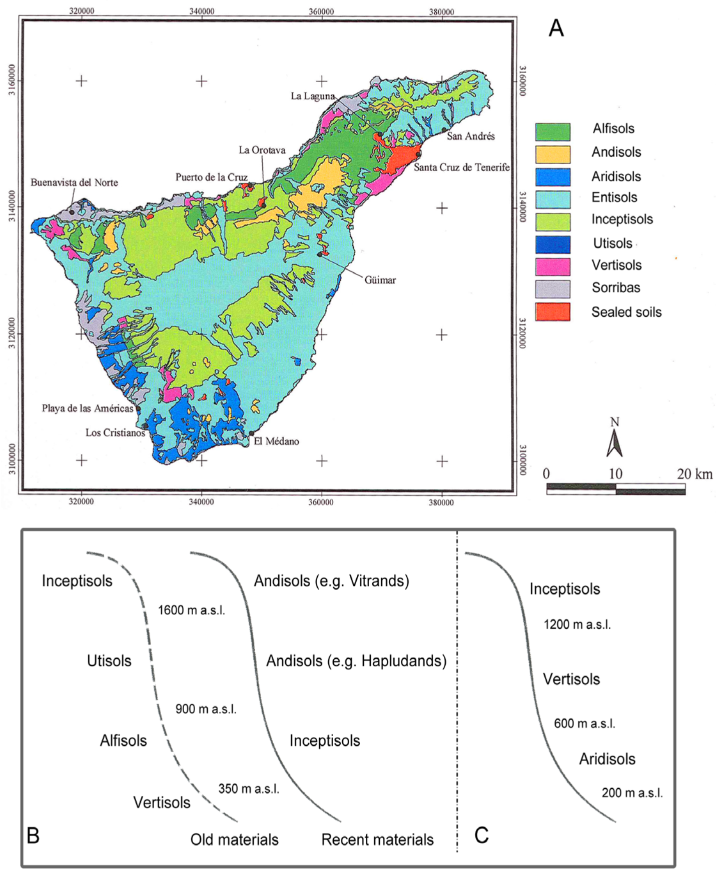


Fig.7 A) The map shows the distribution of soils in Tenerife after Naumann, 2008. B) Soil climosequence of the northern slope of Tenerife (Tejedor et al., 2007). C) Soil climosequence of the southern slope of Tenerife (Tejedor et al., 2007).

In Tenerife, there are eight of these twelve soil orders represented, which are classified after the USDA Soil Classification System as **Alfisols, Andisols, Aridisols, Entisols, Inceptisols, Vertisols,** and **Ultisols** (Tejedor et al., 2007; Naumann, 2008) (Fig.7 a).

Furthermore, the altitudinal and the climatic variations between the northern and southern slope of Tenerife influenced and affected the soil properties as well as the distribution of soil types significantly (Tejedor et al., 2007).

This causes a typical contiguous array of soils, which is also called a climosequence. For example, two distinct climosequences exist on the northern windward slope of the island (Fig.7 b).

These climosequences depend on the type and age of the soil parent material, which are either old basaltic lava flows or recent pyroclasitc materials (Tejedor et al., 2007). Therefore, Alfisols, Vertisols, Inceptisols and Ultisols corresponding to **aridic/ustic**, **ustic, udic** and **xeric** moisture regimes are found on old basaltic lava flows (Tejedor et al., 2007). At the same climatic levels, allophanic Andisols, vitric Andisols and Inceptisols are present on recent pyroclastic materials (Tejedor et al., 2007) (Fig.7 b). On the souther slope exists only one climosequence with Aridisols, Inceptisols and Vertisols (Fig.7 c). According to the Soil Taxonomy Handbook Second Edition (1999), the mentioned moisture regimes of the northern slope can be descripted as follows:

An **aridic moisture** regime characterizes soils of an arid or semiarid climate. In addition, all parts of the soils are either dry for more than half of the cumulative days per year or they are continuously moist for less than 90 days per year. An **udic moisture regime** characterizes soils of a humid climate with regularly distributed rainfall throughout the year (Tejedor et al. 2002). The soils of an udic regime can store the moisture so that the amount of stored moisture is approximately equal to, the amount of evapotranspiration. An **ustic moisture regime** is intermediate between the aridic and the udic regime. Generally, soils of an ustic regime contain limited amounts of soil moisture. However, soils of a usitc regime contain sufficient moisture amounts always during important plant growing seasons. A **xeric moisture regime** characterizes soils of Mediterranean areas, where winters are wet and the temperatures stable and the summers are dry and the temperatures high.

1.2.1 Soils of the laurel forest

The laurel forest soil properties are described according to the Soil Taxonomy Handbook Second Edition (1999). Precise descriptions are described according to the results from Arnalds et al. (2007) and Tejedor et al. (2007) about soils from volcanic regions in Europe. Generally, the laurel forest soils on the northern slope of Tenerife range in the climosequence of Andisols and Inceptisols (Fig.7 b). The common characteristics of **Andisols** are high phosphorus retention, high available water capacity, and high cation-exchange capacity. Most Andisols formed in volcanic ashes or pyroclastic materials. Andisols can form in almost any environment, however, as long as suitable temperature and adequate moisture are available to permit weathering and the formation of short-range-order minerals. Andisols are found on recent pyroclastic materials as well as on old basaltic lava flows. One of the unique characteristics of these soils are their andic property.

Andic properties result from the low weathering resistance of volcanic parent materials with a significant amount of volcanic glass, which causes that the elements are released and mobilized faster than crystalline minerals can be formed (Shoji et al. 1982; Tejedor et al. 2002). This in turn causes an accumulation of metastable, non-crystalline or short-range order materials within the laurel forest soils, such as **allophane, imogolite** (allophanic soils)**, ferrihydrite,** crystalline **Fe-oxyhydroxides, gibbsite, halloysite** and **illite** (Tejedor et al., 2007). The chemical formulas of these metastable, non-crystalline materials are shown at chapter 1.2.2. Generally, the laurel forest soils are classified as **allophanic Andisols, non-allophanic Andisols** or **Inceptisols**, due to their altitudinal-climatic conditions and their soil parent materials (Fig.7 b).

Allophanic Andisols (Hapludands) are confined to the northern side of Tenerife, coinciding with the trade wind condensation level. These soils have also formed on pyroclastic materials. Given the good permeability of the surface soil, the buried soils must be assumed being influenced by leachates, originating from the topsoil. The upper soils have a low base saturation, high organic carbon content (1% even at 2 m), high exchange capacity, pH of around 6.0 with minimum (and sometimes no) differences between the values obtained in H_20 and in KCl, no exchangeable aluminium, low bulk density, and high moisture retention. The mineralogy is dominated by allophane, imogolite, gibbsite, some volcanic glass and traces of phyllosilicates. Aluminium oxalate reaches 8% and phosphate retention is more than 99.5%. These Andisols frequently buries older soil layers in which allophane has disappeared and clay minerals predominate, mainly halloysite.

Non-allophanic Andisols (Fulvudands) are found only in udic regime conditions on pyroclastic materials. Some of these soils formed on basaltic and/or phonolitic pyroclasts 8000-9000 years in age and overlie multiple layers of well-developed older soils. The non-allophanic Andisols have very high organic matter content, a low degree of saturation, high exchangeable aluminium, low pH, low bulk density, poor dispersion and finer fraction than the previous mentioned Andisols. Halloysite predominates, with traces of illite and vermiculite. The chemical activity of the soils is conditioned not by the allophane but by the aluminium-humus complexes.

Inceptisols have a wide range in characteristics and occur in a wide variety of climates. They can form in almost any environment, except for an arid environment, and the comparable differences in vegetation are great. Inceptisols occur on a variety of landforms. The unique properties are a combination of water available to plants for more than half the year or more than 3 consecutive months during a warm season and one or more pedogenic horizons of alteration or concentration with little accumulation of translocated materials other than carbonates or amorphous silica.

1.2.2 Mineralogy of laurel forest soils

This section describes the possibly occurring secondary minerals and accumulated metastable, non-crystalline or short-range order materials of the laurel forest soils (Tejedor et al. 2002, 2007).

Allophane is an amorphous or poorly crystalline hydrous aluminium silicate clay mineraloid with the chemical formula $Al_2O_3 \cdot (SiO_2)_{1.3\text{-}2} \cdot (2.5\text{-}3)H_2O$ (Wada, 1989). The components Al_2O_3 (x) and SiO_2 (y) have a ratio of 1:1. It is a weathering product or an alteration product of volcanic glass and feldspars (Wada, 1989). It typically forms under pH conditions between pH 5 and pH 7 (Wada, 1989).

Imogolite is an aluminium silicate clay mineral with the formula $Al_2SiO_3(OH)_4$. It commonly occurs together with allophane, quartz, cristobalite, gibbsite, vermiculite and limonite (Wada, 1989).

Ferrihydrite is a widespread metastable hydrous ferric oxyhydroxide mineral with the chemical formula $\{(Fe^{3+})_2O_3{*}0.5\ H_2O\}$ (Cornell & Schwertmann 2003). It forms in several types of environments ranging from freshwater, aquifers, hydrothermal hot springs to soils.

Gibbsite is one of the mineral forms of aluminium hydroxide, with the chemical formula $Al(OH)_3$ (Mitchell, 1993). The structure of gibbsite is similar to the basic structure of micas. It´s basic structure forms stacked sheets of linked octahedrons of aluminium hydroxide (Mitchell, 1993).

Halloysite is a 1:1 alumina-silicate clay mineral with the chemical formula $Al_2Si_2O_5(OH)_4$ (Wilson, 1999). It consist mainly of Al (20.90 %) Si (21.76 %) and H (1.56 %). It typically forms by hydrothermal alteration of alumina-silicate minerals. It can occur intermixed with kaolinite, montmorillonite and other clay minerals (Wilson, 1999).

Illite is a phyllosilicate or layered alumina-silicate with the chemical formula $(K,H_3O)(Al,Mg,Fe)_2(Si,Al)_4O_{10}[(OH)_2,(H_2O)]$ (Mitchell, 1993). It occurs as an alteration and weathering product of muscovite and feldspar (Mitchell, 1993).

Aluminium oxalate is an insoluble precipitate of Al and oxalate with the formula $Al_2(C_2O_4)_3$.

Vermiculite is a hydrous silicate mineral, which is classified as a phyllosilicate with the chemical formula $(Mg_{0,5},Ca_{0,5},Na,K)_{0,7}(Mg,Fe,Al)_3[(OH)_2|(Al,Si)_2Si_2O_{10}] \cdot 4H_2O$ (Mitchell, 1993). Vermiculite expands greatly when the surrounding temperature is heated up. Associated mineral phases are apatite and serpentine. It occurs interlayered with biotite, chlorite and phlogopite (Mitchell, 1993).

1.2.3 Carbon in soil

It is reported that the amounts of carbon in soils are more or less three times higher than the amounts of carbon in the aboveground biomass and they are approximately double as high as the amounts of carbon in the atmosphere (Eswaran et al., 1993). The total carbon content of a soil represents the present amount of inorganic and organic carbon. Generally, inorganic carbon is present typically as carbonates in soils, which are either of geogenic or of anthropogenic origin (e.g. agricultural input, liming practices) (Schumacher, 2002). The most common carbonate minerals in soils are calcite ($CaCO_3$) and dolomite $[CaMg(CO_3)_2]$ (Scheffer & Schachtschabel, 2010).

Other forms can occur as well (e.g. siderite $FeCO_3$) (Scheffer & Schachtschabel, 2010). However, the majority of carbon in most soils is present as soil organic carbon (SOC), with exception of calcareous soils (Nelson, & Sommers, 1996; Milne, 2009). Generally the soil organic carbon (SOC) content represents the amount of carbon, which is bound in the soil organic matter (SOM) (Nelson, & Sommers, 1996). The terminus soil organic matter is used to describe the organic compounds, including non-humic and humic substances (e.g. tissues from dead plants and animals, as well as sugars, amino acids, lipids etc.) (Nelson & Sommers, 1996; Milne, 2009).

1.3 Geology of the Canary Islands and Tenerife

The Canary archipelago consists of seven major volcanic islands and several islets, grown on the passive margin of the African Plate within the eastern Central Atlantic Ocean (Abratis et al., 2002). Together, they stretches roughly east–west between 28 and 29°N, about 90 to 500 km west of Africa (Fig.8). The Canary Islands are situated on Jurassic oceanic crust with ages between 156 Ma and 175 Ma (Roeser 1982; Klitgord and Schouten 1986; Schmincke et al. 1998).

The volcanic evolution of the Canary archipelago has been much discussed during the last decades and several theories have been proposed to explain the origin of the Canary Islands. There are for example the theory of propagating fractures (Anguita & Hernán, 1975), a local extensional ridge (Fúster, 1975), regional orogenesis and faulting (Araña & Carracedo, 1978), uplifted tectonic blocks (Araña & Ortiz, 1986), a mantle hotspot (Holik et al., 1991; Hoernle & Schmincke, 1993a, 1993b) and a unifying model (Anguita & Hernán, 2000) that suggest the origin of magmas from a mantle anomaly. The mantle hot spot theory is now widely accepted to explain the origin and the formation of the Canary Islands. Fundamental debates are still taken place to discuss the matter for the mantle hot spot (Hoernle & Schmincke, 1993a, 1993b; Carracedo et al., 1998; Anguita and Hernán, 2000). There are several dozens publications available, dealing with topics like the geochemical evolution of individual islands, giant landslides, K-Ar data, or Pb-Sr-Nd-O isotope geochemistry, and others (e.g. Ancochea et al. 1990; Thrilwall et al. 1997; Longpré et al. 2009, etc.).

The mantle hot spot theory

Several publications assume that the Canary Islands, like Hawaii, owe their origin to a mantle hot spot (Holik et al., 1991; Hoernle & Schmincke, 1993a, 1993b; Hoernle et al. 1995; Oyarzun et al. 1997; Carracedo et al., 1998; Canales & Dañobeitia, 1998; Anguita & Hernán, 2000). It has been proposed that the Canary hot spot is characterized through upwelling plume material ("blobs") from a broad region (>600 km long and >200 km wide) 100 to 200 km beneath the islands (Hoernle & Schmincke, 1993a). Hoernle & Schmincke (1993a) proposed in their model that the decompression melting of a single blob produces a discrete magmatic cycle, in which the saturation of magmas in SiO_2 initially increases and then decreases.

Some features of Canarian volcanism remain difficult to reconcile with a simple, continuously active mantle plume, such as the long period of eruptive activity in the archipelago (> 20 Ma in some islands), multiple magmatic cycles on a single island, morphological and structural features, seismic signatures and the geochemical evolution (Schmincke, 1973; Hoernle et al., 1995; Hoernle & Schmincke, 1993a, 1993b; Carracedo et al., 1998; Canas et al., 1998, and others). It is assumed that a greater lithospheric thickness, a lower plume flux and a slower plate motion are the reasons for the major peculiarities of the Canarian volcanoes, in consideration to ''archetypal'' hot spot volcanoes like Hawaii, La Réunion or Society (cf. Hoernle & Schmincke, 1993b; Carracedo et al., 1998).

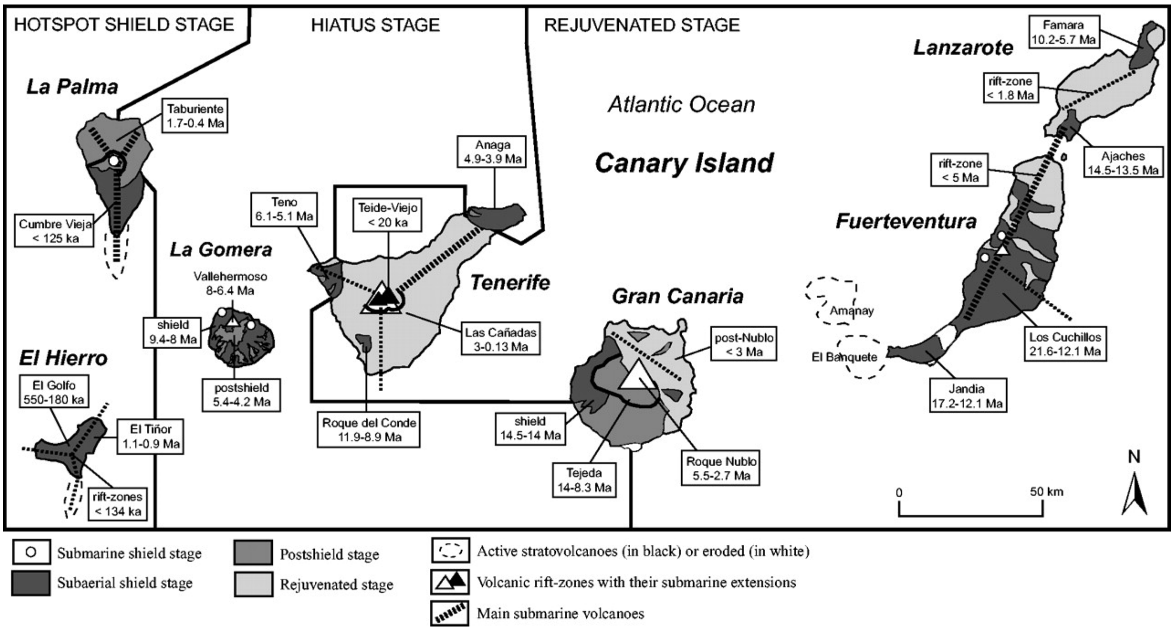


Fig.8 Volcanic history and main volcanic structures of the Canary Islands, according to the hotspot stages of evolution (Paris et al, 2005). Radiometric ages after Guillou et al. (1996) for El Hierro; Guillou et al. (1998, 2001) for La Palma; Paris et al., (2005); Carracedo et al. (2003) and Guillou et al. (2004) for Tenerife; MacDougall & Schmincke (1976), Pérez Torrado et al. (1995) and Schirnick et al. (1999) for Gran Canaria; Coello et al. (1992) and Ancochea et al. (1996) for Fuerteventura and Lanzarote. Map from Paris et al, 2005.

In contrast to Hawaii, the Canary Islands are built close to a continental margin and on a near-stationary plate, which result in a slow volcanic propagation rate (Longpré et al. 2009; Carracedo et al., 1998). Each Canary Island represents, like the Hawaiian Archipelago, the product of coalescing volcanoes (e.g., Carracedo et al., 2001; Guillou et al., 2004). In recent years a wealth of geological data has led to the conclusion that the Canary Islands, like the Hawaiian archipelago, show submarine stages, followed by shield-building, declining, erosive and rejuvenation stages (Walker, 1990; Paris et al., 2005) (Fig.8). For several Canary Islands a two-step evolution is most readily identifiable, including a shield stage and a rejuvenated stage (Longpré et al. 2009) (Fig. 8). However, equivalents of the four Hawaiian stages have also been proposed to occur (cf. Carracedo et al., 1998; Paris et al., 2005).

The Canary volcanic evolution can be explained in four stages according to Walker (1990):
A) Seamount and emergent, containing submarine sediments, volcanic rocks (mainly alkali basaltic pillow basalts and hyaloclastites), dyke swarms and mafic and ultramafic plutonic intrusions, which form the cores of these islands.
B) Shield building, characterized by subaerial alkaline basalts and trachybasalts lava flows.
C) Declining, containing rocks with trachytic and phonolitic compositions.
D) Rejuvenation, containing nephelinites, basanites and basaltic lava flows.

1.3.1 Volcanic evolution of Tenerife

Tenerife is the largest of the Canary Islands, covering 2058 km2 with an approximately triangular shape. It rises on the Atlantic Ocean seafloor from a depth of about 3.5 km and reaches to more than 3.7 km above the sea level at the peak of Teide (Marinoni & Gudmundsson, 2000). Tenerife was created by the coalescence of three independent shield volcanoes from the late Miocene to the late Pliocene around 11.9 Ma and 3.9 Ma ago (e.g. Thirlwall et al., 2000; Longpré et al. 2009). The remnants of these volcanoes crop out in the Roque del Conde massif (South), the Teno massif (NW) and the Anaga massif (NE) (Ancochea et al., 1990; Thirlwall et al., 2000; Guillou et al., 2004) (Fig.9 a to g). In the recent years, various geoscientists examined the volcanic evolution of Tenerife and particulary the evolution of the Teno and Anaga shield volcano (cf. Ancochea et al., 1990; Thirlwall et al. 2000; Walter & Schmincke, 2002; Guillou et al., 2004; Leonhardt & Soffel, 2006; Carracedo et al., 2007; Longpré et al. 2009).

The earliest stages of subaerial volcanism are represented in the **Roque del Conde massif**, with radiometric dates between **11.9 Ma** and **8.9 Ma** (Thirlwall et al., 2000; Longpré et al. 2009) (Fig.9 a). The Roque del Conde massif is thought to be the only exposed part of a much larger Central shield volcano (Guillou et al., 2004).

The **Teno shield volcano** emerged around **6.27 Ma** and **4.89 Ma**, in the northwest of the present-day island (Thrilwall et al., 2000; Longpré et al., 2009) (Fig.9 b). Generally, the Masca Formation is defined as the oldest series of Teno lavas, mostly exposed in the Barranco de Masca underlying the Masca unconformity (Longpré et al. 2009) (Fig.10). These lavas appear to have been largely extruded during the reverse polarity chron C3An.1r, from 6.27 to 6.14 Ma ago (Cande and Kent, 1995; Longpré et al. 2009). Subsequently, a series of events are thought to have taken place during the normal polarity chron C3An.1n, lasting around 250 ka from 6.14 to 5.89 Ma ago (Thirlwall et al. 2000; Longpré et al. 2009). The Masca Collapse was the first giant landslide, creating the Masca Unconformity and followed by the infill of the collapse embayment by the lavas of the Carrizales Formation (Longpré et al. 2009). Then, a second landslide occurred, the Carrizales Collapse (forming the Carrizales Unconformity) (Longpré et al. 2009). This event was followed by the extrusion of most of the lavas of the El Palmar Formation that accumulated inside the newly formed scar (Thirlwall et al. 2000; Longpré et al. 2009). After a possible hiatus in volcanic activity during the next reverse polarity chron, the youngest Miocene lavas in Teno were extruded during the normal polarity interval C3n.4n, from 5.23 Ma to 4.98 Ma ago, forming the cliffs of Los Gigantes (Los Gigantes Formation) (Thirlwall et al. 2000; Longpré et al. 2009). A gap in volcanic activity of about 4 Ma separates the Los Gigantes eruptions from the Pleistocene volcanic eruptions. The Pleistocene volcanic eruptions have been dated between 706 ka and 153 ka and interpreted as distal products of the Northwest Rift of the recent and active central edifices (Carracedo et al., 2007).

The **Anaga shield volcano** emerged in the northeast from around **4.9 Ma** to **3.9 Ma** ago (Guillou et al., 2004; Leonhardt & Soffel, 2006) (Fig.9 c). Dyke swarms, emplaced in the Teno and Anaga succession, contain radiometric ages between 5.8 Ma to 3.9 Ma (Féraud et al.,1985). The Anaga and

Teno massifs, together with the Roque del Conde massif, belong to the Old Basaltic Series (or Series I), according to the currently accepted stratigraphy of the island (Fúster et al., 1968; Coello, 1973; Bryan et al., 1998). After the last eruptions of the Anaga volcano, a volcanic hiatus of approx. 0.2 Ma followed with intensive processes of erosion (Ancochea et al. 1990).

Around **3.5 Ma** to **2.2 Ma** ago rejuvenated volcanism started to form the voluminous **Las Cañadas I** stratovolcano in the central part of Tenerife (Ancochea et al. 1990; Martí et al. 1994) (Fig.9 d). It is assumed that the Las Cañadas I stratovolcano, reached about 40 km in diameter and about 4500 m a.s.l in height (Carracedo et al., 2002).

Ensuing the **Las Cañadas II** volcano started to build up from around **1.59 Ma** to **0.175 Ma** ago (Martí et al., 1994). It comprises the products of three felsic volcanic cycles: the **Ucanca (1.59 –1.18 Ma**) (Fig.9 e), **Guajara (0.85–0.65 Ma)**, and **Diego Hernández (0.37–0.175 Ma)** formations (Martí et al., 1994) (Fig.9 f). According to Martí et al. (1994, 1997) each Upper Group cycle was terminated by a caldera collapse episode associated with felsic pyroclastic eruptions and followed by a migration in the focus of eruptive activity. These several destructive events formed the present-day Las Cañadas caldera. Together, both Las Cañadas volcanoes (I & II) form the voluminous Las Cañadas edifice in the central part of Tenerife (Ancochea et al. 1990; Martí et al. 1994) (Fig.9 h). The Las Cañadas I volcano represents the mafic to intermediate Lower Group and the Las Cañadas II volcano the felsic Upper Group, with its three volcanic cycles (Martí et al., 1994).

After the last destructive event (**~0.175 Ma**), renewed volcanic activity constructed in the central part of the **Las Cañadas caldera** the twin stratovolcano complex **Teide-Pico-Viejo** and numerous satellite vent systems (Mitjavila & Villa, 1993) (Fig.9 g). The stratovolcano complex consists of the Pico del Teide (3718 m a.s.l.) and the Pico Viejo (3134 m a.s.l.). The most notable satellite system is Montaña Blanca, which produced a substantial subplinian phonolitic eruption at ~2 ka (Ablay et al., 1995). The emissions from this rejuvenated stage volcanism are significantly more alkalic and present much higher proportions of felsic products (phonolites) than the older basaltic shields (Ablay et al., 1998). The most recent eruption (1909) took place on the Northwest Rift zone of the central edifices with a basaltic composition (Carracedo et al., 2007).

Episodes of **mass-wasting** events, occurring as early as **6 Ma** and as late as **150 ka**, have affected the Teno, Anaga and Las Cañadas edifices as well as the Central shield (Masson et al., 2002, Carracedo et al., 2007). Large **volcanic landslides** are a common phenomenon in the Canary Islands (Hürlimann et al., 2004). More than 20 huge volcanic landslides were detected during the last decades around the archipelago (Holcomb and Searle, 1991; Watts and Masson, 1995; Watts and Masson, 2001; Teide-Group, 1997; Funck and Schmincke, 1998; Urgeles et al., 2001). Eight of these events are situated on Tenerife and together they removed more than 1000 km3 of volcanic rocks from the upper slopes of the volcanic edifices (Masson et al., 2002; Hürlimann et al., 2004). Two recent day valleys, which have been created due to giant landslides, are the Orotava and the Guimar valley (Fig.10).

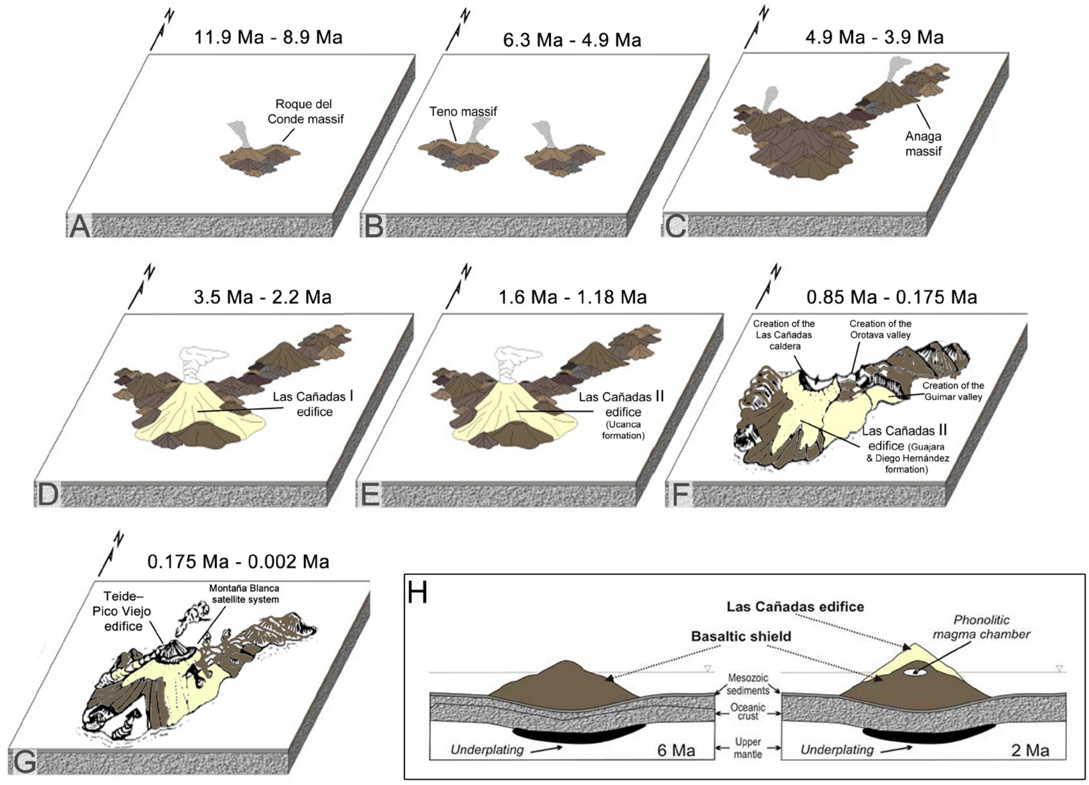


Fig.9 The volcanic evolution of Tenerife with illustrations from Geyer & Martí (2010) and Anchochea (1990).

A) The earliest stages of subaerial volcanism are represented in the Roque del Conde massif, with radiometric dates between 11.9 Ma and 8.9 Ma (Thirlwall et al., 2000; Longpré et al. 2009). **B)** The Teno shield volcano emerged around 6.27 Ma and 4.89 Ma, in the northwest of the present-day island (Thrilwall et al., 2000; Longpré et al., 2009). **C)** The Anaga shield volcano emerged in the northeast from around 4.9 Ma to 3.9 Ma ago (Guillou et al., 2004; Leonhardt & Soffel, 2006). After the last eruptions of the Anaga volcano, a volcanic hiatus of approx. 0.2 Ma followed with intensive processes of erosion (Ancochea et al. 1990). **D)** Around 3.5 Ma to 2.2 Ma ago rejuvenated volcanism started to form the voluminous Las Cañadas I stratovolcano in the central part of Tenerife (Ancochea et al. 1990; Martí et al. 1994). **E & F)** Ensuing the Las Cañadas II volcano started to build up from around 1.59 Ma to 0.175 Ma ago (Martí et al., 1994). It comprises the products of three felsic volcanic cycles: the Ucanca (1.59 –1.18 Ma) (**E**), Guajara (0.85–0.65 Ma), and Diego Hernández (0.37–0.175 Ma) formations (Martí et al., 1994) (**F**). According to Martí et al. (1994, 1997) each Upper Group cycle was terminated by a caldera collapse episode associated with felsic pyroclastic eruptions and followed by a migration in the focus of eruptive activity. **G)** After the last destructive event (~0.175 Ma), renewed volcanic activity constructed in the central part of the Las Cañadas caldera the twin stratovolcano complex Teide-Pico-Viejo and numerous satellite vent systems (Mitjavila & Villa, 1993). The stratovolcano complex consists of the Pico del Teide (3718 m a.s.l.) and the Pico Viejo (3134 m a.s.l.). **H)** Cross-section cutting the Old Basaltic Series and the Cañadas edifices (after Geyer & Martí, 2010). The increase in height of the central part of the shield complex allowed ascending mafic magmas to stop and accumulate in the interior of the basaltic construct, forming shallow magma chambers. There, they evolved phonolitic compositions and drove the construction of the Tenerife central volcanic complex (the Cañadas edifice)(Map from Geyer & Martí, 2010).

1.3.2 Geology and mineralogy of the Anaga and Teno massifs

Tenerife, as already described, is an amalgamation of three basaltic shield complexes of different ages (Ancochea et al., 1990) (Fig.10). The **Anaga peninsula** is roughly 11.5 km wide, 26 km long and has a maximum height of 1024 m a.s.l. (Marinoni & Gudmundsson, 2000; Grafcan 2013) (Fig. 10). The deep valleys (Barrancos), trending N-S to NNW-SSE, cut the Anaga peninsula and expose the stratigraphic succession in which two major angular unconformities have been identified (Marinoni & Gudmundsson, 2000; Guillou et al., 2004; Leonhardt & Soffel, 2006). They are used to divide the Old Basaltic Anaga Series I into three sub-series (lower, middle, upper Series I), representing three successive and major cycles of volcanic activity (Marinoni & Gudmundsson, 2000).

The **Teno massif** is roughly 13.5 km wide, 16.5 km long and has a maximum elevation of 1300 m a.s.l. (Longpré et al. 2009; Grafcan, 2013). It is well delineated by two straight lineaments trending NW-SE and WSW-ENE (Marinoni & Gudmundsson, 2000). Most of the stratigraphic sequences are exposed by ridges (bounded by >200 m high cliffs) and up to 500 m deep eroded canyons (''barrancos'') (Longpré et al. 2009) (Fig.10). In recent years, the major and trace element geochemistry and its implications for magma petrogenesis of the three basaltic shield complexes are widely discussed and studied by various researchers (cf. Anchochea et al., 1990; Neumann et al., 1999; Simonsen et al., 2000; Thirlwall et al., 2000; Longpré et al., 2009).

One of the fundamental findings was the determination of typical signatures (e.g. element ratios, radiogenic isotope ratios, geochemical etc.), either for the whole Canary archipelago or for each shield complex in Tenerife (Schmincke, 1982; Neumann et al., 1999; Simonsen et al., 2000; Thirlwall et al., 2000; Longpré et al., 2009; and others). Generally, TiO_2-rich alkali basalts dominate the mafic magmas in the Canary Islands and the total range varies from hypersthene-normative tholeiitic basalts to strongly undersaturated melilite nephelinites (Schmincke, 1982). In addition, the islands basaltic rocks have typical Ocean Island Basalt (OIB) geochemical signatures (Abratis et al., 2002).

These typical signatures can be related to various mantle sources, which are reflected particularly in different element ratios (e.g. K/Nb, Ba/Nb, Ba/La etc.) and radiogenic isotope ratios (cf. Thirlwall et al., 2000; Abratis et al., 2002). For example, the majority of basalts from the Teno massif have slightly higher Ba/Nb and Ba/La ratios than basalts of the Roque del Conde massif (Abratis et al., 2002). In addition, Teno rocks have the highest Nd and the lowest Sr isotope ratios, instead of the Anaga rocks with the most radiogenic Sr and the lowest Nd isotope ratios (Abratis et al., 2002).

Generally, the **Teno** and **Anaga massifs** are composed of largely **basaltic lava flows** and **pyroclastics**, with abundant **alkali basalts** and **ankaramites**, common **basanites** and less frequent, more evolved **hawaiites, tephrites, mugearites** and **benmoreites** (cf. Thirlwall et al., 2000; Abratis et al., 2002; Longpré et al. 2009). The exposed parts of the Anaga and Teno Mountains are composed of a dominantly alkali-basaltic layered succession of lava flows and pyroclastic deposits (Marinoni & Gudmundsson, 2000). Both massifs are characterized by extensive fractional crystallisation, which involved the progressive separation of olivine, clinopyroxene and magnetite to generate hawaiites and tephrites from basaltic and basanitic parents, followed by the removal of plagioclase, amphibole and subsequently apatite to generate mugearites and benmoreites (Thirlwall et al., 2000). The comprehensive study of Thrilwall et al. (2000) and Longpré et al. (2009) determined **olivine, clinopyroxene, hornblende, plagioclase, magnetite** and **apatite** as the common minerals in the volcanic rocks of the Anaga and Teno Mountains. Both studies collected and analysed several dozen of volcanic rocks from various altitudes (100 – 1100 m a.s.l). For example, Thrilwall et al. (2000) analysed the geochemical and mineralogical composition of 42 Anaga and 46 Teno rocks. In addition, Longpré et al. (2009) analysed the geochemical and mineralogical composition of 22 Teno rocks. Thereby, clear mineralogical differences have been determined between the mineral composition of Teno and Anaga rocks.

According to Thirlwall et al. (2000), the 42 **Anaga rocks** contain: **Olivine** in the range of 0.2 and 30 % (30 rocks), **clinopyroxene** in the range of 0.5 – 45 % (40 rocks), **hornblende** in the range of 0.2 and 4 % (9 rocks), **plagioclase** in the range of 0.1 and 10 % (8 rocks), **magnetite** in the range of 0.1 and 5 % (determined for 35 rocks), **apatite** in the range of 0.5 and 1 % (5 rocks).

According to Thirlwall et al., (2000), the 46 **Teno rocks** contain: **Olivine** in the range of 0.2 and 40 % (35 rocks), **clinopyroxene** in the range of 0.1 – 50 % (38 rocks), **hornblende** in the range of 0.1 and 4 % (determined for 7 rocks), **plagioclase** in the range of 0.5 and 40 % (10 rocks), **magnetite** in the range of 0.1 and 5 % (20 rocks), **apatite** in the range of 0.2 and 0.5 % (2 rocks).

The results from Thrilwall et al. (2000) and Longpré et al., (2009) showed higher levels of olivine, hornblende and plagioclase in the Teno Mountains as in the Anaga Mountains. Both areas contain relatively similar amounts of magnetite and clinopyroxene (Thrilwall et al. 2000). For the further discussion about geochemical fingerprints it is important to keep in mind that differences exist in the olivine, hornblende and plagioclase amounts. Volcanic rocks of Tenerife contain higher amounts of Fe-Ti oxides as other volcanic regions (Martinéz et al. 2007; Arnalds et al. 2007).

1.3.3 Geology and mineralogy of the Orotava valley

As already described, several valleys (Orotava, Icod, Guimar) have been formed due to giant volcanic landslide events, which are related to the various changing volcanic activities (cf. Masson et al., 2002, Abratis et al., 2002; Hürlimann et al., 2004; Carracedo et al., 2007). The Orotava valley has the shape of an antique amphitheatre (Fig.10). It is roughly 7.5 km wide and 9 km long (Grafcan, 2013) (Fig.10). A huge volcanic landslide formed the Valley for around 0.56 Ma ago (Hürlimann et al., 2004). The valleyis filled by a significant amount of post-slide volcanic deposits, which can be divided into two main rock sequences: the pre-slide deposits (older than 0.56 Ma) and the post-slide deposits (younger than 0.56 Ma)(Hürlimann et al., 2004; IGME, 1988). Outcrops of the pre-slide deposits are located along the lateral valley scarps, including the Tigaiga scarp, the Dorsal Ridge, the Los Organos and the St. Ursula scarp (Fig.10) (Hürlimann et al., 2004).

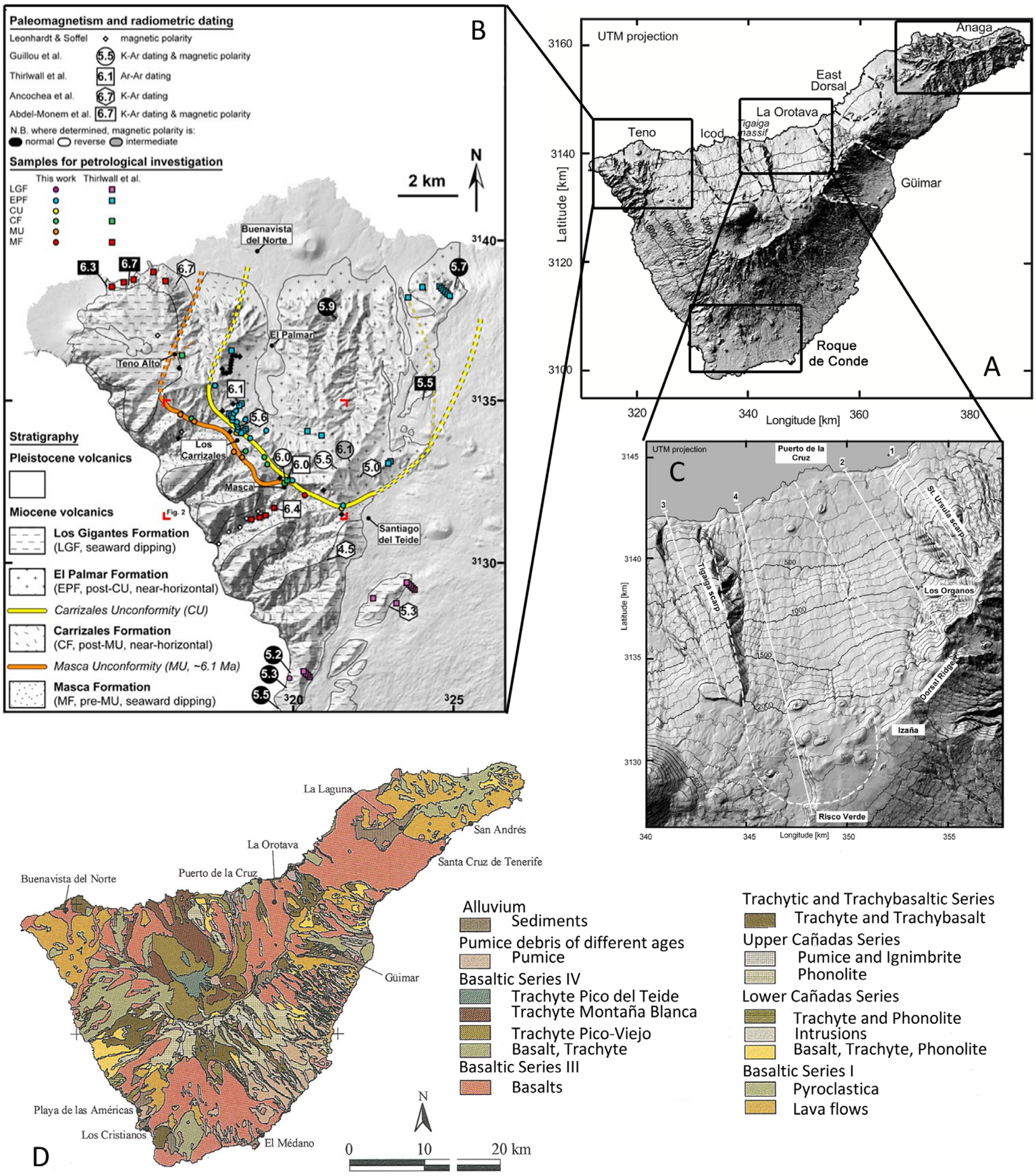


Fig.10 A) Shaded relief of Tenerife (Map from Grafcan, 2013; Hürlimann et al., 2004). B) Detailed information of the Teno massif from Longpré et al., (2009). C) Shaded relief of the Orotava valley (Map from Hürlimann et al., 2004). D) Geology of Tenerife, according to Naumann (2008).

Pre-slide deposits: The Tigaiga massif, at the western border of the valley, is composed of intermediate to phonolitic lavas and phonolitic pyroclastics belonging to the Las Cañadas edifice (Ibarrola et al., 1993; Martí, 1998). It has to be mentioned that the laurel forest samples are collected at this area. The pre-slide deposits at the eastern part are characterized by mafic lava flows from eruptive vents located along the Dorsal Ridge (''old Ridges'') (Hürlimann et al., 2004).

Post-slide deposits: Nearly the entire valley is covered by post-slide deposits (''young Ridges''), which exceed in some locations a thickness of 500 m (Servicio de Planificación Hidráulica, 1991). They consist mainly of breccia and lava flows (Hürlimann et al., 2004). In addition, thick layers of valley filling breccia were found in the water tunnels drilled in the La Orotava valley (Coello, 1973; Hürlimann et al., 2004). These breccia deposits are covered by a thick sequence of lava flows, which come from the volcanic centres along the Dorsal rift zone and from eruptive vents inside the Las Cañadas caldera (Hürlimann et al., 2004). The top of the post-slide sequence contains, either phonolitic pyroclastic deposits of Diego Hernández age or lava flows of the Teide – Pico Viejo age (Hürlimann et al., 2004).

Generally, it can be stated that the Orotava valley and the lateral valley scarps consist of a variety of different rock types belonging either to the Las Cañadas Volcano, the shield complex or to the Teide-Pico Viejo complex (Ablay et al. 1998). According to Ablay et al. (1998), the possibly occurring rocks are: **magnesian alkali basalts, basanites, plagioclase basanites, phono-tephrites, tephri-phonolite, trachy-phonolites**. In addition, the most commen minerals are: **olivine, clinopyroxene, plagioclase** (coexisting Ca-plag and resorbed Na-plag)**, apatite, kaersutite, titano-magnetite, ilmenite, alkali feldspar, biotite** and **titanite**. The rocks belonging to the Teide – Pico Viejo complex contain high amounts of Sr, Ba and Fe in contrast to the Las Cañadas edifice (Ablay et al., 1998).

1.4 Geogenic and anthropogenic element sources

Generally, soils are the interface between the lithosphere, the hydrosphere and the atmosphere. This particular interface position makes soils to critical environments due to the fact they are subdued by a number of element impacts, which are either released by anthropogenic element sources (e.g. industrial, agricultural, transport, etc.) or by geogenic element sources (e.g. weathering of rocks, surface waters, geothermal systems etc.) (Facchinelli et al., 2001). It is reported, that anthropogenic heavy metal inputs to soils, exceeded the natural geogenic inputs in the last decades, even on a regional scale (Facchinelli et al., 2001; Alloway, 1995).

Alloway (1995) reported and discussed this fact by comparing the Cd, Pb and Zn contents of soils from remote areas with soil contents of more densely populated areas. Nevertheless, soils can also exhibit a high natural variability of element contents, which is related and controlled by the heterogeneity of the soil parent lithology and by the process of weathering to which the soil-forming materials have been subjected (Adriano, 1986; Facchinelli et al., 2001). Generally, the more aged the soils are, the less they are influenced by the soil parent rocks (Adriano, 1986).

There is an extreme variable nature of trace element concentration in various soil forming rocks (Adriano, 1986). In the last decades, the terms background concentration or natural concentration have been frequently discussed by various researchers due to the natural variability of elements in soils and due to the widespread anthropic impacts (Gough et al., 1994; Chen et al., 1999; Facchinelli et al., 2001). Both terms have proved to be theoretical rather than practical concepts (Facchinelli et al., 2001). To determine polluted element levels in soils, it is useful to have good knowledge about the mean element contents of the examined region, the natural variability of these elements in soils and the general geochemical baseline concentrations (Facchinelli et al., 2001). Furthermore, it is necessary to apportion the anthropogenic impacts and lithogenic inputs. Nevertheless, the differentiation between both sources is a difficult task in populated and industrial areas, where totally unpolluted soils are nearly impossible to find (Facchinelli et al., 2001; Alloway, 1995). According to Alloway (1995), elements often influenced by anthropogenic emissions are: **Cd, Sb, Ag, Pb, Zn, Se, As, Cu, Ni, Co, Mn** and **V**. Several common anthropogenic and geogenic elements sources are briefly summarized to get an overview about the large range of various element sources.

Geogenic sources of elements: Generally, natural sources and processes, which contribute elements to soils are: e.g. weathering of rocks, mineral deposits, dust particles, Saharan dust particels, sediments, ground waters, surface waters, geothermal systems, volcanic emissions, sea spray aerosols, forest fires, biogenic emissions, and others. In recent years, it is more and more recognized that the uplift, transport and deposition of mineral dust have severe impacts on the atmospheric, pedological and marine compartments (Scheuvens et al., 2012).

For example, regular occurring Saharan dust events cause an increase of the aerosol concentrations over the Canary Islands, especially during the summer months (Arimoto et al., 1995; Dorta-Antequera, 1999; Viana et al., 2002; Kandler et al., 2007; Scheuvens et al., 2012). Kandler et al. (2007) analysed dust samples from two strong homogeneous dust plumes from the Saharan desert, which reached the Izaña Atmospheric Observatory in Tenerife. They reported that the aerosols over Tenerife are dominated by mineral dust with an average composition (by volume) of 64% silicates, 6% quartz, 5% calcium-rich particles, 14% sulphates, 1% hematite, 1% soot and 9% other carbonaceous material (Kandler et al., 2007). In addition, sulphate was found predominantly as coating on other particles and the aerosol calcium content can be correlated with the calcite concentrations of soils in the source region (northern and central Algeria and Morocco, Mali, Mauretania) (Kandler et al., 2007; Scheuvens et al., 2012).

Anthropogenic sources of elements: Today, dozens of anthropogenic sources exist world wide, contributing soils either with harmless elements (Ca, P, N, etc.) or with harmful and hazardous elements (Hg, Cd, Pb, etc.). Common anthropogenic source are: e.g. commercial fertilizers, liming materials, sewage sludge, animal wastes, pesticides, irrigation waters, coal combustion residues, metal smelting industries, traffic emissions, waste combustion processes, fuel burning processes and others. On a regional scale, motor vehicles play a major role by releasing harmful elements to the environment (Stark, 1995).

For example, zinc oxide (ZnO), which is used in the manufacture of car tires, is often contaminated with lead (Pb) and cadmium (Cd) (Stark, 1995; Baumann & Ismeier, 1998; Continental, 1999). In addition, antimony (Sb) is used for brake pad manufacturing processes to increase the heat resistance during deceleration processes (Stark, 1995; Baumann & Ismeier, 1998). Therefore, tires (abrasion processes, recycling or burning of old tires), brake pads (wear due to deceleration processes), and road surface abrasion can contribute various elements to the environment (Stark, 1995; Baumann & Ismeier, 1998; Continental, 1999).

Several studies determined increased Cd, Pb and Zn values within soils and plants near roads (Pagotto et al., 2001; Tausz et al., 2005). However, several other anthropogenic sources exist, releasing elements, such as Cu or Hg, on a global or regional scale. These include the combustion of wood products, fossil fuels, and municipal waste (Baker & Senft, 1999). Furthermore, the distance to power lines can also affect the Cu content of surface soils (Nriagu, 1979; Baker & Senft, 1999). Generally, the first signs of anthropogenically induced surface soil pollution are significantly higher element levels as the geochemical backgrounds, the natural mean contents and increased element accumulation within the topsoils (Adriano, 1986).

2. Methods

2.1 Study area

All sampling sites are located on the windward northern slope of Tenerife between 500 and 1200 m.a.s.l, due to the distribution of the main laurel forest areas (Fig.11). In order to produce comparable and representative results, all of the 26 sampling sites have been selected under strict compliance with clearly defined biological and pedological criteria. Areas not complying with these criteria have not been taken into account for the present research work.

2.1.1 Biological and pedological selection criteria

The laurel forest tree species ***L. novocanariensis*** has to be found at all sampling locations. Moreover, it does not make a difference whether the ***L. novocanariensis*** is growing in the ***Laurisilva*** or in the ***Fayal-Brezal*** areas as long as ***L. novocanariensis*** is present. All trees have to have a vital look. The sampled leaves and roots have to belong to this tree species. The ***L. novocanariensis*** leaves must grow in a height, which is reachable without the use of a ladder (approx. 2 – 3 m).

In addition, the leaves have to be collected always in the same leaf height due to the fact that the element contents are changing with increasing heights (Sander et al., 1998; Jones & Jacobsen 2005). Furthermore, it is very important to avoid any damages at the sampled trees. All of the selected ***L. novocanariensis*** trees should grow on a relatively flat surface in order to avoid any slope effects within the soils (e.g. loss of soil, increased soil erosion effects, increased leaching effects etc.) (McCool et al., 1987a; Liu et al., 1994). In order to make sure that the trees received their nutrients from the related soils, all profiles have to be dug right next to the selected trees.

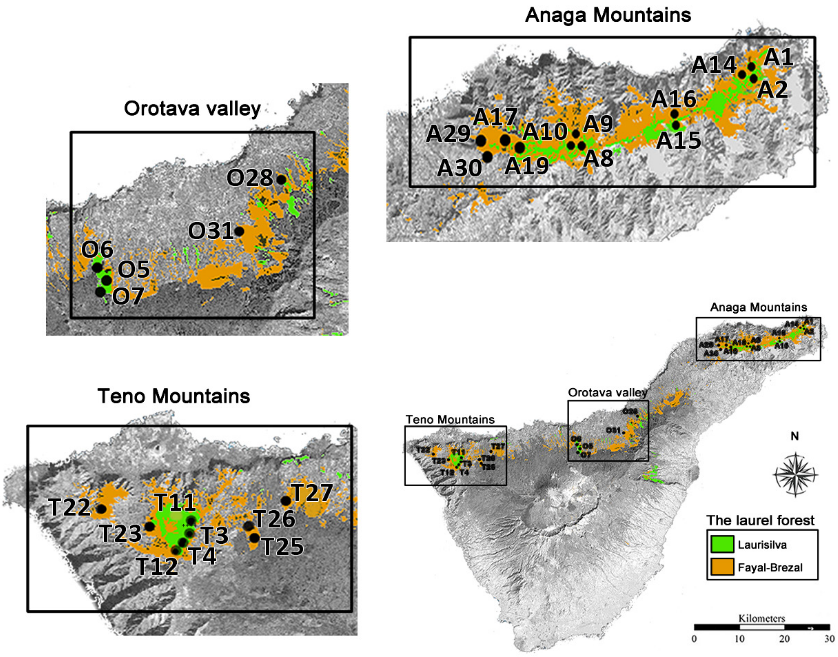


Fig.11 The 26 sampling sites on the northern slope of Tenerife (laurel forest distribution map after Naumann, 2008).

2.1.2 Terrain selection criteria

For the upcoming discussions about **geochemical fingerprints** and **anthropogenic impacts** the laurel forest sampling sites have to fulfil the following criteria:

a) Several sampling sites have to be located in more or less remote areas. In addition, the sampling sites must be difficult to reach and far from roads, hiking trails and popular touristic viewpoints, in order to avoid obvious anthropogenic influences.
b) Several sampling sites should be located in areas which are traversed either by more or less frequented roads or by small forest tracks.
c) Several sampling sites should be located near popular excursion destinations, which are regularly visited by inhabitants and tourists. Nevertheless, the selected trees and soil profiles should be located several 100 m away from popular hiking trails, roads, car parks and turning platforms due to the fact that these areas are obviously anthropogenically affected.

For the discussion about **essential nutrient contents**, the following criteria should be fulfilled:

a) Several sampling sites should be located on fallow agricultural field near the border of the laurel forest vegetation zone.
b) The agricultural areas must not have been cultivated for several years or decades.
c) The species L. novocanariensis has to be found in all these areas.
d) The climatic conditions should be comparable to those of the laurel forest (e.g. regular occurring clouds, high humidity etc.)

One of the geographers, involved in the project (S. Günthert) has narrowed down the number of the most potential fallow agricultural areas in advance, in order to find appropriate spots without wasting too much time throughout the sampling campaign. To this end he used a remote-sensing based analysing technique tool for orthophotos, consisting of an automatized texture-oriented and area-wide extraction of linear agricultural structures like plough furrows, field boundaries and agricultural terraces (Günthert et al., 2011a). This tool allows for an accurate identification of the total area that has once been used for agriculture on Tenerife. It also includes older fallow agricultural areas with a higher level of natural succession, assuming that long-term fallow areas can be detected mainly together with old agricultural terraces and their specific linear texture (dry walls) (Günthert et al. 2011a). Employing this method of detection, several sampling sites were determined near the fringes of the laurel forest, which have formerly been covered with laurel forest, including the L. novocanariensis tree species.

2.1.3 The selected sampling sites

Using the criteria described above, 26 sampling sites have been selected, which are distributed over the Anaga Mountains, the Orotava area and the Teno Mountains (Fig.11). They include 17 laurel forest locations and 9 fallow agricultural locations. The collected samples are labelled according to the following example: The letter preceding the number refers to the sampling area (e.g. A1), the number itself refers to the sampling site. All Anaga samples are labelled with the letter A. All Orotava samples are labelled with the letter O and all Teno samples with the letter T. The laurel forest sampling numbers range from 1 to 19 and the fallow agricultural sampling numbers from 22 to 31. In addition, the sampling areas are divided into the following groups with different location properties.

The sampling sites **A1, A2, A14, T3, T4, T11** and **T12** are located within more ore less **remote** laurel forest **areas**. They are located far from highly frequented roads, popular touristic viewpoints and they are only traversed by a few hiking trails. The sampling sites **A15, A16, A17** and **A19** are located in laurel forest areas, which are **traversed** by more or less frequented **roads**. The sampling sites **A8, A9** and **A10** are located near one of the most **popular touristic** viewpoints within the laurel forest, called "Pico del Ingles". During the sampling campaigns it became obvious that several hundred tourists, carried by bus or car, are visiting the viewpoint per month. The sampling sites **O5, O6** and **O7** are located at the Tigaiga massif, which forms the **steep** western **slope** of the Orotava valley. This area is traversed only by small forest tracks, which are irregularly frequented by municipal workers and by a **few hiking trails**. Nevertheless, the laurel forest areas are exposed to urban emissions from the densely populated Orotava valley. The sampling sites **T22, T23, T25, T26, T27, O28, A29, A30** and **O31** are distributed over the Anaga, Orotava and Teno area. These sites are classified as **fallow agricultural areas**, which have formerly been used for the production of crops. However, these fields have been unused and abandoned for several years or decades. Table 1 shows all sample areas and the coordinates.

2.2 Field methods

2.2.1 Sample types and sampling technics

Vegetation samples

Altogether 60 *L. novocanariensis* leaf samples have been collected from **30 trees**. Of these, 21 trees are located in main forest areas. The remaining 9 trees are located on fallow agricultural fields. The determination of the tree species *L. novocanariensis* was carried out by common identification methods (Bernhardt, 1989). The specie Myrica looks at the first glance very similar to *L. novocanariensis* (Fig.12). There are distinct differentiation characteristics (Bernhardt, 1989). For example, the *L. novocanariensis* leaf midribs are hairy and in the corners of the leaf veins occur regularly so-called „Domatien" (shell-shaped depressions). They contain often mites and are typical for this species (Fig.12).

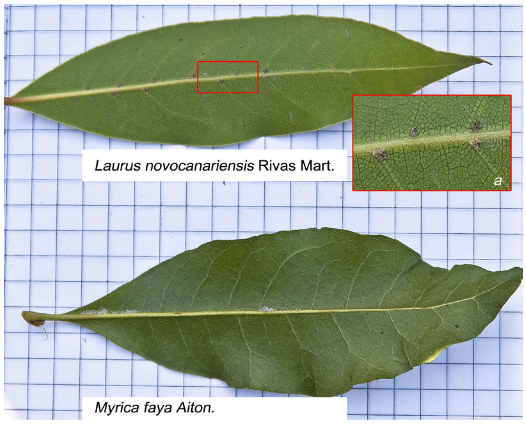


Fig.12 *L. novocanariensis* leaf midribs are hairy and in the corners of the leaf veins occur regularly so-called „Domatien" (shell-shaped depressions). They contain often mites and are typical for this species *L. novocanariensis*.

The occurring vegetation of the different sample areas (Laurel forest and agricultural areas) is described in section "1.1 Biological settings of the laurel forest" on page 3 and "1.1.1 Fallow agricultural areas near the border of the laurel forest" on page 8. **Each leaf sample** consists of approximately **150 wet leaves** with a total weight of approximately **250 g**. All leaves have been ripped of around the selected tree between 2 to 2.5 m leaf height (using sterile lab cloves). Within the laurel forest it was possible to collect *L. novocanariensis* roots without harming the corresponding tree.

Unfortunately, it was not possible to collect roots from agricultural sampling sites. The roots were either to deep or it could have caused serious damage to the tree if roots were collected. The sample types and sample amounts are shown in Table 1. All leaf and root samples are stored in labelled paper bags. Paper bags are used in order to avoid mouldy leaves and roots. If two trees with different heights are sampled at the same location, the samples are additionally labelled with the letters Y (younger tree) or O (older tree). After the fieldwork, all samples are oven dried for 24 h at 55° C ± 2°C to avoid mouldy leaves.

Soil samples

Overall, **26 soil profiles** were excavated right next to the 30 sampled trees by using a common stainless steel shovel. At the sampling sites A1, A15, T3 and T12 two trees with different heights have been sampled at each soil profile. In these cases the related soil profile were excavated in the middle of both trees. Anyway, depending on the corresponding bedrock, the 26 soil profiles have various depths, ranging from 10 to 76 cm. Between 7 and 14 soil horizons have been sampled within each profile. Each soil horizon sample has the similar size (15 x 15 x 2 ± 0,5 cm) and the same sample space intervals within the upper soil horizons (**0 - 2 cm; 2 – 4 cm; 4 – 6 cm; 6 – 8 cm; 8 – 10 cm; 10 – 12 cm; 14 – 16 cm**). Deeper 17 cm, soil samples were collected with varying intervals until the bedrocks increased.

The present study focuses particularly on the upper soil horizons (0 – 15 cm) due to the main research objectives. A total of **124 soil samples** were collected from the upper soil horizons, including 89 laurel forest soil horizons and 35 fallow agricultural soil horizons. The soil colours are determined by using a Munsell soil colour chart. Generally, the sampled laurel forest soils have a thick, black- coloured organic surface layer. The sample types and sample amounts are shown in Table 1.

The soil colours vary between black to dark reddich brown and the soils are fine to medium grained. The soil moisture conditions are generally high, which is caused by regular rainfalls and high humidity. Generally, the laurel forest soils can be classified as Andisols and Inceptisols (Soil Survey Staff, 1999) (see 1.2 Pedological settings). The agricultural soils are homogenized, mostly unconsolidated, and fine to medium grained. The soil colours vary from brown to dark brown or reddish brown with no horizons. Generally, a distinct humus layer is mostly missing, which can be related to the low amount of litter fall and biomass. After each sampling day, the soil samples were stored in a dark and relatively cool environment, in order to limit occurring degradation processes.

Rock samples
At each soil profile about **1 kg** of volcanic rocks has been collected. Altogether there are **29 rock samples**. At the profiles T4, O7 and A16, two different rock types have been collected. These samples are labelled additionally with the letter A and B. Generally, the sampled rocks are mostly dark basalts and often strongly weathered basaltic and trachybasaltic lava flows or pyroclastics. Table 1 shows the most important information about the 26 sampling sites, including coordinates, amount of samples etc. The detailed sampling site descriptions are attached in the Appendix. The sampling site descriptions include the most important observed parameters (e.g. occurring vegetation, soil description, soil temperature etc.).

Table 1 List of all sample areas, types, amounts and properties.

Location	Type*	Nr.	Coordinates	Sample types and amounts			
				Rock	Soil (0-16 cm)	Roots	Leaves**
(Anaga) Northeast Anaga	LF	A1	28°33’41.68”N 16°10’11.90”W	1	5	2	4
		A2	28°33’36.85”N 16°10’17.67”W	1	5	1	2
		A14	28°33’41.32”N 16°10’19.73”W	1	5	1	2
(Anaga) Bailadero	LF	A15	28°33’08.06”N 16°12’13.65”W	1	6	0	4
		A16	28°32’59.35”N 16°12’12.11”W	2	6	1	2
(Anaga) Pico del Ingles	LF	A8	28°31’58.16”N 16°15’47.24”W	1	5	1	2
		A9	28°32’17.06”N 16°16’04.92”W	1	5	1	2
		A10	28°32’08.64”N 16°16’07.29”W	1	5	1	2
(Anaga) NW Las Mercedes	LF	A17	28°32’03.63”N 16°17’59.74”W	1	6	1	2
		A19	28°31’50.51”N 16°17’39.17”W	1	6	1	2
	AGR	A29	28°31’37.94”N 16°19’03.88”W	1	4	0	2
		A30	28°31’48.28”N 16°18’32.36”W	1	4	0	2
Orotava valley (Tigaiga)	LF	O5	28°21’10.91”N 16°35’18.24”W	1	5	1	2
		O6	28°21’26.10”N 16°35’38.74”W	1	5	1	2
		O7	28°21’19.11”N 16°35’18.43”W	2	5	1	2
	AGR	O28	28°26’11.96”N 16°27’11.54”W	1	4	0	2
		O31	28°24’13.51”N 16°29’28.93”W	1	4	0	2
Teno Mountains	LF	T3	28°19’41.34”N 16°48’42.74”W	1	5	1	4
		T4	28°19’37.29”N 16°48’45.02”W	2	5	1	2
		T11	28°19’18.22”N 16°49’16.26”W	1	5	1	2
		T12	28°19’73.07”N 16°48’65.03”W	1	5	1	4
	AGR	T22	28°20’50.71”N 16°52’39.87”W	1	4	0	2
		T23	28°20’35.15”N 16°51’26.38”W	1	4	0	2
		T25	28°20’17.35”N 16°47’15.05”W	1	3	0	2
		T26	28°20’14.90”N 16°47’11.41”W	1	4	0	2
		T27	28°21’13.55”N 16°46’15.88”W	1	4	0	2
			Total amount of samples	29	124	17	60

* LF = Laurel forest areas; AGR = Fallow agricultural areas

*Each leaf sample consists of approximately 150 wet leaves with a total weight of approximately 250 g

2.2.2 pH measurements of aqueous soil extracts

Within the framework of the present doctoral thesis, the pH levels of several laurel forest soils (T3, T11, T12, O5, O6, O7, A8, A9, A10) have been determined together with 3 Bachelor students during the fieldwork. The determined pH results are reported in their bachelor theses and within the result section of the present research work. In addition, the bachelor theses are available at the Institute of Earth Sciences (University of Heidelberg) and the theses titles are listed in the references ("9.3 Supervised and organised Bachelor theses" on page 185). The pH values are determined in aqueous soil extracts. Generally, litmus paper or pH strips are also usable for pH measurements in field. However, the field kit MultiLine F/Set-3 has been used for the pH measurements of aqueous soil extract, including the multiparameter measuring transmitter MultiLine P4 and the pH combination electrode SenTix41. In the run-up of each measurement series, the pH meter has been calibrated by using two standard solutions (pH 4, 7).

Calibration procedures are followed by the manufacturer's instructions. Approximately 1 ml of soil and 10 ml of deionized water are mixed together in a labelled Falcon tube. The solution has been shaken for approx. 10 min before the pH measurement started. In addition, the pH electrode SenTix41 has been rinsed thoroughly with deionized water between each measurement. Depending on the occurring bedrock, 5 to 8 soil extracts were measured with the same sample space intervals at each sampling site (0-2 cm, 2-4 cm, 4-6 cm, 6-8 cm, 8-10 cm, 14-16 cm, 22-24 cm etc.).

2.2.3 Soil carbonate test

This method can be used to determine the presence of carbonates in soils. As described in various reports, the soil carbonate test is based on the reaction of HCl with soil carbonates (see equation 1) and the visual observation of gaseous loss of CO_2 from the sample (U.S. Salinity Laboratory Staff, 1954; Allison & Moodie, 1965; Sobeck et al., 1978). However, the method is not quantitative and should only provide an overview of possibly occurring soil carbonates. During the fieldwork of the present study, the presence of carbonates has been tested at all sampling sites within 2 to 4 soil samples from the upper soil horizons, according to the following reported method (Allison & Moodie, 1965):

Approximately 4 to 6 g of soil sample was placed on a watch glass. Afterwards, a few drops of hydrochloric acid solution (HCL 10%) were added on the sample. Possibly occurring effervescence has been categorized as slightly reactive, moderately or highly reactive (Allison & Moodie, 1965).

$$CaCO_3(s) + 2\,HCl(aq) \rightarrow CaCl_2(aq) + CO_2(g) + H_2O(l) \qquad (1)$$

2.3 Laboratory methods

2.3.1 Sample preparation

The sample preparation is done partially at the Institute of Earth Sciences (University of Heidelberg) and partially at the Acme Analytical Laboratories Ltd. in Vancouver, Canada. The preparation steps a to d are done in the Institute of Earth Sciences. Subsequently, all samples are sent via airmail to the Acme Analytical Laboratories Ltd. (Vancouver, Canada). The preparation steps e and f are done at the Acme labs for the upcoming bulk chemical analyses. Only the soil samples are already prepared for the analyses.

a) Leaf samples

For each of the 30 trees, 2 x 10 g of already dried leaf samples (overall 60 samples) are filled into labelled plastic wide-neck cans. The samples are labelled with the related sample number and either with the suffix washed (wsh) or unwashed (nwsh). This is done because half of the samples will be washed at the Acme Labs before they are analysed. Acme offers its own proprietary method, which is adapted especially to dried leaf samples, without causing any effects of leaching (written notification, Customer Service Acme Analytical Laboratories Ltd.).

b) Root samples

The 16 root samples are thoroughly washed with deionized water to remove all soil particles. The wet and cleaned root samples are frozen at -20°C for about 3 days and afterwards freeze-dried for about 4 days by using the Steris Lyovac GT2. Afterwards, 10 g of each sample is filled into an appropriate labelled wide-neck can.

c) Soil samples

The 124 soil samples are frozen at -20° C for about 3 days. Afterwards, the samples are freeze-dried for about 4 days (Steris Lyovac GT2) (Fig.13 a). Then, the dried soil samples are sieved by using a coarser mesh size (e.g. 2 mm) to remove rock fragments, small roots and other organic materials. The sieved samples are filled into agate cups and milled for 15 minutes (250 rpm) by using a planetary ball mill (Fritsch Pulverisette GT2) (Fig.13 b). In addition, the pulverized samples are sieved again (100 mesh) in order to remove the remaining small organic components and rock fragments (Fig.13 c). Finally, 20 g of each sample is filled into a wide-neck can, which is labelled with the sample number and the related soil horizon (e.g. A1 0 – 2 cm).

d) Rock samples

All rock samples are washed thorough with deionized water, in order to remove all soil particles. The washed samples are subsequently oven dried (55°±2°C) for 24 h. Finally, approximately 200 g of each sample is filled into a labelled wide-neck can.

Fig.13 A) The small freeze-drying unit Steris Lyovac GT2. B) The freeze-dried samples are placed into agate cups, which are used for the planetary ball mill Fritsch Pulverisette GT2. C) Subsequently, all samples are sieved again (100 mesh) to remove the remaining small organic components.

e) Leaf and root samples

Each leaf sample, labelled with the suffix "washed" and each root sample is placed in a plastic pan, which is filled with deionized water (Type-1 water). To remove dust particles and to avoid leaching effects, the filled plastic pan is gently moved back and forth for 5 minutes. Afterwards, the washed samples are dried at 60° C for 24 h. Then, all dry leaf (washed & unwashed) and root samples are pulverized to 100-mesh size by using a planetary ball mill.

f) Rock samples

The rock samples are crushed to 80%, passing a 10-mesh size. Afterwards, a quarter of the crushed sample split off for being pulverized to 85%, passing a 200-mesh size.

2.3.2 Bulk chemical analysis

The **Acme Analytical Laboratories** performed the bulk chemical analyses of the rock, soil, root and leaf samples. The following measurement procedures are reported in the latest Acme Lab. price list (2013). Unfortunately, the laboratory is very reluctant in terms of instrument specifications and detailed sample procedures. However, the analytical instruments (e.g. ICP-MS, Leco etc.) are briefly explained in a subchapter due to the fact that the unknown manufacturers specifications have no effect on the general measurement principles.

Rock and soil samples

The analytical standard method code **4A02/4B02** was chosen for the rock and soil samples. This method determines 66 inorganic elements, including the major oxides and several important trace elements. The total abundances of the major oxides and several minor elements were reported on a 0.2 g sample, analysed by ICP-emission spectrometry following a Lithium metaborate/ tetraborate fusion and a dilute nitric digestion. The rare earth and refractory elements were reported on a 0.2 g sample, analysed by ICP mass spectrometry following a Lithium metaborate / tetraborate fusion and a nitric acid digestion. In addition, a separate 0.5 g split is digested in Aqua Regia (HNO_3 + 3HCL) and analysed afterwards by ICP Mass Spectrometry to report the precious and base metals. The total carbon and total sulphur contents were measured by using a Leco Carbon/Sulfur-Determinator. The Loss on ignition (LOI) is determined by weight difference after ignition at 1000° C.

Vegetation samples

The analytical standard method code **1VE2** was chosen for the vegetation samples. This analytical method includes the determination of 53 inorganic elements by Ultratrace Aqua Regia Digestion. Therefore, 0.5 g of a prepared sample is digested first in HNO_3 and then in Aqua Regia. Afterwards the digested sample is analysed by ICP- mass spectrometry. The complete analytical data sets, including all elements, are attached on the DVD in the appendix (page 286).

2.3.2.1 ICP-OES, ICP-MS, Carbon/Sulphur - Determinator

Inductively Coupled Plasma Optical Emission Spectrometry (ICP-OES) or Inductively Coupled Plasma Mass Spectrometry (ICP-MS) are commonly used analytical technique for the inorganic elemental determination (Olesik, 1991). Generally, both technics are using a high-temperature Inductively Coupled Plasma (ICP) source, which converts the atoms of the elements in the sample to ions (Olesik, 1991). Typically, the sample is introduced into the plasma as an aerosol, either by aspirating a liquid or dissolved solid sample into a nebulizer or using a laser to directly convert solid samples into an aerosol (Olesik,1991). At the **ICP-MS** the sample aerosol is introduced into the ICP torch and completely desolvated. The elements in the aerosol are converted first into gaseous atoms and then ionized towards the end of the plasma, which are then separated and detected by the mass spectrometer (Olesik, 1991).

At the **ICP-OES** the plasma energy excites the component elements (atoms). When the excited atoms return to low energy position, emission rays (spectrum rays) are released and the emission rays that correspond to the photon wavelength are measured (Olesik, 1991). The element type is determined based on the position of the photon rays, and the content of each element is determined based on the rays' intensity (Olesik, 1991).

The **LECO CNS** Carbon, Nitrogen and Sulphur Analyser is a non-dispersive, infrared, microcomputer based instrument, designed to measure the total carbon, nitrogen, and sulphur content in a wide variety of materials (LECO Corporation, 2007). The majority of metals and their alloys will burn in oxygen if heated to a high enough temperature. The carbon in the sample is oxidized to carbon dioxide (CO_2) while the sulphur is converted to sulphur dioxide (SO_2). CO_2 and SO_2 can then be measured by infrared (IR) detectors (LECO Corporation, 2007). Often, combustion of inorganic materials can be hastened through the use of an accelerator (LECO Corporation, 2007). The purpose of the accelerator is to ignite or set fire to the sample. It can also double as a flux to dissolve any oxide skins making the melt thoroughly fluid (LECO Corporation, 2007).

2.4 Precision, Accuracy and Total Analytical Errors

The Acme Analytical Laboratories are using various technics for the quality control and for the verification of the analytical precision and accuracy. Each analysing package includes several results of **reagent blanks, in-house reference materials, pulp duplicates** and **reject duplicates.** For example, reagent blanks are used to measure the background noise and reject duplicates are used to monitor sub-sampling variations. Nevertheless, unrecognizable certified **USGS reference materials** (e.g. SGR-1, BCR-2, GSP-2) were sent to the lab as well to prove the accuracy of the measurements.

2.4.1 Method detection limit (MDL)

Within the present study, all of the mentioned method detection limits (MDL) have been determined by the Acme Analytical Laboratories. Generally, the MDL is calculated by multiplying the Instrument Detection Limit or Lower Level of Detection by the dilution prior to analysing the sample solution on the instrument (IUPAC, 1997). This estimation, however, ignores any uncertainty that arises from performing the sample preparation and will therefore probably underestimate the true MDL (IUPAC, 1997). The various MDL´s of the two analytical methods (4A02/4B02 and 1VE2) are shown in table 2.

2.4.2 Precision of measurements

Precision is also called reproducibility or repeatability. Precision expresses the degree to which repeated measurements under unchanged conditions show the same results (Brodersen et al. 2010). For example, if a sample is measured several times in succession, the precision expresses how close all analytical results are to each other (Brodersen et al. 2010). The Acme Lab proved their analytical precision with several dozen repeated measurements of various In-house reference materials (STD DS8, STD GS311-1, STD GS910-4, STD OREAS45CA, STD-SO-18, STD-V14, STD-V16) and pulp duplicates.

The standard deviation (SD) and the percent coefficient of variation (% CV) are generally used to express the analytical precision (Taylor, 1999). The standard deviation expresses how much variation exists from the mean value or the expected value (Taylor, 1999). The normal SD distribution looks like a bell shaped curve (Fig. 14). The SD can be expressed by equation 2, where $\bar{\mathbf{X}}$ is the mean of all samples, **X** the value of an individual sample and **n** the number of samples. The mean value is calculated by equation 3, where $\mathbf{X_n}$ is the sum of all results and **n** the number of all samples.

The 1 standard deviation (1 SD) indicates that the results tend to be very close to the mean and 68% of the determined results will fall into the range of the Mean ± 1 SD (Taylor, 1999). The 2 standard deviation (2 SD) indicates that the results are spread out over a large range of values and 95% of the results will fall into the range of the Mean ± 2 SD (Taylor, 1999).

The 2 SD is calculated by multiplying 1 SD with the factor 2. The percent coefficient of variation (% CV) expresses the standard deviation as a percent of the average value (Taylor, 1999). It can generally be used to compare the variations of a test method with other test methods. The % CV can be determined with equation 4, where **1SD** is the first standard deviation and $\overline{\mathbf{X}}$ the mean of all samples.

$$1\ SD = \sqrt{\frac{\sum(x-\overline{x})^2}{n-1}} \qquad (2)$$

$$\overline{X} = (\sum X_n)/n \qquad (3)$$

$$\%CV = 1SD/\overline{X}*100 \qquad (4)$$

2.4.3 Verification of the reproducibility of the measurements

Within the present study, the reproducibility of the measurements has been verified by the calculation of the 1 SD, 2 SD and the % CV of the standard reference materials and the pulp duplicates. The calculation will be explained with the standard reference material STD-SO-18 (Table 3). This standard material has been used for several repeated measurements and the results indicate the high reproducibility. For example, the reference material STD-SO-18 has a mean SiO_2 level of 58.14 wt.%, a 1 SD of 0.12 wt.%, a 2 SD of 0.24 wt.% and a CV of 0.20 %. That means, 68% of the results will fall in the range of the Mean (58.14 wt.%) ± 1 SD (0.12 wt.%) or in the Mean (58.14 wt.%) ± CV% (0.20 %). Furthermore, 95% of the results will fall in the range of the Mean (58.14 wt.%) ± 2 SD (0.24 wt.%) or in the Mean (58.14 wt.%) ± 2x CV% (0.40 %). Generally, if the same sample will be measured 100 times, 95 results will range from 57.91 wt.% to 58.37 wt.% (58.14 wt.% ± 2x CV%). The remaining 5 results will be outside the range.

2.4.4 Accuracy of the results

Generally, the accuracy is the degree of closeness of an analytical measurement to the expected value of what is being measured (Taylor, 1999; Brodersen et al. 2010). That means the accuracy expresses how close a determined value is to the expected "true" value. The best way to determine the accuracy of analytical results is to compare the determined element level of the reference material with the given element value of the analysed reference material (Taylor, 1999; Brodersen et al. 2010). The percentage difference between the determined value and the expected value is the bias. For the present study, various unrecognizable certified USGS reference materials (e.g. SGR-1, BCR-2, GSP-2) are sent together with the other sample materials to the Acme Laboratory, in order to proved the accuracy of the determined results (Table 4). The USGS reference material BCR-2 has an expected SiO_2 level of 54.10 wt.%. The determined Acme result is 53.96 wt.% and the difference between both values is 0.14 wt.% and the bias is therefore 0.26 %. Table 4 shows that the calculated differences between the expected and the determined values are always in the range of the certified USGS bias levels, which verifies the accuracy of the analytical Acme results.

Table 2 The various method detection limits (MDL) of the analytical methods 4A02/4B02 and 1VE2.

Analyte	Unit	MDL (4A-4B)	MDL (1VE)
SiO_2	wt.%	0.01	
Al_2O_3	wt.%	0.01	0.01
Fe_2O_3	wt.%	0.04	0.001
CaO	wt.%	0.01	0.01
Na_2O	wt.%	0.01	0.001
MgO	wt.%	0.01	0.001
K_2O	wt.%	0.01	0.01
TiO_2	wt.%	0.01	1 (µg/g)
P_2O_5	wt.%	0.01	0.001
MnO	wt.%	0.01	1 (µg/g)
Sr	µg/g	0.5	0.5
C_{tot}	wt.%	0.02	
S_{tot}	wt.%	0.02	0.01
Zr	µg/g	0.1	0.01
Ni	µg/g	0.1	0.1
Zn	µg/g	1	0.1
Cu	µg/g	0.1	0.01
Pb	µg/g	0.1	0.01
Mo	µg/g	0.1	0.01
Sb	µg/g	0.1	0.02
Cd	µg/g	0.1	0.01
Hg	µg/g	0.01	0.001
LOI	wt.%	-5.1	

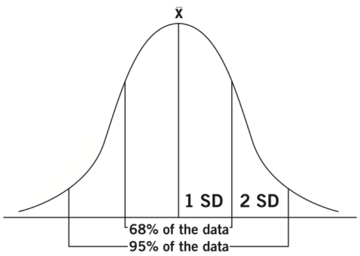


Fig.14 The normal standard distribution (SD) looks like a bell shaped curve.

Table 3 Verification of the reproducibility of the major oxide results (Si, Al, Fe), due to the reference material STD SO-18.

Standard material	SiO_2 wt.%	Al_2O_3 wt.%	Fe_2O_3 wt.%
STD SO-18	58.10	14.12	7.54
STD SO-18	57.98	14.28	7.64
STD SO-18	58.06	14.07	7.62
STD SO-18	58.11	14.08	7.61
STD SO-18	58.15	14.01	7.65
STD SO-18	58.19	14.11	7.57
STD SO-18	58.06	14.07	7.62
STD SO-18	58.11	14.08	7.61
STD SO-18	58.24	13.99	7.62
STD SO-18	58.15	14.04	7.62
STD SO-18	58.09	14.08	7.64
STD SO-18	57.92	14.33	7.62
STD SO-18	58.39	14.05	7.54
STD SO-18	58.01	14.20	7.64
STD SO-18	58.39	13.99	7.56
STD SO-18	58.12	14.05	7.60
STD SO-18	57.94	14.08	7.70
STD SO-18	58.17	14.05	7.63
STD SO-18	58.11	14.12	7.55
STD SO-18	58.26	14.04	7.56
STD SO-18	58.15	14.08	7.62
STD SO-18	58.18	14.13	7.53
STD SO-18	58.26	14.04	7.53
STD SO-18	58.25	14.10	7.56
STD SO-18	57.97	14.15	7.62
STD SO-18	58.18	14.08	7.58
Mean	58.14	14.09	7.60
1 SD	0.12	0.08	0.04
2 SD	0.24	0.15	0.08
%CV	0.20	0.54	0.56

Table 4 Verification of the accuracy of the analytical Acme results, due to the comparison with expected USGS standard material oxide levels.

SiO_2	USGS EXP.	ACME	Differ.	% Dev.	**Al_2O_3**	USGS EXP.	ACME	Differ.	% Dev.
	wt.%	wt.%	wt.%			wt.%	wt.%	wt.%	
GSP-2	66.60	66.11	0.49	0.74	GSP-2	14.90	14.99	-0.09	-0.60
BCR-2	54.10	53.96	0.14	0.26	BCR-2	13.50	13.48	0.02	0.15
SGR-1	49.28	48.17	1.11	2.25	SGR-1	12.27	11.92	0.35	2.85

Fe_2O_3	USGS EXP.	ACME	Differ.	% Dev.	**MgO**	USGS EXP.	ACME	Differ.	% Dev.
	wt.%	wt.%	wt.%			wt.%	wt.%	wt.%	
GSP-2	4.90	4.96	-0.06	-1.22	GSP-2	0.96	0.97	-0.01	-1.04
BCR-2	13.80	13.95	-0.15	-1.09	BCR-2	3.59	3.65	-0.06	-1.67
SGR-1	9.34	9.15	0.19	2.03	SGR-1	1.54	1.49	0.05	3.25

Table 5 The calculated total error values.

Element	Error %	(+/-)	Element	Error %	(+/-)
Si	1.28	{wt %}	S_{tot}	8.22	{wt %}
Al	1.40	{wt %}	Zr	5.45	{µg/g}
Fe	3.21	{wt %}	Ni	9.94	{µg/g}
Ca	2.67	{wt %}	Zn	8.33	{µg/g}
Na	3.39	{wt %}	Cu	9.30	{µg/g}
Mg	3.44	{wt %}	Pb	7.14	{µg/g}
K	2.68	{wt %}	Mo	6,85	{µg/g}
Ti	0.74	{wt %}	Sb	4.61	{µg/g}
P	7.69	{wt %}	Cd	7.85	{µg/g}
Mn	6.25	{wt %}	Hg	14.88	{µg/g}
Sr	5.83	{µg/g}	LOI	0.57	{wt %}
C_{tot}	4.42	{wt %}			

2.5 Determination of the total error

The calculations of the various standard deviations and percent coefficient of variations indicated the high precision of the measurements. The calculated percentage bias levels proved the high accuracy of the results. All of the calculated percentage differences are in the error range of the certified USGS reference materials. Therefore, the analytical error range of each element will be expressed by the percentage difference from the expected reference value and the certified error range by using equation 5, where $\mathbf{X_{error}}$ is the known reference error and $\mathbf{X_{expected}}$ the expected reference material level. For example, the USGS reference material GSP-2 has an expected SiO_2 level of 66.60 wt.%. The certified bias is ± 0.80 wt.%. The calculated total error range is therefore ± 1.20 %. That means, a sample with 20.00 wt.% of SiO_2 has an total analytical error of ± 0.24 wt.% (1.2 %). The calculated total error values are shown in Table 5.

$$\text{Total error} = (X_{error} / X_{expected}) \times 100 \qquad (5)$$

2.6 Inorganic and organic carbon determination in soils

The total carbon content of a soil represents the present amount of inorganic and organic carbon. This can be expressed by equation 6. Generally there are two ways to determine the organic carbon content. For example, it is possible to measure the total carbon and the inorganic carbon (Nelson, & Sommers, 1996). Subtracting the inorganic carbon from the total carbon yields the organic carbon, which can be expressed by equation 7.

$$\text{Total Carbon } (C_{tot}) = \text{Inorganic Carbon} + \text{Organic Carbon} \quad (6)$$

$$\text{Organic Carbon} = \text{Total Carbon } (C_{tot}) - \text{Inorganic Carbon} \quad (7)$$

A common cost effective technic for measuring the inorganic carbon content is the so-called "**Karbonat-Bombe**" (Müller & Gastner, 1971). It is a simple devise for the determination of the carbonate content in sediments and soils. The measurement accuracy is the main problem of this technic. The absolute error of a single determination is ± 1% of $CaCO_3$ (Müller & Gastner, 1971).

The **Loss on ignition** (LOI) is a widely used method to estimate the amount of organic material as well as the carbonate mineral contents within soils (Dean, 1974, 1999; Korsman et al. 1999; Dodson and Ramrath 2001; Heiri et al. 2001; Boyle 2002, Boyle 2004; Bendell-Young et al. 2002; and Beaudoin 2003). The relationships between the LOI at 550°C (LOI_{550}) and the LOI at 950°C (LOI_{950}) are currently accepted as a standard method for the determination of organic and inorganic carbon (Santisteban et al., 2004). It is known that the LOI can be increased by volatile non-carbon components, lattice water in clays, gypsum, sulphide minerals and metallic oxihydroxides (Meyers & Lallier-Verges 1999; Meyers & Teranes 2001; Dean 1974; Ran et al. 2000; Heiri et al. 2001; Brauer et al. 2000; Rosen et al. 2002; Ralska-Jasiewiczowa et al. 2003). Additional errors come from the loss of inorganic carbon at temperatures between 425 °C and 520 °C in minerals such as siderite, magnesite and dolomite (Heiri et al. 2001). Within the present study, the LOI has been detected at 1000°C. Conversely, this means that the present LOI values are not useable for the determination of the organic carbon or organic soil material contents due to the fact that the calculated LOI values are possibly affected by all of the above-mentioned LOI increasing components.

Another common technic is to **remove** the **inorganic carbon** before the total carbon is measured. This can be done for example by measuring dried and acidified soils with the LECO Carbon Analyser. There are many technics reported for the determination of the organic carbon content in soils, which are shortly described. For example, two common qualitative technics are the nuclear magnetic resonance (NMR) spectroscopy and the diffuse reflectance infrared Fourier transform (DRIFT) spectroscopy (Kogel-Knaber, 1997; Rumpel et al., 2001).

In addition, a common semi-quantitative method for the determination of organic matter is the hydrogen peroxide digestion (H_2O_2) (Nelson, & Sommers, 1996). Generally, the semi-quantitative methods are based upon the indiscriminate removal of all organic matter followed by gravimetric determination of sample weight loss (Blume et al., 1990; Nelson and Sommers, 1996; ASTM, 2000).

In addition, there are several quantitative techniques reported for the determination of total organic carbon. They include destructive and non-destructive techniques (Nelson, & Sommers, 1996). The three basic principles of the destructive techniques are:

(1) Wet oxidation followed by titration with ferrous ammonium sulphate or photometric determination of Cr^{3+}. (2) Wet oxidation followed by the collection and measurement of evolved CO_2. (3) Dry combustion at high temperatures in a furnace with the collection and detection of evolved CO_2 (Tiessen and Moir, 1993). An innovative non-destructive technique using non-elastic neutron scattering is also being developed for total organic carbon determination (Wielopolski et al., 2000).

2.6.1 Determination of the soil organic carbon

To achieve the main research aims it is necessary to determine the amount of soil organic carbon within the 124 soil horizons (see section 4.1). The bulk chemical analyses from the Acme Laboratory include the determination of the total carbon (C_{tot}) content of the 124 soil horizons. Therefore, we decided to remove the inorganic carbon contents of all 124 samples by using the recommended hot concentrated hydrochloric acid digestion (cf. Lund et al., 1973; Gautelier et al. 1999). Afterwards, the total carbon contents of the acidified and inorganic carbon free soil samples are measure again by using a Leco Carbon Analyser at the Institute of Earth Sciences. This can be expressed by the equation 8.

$$\text{Soil Organic Carbon (SOC)} = \text{Total Carbon } (C_{tot}) \quad (8)$$

2.6.1.1 Hot concentrated hydrochloric acid digestion

To remove all common carbonate minerals, including calcite and dolomite, it is recommended to make an acid digestion with hot concentrated hydrochloric acid (HCL 37%, 80° C) (Lund et al., 1973; Gautelier et al. 1999). Therefore, about 5 g of pulverized soil sample are filled into a beaker. Afterwards, about 10 ml of HCL (37%, 80° ± 5° C) is added into the beaker until the sample is slightly covered. The beaker has to be slightly stirred to be sure that the entire soil sample reacts with the acid. In addition, the samples should react for about 100 minutes (Gautelier et al. 1999).

The occurring effervescence is noted and categorized as slightly reactive, moderately reactive or highly reactive (U.S. Salinity Laboratory Staff, 1954; Allison & Moodie, 1965; Sobeck et al., 1978). Afterwards all acidified soil samples have to be dried (55 ° C ± 2°C / 48 h) and pulverized for the upcoming measurements with the Leco Carbon Analyser at the Institute of Earth Sciences.

2.6.1.2 Verification of the observed effervescence

In order to verify the accuracy of the visual observation of the occurring effervescence and in order to determine a percentage bias of the visual observation, 6 pulverized soil samples are filled into labelled beakers. The 6 samples are mixed with pulverized calcite ($CaCO_3$) and dolomite [$CaMg(CO_3)_2$], according to the following preparation steps:

10 g soil + 1 g calcite = 10 % calcite within the soil.
10 g soil + 0.1 g calcite = 1 % calcite within the soil.
10 g soil + 0.05 g calcite = 0.5 % calcite within the soil.

10 g soil + 1 g dolomite = 10 % dolomite within the soil.
10 g soil + 0.1 g dolomite = 1 % dolomite within the soil.
10 g soil + 0.05 g dolomite = 0.5 % dolomite within the soil.

Afterwards, hot HCL (37%, 80°± 5 C) is added (about 10 ml) into each of the 6 beakers. The occurring effervescence is noted and categorized according to the reported categories (U.S. Salinity Laboratory Staff, 1954; Allison & Moodie, 1965; Sobeck et al., 1978).

Generally, the observed reactions can be described by the equations 9 and 10.

$$CaCO_3(s) + 2HCl(aq) \rightarrow CaCl_2(aq) + CO_2(g) + H_2O(l) \quad (9)$$

$$CaMg(CO_3)_2 + 4HCL(aq) \rightarrow CaCl_2(aq) + MgCl_2(aq) + 2\ CO_2(g) + 2H_2O(l) \quad (10)$$

2.7 Data analysis

A total of 66 element levels are measured for each rock and soil sample. In addition, 53 element values are determined for each leaf and root sample. The present study focuses on the following 22 elements, which are listed according to their abundance in the lithosphere (Lide, 2012): **Si, Al, Fe, Ca, Na, Mg, K, Ti, P, Mn, Sr, S_{tot}, C_{tot}, Zr, Ni, Zn, Cu, Pb, Mo, Sb, Cd, Hg**.

2.7.1 Converting oxide levels into element levels

The rock and soil analyses include the determination of the major oxides (SiO_2, Al_2O_3, Fe_2O_3, MgO, CaO, Na_2O, K_2O, TiO_2, P_2O_5, MnO). However, the vegetation analysis includes only element levels. To compare all results with each other, it is necessary to convert the determined oxide levels (e.g. SiO_2 wt.%) into element levels (Si wt.%). For this, one proceeds according to the following steps: First, look up the atomic masses from the periodic table for the elements of interest (e.g. Si = 28.0855 / O = 15.9994). Next, determine how many grams of each element are present in 1 mole of the oxide of interest (e.g. SiO_2). For example: The mass of 1 mol SiO_2 = 28.0855 g of Si and 2 x 15.9994 g of O. The summarized molar mass of SiO_2 is therefore 60.0843 g/mol.

Within the next steps, the mass percentages of the involved elements have to be calculated. For example: **Si** = (28.0855 g / 60.0843 g)*100 = 46.743 % = 0.46743 / **O** = (15.9994*2 g / 60.0843 g)* 100 = 53.257 %. To convert the determined SiO_2 levels to comparable Si levels, the determined oxide level is multiplied with the mass percentage of the element. For example: 40.15 wt.% SiO_2 = 18.76 wt.% Si (40.15 x 0.4675).

2.7.2 Normalization of soil samples

Concentrations of the element of interest have to be adjusted to take into account processes such as the leaching of other elements or the addition of organic matter, which will also change the concentration of the element of interest (Hodson, 2001). This can be done by normalizing concentrations to the concentration of an "immobile" element; the total quantity of an immobile element in a given horizon is unaffected by weathering processes, although its concentration may change due to other processes such as loss or addition of other elements or addition of organic matter (Hodson, 2001). Therefore, the determined inorganic element levels of each soil sample are normalized with the immobile element Ti and Zr.

The normalized concentration of an element in a sample was recalculated to a dilution free basis by the equation 11, where **X** is the concentration of the element of interest, **Y** is the related determined level of Ti or Zr and $\mathbf{X_{fr}}$ is the adjusted concentration.

$$X_{fr} = X/Y \qquad (11)$$

2.7.3 Calculation of the element-to-element ratios

For the discussion about geochemical fingerprints it is important to know the element ratios of the elements of interests (e.g. Na/Ca). These element ratios can be easily calculated by using the program Excel. The formula, which is necessary for the calculation, is explained with the element levels of Na and Ca, of the soil horizon A1 (0 – 2 cm).

For example, if the Na level (0.13 wt.%) is listed in **column A** of the Excel sheet and the Ca level (0.68 wt.%) in **column B**, then the formula will be (12):

Na/Ca = IF(A1<B1;"1;"&(TRUNC(B1/A1;1));(TRUNC(A1/B1;1))&";1") = 1:5 (12)

2.7.4 Calculation of the index of geoaccumulation

The index of geoaccumulation (I_{geo}) was used to classify all element concentrations of the examined soil sample by comparing present concentrations with pre-industrial or natural geochemical backgrounds (Müller, 1979). The $\mathbf{I_{geo}}$ can give hints if an analysed soil contains unpolluted or polluted amounts of elements. Values of the geoaccumulation index can be defined as in equation 13, where $\mathbf{C_n}$ is the concentration of the examined element in the examined soil and $\mathbf{B_n}$ the geochemical background.

$$I_{geo} = \log_2 C_n/(1.5 * B_n) \qquad (13)$$

Müller (1979) proposed the geochemical background value of clay sediments for the evaluation of anthropogenic element contamination (Turekian and Wedepohl, 1961). These geochemical background values are sometimes far too high for laurel forest soils. In order to classify the soils in a realistic view, the lowest mean value or the average mean value of pristine sampling sites is used as a geochemical background. Müller (1979) established six index classes, which can be described as follows:

I_{geo} 0 = unpolluted
I_{geo} 0 - 1 = unpolluted to slightly polluted
I_{geo} 1 - 2 = slightly polluted
I_{geo} 2 - 3 = slightly to heavily polluted
I_{geo} 3 - 4 = heavy polluted
I_{geo} 4 - 5 = heavily to excessively polluted
I_{geo} 5 - 6 = excessively polluted

3. Results

The determined geochemical results, including rocks, soils and vegetation samples are described and sorted according to their abundance in the lithosphere after Lide (2012): **Si, Al, Fe, Ca, Na, Mg, K, Ti, P, Mn, Sr, C_{tot}, S_{tot}, Zr, Ni, Zn, Cu, Pb, Mo, Sb, Cd, Hg.** The soil organic carbon (SOC) results as well as the loss on ignition (LOI) results are described in the chapters “4.1 Degree of rock alteration” on page 105 and “4.2 Soil organic carbon” on page 108 due to their importance for the research aim discussions.Within the upcoming section each element chapter consists of three subchapters in which the rock, soil and vegetation results are described separately. Furthermore, each subchapter starts with a general overview, which deals with the determined minimum, maximum and mean levels. Afterwards follow the detailed sampling area results (Anaga, Orotava, Teno), starting with the laurel forest areas. In addition, the amount of samples is not referred to explicitly within the geochemical descriptions in order to keep the subchapters as clearly and compact as possible. However, the amounts of samples will be treated in section 2.2 (Table 1 on page 28). Generally, histograms are used to display the element levels of the rocks, the mean values of the soils and the element levels of the unwashed leaf samples. Furthermore, soil depth profiles are used to display the element distribution within the upper soil horizons (0 – 15 cm). In addition, scatterplots of the washed and unwashed leaf values are used to show possibly occurring particles on the leaf surface. The results of the root sample will not be related to in the figures. They are only described within the appropriate subchapters. All results, including rocks, soils, roots and leaves are listed in several comprehensive tables, which are attached in the appendix (14.2 on page 245; 14.3 on page 250; 14.4 on page 276).

3.1 Silicon (Si)

Volcanic rocks

The laurel forest samples contain between 11.64 ± 0.15 wt.% and 25.15 ± 0.32 wt.% of Si, with an average of 17.59 ± 0.23 wt.% (Fig. 15). The fallow agricultural samples contain between 16.86 ± 0.22 wt.% and 20.24 ± 0.26 wt.% of Si, with an average of 18.61 ± 0.24 wt.% (Fig.15).

Anaga rocks: The Si levels are heterogeneously distributed within the laurel forest samples. The Si contents vary from 11.64 ± 0.15 wt.% (A1) to 20.15 ± 0.26 wt.% (A14), with a mean of 16.07 ± 0.21 wt.%. The two highest Si levels are measured at sampling site A17 (20.09 ± 0.26 wt.%) and A14. The agricultural sample A29 contains 16.86 ± 0.22 wt.% of Si and A30 contains 17.63 ± 0.23 wt.% of Si.

Orotava rocks: The laurel forest samples contain between 19.86 ± 0.26 wt.% (O5) and 25.15 ± 0.32 wt.% (O7a) of Si. The mean value is 21.84 ± 0.28 wt.%. The agricultural samples contain 17.89 ± 0.23 wt.% (O31) and 18.52 ± 0.24 wt.% (O28), with a mean of 18.25 ± 0.23 wt.%.

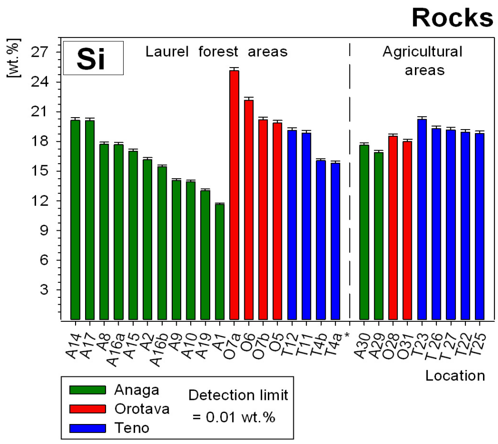


Fig.15 Histogram of the Si rock results.

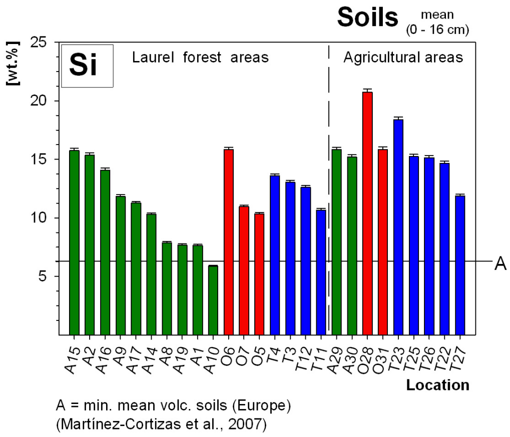


Fig.16 Histogram of the mean Si topsoil results.

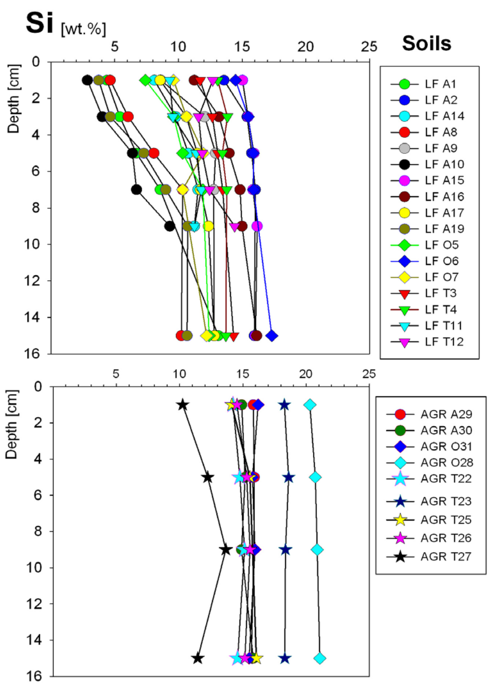


Fig.17 The Si soil depth profiles.

Teno rocks: The laurel forest samples contain between 15.81 ± 0.20 wt.% (T4a) and 19.12 ± 0.25 wt.% (T12) of Si, with an average of 17.52 ± 0.23 wt.%. The agricultural samples contain between 18.81 ± 0.24 wt.% (T25) and 20.24 ± 0.26 wt.% (T23) of Si (average 19.29 ± 0.25 wt.%).

Soils

The laurel forests mean Si levels range from 5.87± 0.08 wt.% to 15.82 ± 0.20 wt.%, with an average of 11.45 ± 0.15 wt.% (Fig. 16). The 89 laurel forest horizons contain between 2.86 ± 0.04 wt.% and 17.33 ± 0.22 wt.% of Si, with an average content of 11.48 ± 0.15 wt.%. The fallow agricultural mean contents vary from 11.88 ± 0.15 wt.% to 20.74 ± 0.27 wt.%, with an average of 15.88 ± 0.20 wt.% (Fig.16). The 35 fallow agricultural horizons contain between 10.23 ± 0.13 wt.% and 21.08 ± 0.27 wt.% of Si, with an average of 15.90 ± 0.20 wt.%.

Anaga laurel forest soils: The 10 profiles contain mean Si levels from 5.78 ± 0.08 wt.% (A10) to 15.75 ± 0.20 wt.% (A15) (average 10.87 ± 0.14 wt.%). It is recognizable that the mean Si results are separable into 3 ranges. The sampling sites A10, A19, A8 and A1 contain the lowest mean Si levels in the range of 5.78 ± 0.08 wt.% and 7.87 ± 0.10 wt.%. A mean Si range between 10.30 ± 0.13 wt.% and 11.83 ± 1.15 wt.% is determined for profile A14, A9 and A17. The remaining profiles (A2, A15, A16) contain mean Si levels in the range of 14.07 ± 0.18 wt.% and 15.75 ± 0.20 wt.%. The 54 soil horizons contain between 2.86 ± 0.04 wt.% and 16.18 ± 0.21 wt.% of Si. Regarding each profile separately shows that the lowest Si levels occur always in the upper soil horizons (0 – 2 cm, 2 – 4 cm) (Fig.17). The Si levels increase with increasing depth and the deviation between the uppermost and the lowest horizon are very heterogeneous. he highest differences occur at profile A1, A19, A10 and A8 (5.59 ± 0.07 wt.% to 8.75 ± 0.11 wt.%) (Fig.17).

Anaga agricultural soils: Profile A30 contains a mean of 15.20 ± 0.19 wt.% and profile A29 a mean of 15.81 ± 0.20 wt.%. Both soil profiles contain homogenous distributed Si contents in the upper 15 cm and nearly no variations within increasing depth (Fig.17).

Orotava laurel forest soils: The mean Si levels of the 3 profiles range between 10.34 ± 0.13 wt.% (O5) and 15.82 ± 0.20 wt.% (O6) (average 12.37 ± 0.16 wt.%). The Si levels within the 16 soil horizons vary between 7.42 ± 0.09 wt.% and 17.33 ± 0.22 wt.%. Like already mentioned, the Si levels of each profile are increasing with increasing depth (Fig.17). The deviation differences between the uppermost and the lowest soil horizons vary from 2.60 ± 0.03 wt.% (O7) to 5.00 ± 0.06 wt.% (O5).

Orotava agricultural soils: The mean value of O31 is 15.85 ± 0.20 wt.% and the mean value of O28 is 20.74 ± 0.27 wt.%. The 8 soil horizons contain between 15.49 ± 0.20 wt.% and 21.08 ± 0.27 wt.% of Si, with a mean of 18.30 ± 0.23 wt.%. Each profile contains relative homogenous distributed Si levels. The variations of the uppermost and lowest horizon vary from 0.71 ± 0.01 wt.% to 0.78 ± 0.01 wt.% (Fig.17).

Teno laurel forest soils: The mean levels range from 10.67 ± 0.14 wt.% (T11) to 13.58 ± 0.17 wt.% (T4), with an average of 12.48 ± 0.16 wt.%. The 20 soil horizons contain between 9.32 ± 0.12 wt.% and 14.41 ± 0.18 wt.% of Si. The Si levels increase with increasing depth (Fig.17). The deviations between the uppermost and the lowest horizons range from 0.64 ± 0.01 wt.% and 2.62 ± 0.03 wt.%.

Teno agricultural soils: The profiles contain mean Si contents between 11.88 ± 0.15 wt.% (T27) and 18.39 ± 0.24 wt.% (T23), with an average of 15.06 ± 0.19 wt.%. The Si levels of the 19 soil horizons vary from 10.23 ± 0.13 wt.% to 18.61 ± 0.24 wt.%. The soil profiles contain a homogenous distribution of Si (Fig.17).

3.2 Aluminium (Al)

Volcanic rocks

The laurel forest samples contain between 5.34 ± 0.07 wt.% and 20.14 ± 0.28 wt.% of Al, with an average of 9.77 ± 0.14 wt.% (Fig.). The fallow agricultural samples contain between 5.95 ± 0.08 wt.% and 9.07 ± 0.13 wt.% of Al, with an average of 7.90 ± 0.11 wt.% (Fig.18).

Anaga rocks: The laurel forest samples contain between 6.49 ± 0.09 wt.% (A16a) and 20.14 ± 0.28 wt.% (A1), with an average of 10.98 ± 0.15 wt.%. Comparing the results with each other shows that sample A1 has a significantly higher Al content as the remaining samples. Without A1, the Al contents of 5 samples vary from 6.49 ± 0.09 wt.% to 9.24 ± 0.13 wt.% (A16b) and 5 samples from 10.38 ± 0.14 wt.% (A2) to 13.95 ± 0.19 wt.% (A14). The agricultural sample A30 contains 7.48 ± 0.10 wt.% of Al and A29 contains 9.07 ± 0.13 wt.%.

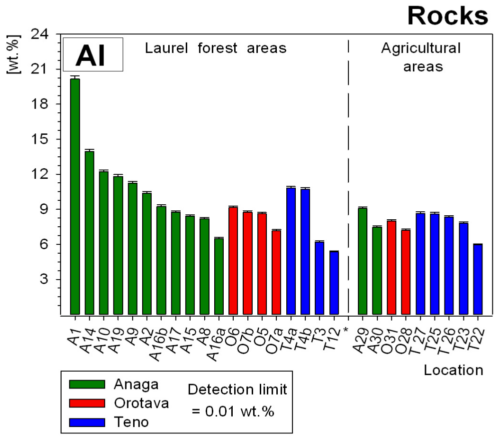


Fig.18 Histogram of the Al rock results.

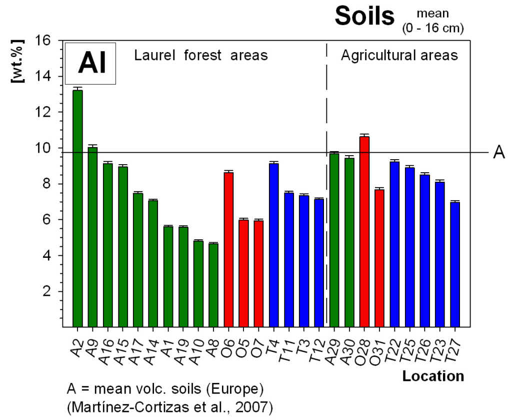


Fig.19 Histogram of the mean Al topsoil results.

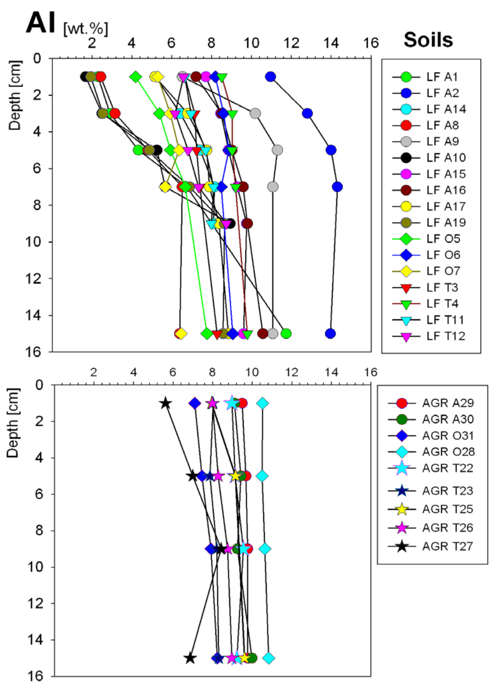


Fig.20 The Al soil depth profiles.

Orotava rocks: The laurel forest samples contain between 7.16 ± 0.10 wt.% (O7a) and 9.14 ± 0.13 wt.% (O6) of Al, with an average of 8.42 ± 0.12 wt.%. The agricultural samples contain 7.20 ± 0.10 wt.% (O28) and 8.01 ± 0.11 wt.% (O31) of Al.

Teno rocks: The laurel forest samples contain between 5.34 ± 0.07 wt.% (T12) and 10.81 ± 0.15 wt.% (T4a) of Al (average 8.18 ± 0.11 wt.%). The samples T4a and T4b (10.70 ± 0.15 wt.%) contain the highest Al levels. The agricultural samples contain between 5.95 ± 0.08 wt.% (T22) and 8.65 ± 0.12 wt.% (T27) of Al (average 7.87 ± 0.11 wt.%).

Soils

The laurel forests mean Al levels range from 4.66 ± 0.07 wt.% to 13.20 ± 0.18 wt.%, with an average of 7.54 ± 0.11 wt.% (Fig.19). The 89 laurel forest soil horizons contain between 1.68 ± 0.02 wt.% and 14.31 ± 0.20 wt.% of Al (average 7.55 ± 0.11 wt.%). The fallow agricultural mean levels range from 6.97± 0.10 wt.% to 10.62 ± 0.15 wt.%, with an average of 8.79 ± 0.12 wt.% (Fig.19). The Al values of the 35 agricultural soil horizons vary from 5.61 ± 0.08 wt.% to 10.83 ± 0.15 wt.% (average 8.79 ± 0.12 wt.%).

Anaga laurel forest soils: The mean levels range from 4.88 ± 0.07 wt.% (A8) to 13.20 ± 0.18 wt.% (A2) (average 7.66 ± 0.11 wt.%). Mean contents above 10.00 wt.% are determined at sampling site A2 and A9 (10.03 ± 0.14 wt.%). The 54 soil horizons contain between 1.68 ± 0.02 wt.% and 14.31 ± 0.20 wt.% of Al. The lowest Al contents occur always in the upper soil horizons (0 – 2 cm, 2 – 4 cm) (Fig.20). Furthermore, highest deviation differences are determined at sampling site A1, A10 and A19. The deviations vary from 6.64 ± 0.10 wt.% and 9.43 ± 0.13 wt.%. The remaining profiles contain a significantly lower variation between the uppermost and the lowest soil horizon (Fig.20). The deviation levels vary from 1.89 ± 0.03 wt.% to 4.52 ± 0.06 wt.%.

Anaga agricultural soils: The mean Al values are relatively homogenous. Profile A30 contains 9.44 ± 0.13 wt.% of Al and A29 9.67 ± 0.14 wt.% of Al. The Al contents are homogenously distributed within both soil profiles and the differences between the uppermost and the lowest soil horizons vary between 0.27 ± 0.00 wt.% and 0.87 ± 0.01 wt.% (Fig.20).

Orotava laurel forest soils: The profiles contain between 5.95 ± 0.08 wt.% (O7) and 8.64 ± 0.12 wt.% (O6) of mean Al, with an average of 6.86 ± 0.10 wt.%. The 16 soil horizons range from 4.18 ± 0.06 wt.% to 9.06 ± 0.13 wt.%. The Al levels increase with increasing depth at all profiles (Fig.20). The differences between the uppermost and the lowest horizons differ widely from 0.87 ± 0.01 wt.% (O6) to 3.57 ± 0.05 wt.% (O5).

Orotava agricultural soils: Sampling site O31 contains a mean of 7.67 ± 0.11 wt.% and O28 contains 10.62 ± 0.15 wt.% of Al. The 8 soil horizons contain between 7.09 ± 0.10 wt.% and 10.83 ± 0.15 wt.% of Al, with an average of 9.15 ± 0.13 wt.%. The Al deviations vary slightly in the range of 0.31 ± 0.00 wt.% and 1.14 ± 0.02 wt.% (Fig.20).

Teno laurel forest soils: Homogenous mean Al levels in the range of 7.13 ± 0.10 wt.% (T12) and 7.48 ± 0.10 wt.% (T11) are determined at 3 of 4 profiles. Profile T4 contains instead a mean value of 9.11 ± 0.13 wt.%. The 20 soil horizons contain between 6.17 ± 0.09 wt.% and 9.79 ± 0.13 wt.% of Al, with an average of 7.77 ± 0.11 wt.%. With increasing depth, all profiles show an increase of Al (Fig.20). The deviation differences vary from 1.28 ± 0.02 wt.% to 2.15 ± 0.03 wt.% between the uppermost and the lowest soil horizons.

Teno agricultural soils: The mean levels range from 6.97 ± 0.10 wt.% (T27) to 9.22 ± 0.13 wt.% (T22). The average content is 8.31 ± 0.12 wt.%. The 19 soil horizons contain between 5.61 ± 0.08 wt.% and 9.61 ± 0.13 wt.% of Al. The Al levels show nearly no variation with increasing depth. However, two profiles show slight variation within the upper 15 cm (T25, T27) and the deviation differences range from 1.25 ± 0.02 wt.% to 1.67 ± 0.02 wt.% (Fig.20).

Roots and leaves

The *L. novocanariensis* roots contain between 0.02 ± 0.00 wt.% and 0.26 ± 0.00 wt.% of Al, with an average of 0.09 ± 0.00 wt.%. However, the Al levels of all laurel forest and fallow agricultural samples are below the Al detection limit (<0.01 wt.%).

3.3 Iron (Fe)

Volcanic rocks

The laurel forest samples contain between 6.07 ± 0.19 wt.% and 17.08 ± 0.55 wt.% of Fe, with an average of 11.56 ± 0.37 wt.% (Fig.21). The fallow agricultural samples contain between 10.10 ± 0.32 wt.% and 12.59 ± 0.40 wt.% of Fe, with an average of 11.08 ± 0.36 wt.%.

Anaga rocks: The Fe levels of the laurel forest samples vary between 6.07 ± 0.19 wt.% and 17.08 ± 0.55 wt.% (average 11.85 ± 0.38 wt.%.) The two lowest amounts are determined at sample A14 and A1 (6.17 ± 0.20 wt.%). The three highest at A10 (15.92 ± 0.51 wt.%), A9 (16.54 ± 0.53 wt.%) and A19 (17.08 ± 0.55 wt.%). The remaining samples range from 9.94 ± 0.32 wt.% (A17) to 12.02 ± 0.39 wt.% (A8). Agricultural samples contain 11.47 ± 0.37 wt.% (A30) and 12.59 ± 0.40 wt.% (A29) .

Orotava rocks: The laurel forest samples contain between 7.01 ± 0.22 wt.% (O6) and 9.87 ± 0.32 wt.% (O7b) of Fe, (average 9.01 ± 0.29 wt.%). Relatively homogenous levels are determined for the agricultural samples. Sample O31 contains 10.76 ± 0.34 wt.% and O28 10.83 ± 0.35 wt.%.

Teno rocks: The laurel forest samples contain between 11.39 ± 0.37 wt.% (T12) and 14.66 ± 0.47 wt.% (T4a) of Fe, with an average of 12.98 ± 0.42 wt.%. The agricultural samples contain between 10.10 ± 0.32 wt.% (T23) and 11.93 ± 0.38 wt.% (T22) of Fe (average 10.81 wt.%).

Soils

The laurel forests mean Fe levels vary from 3.57 ± 0.11 wt.% to 12.73 ± 0.41 wt.%, with an average of 7.74 ± 0.25 wt.% (Fig.22). The 89 laurel forest soil horizons contain between 1.40 ± 0.04 wt.% and 14.27 ± 0.46 wt.% of Fe, with an average of 7.77 ± 0.25 wt.%. The fallow agricultural mean Fe levels vary between 6.51 ± 0.21 wt.% and 12.95 ± 0.42 wt.%, with an average of 9.53 ± 0.31 wt.% (Fig.22). The 35 fallow agricultural soil horizons contain between 5.44 ± 0.17 wt.% and 13.18 ± 0.42 wt.% of Fe, with an average level of 9.59 ± 0.31 wt.%.

Anaga laurel forest soils: The profiles contain mean Fe levels in the range of 3.57 ± 0.11 wt.% (A1) and 12.73 ± 0.41 wt.% (A9), with an average of 7.67 ± 0.25 wt.%. Without considering the lowest and highest mean value, it is possible to subdivide the Fe levels into two ranges. For example, the profiles A14, A8, A10, and A17 contain between 5.34 ± 0.17 wt.% (A14) and 7.20 ± 0.23 (A19) of Fe. The profiles A2, A16 and A15 contain instead between 8.58 ± 0.28 wt.% and 9.77 ± 0.31 wt.% of Fe. The 54 soil horizons contain between 1.40 ± 0.04 wt.% and 14.27 ± 0.46 wt.% of Fe. The lowest Fe levels occur always in the upper soil horizons (0 – 2 cm, 2 – 4 cm) (Fig.23). All profiles show with increasing depth an increase of Fe (Fig.23).The differences between the uppermost and lowest soil horizon range from 1.84 ± 0.06 wt.% (A15) to 10.34 ± 0.33 wt.%. Only profile A8 contains a more or less homogenous Fe distribution within the upper 15 cm.

Anaga agricultural soils: Profile A29 contains a mean of 11.97 ± 0.38 wt.% and A30 a mean of 12.95 ± 0.42 wt.%. The 8 soil horizons contain between 11.70 ± 0.38 wt.% and 13.18 ± 0.42 wt.% (average 12.46 ± 0.40 wt.%). Both soil profiles show nearly no variation (Fig.23).

Orotava laurel forest soils: Mean Fe levels in the range of 5.55 ± 0.18 wt.% (O7) and 6.32 ± 0.20 wt.% (O5) are determined for the 3 soil profiles (average 5.94 ± 0.19 wt.%). The 16 soil horizons vary from 4.22 ± 0.14 wt.% to 7.88 ± 0.25 wt.%. The Fe levels of two profiles increase with increasing depth. The deviation between uppermost and lowest soil horizon vary between 1.50 ± 0.05 wt.% (O7) and 3.66 ± 0.12 wt.% (O5). Profile O6 contains relative homogenous Fe values (Fig.23).

Orotava agricultural soils: The two sampling sites contain mean Fe values of 8.19 ± 0.26 wt.% (O28) and 9.44 ± 0.30 wt.% (O31). The 8 soil horizons vary between 8.01 ± 0.26 wt.% and 9.75 ± 0.31 wt.% (average 8.81 ± 0.28 wt.%). The Fe values of profile O31 are slightly decreasing with increasing depth (Fig.23). The deviation is 0.48 ± 0.02 wt.%. O28 contains instead increasing Fe levels. Anyway, the deviation is also quite small (0.41 ± 0.01 wt.%).

Teno laurel forest soils: The profiles contain between 6.50 ± 0.21 wt.% (T11) and 11.78 ± 0.38 wt.% (T3) of Fe. The 20 soil horizons contain between 5.56 ± 0.18 wt.% and 12.62 ± 0.40 wt.% of Fe (average 9.40 ± 0.30 wt.%). The levels increase with increasing depth and the deviations between the uppermost and the lowest horizons are ranging between 1.09 ± 0.04 wt.% and 2.03 ± 0.07 wt.%.

Teno agricultural soils: The profiles contain between 6.51 ± 0.21 wt.% (T27) and 10.57 ± 0.34 wt.% (T23) of Fe (average 8.71 ± 0.28 wt.%.) The 19 horizons range from 5.44 ± 0.17 wt.% to 10.81 ± 0.35

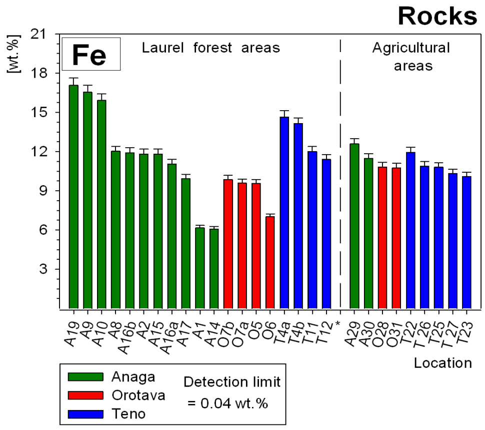


Fig.21 Histogram of the Fe rock results.

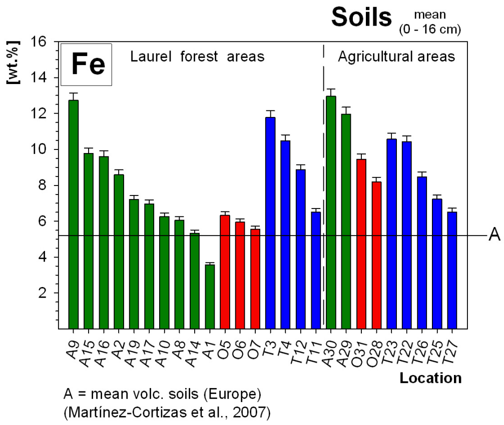


Fig.22 Histogram of the mean Fe topsoil results.

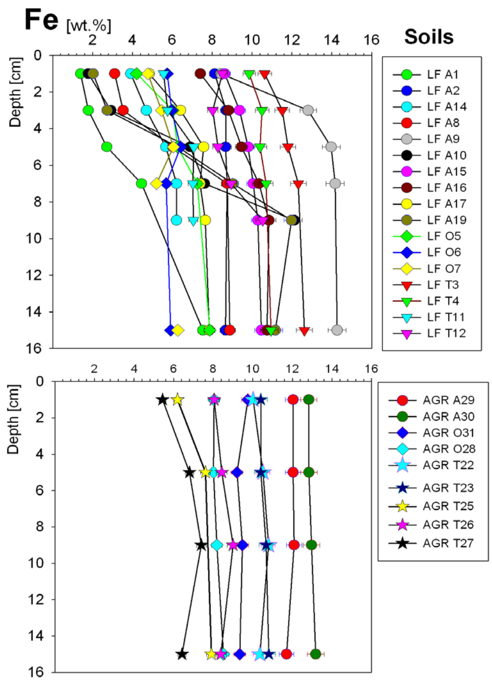


Fig.23 The Fe soil depth profiles.

wt.%. Three of five soil profiles show nearly no variation within the upper 15 cm (T22, T23, T26) (Fig.23). The deviations vary between 0.34 ± 0.01 wt.% and 0.41 ± 0.01 wt.%. The remaining two deviation values are 0.99 ± 0.03 wt.% (T27) and 1.71 ± 0.05 wt.% (T25).

Roots and leaves

The 42 ***L. novocanariensis*** leaf samples from the laurel forest contain between 0.003 ± 0.000 wt.% and 0.051 ± 0.002 wt.% of Fe, with an average of 0.007 ± 0.000 wt.% (Fig.24). The 16 ***L. novocanariensis*** root samples from the laurel forest contain between 0.013 ± 0.000 wt.% and 0.348 ± 0.011 wt.% of Fe, with an average of 0.081 ± 0.003 wt.%. The 18 ***L. novocanariensis*** leaf samples from the fallow agricultural areas contain between 0.006 ± 0.000 wt.% and 0.012 ± 0.000 wt.% of Fe, with an average of 0.009 ± 0.000 wt.% (Fig.24).

Anaga laurel forest areas: The root samples of the 10 trees contain between 0.014 ± 0.000 wt.% and 0.223 ± 0.007 wt.% of Fe, with an average of 0.080 ± 0.003 wt.%. By far the highest Fe levels are determined for the trees A10 (0.223 ± 0.007 wt.%) and A17 (0.164 ± 0.005 wt.%). No significant differences are seen between the unwashed and washed leaves (Fig.25). The 22 leaf samples contain between 0.003 ± 0.000 wt.% and 0.018 ± 0.001 wt.% of Fe (average 0.006 ± 0.000 wt.%).

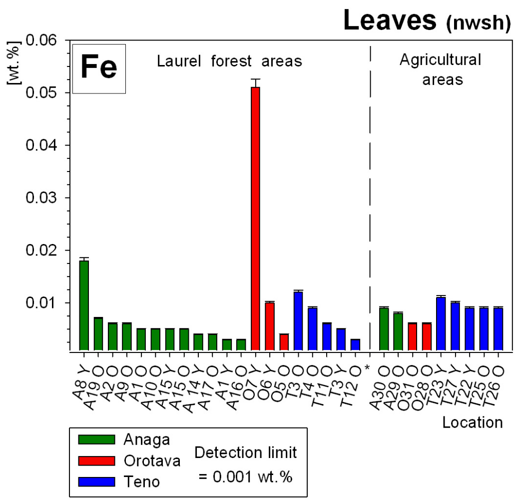


Fig.24 Histogram of the unwashed Fe leaf values.

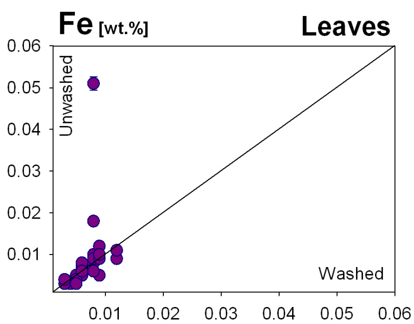


Fig.25 Plotted washed and unwashed Fe leaf results.

Anaga agricultural areas: No significant differences are seen between the unwashed and washed leaves. The 4 leaf samples contain between 0.008 ± 0.000 wt.% and 0.009 ± 0.000 wt.% of Fe, with an average of 0.009 ± 0.000 wt.%.

Orotava laurel forest areas: The roots contain between 0.013 ± 0.000 wt.% and 0.028 ± 0.001 wt.% of Fe, with an average of 0.020 ± 0.001 wt.%. No significant differences are seen between the unwashed and washed leaves of O5 and O6 (Fig.25). The 4 samples contain between 0.004 ± 0.000 wt.% and 0.010 ± 0.000 wt.% of Fe. Only the unwashed sample of tree O7 contains higher levels (0.051 ± 0.002 wt.%) as the washed sample (0.008 ± 0.000 wt.%).

Orotava agricultural areas: No significant differences are seen between the unwashed and washed leaves. The 4 leaf samples contain between 0.006 ± 0.000 wt.% and 0.008 ± 0.000 wt.% of Fe, with an average of 0.007 ± 0.000 wt.%.

Teno laurel forest areas: The roots contain between 0.014 ± 0.000 wt.% and 0.348 ± 0.011 wt.% of Fe, with an average of 0.130 ± 0.004 wt.%. No significant differences are seen between the unwashed and washed leaves (Fig.25). The 12 leaf samples contain between 0.003 ± 0.000 wt.% and 0.012 ± 0.000 wt.% of Fe, with an average of 0.008 ± 0.000 wt.%.

Teno agricultural areas: No significant differences are seen between the unwashed and washed leaves (Fig.25). The 10 leaf samples contain between 0.008 ± 0.000 wt.% and 0.012 ± 0.000 wt.% of Fe, with an average of 0.010 ± 0.000 wt.%.

3.4 Calcium (Ca)

Volcanic rocks

The laurel forest samples contain between 0.03 ± 0.00 wt.% and 8.97 ± 0.24 wt.% of Ca, with an average of 4.24 ± 0.11 wt.% (Fig.26). The fallow agricultural samples contain between 5.51 ± 0.15 wt.% and 8.21 ± 0.22 wt.% of Ca, with an average of 7.43 ± 0.20 wt.% (Fig.26).

Anaga rocks: The laurel forest samples contain between 0.03 ± 0.00 wt.% and 8.97 ± 0.24 wt.% of Ca, with an average of 3.71 ± 0.10 wt.%. The lowest Ca level is detected at sample A10 and the highest level at sample A16a. Comparing all samples with each other shows that the Ca levels are dividable into two divergent ranges. Sample A1, A14, A9, A10 and A19 contain between 0.03 ± 0.00 wt.% and 0.62 ± 0.02 wt.% of Ca. The remaining from 4.41 ± 0.12 wt.% to 8.97 ± 0.24 wt.%. The agricultural samples contain 5.51 ± 0.14 wt.% (A29) and 7.29 ± 0.19 wt.% of Ca (A30).

Orotava rocks: The laurel forest samples contain between 5.03 ± 0.13 wt.% (O7a) and 6.97 ± 0.19 wt.% (O7b) of Ca (average 6.24 ± 0.17 wt.%). The agricultural samples contain 7.09 ± 0.19 wt.% (O31) and 7.36 ± 0.19 wt.% (O28) of Ca.

Teno rocks: The laurel forest samples contain between 1.14 ± 0.03 wt.% (T4a) and 6.86 ± 0.18 wt.% (T11) of Ca, with an average of 3.81 ± 0.10 wt.%. The two lowest amounts are determined at sample T4a and T4b (1.23 ± 0.03 wt.%). The remaining levels are significantly higher (>4.20 ± 0.11 wt.%). The agricultural samples contain between 7.59 ± 0.20 wt.% (T23) and 8.21 ± 0.22 wt.% (T25) of Ca, with an average of 7.93 ± 0.21 wt.%.

Soils

The laurel forests mean Ca levels vary from 0.39 ± 0.01 wt.% to 3.72 ± 0.10 wt.% (average 1.62 ± 0.04 wt.%) (Fig.27). The 89 laurel forest soil horizons contain between 0.20 ± 0.01 wt.% and 4.18 ± 0.11 wt.% of Ca (average 1.59 ± 0.04 wt.%). Agricultural mean levels vary between 0.56 ± 0.01 wt.% and 4.59 ± 0.12 wt.% (average 3.11 ± 0.08 wt.%) (Fig.27). The 35 fallow agricultural horizons contain between 0.54 ± 0.01 wt.% and 5.04 ± 0.13 wt.% of Ca, with an mean of 3.12 ± 0.08 wt.%.

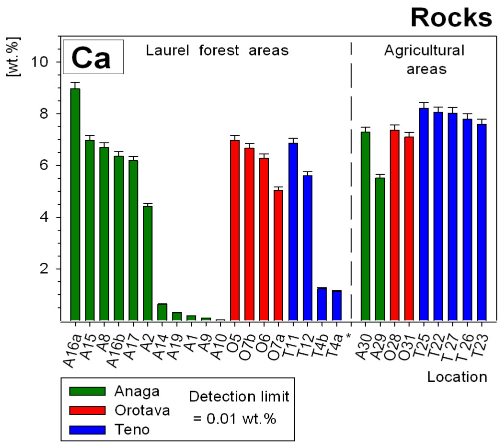


Fig.26 Histogram of the Ca rock results.

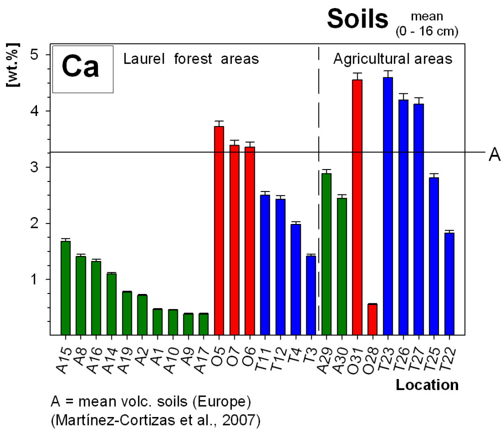


Fig.27 Histogram of the mean Ca topsoil results.

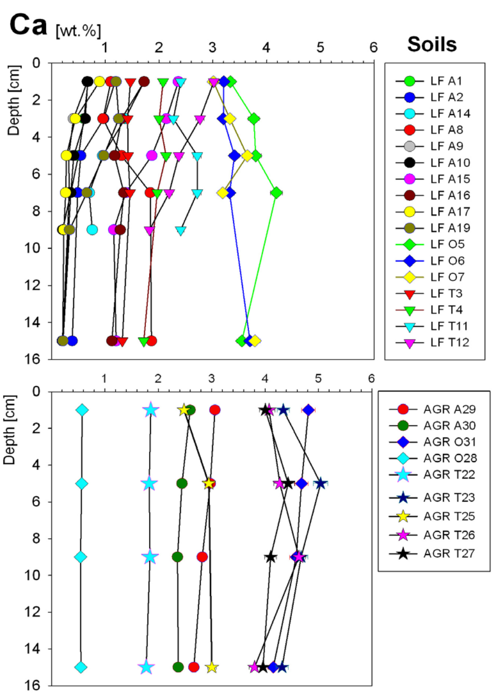


Fig.28 The Ca soil depth profiles.

Anaga laurel forest soils: The mean Ca levels range from 0.39 ± 0.01 wt.% (A17, A9) and 1.68 ± 0.04 wt.% (A15), with an average of 0.88 ± 0.02 wt.%. The mean values are dividable into two ranges. Mean Ca levels between 0.39 ± 0.01 wt.% and 0.77 ± 0.02 wt.% are determined for A17, A9, A1, A10, A2 and A19. The remaining profiles contain a mean Ca range of 1.10 ± 0.03 wt.% 8A14) and 1.68 ± 0.04 wt.% (A15). The 54 soil horizons contain between 0.20 ± 0.01 wt.% and 2.36 ± 0.06 wt.% of Ca. The Ca levels decrease with increasing depth within 9 of 10 profiles (Fig.28). Only sampling site A8 shows an increase of Ca. The variations between the uppermost and lowest soil horizon range from 0.46 ± 0.01 wt.% to 1.16 ± 0.03 wt.%. None of profiles contains a homogenous Ca distribution within the upper 15 cm.

Anaga agricultural soils: Profile A30 contains 2.44 ± 0.07 wt.% and A29 2.88 ± 0.07 wt.%. The 8 agricultural soil horizons contain from 2.36 ± 0.06 wt.% to 3.06 ± 0.08 wt.% of Ca (average 2.66 ± 0.07 wt.%). With increasing depth the Ca levels of A29 decrease and of A30 increase (Fig.28).

Orotava laurel forest soils: The profiles contain mean Ca levels between 3.36 ± 0.09 wt.% (O6) and 3.72 ± 0.10 wt.% (O5) (average 3.49 ± 0.09 wt.%). The 16 horizons contain from 3.01 ± 0.08 wt.% to 4.18 ± 0.11 wt.% of Ca. All profiles show with increasing depth a slight increase of Ca (Fig.28). Deviations range from 0.21 ± 0.01 wt.% (O5) to 0.77 ± 0.02 wt.% (O7).

Orotava agricultural soils: The agricultural sampling sites contain 0.56 ± 0.01 wt.% (O28) and 4.56 ± 0.12 wt.% (O31) of Ca. The 8 soil horizons vary from 0.54 ± 0.01 wt.% to 4.81 ± 0.13 wt.% of Ca, with an average of 2.56 ± 0.07 wt.%. Profile O31 shows with increasing depth a decrease of Ca (0.66 ± 0.02 wt.%). Instead of O28, which is more or less homogenous within the upper 15 cm.

Teno laurel forest soils: The profiles contain between 1.42 ± 0.04 wt.% (T3) and 2.50 ± 0.07 wt.% of Ca. The 20 soil horizons contain between 1.32 ± 0.04 wt.% and 3.02 ± 0.08 wt.% of Ca, with an average of 2.08 ± 0.06 wt.%. The Ca levels of 3 profiles (T3, T4, T12) decrease with increasing depth (Fig.28). The deviation levels vary between 0.15 ± 0.00 wt.% and 1.19 ± 0.03 wt.%. Homogenous values are determined for profile T11.

Teno agricultural soils: The mean Ca levels range from 1.83 ± 0.05 wt.% (T22) to 4.59 ± 0.12 wt.% (T23), with an average of 3.55 ± 0.09 wt.%. The 19 soil horizons contain between 1.77 ± 0.05 wt.% and 5.04 ± 0.13 wt.% of Ca. Three of five soil profiles show nearly no variation within the upper 15 cm (T22, T23, T27). Only the Ca levels of T25 increase (0.52 ± 0.01 wt.%) and the levels of T26 decrease (0.27 ± 0.01 wt.%) with increasing depth.

Roots and leaves

The 42 ***L. novocanariensis*** leaf samples from the laurel forest contain between 0.21 ± 0.01 wt.% and 0.86 ± 0.02 wt.% of Ca, with an average of 0.46 ± 0.01 wt.% (Fig.29). The 16 ***L. novocanariensis*** root samples from the laurel forest contain between 0.05 ± 0.00 wt.% and 1.97 ± 0.05 wt.% of Ca, with an average of 0.48 ± 0.01 wt.%. The 18 ***L. novocanariensis*** leaf samples from the fallow agricultural areas contain between 0.41 ± 0.01 wt.% and 1.03 ± 0.03 wt.% of Ca (average 0.68 ± 0.02 wt.% (Fig.29).

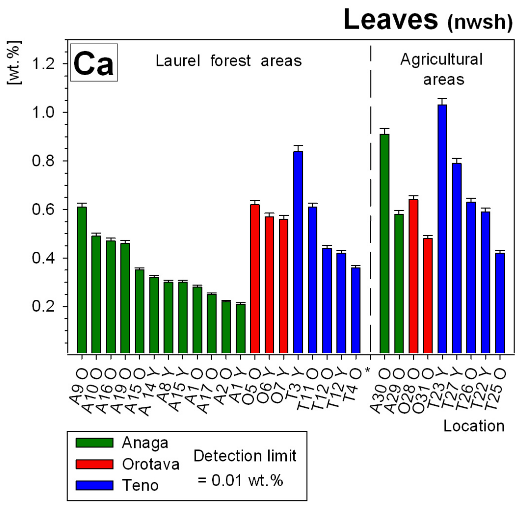


Fig.29 Histogram of the unwashed Ca leaf results.

Anaga laurel forest areas: The roots contain between 0.05 ± 0.00 wt.% and 1.97 ± 0.05 wt.% of Ca, with an average of 0.54 ± 0.01 wt.%. The highest Ca root level is determined for tree A16. No significant differences are seen between the unwashed and washed leaves (Fig.30). The 22 leaf samples contain between 0.21 ± 0.01 wt.% and 0.78 ± 0.02 wt.% of Ca, with an average of 0.37 ± 0.01 wt.%.

Anaga agricultural areas: No significant differences are seen between the unwashed and washed leaves. The 4 leaf samples contain between 0.58 ± 0.02 wt.% and 0.91 ± 0.02 wt.% of Ca, with an average of 0.76 ± 0.02 wt.%.

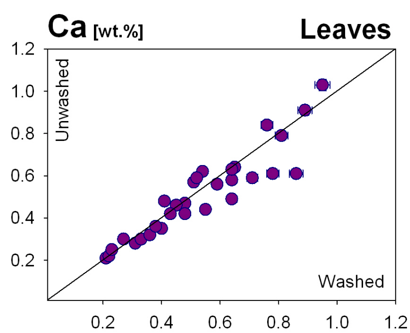


Fig.30 Plotted washed and unwashed leaf results.

Orotava laurel forest areas: The roots contain between 0.19 ± 0.01 wt.% and 0.90 ± 0.02 wt.% of Ca, with an average of 0.46 ± 0.01 wt.%. No significant differences are seen between the unwashed and washed leaves (Fig.30). The 6 leaf samples contain between 0.51 ± 0.01 wt.% and 0.62 ± 0.02 wt.% of Ca, with an average of 0.57 ± 0.02 wt.%.

Orotava agricultural areas: No significant differences are seen between the unwashed and washed leaves. The 4 leaf samples contain between 0.41 ± 0.01 wt.% and 0.65 ± 0.02 wt.% of Ca, with an average of 0.55 ± 0.02 wt.%.

Teno laurel forest areas: The roots contain between 0.11 ± 0.00 wt.% and 0.75 ± 0.02 wt.% of Ca, with an average of 0.34 ± 0.01 wt.%. No significant differences are seen between the unwashed and washed leaves (Fig.30). The 12 leaf samples contain between 0.36 ± 0.01 wt.% and 0.86 ± 0.02 wt.% of Ca, with an average of 0.57 ± 0.01 wt.%.

Teno agricultural areas: No significant differences are seen between the unwashed and washed leaves. The 10 leaf samples contain between 0.42 ± 0.01 wt.% and 1.03 ± 0.03 wt.% of Ca, with an average of 0.70 ± 0.02 wt.%. The two highest values are determined at tree T23 (0.95 ± 0.03 wt.% - 1.03 ± 0.03 wt.%).

3.5 Sodium (Na)

Volcanic rocks

The laurel forest samples contain between 0.04 ± 0.01 wt.% and 3.83 ± 0.13 wt.% of Na, with an average of 1.00 ± 0.03 wt.% (Fig.31). The fallow agricultural samples contain between 0.43 ± 0.01 wt.% and 1.91 ± 0.06 wt.% of Na, with an average of 1.28 ± 0.04 wt.% (Fig.31).

Anaga rocks: The laurel forest rocks contain between 0.04 ± 0.00 wt.% (A10) and 2.12 ± 0.07 wt.% (A17) of Na, with an average of 0.69 ± 0.02 wt.%. Na is heterogeneously distributed within the laurel forest rocks. Only three samples (A16a, A8, A17) contain more than 1.00 wt.% of Na. The levels range from 1.27 ± 0.04 wt.% (A8) to 2.12 ± 0.07 wt.%. The remaining samples contain between 0.04 ± 0.00 wt.% and 0.91 ± 0.03 wt.% (A14) of Na. The agricultural samples contain 0.43 ± 0.01 wt.% (A29) and 0.61 ± 0.02 wt.% (A30) of Na.

Orotava rocks: The laurel forest samples vary between 1.59 ± 0.05 wt.% (O5) and 3.83 ± 0.13 wt.% (O6), with an average of 2.43 ± 0.08 wt.%. The agricultural samples contain 1.14 ± 0.04 wt.% (O31) and 1.22 ± 0.04 wt.% (O28) of Na.

Teno rocks: The laurel forest samples vary from 0.16 ± 0.01 wt.% (T4b) to 1.19 ± 0.04 wt.% (T11) of Na, with an average of 0.53 ± 0.02 wt.%. The agricultural samples vary from 1.12 ± 0.04 wt.% (T22) to 1.91 ± 0.07 wt.% (T27), with an average of 1.62 ± 0.05 wt.%.

Soils

The laurel forests mean Na levels vary from 0.06 ± 0.00 wt.% to 1.57 ± 0.05 wt.% (average 0.36 ± 0.01 wt.%) (Fig.32). The 89 laurel forest soil horizons contain between 0.05 ± 0.00 wt.% and 1.81 ± 0.06 wt.% of Na, with an average of 0.36 ± 0.01 wt.%. The fallow agricultural mean Na levels vary from 0.32 ± 0.01 wt.% to 1.12 ± 0.04 wt.%, with an average of 0.81 ± 0.03 wt.% (Fig.32). The 35 fallow agricultural soil horizons contain between 0.31 ± 0.01 wt.% and 1.22 ± 0.04 wt.% of Na (average 0.80 ± 0.03 wt.%).

Anaga laurel forest soils: The mean Na levels range from 0.06 ± 0.00 wt.% (A9) to 0.39 ± 0.01 wt.% (A15) (average 0.20 ± 0.01 wt.%). The highest mean levels are determined at A16 (0.36 ± 0.01 wt.%) and A15 (0.39 ± 0.01 wt.%). The 54 soil horizons contain between 0.05 ± 0.00 wt.% and 0.53 ± 0.02 wt.% of Na. Regarding each profile separately indicates that nearly no variations exist between the uppermost and the lowest horizon at 6 profiles (Fig.33). A Na decrease with increasing depth is determined for A2 and A15. The deviations vary from 0.12 ± 0.00 wt.% to 0.24 ± 0.01 wt.%. Profile A16 and A8 show an increase with increasing depth. The differences range from 0.13 ± 0.00 wt.% to 0.22 ± 0.01 wt.%

Anaga agricultural soils: Profile A30 contains 0.32 ± 0.01 wt.% and A29 0.39 ± 0.01 wt.% of Na. The 8 soil horizons contain between 0.31 ± 0.01 wt.% and 0.42 ± 0.01 wt.% of Na, (average 0.35 ± 0.01 wt.%). Both profiles show nearly no variations.

Orotava laurel forest soils: The profiles contain between 0.51 ± 0.02 wt.% (O5) and 1.57 ± 0.05 wt.% (O6) of Na (average 0.98 ± 0.03 wt.%). The 16 soil horizons contain between 0.38 ± 0.01 wt.% and 1.81 ± 0.06 wt.% of Na. The Na levels increase with increasing depth at all profiles (Fig.33). The differences between the uppermost and lowest horizon vary from 0.22 ± 0.01 wt.% to 0.42 ± 0.01 wt.%.

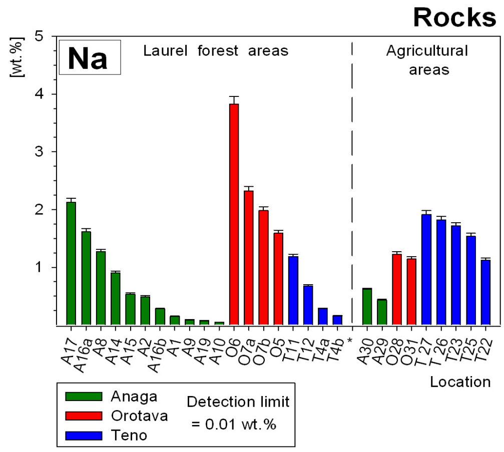


Fig.31 Histogram of the Na rock results.

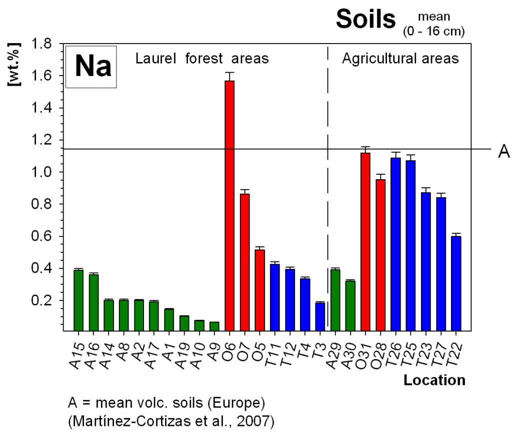


Fig.32 Histogram of the mean Na topsoil results.

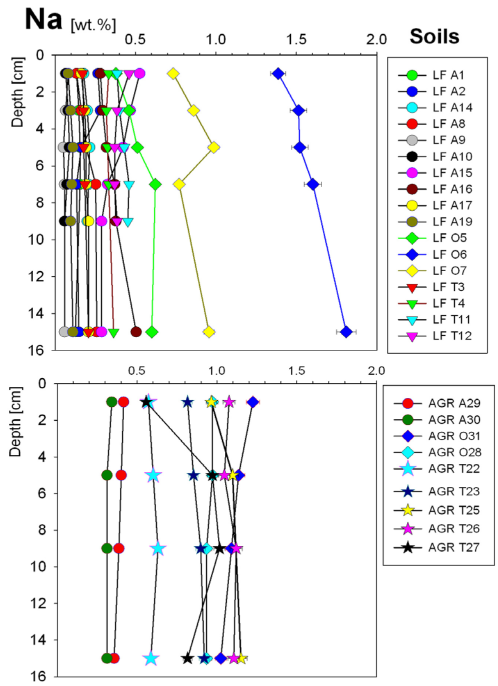


Fig.33 The Na soil depth profiles.

Orotava agricultural soils: The profiles contain 0.95 ± 0.03 wt.% (O28) and 1.12 ± 0.04 wt.% (O31) of Na. The 8 soil horizons contain between 0.93 ± 0.03 wt.% and 1.12 ± 0.04 wt.% of Na, with an average of 1.04 ± 0.04 wt.%. A clear decrease of Na with increasing depth is determined for O31. The deviation is 0.20 ± 0.01 wt.%. O28 shows nearly no variation.

Teno laurel forest soils: The profiles contain between 0.18 ± 0.01 wt.% (T3) and 0.43 ± 0.01 wt.% (T4) of Na (average 0.34 ± 0.01 wt.%). The 20 soil horizons contain between 0.17 ± 0.01 wt.% and 0.46 ± 0.02 wt.% of Na. All profiles show nearly no variation within the upper soil horizons (Fig.33).

Teno agricultural soils: The profiles contain between 0.60 ± 0.02 wt.% (T22) and 1.09 ± 0.04 wt.% (T26) of Na, with an average of 0.88 ± 0.03 wt.%. The 19 soil horizons contain between 0.56 ± 0.02 wt.% and 1.15 ± 0.04 wt.% of Na. The profiles T23, T25 and T27 contain with increasing depth an increase of Na (Fig.33). The differences between the uppermost and the lowest soil horizon vary from 0.10 ± 0.00 wt.% to 0.26 ± 0.01 wt.%.

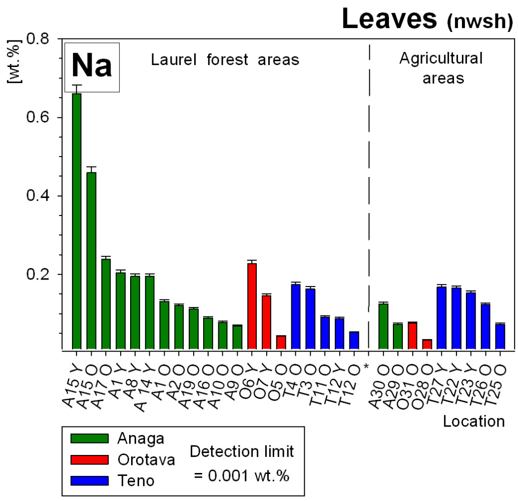


Fig.34 Histogram of the unwashed Na leaf results.

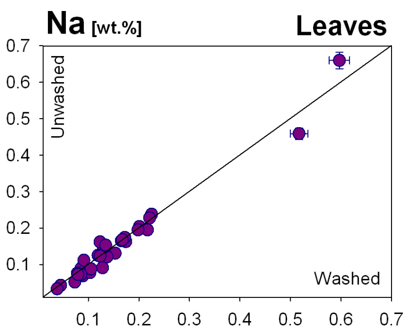


Fig.35 Plotted washed and unwashed leaf results.

Roots and leaves

The 42 ***L. novocanariensis*** leaf samples from the laurel forest contain between 0.043 ± 0.001 wt.% and 0.660 ± 0.022 wt.% of Na, with an average of 0.178 ± 0.006 wt.% (Fig.34). The 16 ***L. novocanariensis*** root samples from the laurel forest contain between 0.008 ± 0.000 wt.% and 0.122 ± 0.004 wt.% of Na, with an average of 0.066 ± 0.002 wt.%. The 18 ***L. novocanariensis*** leaf samples from the fallow agricultural areas contain between 0.033 ± 0.001 wt.% and 0.168 ± 0.006 wt.% of Na, with an average of 0.110 ± 0.004 wt.% (Fig.34).

Anaga laurel forest areas: The root samples contain between 0.032 ± 0.001 wt.% and 0.122 ± 0.004 wt.% of Na, with an average of 0.074 ± 0.003 wt.%. No significant differences are seen between the unwashed and washed leaves (Fig.35). The 22 leaf samples contain between 0.069 ± 0.002 wt.% and 0.660 ± 0.022 wt.% of Na, with an average of 0.215 ± 0.007 wt.%.

Anaga agricultural areas: No significant differences are seen between the unwashed and washed leaves. The 4 leaf samples contain between 0.073 ± 0.002 wt.% and 0.660 ± 0.022 wt.% of Na, with an average of 0.215 ± 0.007 wt.%.

Orotava laurel forest areas: The root samples contain between 0.058 ± 0.002 wt.% and 0.083 ± 0.003 wt.% of Na, with an average of 0.071 ± 0.002 wt.%. No significant differences are seen between the unwashed and washed leaves (Fig.35). The 6 leaf samples contain between 0.043 ± 0.001 wt.% and 0.228 ± 0.008 wt.% of Na, with an average of 0.136 ± 0.005 wt.%.

Orotava agricultural areas: No significant differences are seen between the unwashed and washed leaves. The 4 leaf samples contain between 0.033 ± 0.001 wt.% and 0.078 ± 0.003 wt.% of Na, with an average of 0.056 ± 0.002 wt.%.

Teno laurel forest areas: The root samples contain between 0.008 ± 0.000 wt.% and 0.104 ± 0.004 wt.% of Na, with an average of 0.043 ± 0.001 wt.%. No significant differences are seen between the unwashed and washed leaves (Fig.35). The 12 leaf samples contain between 0.052 ± 0.002 wt.% and 0.174 ± 0.006 wt.% of Na, with an average of 0.125 ± 0.004 wt.%.

Teno agricultural areas: No significant differences are seen between the unwashed and washed leaves. The 10 leaf samples contain between 0.073 ± 0.002 wt.% and 0.168 ± 0.006 wt.% of Na, with an average of 0.135 ± 0.005 wt.%.

3.6 Magnesium (Mg)

Volcanic rocks

The laurel forest samples contain between 0.31 ± 0.01 wt.% and 9.71 ± 0.33 wt.% of Mg, with an average of 2.99 ± 0.10 wt.% (Fig.36). The fallow agricultural samples contain between 2.59 ± 0.09 wt.% and 6.16 ± 0.21 wt.% of Mg, with an average of 4.63 ± 0.16 wt.% (Fig.36).

Anaga rocks: The laurel forest samples contain between 0.32 ± 0.01 wt.% and 3.99 ± 0.14 wt.% of Mg, with an average of 2.18 ± 0.08 wt.%. The lowest Mg level is determined at sample A1. The highest value is measured at A16a. Generally, the Mg results are dividable into to divergent Mg ranges. The samples A1, A14, A9, A10 and A19, contain between 0.32 ± 0.01 wt.% and 1.16 ± 0.04 wt.% of Mg. The remaining samples contain between 2.64 ± 0.09 wt.% and 3.99 ± 0.14 wt.% of Mg. The agricultural samples contain 2.59 ± 0.09 wt.% (A29) and 5.29 ± 0.18 wt.% (A30) of Mg.

Orotava rocks: The laurel forest samples contain between 2.16 ± 0.07 wt.% (O7a) and 3.32 ± 0.11 wt.% (O5), with an average of 2.68 ± 0.09 wt.%. The agricultural samples contain 5.91 ± 0.20 wt.% (O31) and 6.13 ± 0.21 wt.% (O28) of Mg.

Teno rocks: The laurel forest samples contain between 1.71 ± 0.06 wt.% (T4b) and 9.71 ± 0.33 wt.% (T12) of Mg, with an average of 5.00 ± 0.17 wt.%. The two highest values are detected at sample T3 (8.90 ± 0.31 wt.%) and T4b. These two Mg levels are the highest of all determined Mg levels. The agricultural samples contain between 3.63 ± 0.12 wt.% (T27) and 6.16 ± 0.21 wt.% (T27) of Mg, with an average of 4.35 ± 0.15 wt.%.

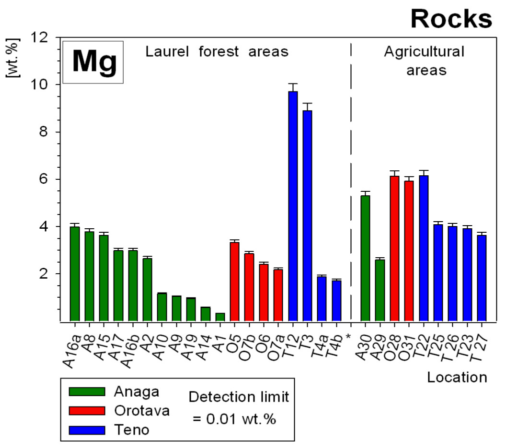
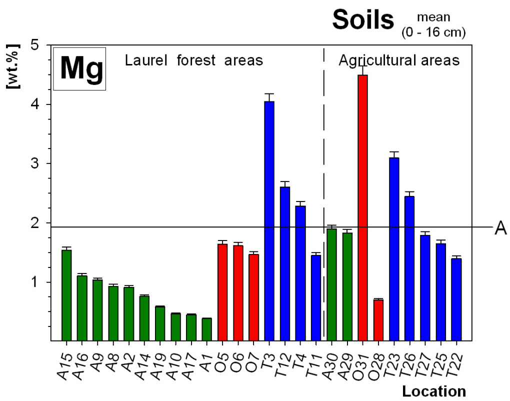


Fig.36 Histogram of the Mg rock results.



A = max. mean volc. soils (Europe) (Martinez-Cortizas et al., 2007)

Fig.37 Histogram of the mean Mg topsoil results.

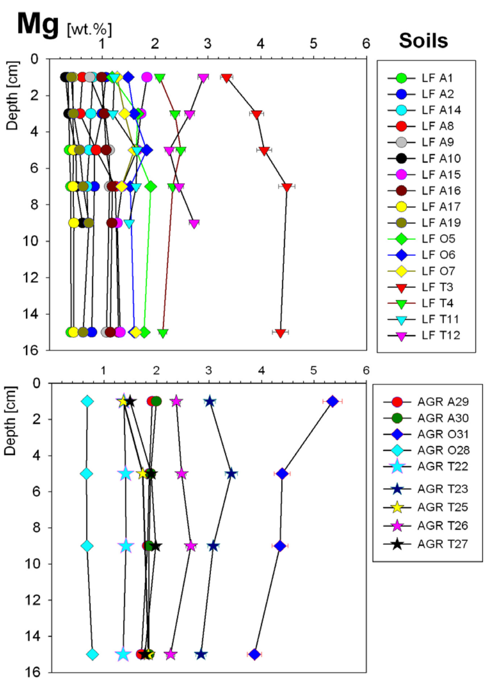


Fig.38 The Mg soil depth profiles.

Soils

The laurel forests mean Mg levels vary from 0.38 ± 0.01 wt.% to 4.04 ± 0.14 wt.%, with an average of 1.37 ± 0.05 wt.% (Fig.37). The 89 laurel forest soil horizons contain between 0.31 ± 0.01 wt.% and 4.49 ± 0.15 wt.% of Mg, with an average of 1.35 ± 0.05 wt.%. The agricultural mean Mg levels vary from 0.70 ± 0.02 wt.% to 4.49 ± 0.15 wt.% (average 2.14 ± 0.17 wt.%) (Fig.37). The 35 fallow agricultural horizons contain between 0.66 ± 0.02 wt.% and 5.35 ± 0.18 wt.% of Mg, with a men of 2.16 ± 0.07 wt.%.

Anaga laurel forest soils: The mean levels range from 0.38 ± 0.01 wt.% (A1) to 1.54 ± 0.05 wt.% (A15) (average 0.82 ± 0.03 wt.%). Mean Mg levels above 1.00 wt.% are determined at profile A9, A16 and A15. The 54 horizons contain between 0.31 ± 0.01 wt.% and 1.85 ± 0.06 wt.% . The comparison of the uppermost and the lowest soil horizons indicates that 5 profiles (A16, A9, A10, A19, A8) contain an increase of Mg with increasing depth (Fig.38). The deviations range from 0.16 ± 0.01 wt.% to 0.68 ± 0.02 wt.%. Two profiles contain a decrease of Mg with increasing depth (A2 0.27 ± 0.01 wt.%; A15 0.51 ± 0.02 wt.%).

Anaga agricultural soils: The profiles contain 1.83 ± 0.06 wt.% (A29) and 1.90 ± 0.07 wt.% (A30) of Mg. The 8 soil horizons contain between 1.71 ± 0.06 wt.% and 2.00 ± 0.07 wt.% of Mg, with an average of 1.86 ± 0.06 wt.%. The Mg levels of both profiles decrease with increasing depth. Deviations range from 0.14 ± 0.01 wt.% to 0.21 ± 0.01 wt.%.

Orotava laurel forest soils: The profiles contain between 1.46 ± 0.06 wt.% (O7) and 1.64 ± 0.06 wt.% (O5) of Mg, with an average of 1.57 ± 0.05 wt.%. The 16 soil horizons contain between 1.19 ± 0.04 wt.% and 1.92 ± 0.07 wt.% of Mg.

Orotava agricultural soils: Profile O28 contains 0.70 ± 0.02 wt.% and O31 up to 4.49 ± 0.15 wt.% of Mg. The 8 soil horizons contain between 0.66 ± 0.02 wt.% and 5.35 ± 0.18 wt.% of Mg, with an average of 2.60 ± 0.09 wt.%. Profile O31 shows with increasing depth a decrease of Mg (1.49 ± 0.05 wt.%) (Fig.38). O28 is more or less homogenous.

Teno laurel forest soils: The profiles contain between 1.45 ± 0.05 wt.% (T11) and 4.04 ± 0.14 wt.% (T3) of Mg. The 20 soil horizons contain between 1.20 ± 0.04 wt.% and 4.49 ± 0.15 wt.% of Mg, with an average of 2.59 ± 0.09 wt.%. The Mg levels of 3 profiles (T3, T4, T11) increase with increasing depth (Fig.38). The deviation levels vary from 0.06 ± 0.00 wt.% (T4) to 1.02 ± 0.04 wt.% (T3). Profile T12 contains decreasing Mg levels.

Teno agricultural soils: The profiles contain between 1.39 ± 0.05 wt.% (T22) and 3.09 ± 0.11 wt.% (T23) of Mg, with an average of 2.10 ± 0.07 wt.%. The 19 soil horizons contain between 1.36 ± 0.05 wt.% and 3.43 ± 0.12 wt.% of Mg. Two profiles (T23, T26) contain decreasing levels and two profiles (T25, T27) increasing levels with increasing depth.

Roots and leaves

The 42 *L. novocanariensis* leaf samples from the laurel forest contain between 0.102 ± 0.004 wt.% and 0.331 ± 0.011 wt.% of Mg, with an average of 0.194 ± 0.007 wt.% (Fig.39). The 16 *L. novocanariensis* root samples from the laurel forest contain between 0.020 ± 0.001 wt.% and 0.491 ± 0.017 wt.% of Mg, with an average of 0.131 ± 0.005 wt.%. The 18 *L. novocanariensis* leaf samples from the fallow agricultural areas contain between 0.073 ± 0.003 wt.% and 0.279 ± 0.010 wt.% of Mg, with an average of 0.148 ± 0.005 wt.% (Fig.39).

Anaga laurel forest areas: The root samples contain between 0.021 ± 0.001 wt.% and 0.383 ± 0.013 wt.% of Mg, with an average of 0.115 ± 0.004 wt.%. The highest Mg root level is determined for tree A19. The second highest root value has been determined at A16 (0.225 ± 0.008 wt.%). No significant differences are seen between the unwashed and washed leaves (Fig.40). The 22 leaf samples contain between 0.102 ± 0.004 wt.% and 0.331 ± 0.011 wt.% of Mg, with an average of 0.176 ± 0.006 wt.%.

Anaga agricultural areas: No significant differences are seen between the unwashed and washed leaves. The 4 leaf samples contain between 0.102 ± 0.004 wt.% and 0.331 ± 0.011 wt.% of Mg, with an average of 0.176 ± 0.006 wt.%.

Orotava laurel forest areas: The root samples contain between 0.048 ± 0.002 wt.% and 0.491 ± 0.017 wt.% of Mg, with an average of 0.220 ± 0.008 wt.%. No significant differences are seen between the unwashed and washed leaves (Fig.40). The 6 leaf samples contain between 0.173 ± 0.006 wt.% and 0.224 ± 0.008 wt.% of Mg, with an average of 0.199 ± 0.007 wt.%.

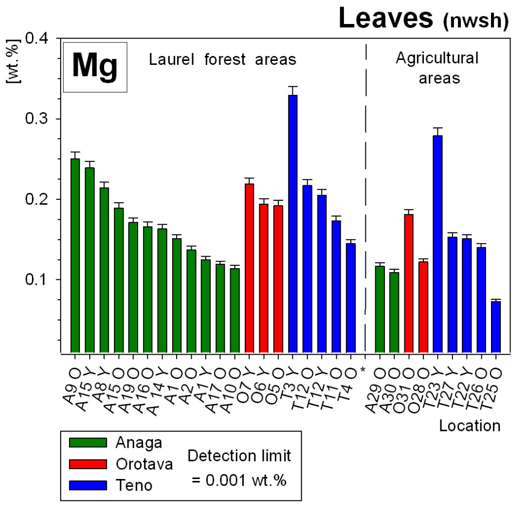


Fig.39 Histogram of the unwashed Mg leaf results.

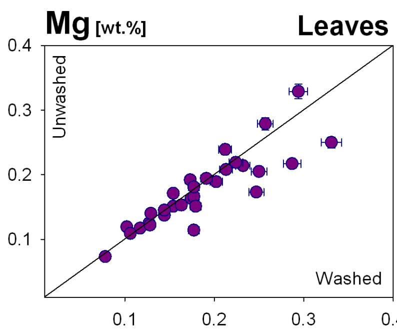


Fig.40 Plotted washed and unwashed leaf results.

Orotava agricultural areas: No significant differences are seen between the unwashed and washed leaves. The 4 leaf samples contain between 0.122 ± 0.004 wt.% and 0.181 ± 0.006 wt.% of Mg (average 0.152 ± 0.005 wt.%.)

Teno laurel forest areas: The root samples contain between 0.020 ± 0.001 wt.% and 0.268 ± 0.009 wt.% of Mg (average 0.104 ± 0.004 wt.%). No significant differences are seen between the unwashed and washed leaves (Fig.40). Only the unwashed Mg levels of T3 and T12 are slightly above the washed levels (T3a wsh = 0.294 ± 0.010, T3a nwsh = 0.329 ± 0.011; T12b wsh = 0.217 ± 0.007, T12b nwsh = 0.287 ± 0.010). However, the 12 leaf samples contain between 0.144 ± 0.005 wt.% and 0.329 ± 0.011 wt.% of Mg, with an average of 0.226 ± 0.008 wt.%. The two highest washed and unwashed values are determined at tree T3a (0.294 ± 0.010 wt.% / 0.329 ± 0.010 wt.%).

Teno agricultural areas: No significant differences are seen between the unwashed and washed leaves. The 10 leaf samples contain between 0.073 ± 0.003 wt.% and 0.279 ± 0.010 wt.% of Mg, with an average of 0.160 ± 0.006 wt.%. The two highest values of 0.257 ± 0.009 wt.% and 0.279 ± 0.010 wt.% are determined at tree T23.

3.7 Potassium (K)

Volcanic rocks

The laurel forest samples contain between 0.10 ± 0.00 wt.% and 2.59 ± 0.07 wt.% of K, with an average of 0.85 ± 0.02 wt.% (Fig.41). The fallow agricultural samples contain between 0.29 ± 0.01 wt.% and 1.54 ± 0.04 wt.% of K, with an average of 0.78 ± 0.02 wt.% (Fig.41).

Anaga rocks: The K levels of the laurel forest rocks are ranging between 0.10 ± 0.003 wt.% and 2.59 ± 0.07 wt.% with an average of 0.77 ± 0.02 wt.%. The lowest K level is detected at sampling site A1. The highest amount is detected at location A14. Comparing the 11 Anaga rocks samples with each other shows that the K levels are dividable into two divergent ranges. The samples A2, A14, A16a and A17 contain between 1.27 ± 0.03 wt.% and 2.59 ± 0.07 wt.% of K. The remaining samples (A1, A15, A16b, A8, A9, A10, A19), contain between 0.10 ± 0.00 wt.% and 0.64 ± 0.02 wt.% of K. Agricultural sample A30 contains 0.52 ± 0.01 wt.% and A29 1.54 ± 0.04 wt.% of K.

Orotava rocks: The laurel forest samples contain between 1.00 ± 0.03 wt.% (O7b) and 1.71 ± 0.05 wt.% (O7a) of K, with an average of 1.32 ± 0.04 wt.%. The two results of sampling site O7 are showing that even within the same location, the K levels can differ widely. The agricultural samples contain 0.29 ± 0.01 wt.% (O31) and 0.66 ± 0.02 wt.% (O28).

Teno rocks: The laurel forest samples contain between 0.22 ± 0.006 wt.% (T4b) and 1.13 ± 0.03 wt.% (T11) of K, with an average of 0.66 ± 0.02 wt.%. The agricultural samples contain between 0.52 ± 0.01 wt.% (T25) and 1.06 ± 0.03 wt.% (T23) of K (average 0.81 ± 0.02 wt.%).

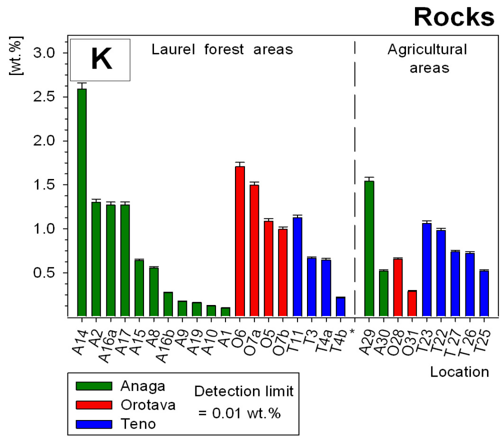


Fig.41 Histogram of the K rock results.

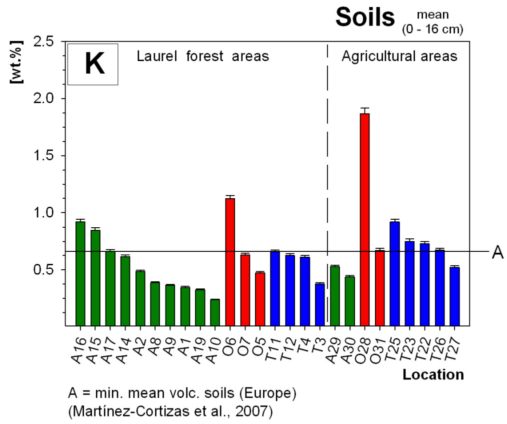


Fig.42 Histogram of the mean K topsoil results.

Soils

The laurel forests mean K levels vary from 0.24 ± 0.01 wt.% to 1.12 ± 0.03 wt.%, with an average of 0.57 ± 0.02 wt.% (Fig.42). The 89 laurel forest soil horizons contain between 0.21 ± 0.01 wt.% and 1.21 ± 0.03 wt.% of K, with an average of 0.57 ± 0.02 wt.%. The fallow agricultural mean K levels vary from 0.44 ± 0.01 wt.% to 1.87 ± 0.05 wt.% (average 0.79 ± 0.02 wt.%) (Fig.42). The 35 agricultural horizons from 0.38 ± 0.01 wt.% to 1.90 ± 0.05 wt.% of K (average 0.78 ± 0.02 wt.%).

Anaga laurel forest soils: The mean K levels range from 0.24 ± 0.01 wt.% (A10) to 0.92 ± 0.02 wt.% (A16) (average 0.53 ± 0.01 wt.%). Some profiles contain relatively homogenous mean values, such as profile A19, A1, A9 and A8 (0.33 ± 0.01 wt.% to 0.39 ± 0.01 wt.%) and profile A14 and A17 (0.61 ± 0.02 wt.% and 0.66 ± 0.02 wt.%). The highest means are determined at A15 (0.85 ± 0.02 wt.%) and A16 (0.92 ± 0.02 wt.%). The 54 soil horizons contain between 0.21 ± 0.01 wt.% and 1.13 ± 0.03 wt.% of K. Regarding each profile separately shows that the K levels of profile A1 and A2 decrease with increasing depth (Fig.43). Instead of the K values of A8, A16, A17 and A19, which increase with increasing depth. Profile A2 and A16 contain the larges variation between the uppermost and lowest soil horizon (0.25 ± 0.01 wt.% / 0.35 ± 0.01 wt.%).

Anaga agricultural soils: Profile A30 contains a mean K value of 0.44 ± 0.01 wt.% and profile A29 a mean value of 0.53 ± 0.01 wt.%. The 8 soil horizons contain between 0.41 ± 0.01 wt.% and 0.55

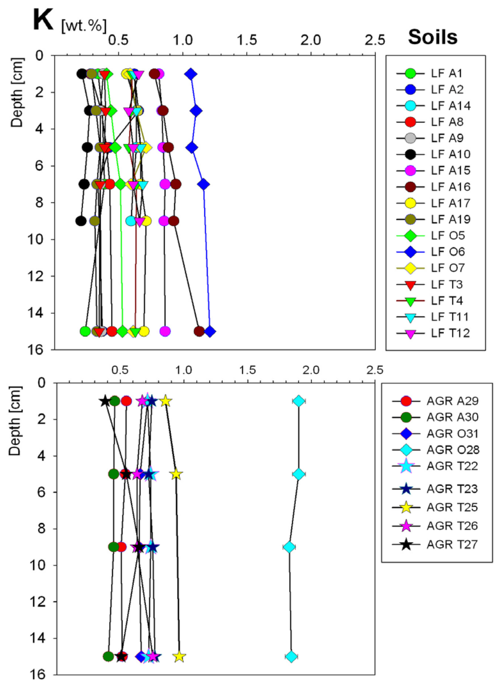


Fig.43 The K soil depth profiles.

± 0.01 wt.% of K, with an average of 0.48 ± 0.01 wt.%. Both soil profiles show nearly no K variation within the upper 15 cm.

Orotava laurel forest soils: The profiles contain mean K levels between 0.47 ± 0.01 wt.% (O5) and 1.12 ± 0.03 wt.% (O6) (average 0.74 ± 0.01 wt.%). The K levels within the 16 soil horizons vary from 0.41 ± 0.01 wt.% to 1.21 ± 0.03 wt.%. Two profiles show with increasing depth only a slight increase of K (O5, O7).

Orotava agricultural soils: The profiles contain 0.67 ± 0.01 wt.% (O31) and 1.87 ± 0.05 wt.% (O28). The 8 soil horizons contain between 0.65 ± 0.02 wt.% and 1.90 ± 0.05 wt.% (average 1.27 ± 0.03 wt.%. Both profiles are more or less homogenous (Fig.43).

Teno laurel forest soils: Three of four profiles (T4, T12, T11) contain homogenous mean K levels in the range of 0.61 ± 0.02 wt.% and 0.66 ± 0.02 wt.%. Sample T3 contains only 0.38 ± 0.01 wt.% of K. The K levels of the 20 soil horizons range from 0.35 ± 0.01 wt.% to 0.69 ± 0.02 wt.% (average 0.57 ± 0.02 wt.%). The profiles contain a relatively homogenous distribution (Fig.43).

Teno agricultural soils: The profiles contain mean K values between 0.52 ± 0.01 wt.% (T27) and 0.92 ± 0.02 wt.% (T25) (average 0.71 ± 0.02 wt.%). The 19 soil horizons contain between 0.38 ± 0.01 wt.% and 0.96 ± 0.03 wt.% of K. Three of five profiles show nearly no variation within the upper 15 cm (T22, T23, T26) and two profiles only a slight increase with increasing depth (Fig.43).

Roots and leaves

The 42 *L. novocanariensis* leaf samples from the laurel forest contain between 0.45 ± 0.01 wt.% and 1.25 ± 0.03 wt.% of K (average 0.77 ± 0.02 wt.%) (Fig.44). The 16 *L. novocanariensis* root samples from the laurel forest contain between 0.07 ± 0.00 wt.% and 0.52 ± 0.01 wt.% of K (average 0.25 ± 0.01 wt.%). The 18 *L. novocanariensis* leaf samples from the fallow agricultural areas contain between 0.49 ± 0.01 wt.% and 1.33 ± 0.04 wt.% of K (average 0.77 ± 0.02 wt.%) (Fig.44).

Anaga laurel forest areas: The root samples contain between 0.12 ± 0.00 wt.% and 0.52 ± 0.01 wt.% of K (average 0.27 ± 0.01 wt.%). No significant differences are seen between the unwashed and washed leaves (Fig.45). The 22 samples contain 0.45 ± 0.01 wt.% to 1.16 ± 0.03 wt.% of K, (average 0.74 ± 0.02 wt.%). Potassium above 0.91 ± 0.02 wt.% is determined at A9, A10 and A14.

Anaga agricultural areas: No significant differences are seen between unwashed and washed leaves. The 4 leaf samples contain from 0.75 ± 0.02 wt.% to 1.06 ± 0.03 wt.% (average 0.90 ± 0.02 wt.%).

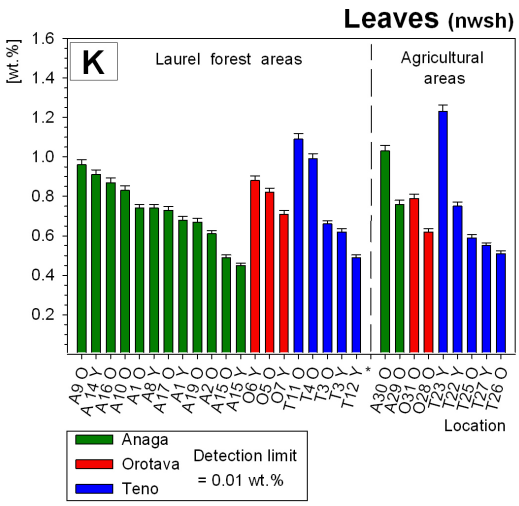


Fig.44 Histogram of the unwashed K leaf results.

Orotava laurel forest areas: The root samples contain between 0.07 ± 0.00 wt.% and 0.29 ± 0.01 wt.% of K, with an average of 0.21 ± 0.01 wt.%. No significant differences are seen between the unwashed and washed leaves (Fig.45). The 6 leaf samples contain between 0.71 ± 0.02 wt.% and 0.94 ± 0.03 wt.% of K, with an average of 0.83 ± 0.02 wt.%.

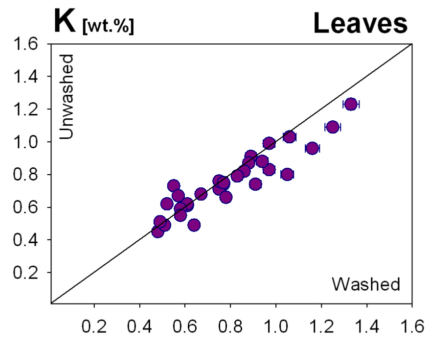


Fig.45 Plotted washed and unwashed leaf results.

Orotava agricultural areas: No significant differences are seen between the unwashed and washed leaves. The 4 leaf samples contain between 0.61 ± 0.02 wt.% and 0.83 ± 0.02 wt.% of K, with an average of 0.71 ± 0.02 wt.%.

Teno laurel forest areas: The root samples contain between 0.13 ± 0.00 wt.% and 0.34 ± 0.01 wt.% of K, with an average of 0.24 ± 0.01 wt.%. No significant differences are seen between the unwashed and washed leaves (Fig.45). The 12 leaf samples contain between 0.49 ± 0.01 wt.% and 1.25 ± 0.03 wt.% of K, with an average of 0.82 ± 0.02 wt.%. The highest K levels range from 0.97 ± 0.03 wt.% to 1.25 ± 0.03 wt.% (T4, T12b, T11).

Teno agricultural areas: No significant differences are seen between the unwashed and washed leaves (Fig.45). The 10 leaf samples contain between 0.49 ± 0.01 wt.% and 1.33 ± 0.04 wt.% of K, with an average of 0.74 ± 0.02 wt.%. The two highest values are determined at tree T23 (1.23 ± 0.03 wt.% / 1.33 ± 0.04 wt.%).

3.8 Titanium (Ti)

Volcanic rocks

The laurel forest samples contain between 1.37 ± 0.01 wt.% and 4.40 ± 0.03 wt.% of Ti, with an average of 2.80 ± 0.02 wt.% (Fig.46). The fallow agricultural samples contain between 2.33 ± 0.02 wt.% and 3.25 ± 0.02 wt.% of Ti, with an average of 2.54 ± 0.02 wt.% (Fig.46).

Anaga rocks: The laurel forest samples contain between 1.47 ± 0.01 wt.% (A1) and 4.40 ± 0.03 wt.% (A19), with an average of 3.16 ± 0.02 wt.%. The two lowest Ti levels are measured at sample A1 and A14 (1.50 ± 0.01 wt.%). The Ti levels of the remaining samples are ranging between 2.63 ± 0.02

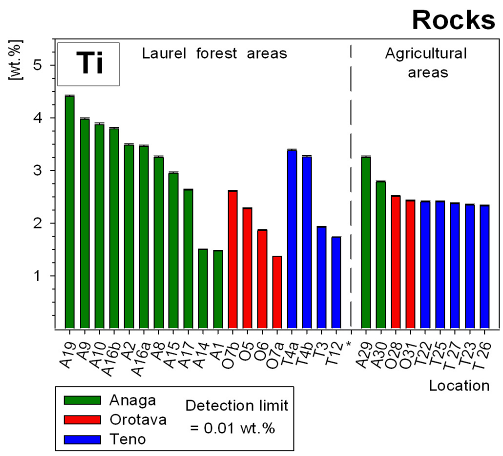


Fig.46 Histogram of the Ti rock results.

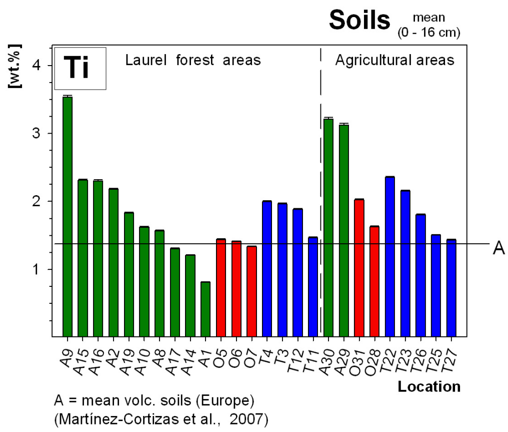


Fig.47 Histogram of the mean Ti topsoil results.

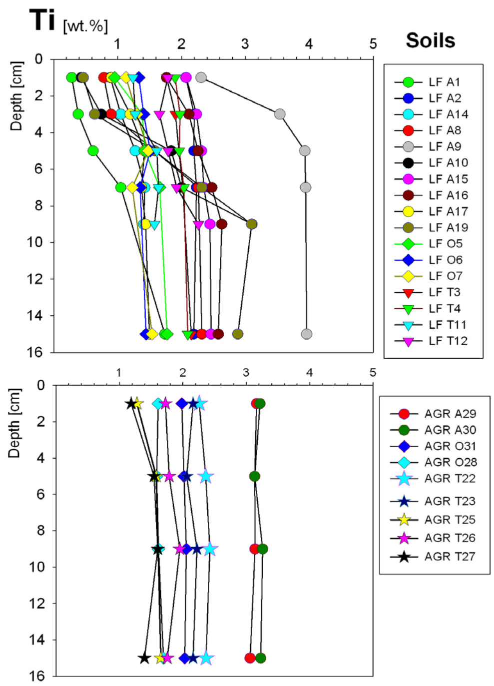


Fig.48 The Ti soil depth profiles.

wt.% (A17) and 4.40 ± 0.03 wt.%. The agricultural samples contain 2.79 ± 0.02 wt.% (A30) and 3.25 ± 0.02 wt.% (A29).

Orotava rocks: Laurel forest samples contain between 1.37 ± 0.01 wt.% (O7a) and 2.61 ± 0.02 wt.% (O7b), with an average of 2.03 ± 0.02 wt.%. Location O7 indicates that even within the same location the Ti values differ widely. Agricultural samples contain 2.42 ± 0.02 wt.% (O31) and 2.51 ± 0.02 wt.% (O28).

Teno rocks: The laurel forest samples contain between 1.73 ± 0.01 wt.% (T12) and 3.38 ± 0.03 wt.% (T4a) of Ti, with an average of 2.64 ± 0.02 wt.%. The two highest levels are detected at sample T4a and T4b (3.26 ± 0.02 wt.%). The agricultural samples contain between 2.33 ± 0.02 wt.% (T26) and 2.41 ± 0.01 wt.% (T22) of Ti, with an average of 2.37 ± 0.02 wt.%.

Soils

The laurel forests mean Ti levels vary from 0.81 ± 0.01 wt.% to 3.54 ± 0.03 wt.% (average 1.77 ± 0.01 wt.%) (Fig.47). The 89 laurel forest soil horizons contain between 0.28 ± 0.00 wt.% and 3.96 ± 0.03 wt.% of Ti, with an average of 1.78 ± 0.01 wt.%. The fallow agricultural mean Ti levels vary from 1.43 ± 0.01 wt.% to 3.21 ± 0.02 wt.%, with an average of 2.14 ± 0.02 wt.% (Fig.47). The 35 fallow agricultural soil horizons contain between 3.26 ± 0.02 wt.% and 2.15 ± 0.02 wt.% of Ti (average 15.90 ± 0.20 wt.%).

Anaga laurel forest soils: The profiles contain mean levels between 0.81 ± 0.01 wt.% (A1) and 3.54 ± 0.03 wt.% (A9), with an average of 1.87 ± 0.01 wt.%. The mean results are separable into different Ti ranges. Profile A1, A14 and A17 contain between 0.81 ± 0.01 wt.% and 1.30 ± 0.01 wt.% of Ti. Profile A8, A10 and A19 contain between 1.57 ± 0.01 wt.% and 1.83 ± 0.01 wt.%. Profile A2, A16 and A15 contain between 2.18 ± 0.02 wt.% and 2.31 ± 0.02 wt.%.

By far the highest value occurs at A9 (3.54 ± 0.03 wt.%). The 54 horizons contain between 0.28 ± 0.002 wt.% and 3.96 ± 0.03 wt.% of Ti. The lowest levels occur in the upper soil horizons (0 – 2 cm, 2 – 4 cm) and increase with increasing depth (Fig.48). A1, A8, A9, A10 and A19 contain the larges differences (1.53 ± 0.01 wt.% to 2.67 ± 0.02 wt.%).

Anaga agricultural soils: A29 contains a mean of 3.12 ± 0.02 wt.% and profile A30 a mean of 3.21 ± 0.02 wt.%. Both profiles show nearly no variation.

Orotava laurel forest soils: The mean Ti levels range from 1.34 ± 0.01 wt.% (O7) to 1.44 ± 0.01 wt.% (O5) (average 1.39 ± 0.01 wt.%). The 16 soil horizons contain between 0.95 ± 0.01 wt.% and 1.77 ± 0.01 wt.% of Ti. The levels of all profiles are increasing with increasing depth (Fig.48). Deviations between uppermost and lowest horizon range from 0.11 ± 0.002 wt.% to 0.82 ± 0.01 wt.%.

Orotava agricultural soils: The profiles contain mean values between 1.63 ± 0.01 wt.% (O28) and 2.02 ± 0.01 wt.% (O31). Each profile contains relative homogenous Ti levels (Fig.48). The Ti levels of the 8 soil horizons range from 1.59 ± 0.01 wt.% to 2.05 ± 0.02 wt.%.

Teno laurel forest soils: The mean Ti levels range from 1.47 ± 0.01 wt.% (T11) to 1.99 ± 0.01 wt.% (T4), with an average of 1.83 ± 0.01 wt.%. The 20 soil horizons contain between 1.24 ± 0.01 wt.% and 2.26 ± 0.02 wt.%. The Ti levels increase with increasing depth within all profiles (Fig.48).

Teno agricultural soils:: The profiles contain mean Ti levels between 1.43 ± 0.01 wt.% (T27) and 2.35 ± 0.02 wt.% (T23), with an average of 1.87 ± 0.01 wt.%. The 19 soil horizons contain between 1.19 ± 0.01 wt.% and 2.43 ± 0.02 wt.% of Ti. All profiles contain homogenously distributed Ti and vary only slightly with increasing depth (Fig.48).

Roots and leaves

The analytical Ti results, determined by the Acme Analytical Labs, are given in µg/g with a detection limit of 1 µg/g. A conversion into wt.% does not make sense for the vegetation samples due to the low amounts of Ti. The 42 ***L. novocanariensis*** leaf samples from the laurel forest contain between 4 ± 0 µg/g and 17 ± 0 µg/g of Ti, with an average of 7 ± 0 µg/g (Fig.49). The 16 ***L. novocanariensis*** root samples from the laurel forest contain between 15 ± 0 µg/g and 367 ± 3 µg/g of Ti, with an average of 87 ± 1 µg/g. The 18 ***L. novocanariensis*** leaf samples from the fallow agricultural areas contain between 6 ± 0 µg/g and 12 ± 0 µg/g, with an average of 9 ± 0 µg/g (Fig.49).

Anaga laurel forest areas: The root samples contain between 15 ± 0 µg/g and 279 ± 2 µg/g of Ti, with an average of 81 ± 1 µg/g. By far the highest Ti root level is determined for tree A9. No significant differences are seen between the unwashed and washed leaves (Fig.50). The leaf samples contain between 4 ± 0 µg/g and 9 ± 0 µg/g of Ti, with an average of 7 ± 0 µg/g.

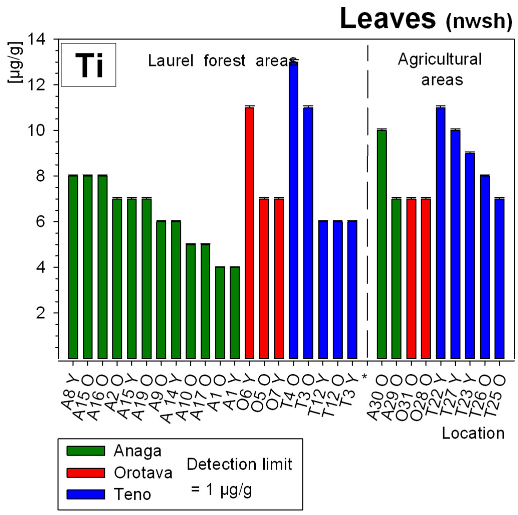


Fig.49 Histogram of the unwashed Ti leaf results

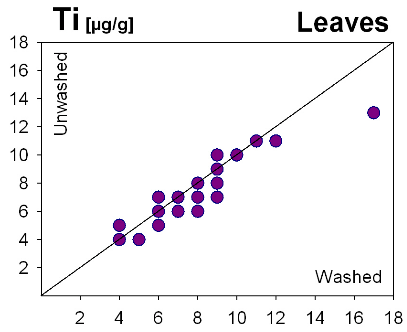


Fig.50 Plotted washed and unwashed leaf results.

Anaga agricultural areas: No significant differences are seen between the unwashed and washed leaves. The 4 leaf samples contain between 7 ± 0 µg/g and 10 ± 0 µg/g of Ti (mean 9 ± 0 µg/g).

Orotava laurel forest areas: The root samples contain between 19 ± 0 µg/g and 30 ± 0 µg/g of Ti, with an average of 25 ± 0 µg/g. No significant differences are seen between the unwashed and washed leaves (Fig.50). The 6 leaf samples contain between 6 ± 0 µg/g and 12 ± 0 µg/g of Ti (mean 9 ± 0 µg/g).

Orotava agricultural areas: Significant differences are not seen between unwashed and washed leaves (Fig.50). The values of 4 samples range from 7 ± 0 to 9 ± 0 µg/g (average 8 ± 0 µg/g).

Teno laurel forest areas: The root samples contain between 16 ± 0 µg/g and 367 ± 3 µg/g of Ti, with an average of 149 ± 1 µg/g. The highest levels are determined at sample T3 and T12 (186 ± 1 µg/g). No significant differences are seen between the unwashed and washed leaves (Fig.50). The 12 leaf samples contain between 6 ± 0 µg/g and 17 ± 0 µg/g of Ti, with an average of 9 ± 0 µg/g.

Teno agricultural areas: No significant differences are seen between the unwashed and washed leaves (Fig.50). The 10 leaf samples contain between 6 ± 0 µg/g and 12 ± 0 µg/g of Ti, with an average of 9 ± 0 µg/g.

3.9 Phosphorus (P)

Volcanic rocks

The laurel forest samples contain between 0.16 ± 0.01 wt.% and 0.71 ± 0.06 wt.% of P, with an average of 0.33 ± 0.03 wt.% (Fig.51). The fallow agricultural samples contain between 0.23 ± 0.02 wt.% and 0.58 ± 0.05 wt.% of P, with an average of 0.33 ± 0.03 wt.% .

Anaga rocks: The laurel forest samples contain between 0.20 ± 0.01 wt.% and 0.71 ± 0.05 wt.% of P, with an average of 0.39 ± 0.03 wt.%. The lowest amount of P is measured at sample A9 and A10.

Samples from Bailadero (A15, A16a, A16b) contain the three highest P values. Sample A15 contains 0.55 ± 0.04 wt.% and sample A16b contains 0.69 ± 0.05 wt.%. The agricultural samples contain 0.34 ± 0.03 wt.% (A30) and 0.58 ± 0.04 wt.% (A29) (average 0.46 ± 0.03 wt.%).

Orotava rocks: The laurel forest samples contain between 0.16 ± 0.01 wt.% (O7a) and 0.44 ± 0.03 wt.% (O6) of P, with an average of 0.32 ± 0.02 wt.%. The agricultural samples contain 0.23 ± 0.02 wt.% (O28) and 0.35 ± 0.03 wt.% (O31) of P.

Teno rocks: The laurel forest samples contain between 0.20 ± 0.01 wt.% (T12) and 0.27 ± 0.02 wt.% (T4a) of P, with an average of 0.23 ± 0.02 wt.%. The agricultural samples contain between 0.27 ± 0.02 wt.% (T23) and 0.31 ± 0.02 wt.% (T22) of P, with an average of 0.29 ± 0.02 wt.%.

Soils

The laurel forests mean P levels vary from 0.11 ± 0.01 wt.% to 0.34 ± 0.03 wt.%, with an average of 0.21 ± 0.02 wt.% (Fig.52). The 89 laurel forest soil horizons contain between 0.08 ± 0.01 wt.% and 0.37 ± 0.03 wt.% of P, with an average of 0.21 ± 0.02 wt.%. The fallow agricultural mean P levels vary from 0.08 ± 0.01 wt.% to 0.31 ± 0.02 wt.%, with an average of 0.22 ± 0.02 wt.% (Fig.52). The 35 fallow agricultural horizons contain between 0.07 ± 0.01 wt.% and 0.31 ± 0.02 wt.% of P, with an average of 0.22 ± 0.02 wt.%.

Anaga laurel forest soils: The mean P levels range from 0.11 ± 0.01 wt.% (A1, A10) to 0.34 ± 0.03 wt.% (A2), with an average of 0.22 ± 0.02 wt.%. Some profiles contain relatively homogenous mean values. For example, profile A1, A10, A19, A17 and A8 contain between 0.11 ± 0.01 wt.% and 0.17 ± 0.01 wt.%. Profile A14, A9 and A16 contain between 0.25 ± 0.02 wt.% and 0.28 ± 0.02 wt.% of P. The remaining two profiles

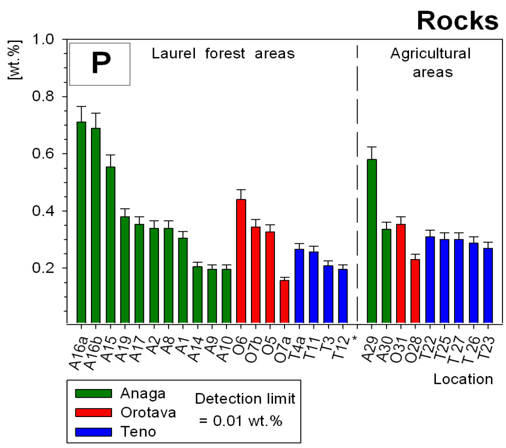


Fig.51 Histogram of the P rock results.

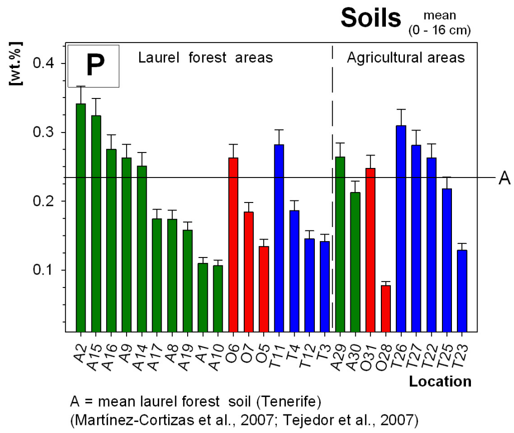


Fig.52 Histogram of the mean P topsoil results.

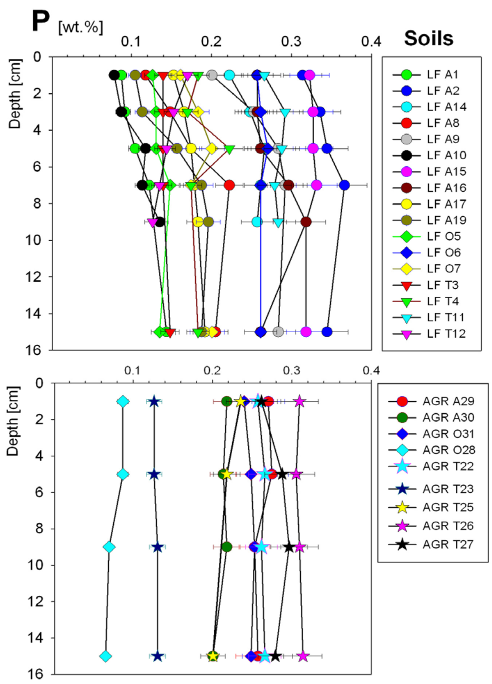


Fig.53 The P soil depth profiles.

contain 0.32 ± 0.02 wt.% (A15) and 0.34 ± 0.03 wt.% (A2). The 54 soil horizons contain between 0.08 ± 0.01 wt.% and 0.37 ± 0.03 wt.%. Regarding each profile separately shows that the P levels of all 10 profiles are more or less homogenously distributed within the upper 15 cm and decrease only slightly with increasing depth (Fig.53).

Anaga agricultural soils: Profile A30 contains a mean value of 0.21 ± 0.02 wt.% and profile A29 a mean value of 0.26 ± 0.02 wt.%. The 8 soil horizons contain between 0.20 ± 0.02 wt.% and 0.27 ± 0.02 wt.% of P, with an average of 0.24 ± 0.02 wt.%. Both soil profiles show nearly no variation within the upper 15 cm (Fig.53).

Orotava laurel forest soils: The profiles contain mean P levels between 0.13 ± 0.01 wt.% (O5) and 0.26 ± 0.02 wt.% (O6), with an average of 0.19 ± 0.01 wt.%. The P levels of the 16 horizons vary from 0.13 ± 0.01 wt.% to 0.27 ± 0.02 wt.%. All profiles contain more or less homogenously distributed P levels within the upper 15 cm. The levels decrease only slightly with increasing depth (Fig.53).

Orotava agricultural soils: The profiles contain mean P values of 0.08 ± 0.01 wt.% (O28) and 0.25 ± 0.02 wt.% (O31). The 8 soil horizons contain between 0.07 ± 0.01 wt.% and 0.25 ± 0.02 wt.%, with an average of 0.16 ± 0.01 wt.%. The profiles are more or less homogenous with only slight variations between the uppermost and lowest horizon (Fig.53).

Teno laurel forest soils: The profiles contain mean P levels between 0.14 ± 0.01 wt.% (T3) and 0.28 ± 0.02 wt.% (T11). The 20 soil horizons contain between 0.13 ± 0.01 wt.% and 0.29 ± 0.02 wt.% of P, with an average of 0.19 ± 0.01 wt.%. The profiles contain relatively homogenous P levels within the upper 15 cm (Fig.53).

Teno agricultural soils: The profiles contain mean P values from 0.13 ± 0.01 wt.% (T23) to 0.31 ± 0.02 wt.% (T26), with an average of 0.24 ± 0.02 wt.%. The 19 soil horizons contain between 0.13 ± 0.01 wt.% and 0.31 ± 0.02 wt.%. All soil profiles show nearly no variation 15 cm (Fig.53).

Roots and leaves

The 42 *L. novocanariensis* leaf samples from the laurel forest contain between 0.072 ± 0.006 wt.% and 0.178 ± 0.014 wt.% of P, with an average of 0.129 ± 0.010 wt.% (Fig.54). The 16 ***L. novocanariensis*** root samples from the laurel forest contain between 0.021 ± 0.002 wt.% and 0.167 ± 0.013 wt.% of P, with an average of 0.053 ± 0.004 wt.%. The 18 agricultural leaf samples contain between 0.074 ± 0.006 wt.% and 0.205 ± 0.016 wt.% of P (average 0.123 ± 0.010 wt.%.

Anaga laurel forest areas: The root samples contain between 0.021 ± 0.002 wt.% and 0.167 ± 0.013 wt.% of P, with an average of 0.058 ± 0.005 wt.%. The highest P root level is determined for A16. No significant differences are seen between the unwashed and washed leaves (Fig.55). The 22 leaf samples contain between 0.072 ± 0.006 wt.% and 0.178 ± 0.014 wt.%, with an average of 0.125 ± 0.010 wt.%.

Anaga agricultural areas: No significant differences are seen between the unwashed and washed leaves (Fig.55). The 4 leaf samples contain between 0.106 ± 0.008 wt.% and 0.150 ± 0.012 wt.% of P (average 0.126 ± 0.010 wt.%).

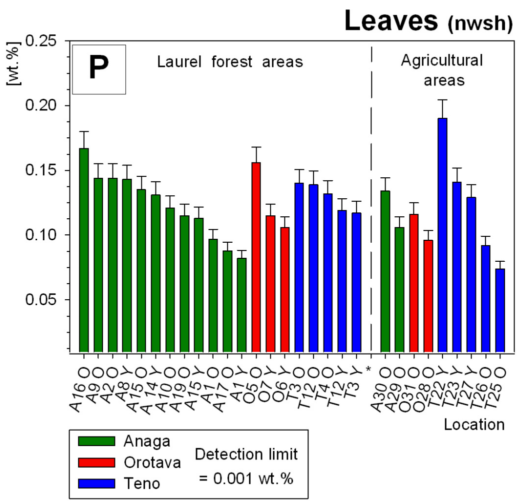


Fig.54 Histogram of unwashed P leaf results.

Orotava laurel forest areas: The root samples contain P in the range of 0.042 ± 0.003 wt.% and 0.071 ± 0.005 wt.%, with an average of 0.052 ± 0.004 wt.%. No significant differences are seen between the unwashed and washed leaves (Fig.55). The 6 leaf samples contain between 0.106 ± 0.008 wt.% and 0.161 ± 0.012 wt.% of P (average 0.128 ± 0.010 wt.%). The two highest values are determined at tree O5 (0.156 ± 0.012 wt.% and 0.161 ± 0.012 wt.%).

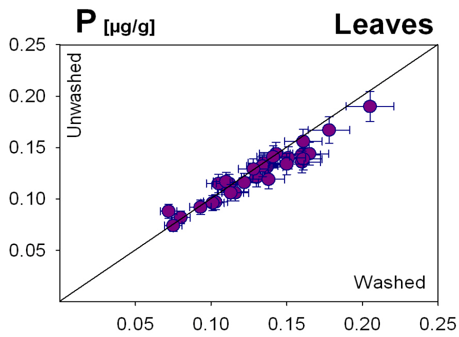


Fig.55 Plotted washed and unwashed leaf result.

Orotava agricultural areas: No significant differences are seen between the unwashed and washed leaves (Fig.55). The 4 leaf samples contain between 0.096 ± 0.007 wt.% and 0.122 ± 0.009 wt.% of P, with an average of 0.109 ± 0.008 wt.%.

Teno laurel forest areas: The root samples contain between 0.029 ± 0.002 wt.% and 0.065 ± 0.005 wt.% of P, with an average of 0.043 ± 0.003 wt.%. No significant differences are seen between the unwashed and washed leaves (Fig.55). The 12 leaf samples contain between 0.110 ± 0.008 wt.% and 0.161 ± 0.012 wt.% of P, with an average of 0.136 ± 0.011 wt.%. The highest values are determined at tree T11 (0.160 ± 0.012 wt.%) and T12 (0.161 ± 0.012 wt.%).

Teno agricultural areas: No significant differences are seen between the unwashed and washed leaves (Fig.55). The leaf samples contain between 0.074 ± 0.006 wt.% and 0.205 ± 0.016 wt.% of P, with an average of 0.127 ± 0.010 wt.%. The two highest values are determined at tree T22 (0.190 ± 0.015 wt.% / 0.205 ± 0.016 wt.%).

3.10 Manganese (Mn)

Volcanic rocks

The laurel forest samples contain between 0.11 ± 0.01 wt.% and 0.17 ± 0.01 wt.% of Mn, with an average of 0.13 ± 0.01 wt.% (Fig.56). The fallow agricultural samples contain between 0.14 ± 0.01 wt.% and 0.17 ± 0.01 wt.% of Mn, with an average of 0.15 ± 0.01 wt.% (Fig.56).

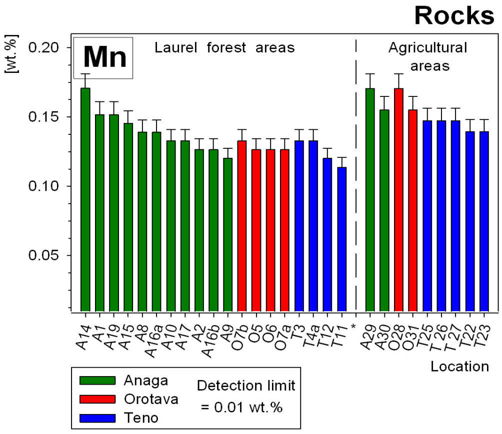


Fig.56 Histogram of the Mn rock results.

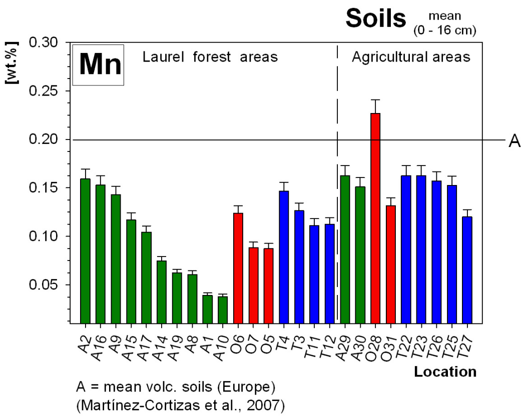


Fig.57 Histogram of the mean Mn topsoil results.

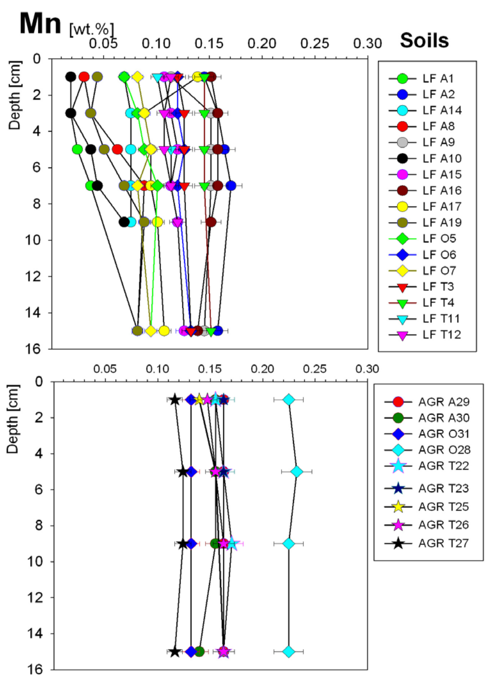


Fig.58 The Mn soil depth profiles.

Anaga rocks: The Mn levels of the laurel forest samples range from 0.12 ± 0.01 wt.% to 0.17 ± 0.01 wt.%, with an average of 0.14 ± 0.01 wt.%. The Mn levels are homogenously distributed within these samples. The agricultural samples contain 0.16 ± 0.01 wt.% (A30) and 0.17 ± 0.01 wt.% (A29) of Mn, with an average of 0.16 ± 0.01 wt.%.

Orotava rocks: The Mn levels of the laurel forest samples are homogenous and show no variations. All contain 0.13 ± 0.01 wt.% of Mn. The agricultural samples contain 0.16 ± 0.01 wt.% (O28) and 0.17 ± 0.01 wt.% (O31) of Mn.

Teno rocks: The Mn amounts of the laurel forest samples range from 0.11 ± 0.01 wt.% (T11) to 0.13 ± 0.01 wt.% (T4a, T4b, T3), with an average of 0.13 ± 0.01 wt.%. The agricultural samples contain between 0.14 ± 0.01 wt.% (T22) and 0.15 ± 0.01 wt.% (T25, T26, T27) of Mn, with an average of 0.14 ± 0.01 wt.%.

Soils

The laurel forests mean Mn levels vary from 0.04 ± 0.00 wt.% to 0.16 ± 0.01 wt.%, with an average of 0.10 ± 0.01 wt.% (Fig.57). The 89 laurel forest soil horizons contain between 0.02 ± 0.00 wt.% and 0.17 ± 0.01 wt.% of Mn, with an average of 0.12 ± 0.01 wt.%. The agricultural mean Mn levels vary from 0.12 ± 0.01 wt.% to 0.23 ± 0.01 wt.%, with an average of 0.16 ± 0.01 wt.% (Fig.57). The 35 agricultural horizons contain between 0.12 ± 0.01 wt.% and 0.23 ± 0.01 wt.% (average 0.16 ± 0.01 wt.%).

Anaga laurel forest soils: The profiles contain mean Mn levels between 0.04 ± 0.00 wt.% (A1, A10) and 0.16 ± 0.01 wt.% (A2) (average 0.10 ± 0.01 wt.%). The mean levels are dividable into two ranges. Profile A1, A10, A19, A8 and A14 contain between 0.04 ± 0.00 wt.% and 0.07 ± 0.00 wt.% of Mn and profile A17, A9, A15, A16 and A2 between 0.10 ± 0.01 wt.% and

0.16 ± 0.01 wt.%. The 54 soil horizons contain between 0.02 ± 0.00 wt.% and 0.17 ± 0.01 wt.%. Mn is homogenously distributed within the upper 15 cm (Fig.58).

Anaga agricultural soils: Profile A30 contains a mean of 0.15 ± 0.01 wt.% and A29 0.16 ± 0.01 wt.%. The 8 horizons show nearly no variation (Fig.58).

Orotava laurel forest soils: The profiles contain mean Mn levels from 0.09 ± 0.01 wt.% (O5, O7) to 0.12 ± 0.01 wt.% (O6), with an average of 0.10 ± 0.01 wt.%. The 16 forest soil horizons contain between 0.07 ± 0.00 wt.% and 0.13 ± 0.01 wt.% of Mn. There is nearly no variation (Fig.58).

Orotava agricultural soils: The mean value of O31 is 0.13 ± 0.01 wt.% and of O28 0.23 ± 0.01 wt.%. The 8 soil horizons contain between 0.13 ± 0.01 wt.% and 0.23 ± 0.01 wt.% of Mn, with an average of 0.18 ± 0.01 wt.%. Both profiles show nearly no variations (Fig.58).

Teno laurel forest soils: The profiles contain mean Mn levels between 0.11 ± 0.01 wt.% (T11, T12) and 0.15 ± 0.01 wt.% (T4). The 20 soil horizons contain between 0.10 ± 0.01 wt.% and 0.15 ± 0.01 wt.% of Mn, with an average of 0.12 ± 0.01 wt.%. The profiles show nearly no variations with increasing depth.

Teno agricultural soils: The mean Mn values range from 0.12 ± 0.01 wt.% (T27) to 0.16 ± 0.01 wt.% (T22, T23, T26), with an average of 0.15 ± 0.01 wt.%. The 19 soil samples contain between 0.12 ± 0.01 wt.% and 0.17 ± 0.01 wt.% of Mn. The profiles show nearly no Mn variation.

Roots and leaves

The analytical Mn results, which have been determined by the Acme Analytical Labs, are given in µg/g with a detection limit of 1 µg/g due to the determined low Mn levels. Anyway, the 42 *L. novocanariensis* leaf samples from the laurel forest contain between 23 ± 1 µg/g and 698 ± 44 µg/g of Mn, with an average of 173 ± 11 µg/g (Fig.59). The 16 *L. novocanariensis* root samples from the laurel forest contain between 7 ± 0 µg/g and 289 ± 18 µg/g of Mn, with an average of 94 ± 6 µg/g. The 18 *L. novocanariensis* leaf samples from the fallow agricultural areas contain between 24 ± 2 µg/g and 298 ± 19 µg/g of Mn, with an average of 84 ± 5 µg/g (Fig.59).

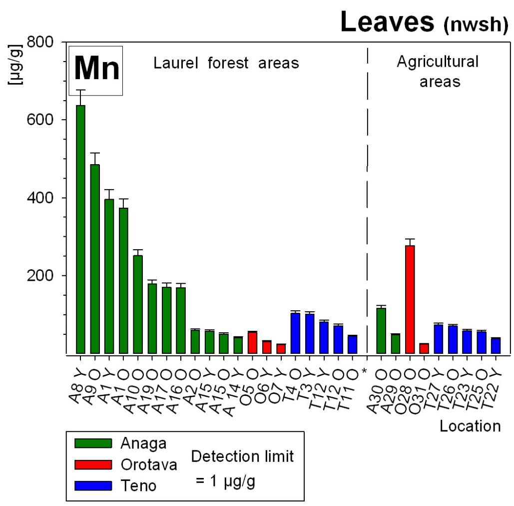


Fig.59 Histogram of the unwashed leaf results.

Anaga laurel forest areas: The root samples contain between 21 ± 1 µg/g and 289 ± 18 µg/g of Mn, with an average of 127 ± 8 µg/g. By far the highest Mn root levels are determined for A1 (289 ± 18 µg/g), A10 (249 ± 16 µg/g) and A8 (246 ± 15 µg/g). No significant differences are seen between the unwashed and washed leaves (Fig.60). The 22 leaf samples contain between 41 ± 3 µg/g and 698 ±

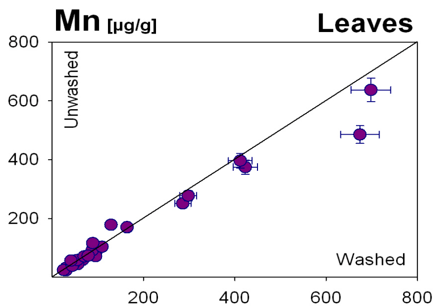


Fig.60 Plotted washed and unwashed leaf results.

44 µg/g of Mn, with an average of 251 ± 16 µg/g. More than 400 µg/g of Mn are determined for the samples A1a, A1b, A9 and above 600 µg/g of Mn at A8 and A9.

Anaga agricultural areas: No significant differences are seen between the unwashed and washed leaves. The 4 leaf samples contain between 48 ± 3 µg/g and 116 ± 7 µg/g of Mn, with an average of 75 ± 5 µg/g.

Orotava laurel forest areas: The root samples contain between 23 ± 1 µg/g and 31 ± 2 µg/g of Mn, with an average of 27 ± 2 µg/g. No significant differences are seen between the unwashed and washed leaves. The 6 samples contain 23 ± 1 µg/g to 54 ± 3 µg/g of Mn (average 36 ± 2 µg/g).

Orotava agricultural areas: No significant differences are seen between the unwashed and washed leaves (Fig.60). The 4 leaf samples contain between 24 ± 2 µg/g and 298 ± 19 µg/g, with an average of 156 ± 10 µg/g. The highest values occur at O28 (277 ± 17 µg/g and 298 ± 19 µg/g).

Teno laurel forest areas: The root samples contain between 7 ± 0 µg/g and 136 ± 9 µg/g of Mn, with an average of 64 ± 4 µg/g. The highest level is determined at T3. No significant differences are seen between the unwashed and washed leaves (Fig.60). The 12 leaf samples contain between 44 ± 3 µg/g and 109 ± 7 µg/g of Mn, with an average of 85 ± 5 µg/g.

Teno agricultural areas: No significant differences are seen between the unwashed and washed leaves (Fig.60). Leaves contain between 38 ± 2 µg/g and 79 ± 5 µg/g (average 58 ± 4 µg/g).

3.11 Strontium (Sr)

Volcanic rocks

The laurel forest samples contain between 38.0 ± 2.2 µg/g and 1694.2 ± 98.8 µg/g of Sr, with an average of 496.5 ± 29.0 µg/g (Fig.61). The fallow agricultural samples contain between 334.0 ± 19.6 µg/g and 899.9 ± 52.9 µg/g of Sr, with an average of 672.2 ± 39.5 µg/g (Fig.61).

Anaga rocks: The laurel forest samples contain a very heterogeneous Sr range with large variations. The samples contain between 38.0 ± 2.2 µg/g (A10) and 1137.0 ± 66.3 µg/g (A17) of Sr, with an average of 423.0 ± 24.7 µg/g. Sr values above 800.0 µg/g are measured at sample A8, A16a and A17. The agricultural samples contain 334.0 ± 19.6 µg/g (A29) and 419.2 ± 24.6 µg/g (A30).

Orotava rocks: The laurel forest rocks contain between 341.9 ± 19.9 µg/g (O7a) and 1694.2 ± 98.8 µg/g (O6) of Sr, with an average of 1071.1 ± 68.3 µg/g. The agricultural samples contain 623.4 ± 36.7 µg/g (O28) and 782.4 ± 46.0 µg/g (O31) of Sr.

Teno rocks: The laurel forest samples contain between 102.0 ± 5.9 µg/g (T4a) and 436.6 ± 27.0 µg/g (T11) of Sr, with an average of 241.9 ± 14.1 µg/g. The agricultural samples contain between 649.4 ± 41.3 µg/g (T22) and 899.9 ± 52.9 µg/g (T27) of Sr (average 778.1 ± 52.9 µg/g).

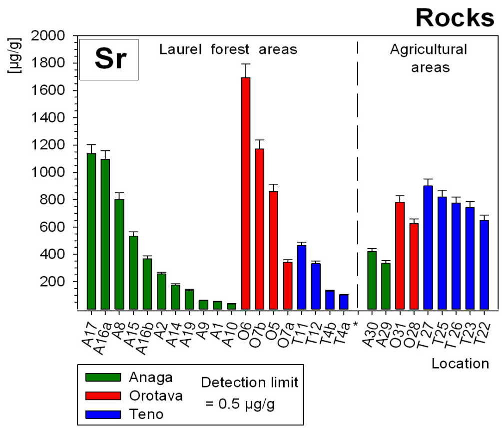


Fig.61 Histogram of the Sr rock results.

Soils

The laurel forests mean Sr levels vary from 67.92 ± 3.96 µg/g to 788.02 ± 45.97 µg/g, with an average of 233.60 ± 13.63 µg/g (Fig.62). The 89 laurel forest soil horizons contain between 57.6 ± 3.4 µg/g and 950.6 ± 55.5 µg/g of Sr (average 231.9 ± 13.5 µg/g). The fallow agricultural mean Sr levels vary from 187.90 ± 10.95 µg/g to 542.75 ± 31.64 µg/g (average 379.56 ± 22.13 µg/g) (Fig.62). The 35 fallow agricultural soil horizons contain between 183.1 ± 10.7 µg/g and 567.5 ± 33.1 µg/g of Sr (average 381.0 ± 22.2 µg/g).

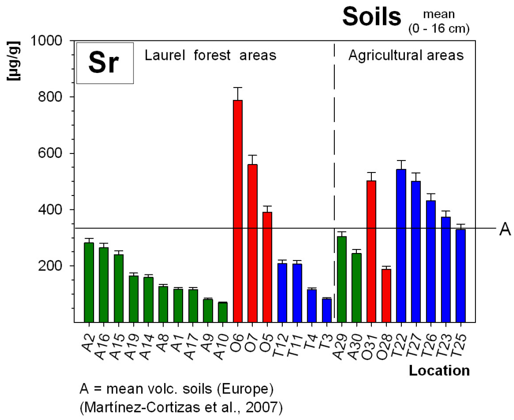


Fig.62 Histogram of the mean Sr topsoil results.

Anaga laurel forest soils: The mean Sr levels range from 67.9 ± 4.0 µg/g (A10) to 281.8 ± 16.4 µg/g (A2), (average 164.5 ± 9.6 µg/g). The three highest mean levels in the range of 240.2 ± 14.0 µg/g and 281.8 ± 16.4 µg/g are determined at A15, A16 and A2. The 54 soil horizons contain between 57.6 ± 3.4 µg/g and 313.3 ± 18.3 µg/g of Sr. Regarding each profile separately shows that the Sr levels decrease with increasing depth within profile A9, A14 and A15. The differences between the uppermost and the lowest horizon range from 40.8 ± 2.4 µg/g to 130.6 ± 7.6 µg/g (A15). An Sr increase with increasing depth is determined for A19, A10, A16, A1, A2, and A8. The levels vary from 6.9 ± 0.4 µg/g to 71.5 ± 4.1 µg/g.

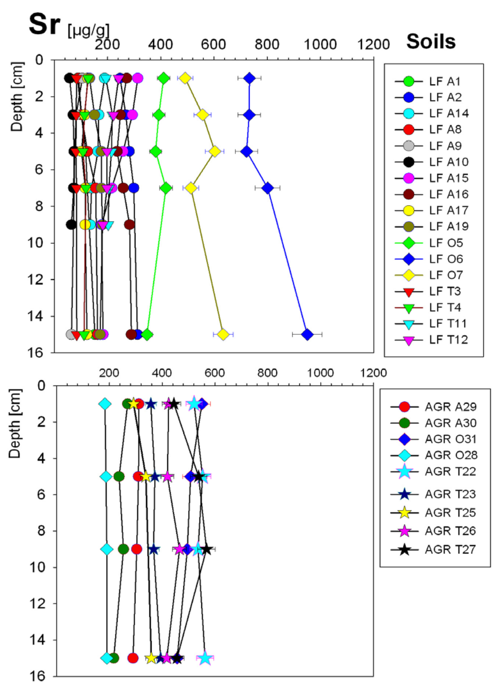


Fig.63 The Sr soil depth profiles.

Anaga agricultural soils: The profiles contain mean Sr levels of 244.0 ± 14.2 µg/g (A30) and 303.7 ± 17.7 µg/g (A29). The 8 soil horizons contain between 216.4 ± 12.6 µg/g and 311.7 ± 18.2 µg/g of Sr, (average 273.9 ± 16.0 µg/g). Profile A29 and A30 show a slight decreases of Sr with increasing depth

(Fig.63). The differences between the uppermost and lowest horizon range from 22.2 ± 1.3 µg/g to 52.9 ± 3.1 µg/g.

Orotava laurel forest soils: The mean Sr levels differ widely in the range of 390.2 ± 22.8 µg/g (O5) and 788.0 ± 46.0 µg/g (O6), with an average of 579.4 ± 33.8 µg/g. The 16 soil horizons contain between 348.0 ± 20.3 µg/g and 950.6 ± 55.5 µg/g of Sr. By far the highest Sr levels above 700 µg/g are determined for profile O6. Two profiles (O6, O7) contain with increasing depth a significant increase of Sr and the values range from 142.9 ± 8.3 µg/g (O7) to 217.4 ± 12.7 µg/g (O6) (Fig.63). Profile O5 contains instead decreasing Sr levels.

Orotava agricultural soils: The profiles contain mean values of 187.9 ± 11.0 µg/g (O28) and 502.3 ± 29.3 µg/g (O31). The 8 soil horizons contain between 183.1 ± 10.7 µg/g and 550.0 ± 32.1 µg/g of Sr (average 345.1 ± 20.1 µg/g). O31 contains with increasing depth a decrease of Sr. The deviation is 93.1 ± 5.4 µg/g. The Sr levels of O28 slightly increase with increasing depth (7.4 ± 0.4).

Teno laurel forest soils: The mean Sr levels range from 82.9 ± 4.8 µg/g (T3) to 208.5 ± 12.2 µg/g (T12), with an average of 153.5 ± 9.0 µg/g. The 20 soil horizons contain between 81.1 ± 4.7 µg/g and 241.7 µg/g of Sr. Two profiles contain with increasing depth a decrease of Sr (T4, T12). The deviations range from 15.6 ± 0.9 µg/g to 59.4 ± 3.5 µg/g. The remaining two profiles show only slight variations with increasing depth (Fig.63).

Teno agricultural soils: The profiles contain mean Sr levels between 329.5 ± 19.2 µg/g (T25) and 542.8 ± 31.6 µg/g (T22), with an average of 441.2 ± 25.7 µg/g. The 19 soil horizons contain between 291.7 ± 17.0 µg/g and 567.5 ± 33.1 µg/g of Sr. Four of five profiles contain an Sr increase with increasing depth (Fig.63). The differences between the uppermost and the lowest soil horizon range from 11.6 ± 0.7 µg/g to 41.3 ± 2.4 µg/g.

Roots and leaves

The 42 ***L. novocanariensis*** leaf samples from the laurel forest contain between 14.5 ± 0.8 µg/g and 148.4 ± 8.7 µg/g of Sr, with an average of 55.2 ± 3.2 µg/g (Fig.64). The 16 ***L. novocanariensis*** root samples from the laurel forest contain between 13.0 ± 0.8 µg/g and 262.6 ± 15.3 µg/g of Sr, with an average of 62.6 ± 3.7 µg/g. The 18 ***L. novocanariensis*** leaf samples from the fallow agricultural areas contain between 39.6 ± 2.3 µg/g and 90.7 ± 5.3 µg/g of Sr, (average 66.9 ± 3.9 µg/g) (Fig.64).

Anaga laurel forest areas: The root samples contain between 13.0 ± 0.8 µg/g and 262.6 ± 15.3 µg/g (A16) of Sr, with an average of 67.2 ± 3.9 µg/g. The highest Sr root levels are determined for A14 (107.1 ± 6.2 µg/g) and A16. No significant differences are seen between the unwashed and washed leaves (Fig.65). The 22 leaf samples contain from 14.5 ± 0.8 µg/g to 87.5 ± 5.1 µg/g of Sr (mean 39.7 ± 2.3 µg/g).

Anaga agricultural areas: No significant differences are seen between the unwashed and washed leaves (Fig.65). The Sr levels within the 4 leaf samples range from 69.5 ± 4.1 µg/g to 88.1 ± 5.1 µg/g, with an average of 80.0 ± 4.7 µg/g.

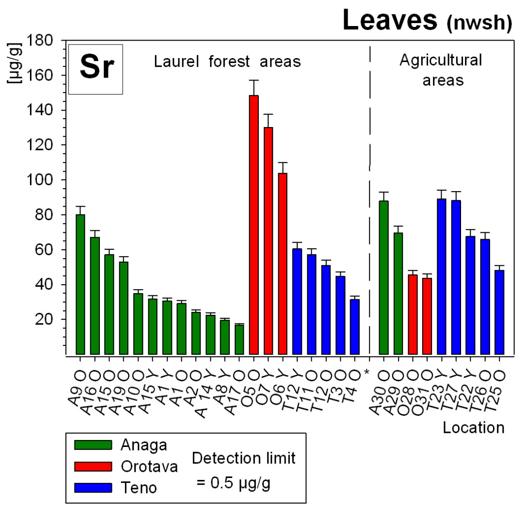


Fig.64 Histogram of the unwashed Sr leaf results.

Orotava laurel forest areas: Roots contain between 47.3 ± 2.8 µg/g and 178.7 ± 10.4 µg/g of Sr, (average 95.7 ± 5.6 µg/g). No significant differences are seen between the unwashed and washed leaves (Fig.65). The 6 leaf samples contain between 91.7 ± 5.3 µg/g and 148.4 ± 8.7 µg/g (average 122.6 ± 7.2 µg/g). The highest levels are determined at sample O7 and O5.

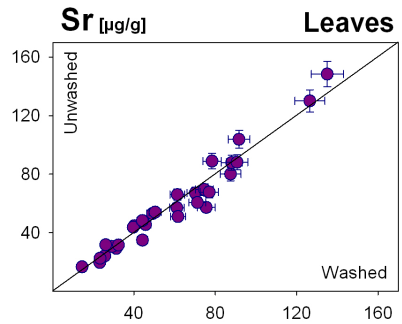


Fig.65 Plotted washed and unwashed leaf results.

Orotava agricultural areas: No significant differences are seen between the unwashed and washed leaves (Fig.65). The Sr levels within the 4 leaf samples range from 39.6 ± 2.3 µg/g to 45.7 ± 2.7 µg/g, with an average of 43.6 ± 2.5 µg/g.

Teno laurel forest areas: The root samples contain Sr in the range of 15.2 ± 0.9 µg/g and 47.5 ± 2.8 µg/g, with an average of 26.5 ± 1.5 µg/g. No significant differences are seen between the unwashed and washed leaves (Fig.65). The 12 leaf samples contain between 31.5 ± 1.8 µg/g and 75.6 ± 4.4 µg/g of Sr, with an average of 52.5 ± 3.1 µg/g.

Teno agricultural areas: No significant differences are seen between the unwashed and washed leaves (Fig.65). The 10 leaf samples contain between 44.1 ± 2.6 µg/g and 90.7 ± 5.3 µg/g of Sr, with an average of 71.0 ± 4.1 µg/g.

3.12 Total Carbon

Volcanic rocks

The laurel forest samples contain between 0.05 ± 0.00 wt.% and 0.79 ± 0.03 wt.% of C_{tot}, with an average of 0.32 ± 0.01 wt.% (Fig.66). The fallow agricultural samples contain between 0.03 ± 0.00 wt.% and 0.30 ± 0.01 wt.% of C_{tot}, with an average of 0.18 ± 0.01 wt.% (Fig.66).

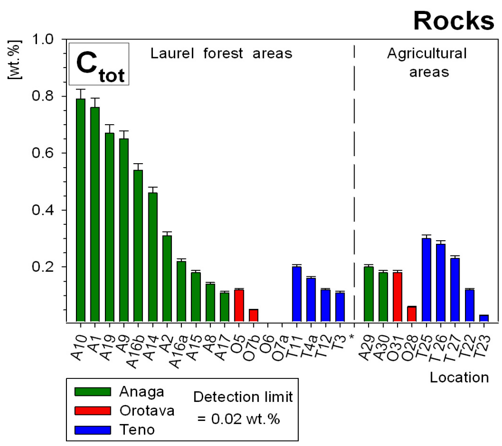


Fig.66 Histogram of the C rock results.

Anaga rocks: The laurel forest rocks contain between 0.11 ± 0.01 wt.% (A17) and 0.79 ± 0.03 wt.% (A10) of C_{tot}, with an average of 0.44 ± 0.02 wt.%. The C_{tot} levels are dividable into two ranges. Sample A2, A8, A15, A16a and A17 contain between 0.11 ± 0.01 wt.% and 0.31 ± 0.01 wt.% (A2) of C_{tot}. The remaining samples contain between 0.46 ± 0.02 wt.% (A14) and 0.79 ± 0.03 wt.% of C_{tot}. The agricultural sample A30 contains 0.18 ± 0.01 wt.% and A29 contains 0.20 ± 0.01 wt.%.

Orotava rocks: Only 2 laurel forest samples contain C_{tot} above the detection limit (<0.02 wt.%). Sample O7b contains 0.05 ± 0.00 wt.% and O5 0.12 ± 0.01 wt.% of C_{tot} The agricultural samples contain 0.06 ± 0.01 wt.% (O28) and 0.18 ± 0.01 wt.% (O31) of C_{tot}.

Teno rocks: The laurel forest samples contain between 0.11 ± 0.01 wt.% (T3) and 0.20 ± 0.01 wt.% (T11) of C_{tot}, with an average of 0.15 ± 0.01 wt.%. The agricultural samples contain between 0.03 ± 0.01 wt.% (T23) and 0.30 ± 0.01 wt.% (T25) of C_{tot}, (average 0.19 ± 0.01 wt.%).

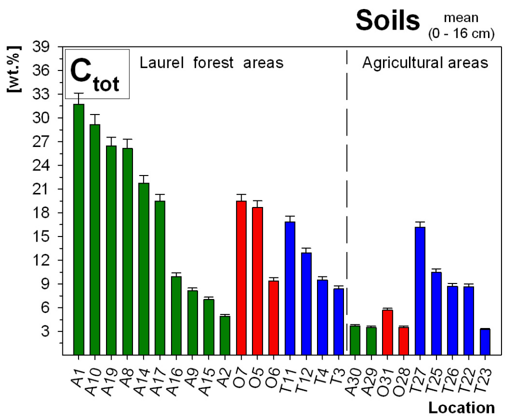


Fig.67 Histogram of the mean C topsoil results.

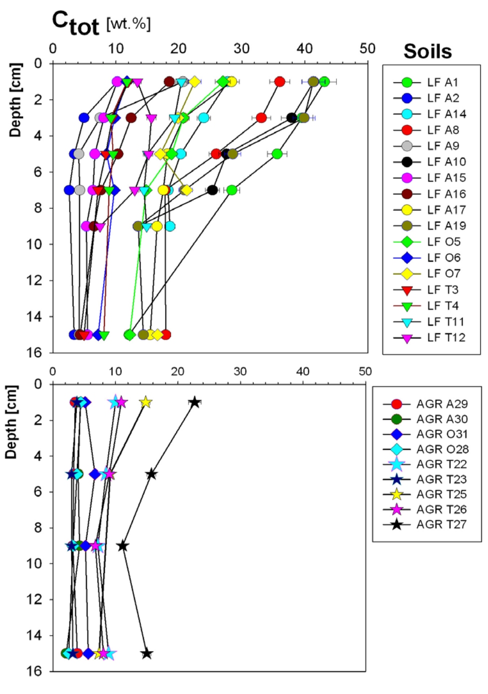


Fig.68 The C soil depth profiles.

Soils

The laurel forests mean C_{tot} levels vary from 4.90 ± 0.22 wt.% to 31.75 ± 1.40 wt.%, with an average of 16.46 ± 0.73 wt.% (Fig.67). The 89 laurel forest soil horizons contain between 2.59 ± 0.11 wt.% and 43.11 ± 1.91 wt.% of C_{tot}, with an average of 16.43 ± 1.91 wt.%. The fallow agricultural mean C_{tot} levels vary from 3.25 ± 0.14 wt.% to 16.14 ± 0.71 wt.%, with an average of 7.06 ± 0.31 wt.% (Fig.67). The 35 fallow agricultural horizons contain between 2.14 ± 0.09 wt.% and 22.66 ± 1.00 wt.% of C_{tot}, with an average of 6.97 ± 0.31 wt.%.

Anaga laurel forest soils: The mean C_{tot} levels range from 4.90 ± 0.22 wt.% (A2) to 31.75 ± 1.40 wt.% (A1), with an average of 18.27 ± 0.81 wt.%. The results are separable into two ranges. The lowest mean levels range from 2.59 ± 0.11 wt.% to 9.95 ± 0.44 wt.% (A2, A9, A15, A16). The remaining profiles contain between 19.45 ± 0.86 wt.% (A17) and 31.75 ± 1.40 wt.% (A1). The 54 soil horizons contain between 2.59 ± 0.11 wt.% and 43.11 ± 1.91 wt.% of C_{tot}. The highest values are detected always in the upper soil horizon (0 – 2 cm) and decrease significantly with increasing depth (Fig.68). Profile A1, A8, A10 and A19 contain in the upper soil horizon between 36.01 ± 1.59 wt.% (A8) and 43.11 ± 1.91 wt.% (A1) of C_{tot}.

Profile A14, A9, A16 and A17 contain between 18.48 ± 0.82 wt.% (A16) and 28.35 ± 1.25 wt.% (A17). The remaining profiles contain 10.19 ± 0.45 wt.% and 10.20 ± 0.45 wt.%.

Anaga agricultural soils: Profile A29 contains a mean value of 3.49 ± 0.15 wt.% and profile A30 a mean value of 3.70 ± 0.16 wt.%. Both soil profiles contain very homogenous C_{tot} values and show nearly no variation within the upper 15 cm (Fig.68). The highest value of 4.39 ± 0.19 wt.% is determined at sample A30.

Orotava laurel forest soils: The profiles contain mean C_{tot} levels between 9.40 ± 0.42 wt.% (O6) and 19.45 ± 0.86 wt.% (O7), with an average of 15.85 ± 0.70 wt.%. The 16 soil horizons contain between 7.18 ± 0.32 wt.% and 26.98 ± 1.19 wt.% of C_{tot}. The highest amounts occur in the upper soil horizon (0 – 2 cm). The highest amounts are determined O5 (26.98 ± 1.19 wt.%) and O7 (22.50 ± 0.99 wt.%).

Orotava agricultural soils: The profiles contain mean values of 3.51 ± 0.16 wt.% (O28) and 5.68 ± 0.25 wt.% (O31). The 8 soil horizons contain between 2.52 ± 0.11 wt.% and 6.72 ± 0.30 wt.% of C_{tot}, with an average of 4.59 ± 0.20 wt.%.

Teno laurel forest soils: The profiles contain mean levels between 8.37 ± 0.37 wt.% (T3) and 16.81 ± 0.74 wt.% (T11), with an average of 11.91 ± 0.53 wt.%. The 20 soil horizons contain between 4.94 ± 0.22 wt.% and 20.39 ± 0.90 wt.%. The highest levels are determined in the upper soil horizon (0 – 2 cm) and decrease significantly with increasing depth (Fig.68).

Teno agricultural soils: The profiles contain mean C_{tot} levels between 3.25 ± 0.14 wt.% (T23) and 16.14 ± 0.71 wt.% (T27), with an average of 9.38 ± 0.41 wt.%. The 19 soil horizons contain between 2.98 ± 0.13 wt.% and 22.66 ± 1.00 wt.%. The highest levels are determined at sample T27 (22.66 ± 1.00 wt.%) (Fig.68).

3.13 Total Sulphur

Volcanic rocks

The S_{tot} levels of 2 laurel forest samples are 0.05 ± 0.00 wt.% (A1) and 0.11 ± 0.01 wt.% (A2), with an average of 0.08 ± 0.01 wt.% (Fig.69). The levels of all remaining rock samples are below the detection limit of 0.02 wt.%. In addition, only 3 agricultural samples (A29, T22, T23) contain between 0.05 ± 0.00 wt.% and 0.11 ± 0.01 wt.% of S_{tot}, with an average of 0.08 ± 0.01 wt.% (Fig.69).

Soils

The laurel forests mean S_{tot} levels vary from 0.03 ± 0.00 wt.% to 0.12 ± 0.01 wt.%, with an average of 0.06 ± 0.00 wt.% (Fig.70). Only 52 of 89 laurel forest soil horizons contain S_{tot} above the detection limit. The S_{tot} levels range from 0.02 ± 0.00 wt.% to 0.17 ± 0.01 wt.%, with an average of 0.06 ±

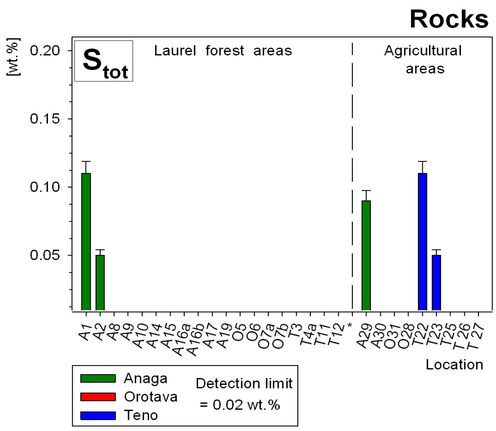


Fig.69 Histogram of the S rock results.

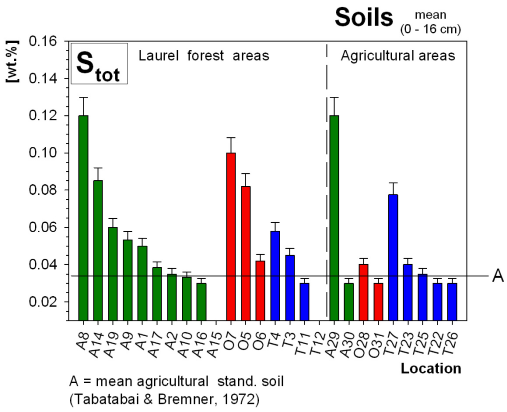


Fig.70 Histogram of the mean S topsoil results.

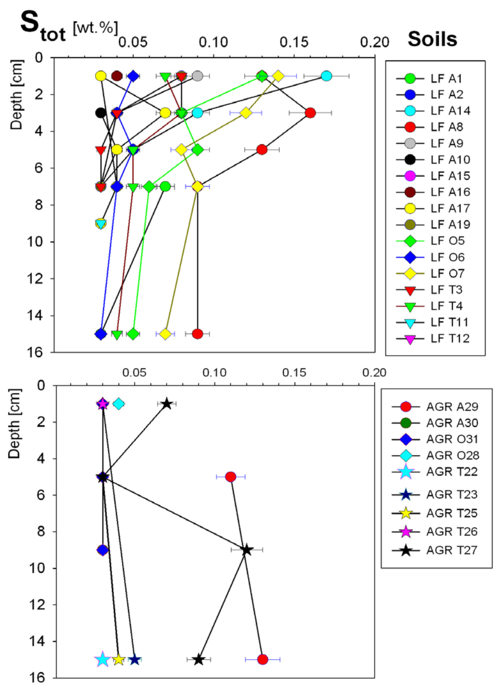


Fig.71 The soil depth profiles.

0.01 wt.%. The fallow agricultural mean S_{tot} levels vary from 0.03 ± 0.00 wt.% to 0.13 ± 0.01 wt.%, with an average of 0.05 ± 0.00 wt.% (Fig.70).

Anaga laurel forest soils: The mean S_{tot} levels range from 0.03 ± 0.00 wt.% (A16, A10) to 0.12 ± 0.01 wt.% (A8), with an average of 0.06 ± 0.01 wt.%. Regarding each profile separately shows totally irregular distributed S_{tot}. For example, detectable S_{tot} levels occur in the upper soil centimetres (0 – 10 cm) of profile A9, A14, A17 and A19 (Fig.71). Only profile A8 contains S_{tot} within all soil horizons (0 – 15 cm). The remaining samples contain S_{tot} either in the upper (A16), middle (A10) or lowest soil horizon (A1). Total sulphur is detectable only within 29 of 54 soil horizons. The levels range from 0.03 ± 0.00 wt.% to 0.17 ± 0.01 wt.%.

Anaga agricultural soils: Total sulphur levels are detectable only within 3 of 8 soil horizons. Two soil horizons of profile A29 contain 0.11 ± 0.01 wt.% and 0.13 ± 0.01 wt.% and one soil horizon of profile A30 contains 0.03 ± 0.00 wt.% (Fig.71).

Orotava laurel forest soils: The profiles contain mean S_{tot} levels between 0.04 ± 0.00 wt.% (O6) and 0.10 ± 0.01 wt.% (O7), with an average of 0.07 ± 0.01 wt.%. All 16 soil horizons contain between 0.03 ± 0.00 wt.% and 0.14 ± 0.01 wt.% of S_{tot}. The two highest amounts occur in the uppermost soil horizon (0 – 2 cm) of profile O5 and O7. The S_{tot} levels decrease with increasing depth at both profiles (Fig.71).

Orotava agricultural soils: Total sulphur levels are above the detection limit within 3 soil horizons of profile O31 and within one horizon of profile O28. The values range from 0.03 ± 0.00 wt.% (O31) to 0.04 ± 0.00 wt.% (O28).

Teno laurel forest soils: Only three of four profiles (T3, T4, T11) contain S_{tot} above the detection limit. Regarding each profile separately shows that the amounts are totally irregular distributed. Only profile T4 contains within all soil horizons S_{tot}. The levels range from 0.04 ± 0.00 wt.% to 0.07 ± 0.00 wt.% and decrease with increasing depth (Fig.71). Profile T3 and T11 contain only in the upper 10 cm detectable S_{tot} levels (0.03 ± 0.00 wt.% to 0.08 ± 0.01 wt.%).

Teno agricultural soils: The profiles contain also totally irregular distributed amounts of S_{tot}. Only profile T27 contains within all horizons S_{tot} above the detection limit. The levels vary from 0.03 ± 0.00 wt.% to 0.12 ± 0.01 wt.%. The remaining profiles contain S_{tot} either in the upper centimetres or in the lowest soil centimetres (Fig.71).

Roots and leaves

The 42 ***L. novocanariensis*** leaf samples from the laurel forest contain between 0.10 ± 0.01 wt.% and 0.23 ± 0.02 wt.% of S_{tot}, with an average of 0.16 ± 0.01 wt.% (Fig.72). The 16 ***L. novocanariensis*** root samples from the laurel forest contain between 0.02 ± 0.00 wt.% and 0.32 ± 0.03 wt.% of S_{tot}, with an average of 0.10 ± 0.01 wt.%. The 18 ***L. novocanariensis*** leaf samples from the fallow agricultural areas contain between 0.07 ± 0.01 wt.% and 0.15 ± 0.01 wt.% of S_{tot},(average 0.12 ± 0.01 wt.% (Fig.72).

Anaga laurel forest areas: The root samples contain between 0.02 ± 0.00 wt.% and 0.32 ± 0.03 wt.% of S_{tot}, with an average of 0.11 ± 0.01 wt.%. By far the highest S_{tot} root level is determined at A16. No significant differences are seen between the unwashed and washed leaves (Fig.73). The 22 leaf samples contain between 0.13 ± 0.01 wt.% and 0.23 ± 0.02 wt.% of S_{tot}, with an average of 0.18 ± 0.01 wt.%. The highest levels occur at A15 and A9.

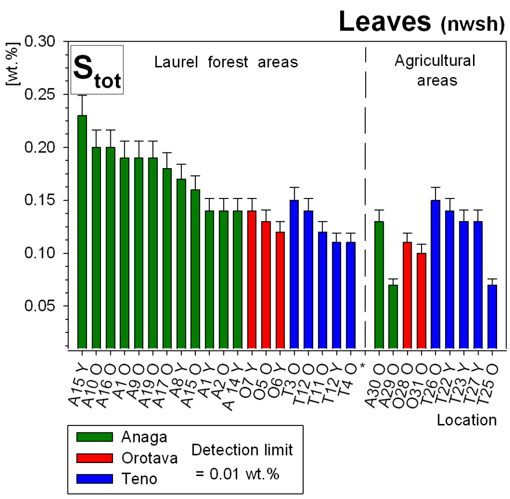


Fig.72 Histogram of the unwashed S leaf results.

Anaga agricultural areas: No significant differences are seen between unwashed and washed leaves (Fig.73). Leaves contain 0.07 ± 0.01 to 0.15 ± 0.01 wt.% (mean 0.11 ± 0.01 wt.%).

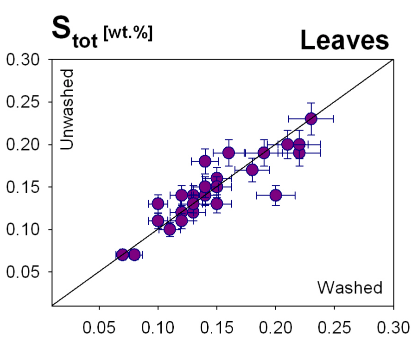


Fig.73 Plotted washed and unwashed leaf results.

Orotava laurel forest areas: The root samples contain between 0.07 ± 0.01 wt.% and 0.12 ± 0.01 wt.% of S_{tot}, with an average of 0.09 ± 0.01 wt.%. No significant differences are seen between the unwashed and washed leaves (Fig.73). The 6 leaf samples contain between 0.12 ± 0.01 wt.% and 0.20 ± 0.02 wt.% of S_{tot}, with an average of 0.15 ± 0.02 wt.%.

Orotava agricultural areas: No significant differences are seen between the unwashed and washed leaves (Fig.73). The 4 leaf samples contain between 0.10 ± 0.01 wt.% and 0.12 ± 0.01 wt.% of S_{tot}, with an average of 0.11 ± 0.01 wt.%.

Teno laurel forest areas: The root samples contain between 0.03 ± 0.00 wt.% and 0.13 ± 0.01 wt.% of S_{tot}, with an average of 0.07 ± 0.01 wt.%. No significant differences are seen between the unwashed and washed leaves (Fig.73). The 12 leaf samples contain between 0.10 ± 0.01 wt.% and 0.15 ± 0.01 wt.% of S_{tot}, with an average of 0.13 ± 0.01 wt.%.

Teno agricultural areas: No significant differences are seen between the unwashed and washed leaves (Fig.73). The 10 leaf samples contain between 0.07 ± 0.01 wt.% and 0.15 ± 0.01 wt.% of S_{tot}, with an average of 0.12 ± 0.01 wt.%.

3.14 Zirconium (Zr)

Volcanic rocks

The laurel forest samples contain between 170.1 ± 9.3 µg/g and 788.3 ± 43.0 µg/g, with an average of 401.4 ± 21.9 µg/g (Fig.74). The fallow agricultural samples contain between 206.2 ± 11.2 µg/g and 443.1 ± 24.1 µg/g of Zr, with an average of 253.1 ± 13.8 µg/g (Fig.74).

Anaga rocks: The laurel forest rocks contain between 328.8 ± 17.9 µg/g (A2) and 788.3 ± 43.0 µg/g (A14) of Zr, (average 486.8 ± 26.5 µg/g). Rock samples from the northeastern part of the Anaga Mountains (A1, A2, A14) show the larges variation within the Zr levels. The lowest and the two highest Zr levels are measured at this area. The remaining samples are relatively homogenous. The agricultural samples contain 253.2 ± 13.8 µg/g (A30) and 443.1 ± 24.1 µg/g (A29).

Orotava rocks: The laurel forest samples contain between 170.1 ± 9.3 µg/g (O7a) and 365.0 ± 19.9 µg/g (O7b) of Zr, with an average of 299.2 ± 16.3 µg/g. Sampling site O7 indicates clearly that the Zr values can differ widely within the same sampling site. The agricultural samples contain 226.4 ± 12.3 µg/g (O28) and 270.3 ± 14.7 µg/g (O31) of Zr (average 248.1 ± 13.5 µg/g).

Teno rocks: The laurel forest samples contain between 214.3 ± 11.7 µg/g (T12) and 381.1 ± 20.8 µg/g (T4b) of Zr, with an average of 294.9 ± 16.1 µg/g. The agricultural samples are relatively homogenous and contain between 206.2 ± 11.2 µg/g (T22) and 228.5 ± 12.5 µg/g (T23) of Zr, with an average of 217.0 ± 11.8 µg/g.

Soils

The laurel forests mean Zr levels vary from 171.78 ± 9.37 µg/g to 595.10 ± 32.46 µg/g, with an average of 309.66 ± 16.89 µg/g (Fig.75). The 89 laurel forest soil horizons contain between 65.1 ± 3.6 µg/g and 646.4 ± 35.3 µg/g of Zr, with an average of 312.0 ± 17.0 µg/g. The fallow agricultural mean Zr levels vary from 236.58 ± 12.89 µg/g to 675.65 ± 36.82 µg/g, with an average of 374.49 ± 20.41 µg/g (Fig.75). The 35 fallow agricultural soil horizons contain between 195.4 ± 10.6 µg/g and 690.2 ± 37.6 µg/g of Zr, with an average of 374.9 ± 20.4 µg/g.

Anaga laurel forest soils: The mean Zr levels range between 171.8 ± 9.4 µg/g (A8) and 595.1 ± 32.5 µg/g (A2), with an average of 331.7 ± 18.1 µg/g. The mean levels are separable into different Zr ranges. Profile A8, A19 and A10 contain between 171.8 ± 9.4 µg/g and 205.5 ± 11.2 µg/g. Profile A1, A14 and A9 contain between 248.0 ± 13.5 µg/g and 348.5 ± 19.0 µg/g. The highest mean levels between 441.2 ± 24.1 µg/g and 595.1 ± 32.5 µg/g are determined for A15, A16 and A2. The 54 soil horizons contain between 65.1 ± 3.6 µg/g and 646.4 ± 35.3 µg/g. The lowest Zr levels occur always in the upper soil horizons (0 – 2 cm, 2 – 4 cm) and increase with increasing depth. The differences between the uppermost and the lowest horizon can differ widely (Fig.76). Profile A10 and A1 have the larges deviations (from 317.9 ± 17.3 µg/g to 489.1 ± 26.7 µg/g).

Anaga agricultural soils: Profile A30 contains a mean value of 377.4 ± 20.6 µg/g and profile A29 a mean value of 392.1 ± 21.4 µg/g. Both soil profiles contain very homogenous Zr values and show only slight variations within increasing depth (Fig.76).

Orotava laurel forest soils: The mean levels range from 215.8 ± 11.8 µg/g (O5) to 410.4 ± 22.4 µg/g (O7), with an average of 294.6 ± 16.1 µg/g. The 16 horizons contain between 154.3 ± 8.4 µg/g and 438.4 ± 23.9 µg/g. The Zr levels increase with increasing depth. The deviations between the uppermost and lowest horizon range from 49.2 ± 2.68 to 128.1 ± 7.0 µg/g.

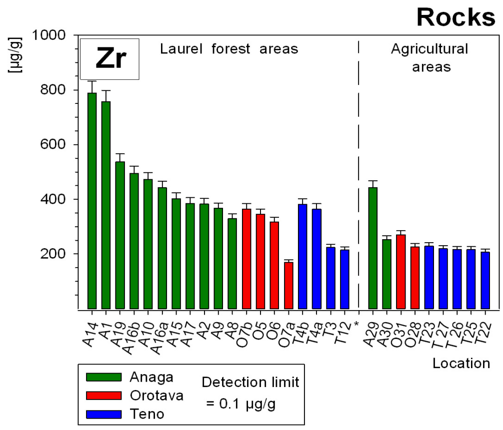


Fig.74 Histogram of the Zr rock results.

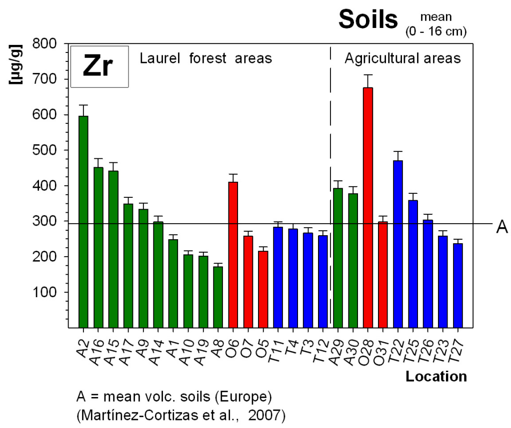


Fig.75 Histogram of the mean Zr topsoil results.

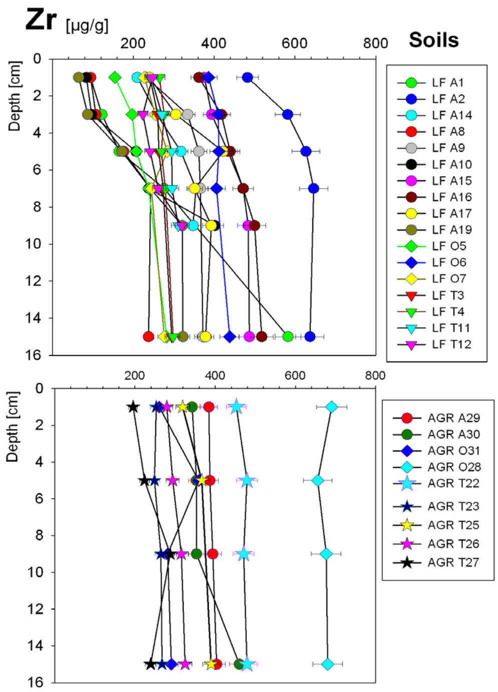


Fig.76 The Zr soil depth profiles.

Orotava agricultural soils: Profile O31 contains a mean of 297.9 ± 16.2 µg/g and O28 a mean of 675.7 ± 36.8 µg/g. Each profile contains relative homogenous Zr levels (Fig.76). The 8 soil horizons contain between 260.4 ± 14.2 µg/g and 690.2 ± 37.6 µg/g, (average 486.8 ± 26.5 µg/g).

Teno laurel forest soils: The mean levels range from 258.9 ± 14.1 µg/g (T12) to 283.3 ± 15.5 µg/g (T11), with an average of 271.6 ± 14.8 µg/g. The 20 soil horizons contain between 223.9 ± 12.2 µg/g and 320.5 ± 17.5 µg/g and the Zr levels increase with increasing depth (Fig.76). The deviations range between 34.3 ± 1.9 µg/g and 73.4 ± 4.0 µg/g.

Teno agricultural soils: The profiles contain mean levels between 258.5 ± 14.1 µg/g (T23) and 358.4 ± 19.5 µg/g (T25), with an average of 323.7 ± 17.6 µg/g. (Fig.76). The 19 soil horizons contain between 195.4 ± 10.6 µg/g and 479.1 ± 26.1 µg/g of Zr.

Roots and leaves

The 42 *L. novocanariensis* leaf samples from the laurel forest contain between 0.03 ± 0.00 µg/g and 0.47 ± 0.03 µg/g of Zr, with an average of 0.09 ± 0.01 µg/g (Fig.77). The 16 *L. novocanariensis* root samples from the laurel forest contain between 0.06 ± 0.00 µg/g and 8.84 ± 0.48 µg/g of Zr, with an average of 1.85 ± 0.10 µg/g. The 18 leaf samples from the fallow agricultural areas contain between 0.06 ± 0.00 µg/g and 0.18 ± 0.01 µg/g of Zr (average 0.13 ± 0.01 µg/g) (Fig.77).

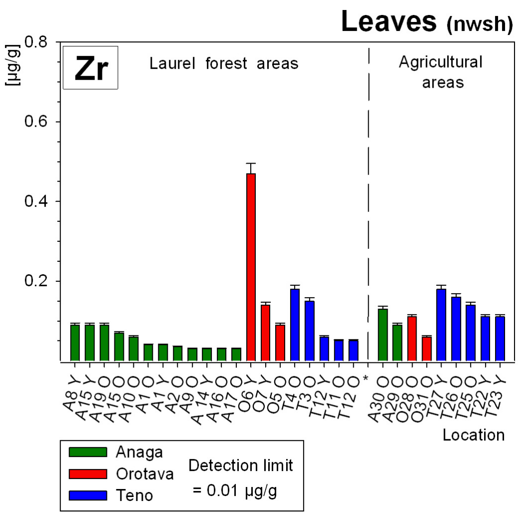


Fig.77 Histogram of the unwashed leaf results

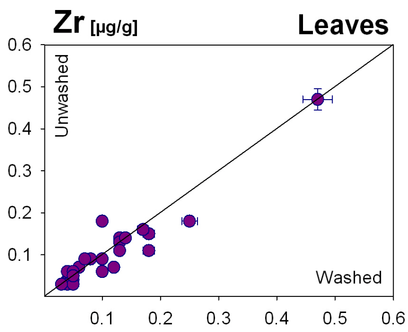


Fig.78 Plotted washed and unwashed leaf results.

Anaga laurel forest areas: The root samples contain between 0.06 ± 0.00 µg/g and 4.07 ± 0.22 µg/g of Zr, with an average of 1.43 ± 0.08 µg/g. No significant differences are seen between the unwashed and washed leaves (Fig.78). The 22 leaf samples contain between 0.03 ± 0.00 µg/g and 0.09 ± 0.00 µg/g of Zr, with an average of 0.05 ± 0.00 µg/g.

Anaga agricultural areas: No significant differences are seen between the unwashed and washed leaves (Fig.78). The 4 leaf samples contain between 0.09 ± 0.00 µg/g and 0.13 ± 0.01 µg/g of Zr, with an average of 0.11 ± 0.01 µg/g.

Orotava laurel forest areas: The root samples contain between 0.75 ± 0.04 µg/g and 1.08 ± 0.06 µg/g of Zr, with an average of 0.96 ± 0.05 µg/g. No significant differences are seen between the unwashed and washed leaves (Fig.78). The 6 leaf samples contain between 0.09 ± 0.00 µg/g and 0.47 ± 0.03 µg/g of Zr (average 0.23 ± 0.01 µg/g).

Orotava agricultural areas: No significant differences are seen between the unwashed and washed leaves (Fig.78). The leaves contain from 0.06 ± 0.00 to 0.18 ± 0.01 µg/g (mean 0.11 ± 0.01).

Teno laurel forest areas: The root samples contain between 0.43 ± 0.02 µg/g and 8.84 ± 0.48 µg/g of Zr, with an average of 3.59 ± 0.19 µg/g. The highest levels are determined at sample T3 and T12 (4.36 ± 0.24 µg/g). No significant differences are seen between the unwashed and washed leaves (Fig.78). The leaves contain from 0.05 ± 0.00 to 0.25 ± 0.01 µg/g of Zr (average 0.11 ± 0.01 µg/g).

Teno agricultural areas: No significant differences are seen between the unwashed and washed leaves (Fig.78). The 10 leaf samples contain between 0.10 ± 0.01 µg/g and 0.18 ± 0.01 µg/g of Zr, with an average of 0.14 ± 0.01 µg/g.

3.15 Nickel (Ni)

Volcanic rocks

The laurel forest samples contain between 0.9 ± 0.1 µg/g and 596.9 ± 70.2 µg/g of Ni, with an average of 94.2 ± 11.1 µg/g (Fig.79). The fallow agricultural samples contain between 7.6 ± 0.11 µg/g and 223.2 ± 22.2 µg/g of Ni, with an average of 104.3 ± 10.4 µg/g (Fig.79).

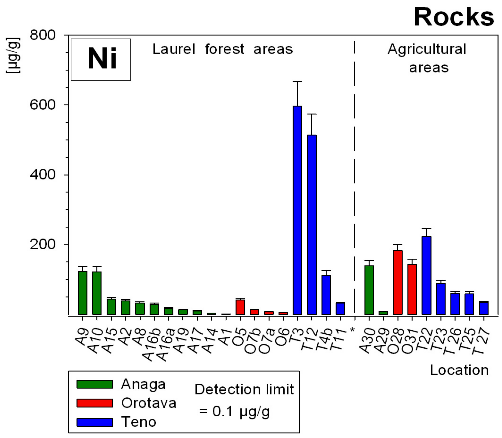


Fig.79 Histogram of the Ni rock results.

Anaga rocks: The laurel forest samples contain between 0.9 ± 0.1 µg/g (A1) and 122.6 ± 14.4 µg/g (A9) of Ni, with an average of 39.4 ± 4.6 µg/g. The Ni amounts are dividable into three groups. Sample A1, A14, A16a, and A17 contain between 0.9 ± 0.1 µg/g and 17.6 ± 2.1 µg/g (A16a) of Ni. Sample A2, A16b, A15 and A8 contain between 29.3 ± 3.4 µg/g (A16b) and 43.5 ± 5.1 µg/g. Sample A9 and A10 contain 122.1 ± 14.2 µg/g and 122.6 ± 14.4 µg/g of Ni. The agricultural samples contain 7.6 ± 0.8 µg/g (A29) and 139.8 ± 13.9 µg/g (A30) of Ni.

Orotava rocks: The laurel forest samples contain between 5.8 ± 0.7 µg/g (O6) and 41.1 ± 4.8 µg/g (O5) of Ni, with an average of 16.9 ± 2.0 µg/g. The agricultural samples contain 143.3 ± 14.2 µg/g (O31), and 183.0 ± 18.2 µg/g (O28) of Ni.

Teno rocks: The laurel forest samples contain between 31.8 ± 3.7 µg/g (T11) and 596.9 ± 70.2 µg/g (T3) of Ni, with an average of 276.5 ± 32.5 µg/g. The highest values occur at T3 and T12 (513.4 ± 60.4 µg/g Ni). The agricultural samples contain between 33.7 ± 3.3 µg/g (T27) and 223.2 ± 22.2 µg/g (T22) of Ni, with an average of 92.9 ± 9.2 µg/g.

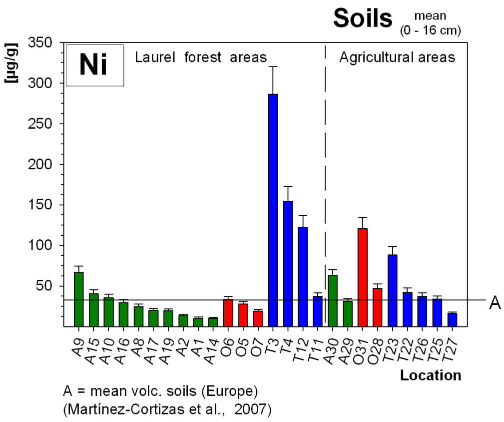


Fig.80 Histogram of the mean Ni topsoil results.

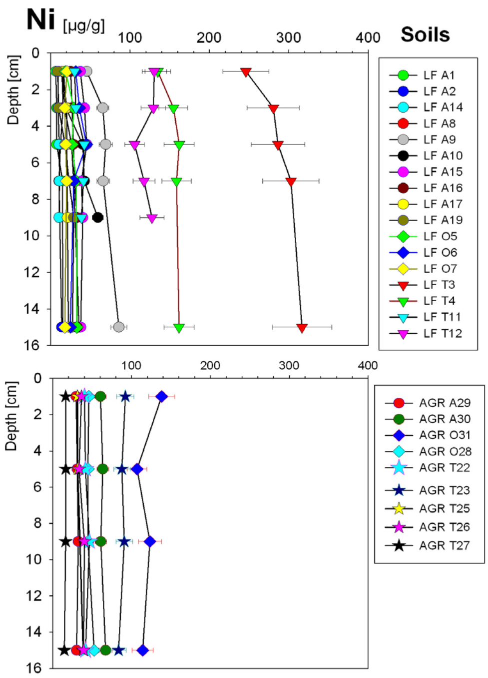


Fig.81 The Ni soil depth profiles.

Soils

The laurel forests mean Ni levels vary from 10.4 ± 1.2 µg/g to 286.4 ± 33.7 µg/g, with an average of 56.0 ± 6.6 µg/g (Fig.80). The 89 laurel forest soil horizons contain between 6.5 ± 0.8 µg/g and 316.6 ± 37.2 µg/g of Ni, with an average of 54.7 ± 6.4 µg/g. The fallow agricultural mean Ni levels vary from 16.0 ± 1.9 µg/g to 120.6 ± 14.2 µg/g, with an average of 53.3 ± 6.3 µg/g (Fig.80). The 35 fallow agricultural soil horizons contain between 14.8 ± 1.7 µg/g and 138.2 ± 16.3 µg/g of Ni, with an average of 53.8 ± 6.3 µg/g.

Anaga laurel forest soils: The mean Ni levels range from 10.4 ± 1.2 µg/g (A14) to 66.6 ± 7.8 µg/g (A9), with an average of 27.1 ± 3.2 µg/g. The three highest mean levels are determined at A10, A15 and A9 (from 35.6 ± 4.2 µg/g to 66.6 ± 7.8 µg/g). The 54 soil horizons contain between 6.5 ± 0.8 µg/g and 86.0 ± 10.1 µg/g of Ni. The Ni levels increase with increasing depth within 8 of 10 profiles (Fig.81). The differences between the uppermost and the lowest horizon range from 1.2 ± 0.1 µg/g (A14) to 43.2 ± 5.0 µg/g (A10). Profile A2 and A15 are more or less homogenous. Highest Ni increase are determined at profile A9 and A10 (> 40.0 µg/g).

Anaga agricultural soils: The profiles contain a mean of 30.9 ± 3.6 µg/g (A29) and 63.0 ± 7.4 µg/g (A30). The 8 soil horizons contain between 29.7 ± 3.5 µg/g and 67.0 ± 7.9 µg/g of Ni, with an average of 46.9 ± 5.5 µg/g. Profile A29 shows nearly no variation within the upper 15 cm. The Ni levels of profile A30 increase with increasing depth (Fig.81).

Orotava laurel forest soils: The mean Ni levels range from 19.1 ± 2.2 µg/g (O7) to 33.4 ± 3.9 µg/g (O6), with an average of 26.9 ± 3.2 µg/g. The 16 soil horizons cotnain between 17.6 ± 2.1 µg/g and 45.3 ± 5.3 µg/g. Two profiles (O6, O7) contain with increasing depth slightly decreasing Ni levels. A clear increase of Ni is determined for O5.

Orotava agricultural soils: The profiles contain a mean of 47.0 ± 5.5 µg/g (O28) and 120.6 ± 14.2 µg/g (O31). The 8 soil horizons contain between 44.6 ± 5.2 µg/g and 138.2 ± 16.3 µg/g of Ni, (average 83.8 ± 9.9 µg/g). Ni decrease with increasing depth at O31 (deviation 24.1 ± 2.8 µg/g).

Teno laurel forest soils: The mean Ni levels range from 37.0 ± 4.4 µg/g (T11) to 286.4 ± 33.7 µg/g (T3), with an average of 150.0 ± 17.6 µg/g. The 20 soil horizons contain between 30.3 ± 3.6 µg/g and 316.6 ± 37.2 µg/g of Ni. Three of four profiles contain with increasing depth an increase of Ni (T3, T4, T11) (Fig.81). The deviations range from 8.7 ± 1.0 µg/g (T11) to 70.6 ± 8.3 µg/g (T3).

Teno agricultural soils: The profiles contain mean Ni levels between 16.0 ± 1.9 µg/g (T27) and 88.5 ± 10.4 µg/g (T23), with an average of 44.1 ± 5.2 µg/g. The 19 soil horizons contain between 14.8 ± 1.7 µg/g and 92.1 ± 10.8 µg/g. The differences between the uppermost and the lowest soil horizon are quite small within 3 of 5 profiles (Fig.81). Only profile T25 shows a clear increase of Ni with increasing depth.

Roots and leaves

The 42 *L. novocanariensis* leaf samples from the laurel forest contain between 0.2 ± 0.0 µg/g and 1.9 ± 0.2 µg/g of Ni, with an average of 0.7 ± 0.1 µg/g (Fig.82). The 16 *L. novocanariensis* root samples from the laurel forest contain between 0.2 ± 0.0 µg/g and 18.5 ± 1.8 µg/g of Ni, with an average of 2.2 ± 0.2 µg/g. The 18 *L. novocanariensis* leaf samples from the fallow agricultural areas contain between 0.2 ± 0.0 µg/g and 2.9 ± 0.3 µg/g of Ni (average 0.7 ± 0.1 µg/g) (Fig.82).

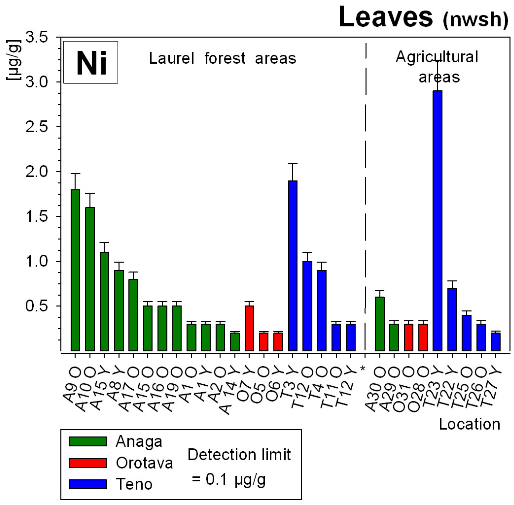


Fig.82 Histogram of the unwashed Ni leaf results.

Anaga laurel forest areas: The root samples contain between 0.2 ± 0.0 µg/g and 4.2 ± 0.4 µg/g of Ni, with an average of 1.2 ± 0.1 µg/g. No significant differences are seen between the unwashed and washed leaves (Fig.83). The 22 leaf samples contain from 0.2 ± 0.0 µg/g to 1.8 ± 0.2 µg/g of Ni (average 0.7 ± 0.1 µg/g).

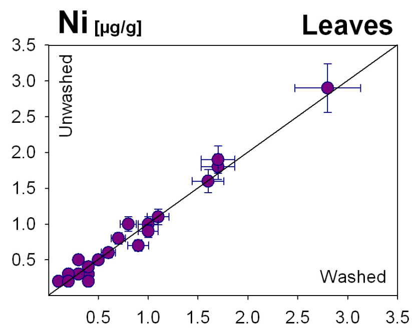


Fig.83 Plotted washed and unwashed leaf results.

Anaga agricultural areas: No significant differences are seen between the unwashed and washed leaves (Fig.83). The 4 leaf samples contain between 0.2 ± 0.0 µg/g and 0.6 ± 0.1 µg/g of Ni, (average 0.4 ± 0.1 µg/g).

Orotava laurel forest areas: The root samples contain between 0.2 ± 0.0 µg/g and 0.9 ± 0.1 µg/g of Ni. No significant differences are seen between the unwashed and washed leaves (Fig.83). The 6 leaf samples contain between 0.2 ± 0.0 µg/g and 0.5 ± 0.0 µg/g of Ni, with an average of 0.3 ± 0.0 µg/g.

Orotava agricultural areas: No significant differences are seen between the unwashed and washed leaves (Fig.83). The 4 leaf samples contain all 0.3 ± 0.0 µg/g.

Teno laurel forest areas: The root samples contain between 0.2 ± 0.0 µg/g and 18.5 ± 1.8 µg/g (average 6.1 µg/g). The highest value is determined at tree T3. No significant differences are seen between the unwashed and washed leaves. The 12 leaf samples contain between 0.3 ± 0.0 µg/g and 1.9 ± 0.2 µg/g of Ni (average 0.9 ± 0.1 µg/g).

Teno agricultural areas: No significant differences are seen between the unwashed and washed leaves (Fig.83). The 10 leaf samples contain between 0.2 ± 0.0 µg/g and 2.9 ± 0.3 µg/g of Ni (average 0.9 ± 0.1 µg/g). Ni levels above 2.8 µg/g are determined at tree T23.

3.16 Zinc (Zn)

Volcanic rocks

The laurel forest samples contain between 63 ± 5 µg/g and 148 ± 12 µg/g of Zn, with an average of 100 ± 8 µg/g (Fig.84). The fallow agricultural samples contain between 46 ± 4 µg/g and 98 ± 8 µg/g of Zn, with an average of 78 ± 7 µg/g (Fig.84).

Anaga rocks: The laurel forest samples contain between 63.0 ± 5.2 µg/g and 148.0 ± 5.2 µg/g of Zn, with an average of 111.4 ± 9.3 µg/g. The highest level is measured at A16b. Sample A2, A15, A16a and A10 contain between 124.0 ± 10.3 µg/g and 146.0 ± 12.2 µg/g of Zn. Sample A14, A8, A9, A17 and A19 contain between 63.0 ± 5.2 µg/g and 89.0 ± 7.4 µg/g. The agricultural samples contain 46.0 ± 3.8 µg/g (A29) and 77.0 ± 6.4 (A30) of Zn.

Orotava rocks: The laurel forest samples contain between 74.0 ± 6.2 µg/g (O7a) and 105.0 ± 8.7 µg/g (O5) of Zn, with an average of 93.7 ± 7.8 µg/g. The agricultural samples contain 71.0 ± 5.9 µg/g (O28) and 83.0 ± 6.9 µg/g (O31) of Zn.

Teno rocks: The laurel forest samples contain between 64.0 ± 5.3 µg/g (T4a) and 107.0 ± 8.9 µg/g (T3) of Zn, (average 81.6 ± 6.8 µg/g). The agricultural samples 74.0 ± 6.2 µg/g (T23) and 98.0 ± 8.2 µg/g (T27) of Zn (average 85.2 ± 7.1 µg/g).

Soils

The laurel forests mean Zn levels vary from 47 ± 4 µg/g to 128 ± 11 µg/g, with an average of 78 ± 6 µg/g (Fig.85). The 89 laurel forest soil horizons contain between 29 ± 2 µg/g and 135 ± 11 µg/g of Zn, with an average of 78 ± 7 µg/g. The agricultural mean Zn levels vary from 55 ± 5 µg/g to 113 ± 9 µg/g, (average 79 ± 7 µg/g) (Fig.85). The 35 agricultural horizons contain between 54 ± 4 µg/g and 120 ± 10 µg/g of Zn, (average 78 ± 6 µg/g).

Anaga laurel forest soils: The mean Zn levels range from 49 ± 4 µg/g (A19) to 128 ± 11 µg/g (A2), with an average of 85 ± 7 µg/g. The three highest mean levels are determined at A15, A16 and A2. The levels range from 105 ± 9 µg/g (A15) to 128 ± 11 µg/g (A2). The 54 soil horizons contain between

29 ± 2 µg/g and 135 ± 11 µg/g of Zn and the Zn levels increase with increasing depth within 8 of 10 profiles. The deviations range from 5 ± 0 µg/g to 69 ± 6 µg/g. Profile A14 and A10 slightly decrease.

Anaga agricultural soils: The profiles contain a mean of 55 ± 5 µg/g (A29) and 74 ± 6 µg/g (A30). The 8 soil horizons contain between 54 ± 4 µg/g and 81 ± 7 µg/g of Zn, with an average of 64 ± 5 µg/g. Profile A29 shows nearly no variation within the upper 15 cm and the Zn levels of profile A30 decrease with increasing depth (Fig.86).

Orotava laurel forest soils: The mean Zn levels range from 47 ± 4 µg/g (O5) to 74 ± 6 µg/g (O7), with an average of 60.5 ± 5 µg/g. The 16 soil horizons contain between 44 ± 4 µg/g and 76 ± 6 µg/g. The profiles contain a homogenous distribution (Fig.86).

Orotava agricultural soils: The profiles contain relatively similar mean values of 75 ± 6 µg/g (O31) and 76 ± 6 µg/g (O28). The 8 soil horizons contain between 54 ± 4 µg/g and 81 ± 7 µg/g of Zn, with an average of 64 ± 5 µg/g. Both profiles show nearly no variation within the upper 15 cm.

Teno laurel forest soils: The mean Zn levels range from 55 ± 5 µg/g (T12) to 89 ± 7 µg/g (T4), with an average of 73 ± 6 µg/g. The 20 soil horizons contain between 50 ± 4 µg/g and 94 ± 8 µg/g. Three of four profiles contain a relatively homogenous distribution of Zn within the upper 15 cm. Only profile T3 shows a slight increase with increasing depth (Fig.86).

Teno agricultural soils: The profiles contain mean Zn levels between 68 ± 6 µg/g (T22) and 113 ± 9 µg/g (T25), with an average of 85 ± 7 µg/g. The 19 soil horizons contain between 66 ± 5 µg/g and 120 ± 10 µg/g of Zn. Profile T22, T23, T25 and T27 contain more or less homogenous Zn levels. Only profile T26 shows a clear increase of Zn with increasing depth (Fig.86). The deviation value is 14 ± 1 µg/g.

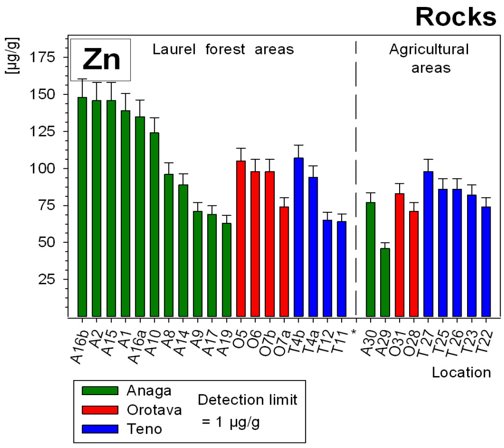


Fig.84 Histogram of the Zn rock results.

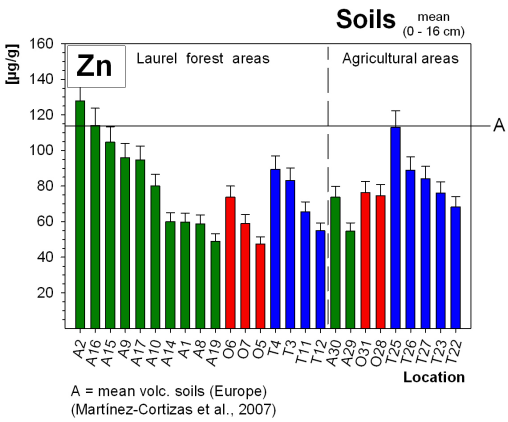


Fig.85 Histogram of the mean Zn topsoil results.

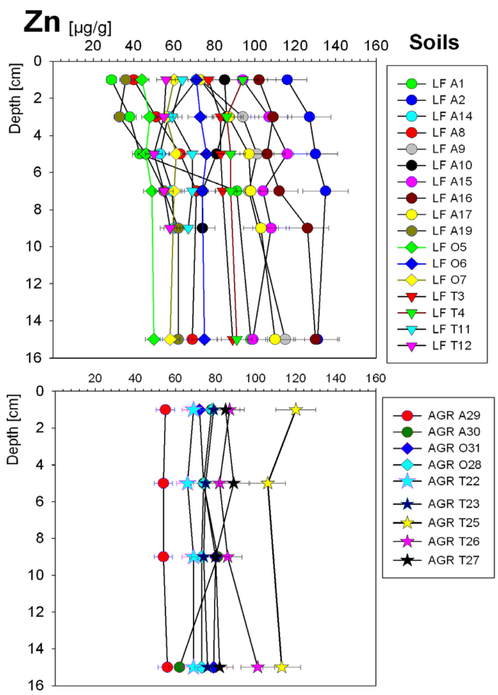


Fig.86 The Zn soil depth profiles.

Roots and leaves

The 42 *L. novocanariensis* leaf samples from the laurel forest contain between 8.2 ± 0.7 µg/g and 112.8 ± 9.4 µg/g of Zn, with an average of 31.7 ± 2.6 µg/g (Fig.87). The 16 *L. novocanariensis* root samples from the laurel forest contain between 5.3 ± 0.4 µg/g and 75.4 ± 6.3 µg/g of Zn, with an average of 23.8 ± 2.0 µg/g. The 18 *L. novocanariensis* leaf samples from the fallow agricultural areas contain between 15.7 ± 1.3 µg/g and 37.4 ± 3.1 µg/g of Zn (average 22.4 ± 1.9 µg/g) (Fig.87).

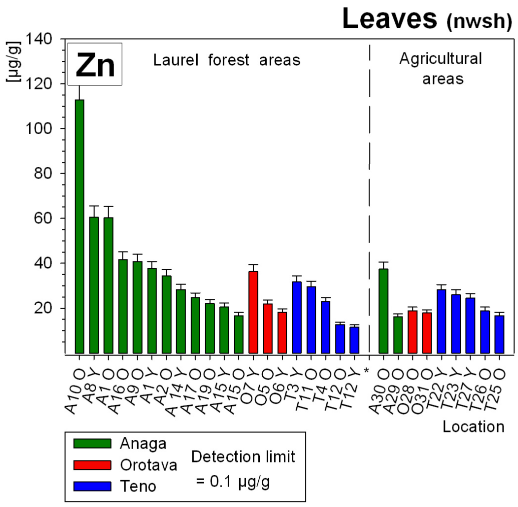


Fig.87 Histogram of the unwashed Zn leaf results.

Anaga laurel forest areas: The root samples contain between 6.4 ± 0.5 µg/g and 75.4 ± 6.3 µg/g, with an average of 28.7 ± 2.4 µg/g. The highest Zn root level is determined for tree A16. No significant differences are seen between the unwashed and washed leaves. Only the unwashed sample (112.8 ± 9.4 µg/g) of tree A10 contains a higher Zn levels as the corresponding washed sample (86.0 ± 7.2 µg/g). Both Zn levels are by far the highest determined amounts of all leaf samples. However, with exception of A10, the leaf samples contain between 16.7 ± 1.4 µg/g and 60.5 ± 5.0 µg/g of Zn, with an average of 33.4 ± 2.8 µg/g.

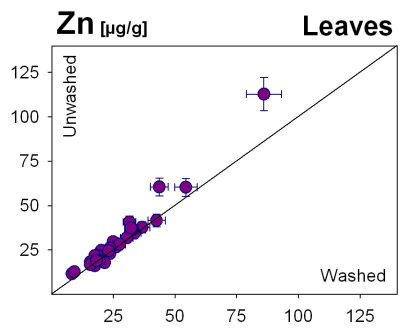


Fig.88 Plotted washed and unwashed Zn leaf results.

Anaga agricultural areas: No significant differences are seen between the unwashed and washed leaves (Fig.88). The 4 leaf samples contain between 16.1 ± 1.3 µg/g and 37.4 ± 3.1 µg/g of Zn, (average 25.8 ± 2.1 µg/g).

Orotava laurel forest areas: The root samples contain between 12.8 ± 1.1 µg/g and 27.6 ± 2.3 µg/g, with an average of 17.8 ± 1.5 µg/g. No significant differences are seen between the unwashed and washed leaves (Fig.88). The 6 leaf samples contain between 15.7 ± 1.3 µg/g and 36.3 ± 3.0 µg/g of Zn, with an average of 23.6 ± 2.0 µg/g.

Orotava agricultural areas: No significant differences are seen between the unwashed and washed leaves (Fig.88). The 4 leaf samples contain between 17.8 ± 1.5 µg/g and 21.5 ± 1.8 µg/g of Zn (average 19.4 ± 1.6 µg/g).

Teno laurel forest areas: The root samples contain between 5.3 ± 0.4 µg/g and 38.3 ± 3.2 µg/g of Zn, with an average of 16.4 ± 1.4 µg/g. No significant differences are seen between the unwashed and washed leaves (Fig.88). The 12 leaf samples contain between 8.2 ± 0.7 µg/g and 31.7 ± 2.6 µg/g of Zn, with an average of 21.5 ± 1.8 µg/g.

Teno agricultural areas: No significant differences are seen between the unwashed and washed leaves (Fig.88). The 10 leaf samples contain between 15.7 ± 1.3 µg/g and 28.2 ± 2.3 µg/g of Zn, with an average of 22.3 ± 1.9 µg/g.

3.17 Copper (Cu)

Volcanic rocks

The laurel forest samples contain between 5.50 ± 0.51 µg/g and 156.60 ± 14.56 µg/g of Cu, with an average of 60.39 ± 5.62 µg/g. The fallow agricultural samples contain between 24.50 ± 2.28 µg/g and 110.40 ± 10.27 µg/g of Cu, with an average of 52.53 ± 4.89 µg/g.

Anaga rocks: The laurel forest samples contain between 5.5 ± 0.5 µg/g and 116.8 ± 10.8 µg/g of Cu, with an average of 42.5 ± 3.9 µg/g. The highest Cu level is measured at sampling site A9. The remaining laurel forest samples contain significantly lower amounts. The agricultural samples contain 27.7 ± 2.6 µg/g (A29) and 74.8 ± 7.0 µg/g (A30).

Orotava rocks: The laurel forest samples contain between 18.6 ± 1.7 µg/g (O6) and 58.1 ± 5.4 (O5) of Cu, with an average of 33.1 ± 3.1. The agricultural samples contain 26.9 ± 2.5 µg/g (O31) and 66.3 ± 6.2 µg/g (O28) of Cu.

Teno rocks: The laurel forest samples contain between 80.7 ± 7.5 µg/g (T12) and 156.6 ± 14.6 µg/g (T4b) of Cu, with an average of 121.5 ± 11.3 µg/g. The samples T11, T4a and T4b contain the highest detected Cu values of all Anaga, Orotava and Teno samples. The agricultural samples contain between 24.5 ± 2.3 µg/g (T25) and 110.4 ± 10.3 µg/g (T23), (average 55.4 ± 5.2 µg/g).

Soils

The laurel forests mean Cu levels vary from 5.2 ± 0.5 µg/g to 87.1 ± 8.1 µg/g, with an average of 38.8 ± 3.6 µg/g (Fig.90). The 89 laurel forest soil horizons contain between 4.20 ± 0.39 µg/g and 108.30 ± 10.07 µg/g of Cu, with an average content of 38.40 ± 3.57 µg/g. The fallow agricultural mean Cu levels vary from 24.7 ± 2.3 µg/g to 67.7 ± 6.3 µg/g, with an average of 41.6 ± 3.9 µg/g (Fig.90). The 35 fallow agricultural soil horizons contain between 24.10 ± 2.24 µg/g and 70.00 ± 6.51 µg/g of Cu, with an average level of 41.73 ± 3.88 µg/g.

Anaga laurel forest soils: The mean Cu levels range from 5.2 ± 0.5 µg/g (A1) to 81.3 ± 7.6 µg/g (A9), with an average of 29.8 ± 2.8 µg/g. The highest mean level is determined at A9. The range of Cu without considering A9, varies from 5.2 ± 0.5 µg/g to 38.9 ± 3.6 µg/g (A15). The 54 soil horizons contain between 4.2 ± 0.4 µg/g and 108.3 ± 10.1 µg/g and the Cu levels increase with increasing depth within 8 of 10 profiles (Fig.91). The deviation between the uppermost and the lowest soil horizon range from 11.0 ± 1.0 µg/g (A9) to 22.2 ± 2.1 µg/g (A10). Profile A2 and A14 decrease.

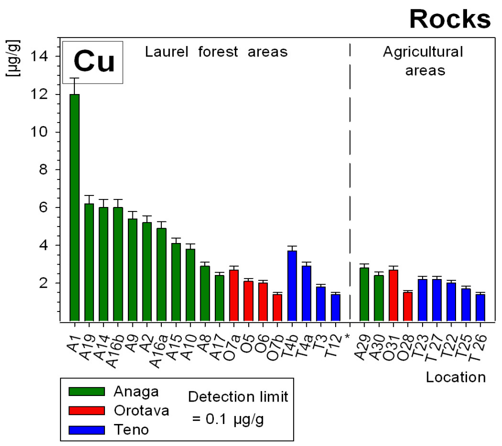


Fig.89 Histogram of the Cu rock results.

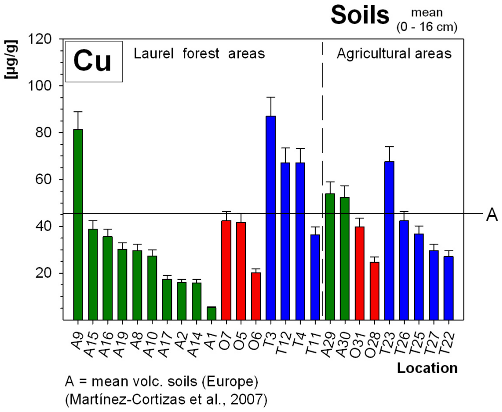


Fig.90 Histogram of the mean Cu topsoil results.

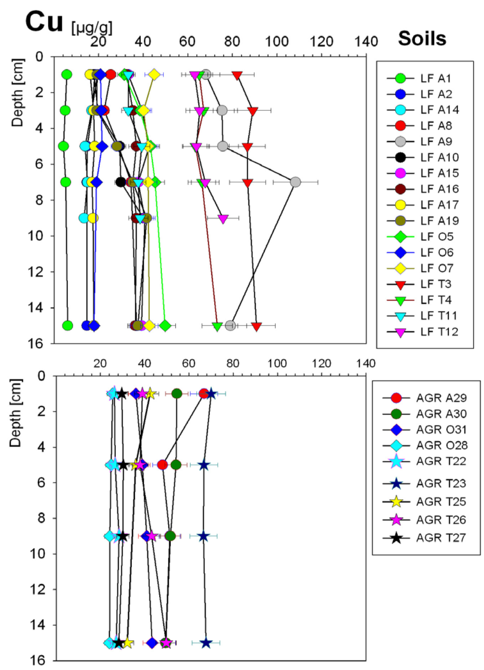


Fig.91 The Cu soil depth profiles.

Anaga agricultural soils: Profile A30 contains a mean value of 52.4 ± 4.9 µg/g and A29 53.9 ± 5.0 µg/g. The 8 soil horizons contain between 48.0 ± 4.5 µg/g and 66.8 ± 6.2 µg/g of Cu, with an average of 53.2 ± 4.9 µg/g. Profile A29 shows nearly no variation within the upper 15 cm (Fig.91). Profile A30 contains a slight decrease of Cu with increasing depth.

Orotava laurel forest soils: The mean Cu levels range from 20.1 ± 1.9 µg/g (O6) to 42.4 ± 3.9 µg/g (O7), with an average of 34.7 ± 3.2 µg/g. The 16 soil horizons contain between 17.9 ± 1.7 µg/g and 49.8 ± 4.6 µg/g of Cu. Profile O6 and O7 show a relatively homogenous Cu distribution within the upper 15 cm. Profile O5 contains a clear Cu increase with increasing depths (18.3 ± 1.7 µg/g).

Orotava agricultural soils: The profiles contain mean values of 24.7 ± 2.3 µg/g (O28) and 39.8 ± 3.7 µg/g (O31). The 8 soil horizons contain between 24.1 ± 2.2 µg/g and 43.3 ± 4.0 µg/g of Cu, with an average of 32.2 ± 3.0 µg/g. Profile O28 shows nearly no variation and O31 a slight Cu increase with increasing depth (Fig.91).

Teno laurel forest soils: The mean Cu levels range from 36.4 ± 3.4 µg/g (T11) to 87.1 ± 8.1 µg/g (T3), with an average of 64.4 ± 6.0 µg/g. The 20 soil horizons contain between 33.3 ± 3.1 µg/g and 90.8 ± 8.4 µg/g. All profiles show with increasing depth an increase of Cu. The differences between the uppermost and the lowest soil horizon range from 5.3 ± 0.5 µg/g (T11) to 12.7 ± 1.2 µg/g (T12).

Teno agricultural soils: The profiles contain mean Cu levels between 27.1 ± 2.5 µg/g (T22) and 67.7 ± 6.3 µg/g (T23), with an average of 40.9 ± 3.8 µg/g. The 19 soil horizons contain between 26.3 ± 2.4 µg/g and 70.0 ± 6.5 µg/g of Cu.

Roots and leaves

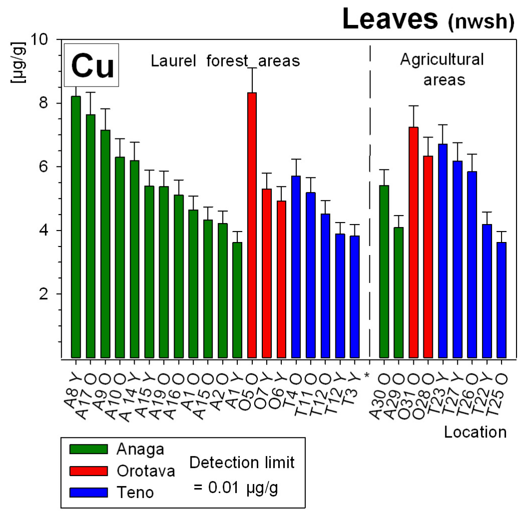


Fig.92 Histogram of the unwashed leaf results.

The 42 *L. novocanariensis* leaf samples from the laurel forest contain between 3.62 ± 0.34 µg/g and 8.33 ± 0.77 µg/g of Cu, with an average of 5.39 ± 0.50 µg/g (Fig.92). The 16 *L. novocanariensis* root samples from the laurel forest contain between 0.90 ± 0.08 µg/g and 18.22 ± 1.69 µg/g of Cu, with an average of 5.57 ± 0.52 µg/g. The 18 *L. novocanariensis* leaf samples from the fallow agricultural areas contain between 3.24 ± 0.30 µg/g and 7.24 ± 0.67 µg/g (average 5.36 ± 0.50 µg/g) (Fig.92).

Anaga laurel forest areas: The root samples contain between 1.50 ± 0.14 µg/g and 9.67 ± 0.90 µg/g of Cu, with an average of 4.84 ± 0.45 µg/g. The highest Cu root level is determined at tree A8. No significant differences are seen between the unwashed and washed leaves (Fig.93). The 22 leaf samples contain between 3.62 ± 0.34 µg/g and 8.21 ± 0.76 µg/g of Cu, (average 5.48 ± 0.51 µg/g).

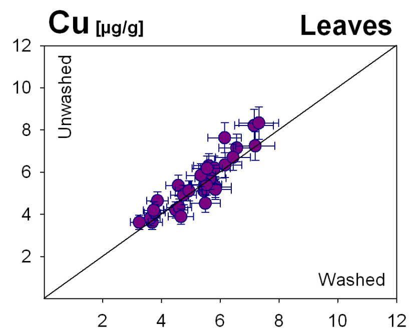


Fig.93 Plotted washed and unwashed Cu leaf results.

Anaga agricultural areas: No significant differences are seen between the unwashed and washed leaves (Fig.93). The 4 leaf samples contain between 3.77 ± 0.35 µg/g and 5.53 ± 0.51 µg/g of Cu (average 4.70 ± 0.44 µg/g).

Orotava laurel forest areas: The root samples contain between 0.90 ± 0.08 µg/g and 7.75 ± 0.72 µg/g of Cu, with an average of 4.14 ± 0.39 µg/g. No significant differences are seen between the unwashed and washed leaves (Fig.93). The leaves contain between 4.75 ± 0.44 µg/g and 8.33 ± 0.77 µg/g (average 6.07 ± 0.56 µg/g).

Orotava agricultural areas: No significant differences are seen between the unwashed and washed leaves (Fig.93). The 4 leaf samples contain between 6.16 ± 0.57 µg/g and 7.24 ± 0.67 µg/g of Cu, with an average of 6.73 ± 0.63 µg/g.

Teno laurel forest areas: The root samples contain between 2.09 ± 0.19 µg/g and 18.22 ± 1.69 µg/g of Cu, with an average of 8.46 ± 0.79 µg/g. The highest Cu value is determined at tree T3. No significant differences are seen between the unwashed and washed leaves (Fig.93). The 12 leaf samples contain between 3.62 ± 0.34 µg/g and 5.83 ± 0.54 µg/g of Cu, (average 4.87 ± 0.45 µg/g).

Teno agricultural areas: No significant differences are seen between the unwashed and washed leaves (Fig.93). The 10 leaf samples contain between 3.24 ± 0.30 µg/g and 6.70 ± 0.62 µg/g of Cu, with an average of 5.08 ± 0.47 µg/g.

3.18 Lead (Pb)

Volcanic rocks

The laurel forest samples contain between 1.40 ± 0.10 µg/g and 12.00 ± 0.86 µg/g of Pb, with an average of 3.99 ± 0.28 µg/g (Fig.94). The fallow agricultural samples contain between 1.40 ± 0.11 µg/g and 2.80 ± 0.22 µg/g of Pb, with an average of 2.10 ± 0.16 µg/g (Fig.94).

Anaga rocks: The laurel forest samples contain between 2.4 ± 0.2 µg/g (A17) and 12.0 ± 0.9 µg/g (A1) of Pb, with an average of 5.4 ± 0.4 µg/g. The Pb level of sample A1 is significantly higher as the remaining determined results. None of the remaining laurel forest rocks contains more than 6.2 ± 0.4 µg/g. The agricultural samples contain 2.4 ± 0.2 µg/g (A30) and 2.8 ± 0.2 µg/g (A29) of Pb.

Orotava rocks: The laurel forest samples contain between 1.4 ± 0.1 µg/g (O7b) and 2.7 ± 0.2 µg/g (O7b) of Pb, with an average of 2.1 ± 0.1 µg/g. The agricultural samples contain 1.5 ± 0.1 µg/g (O28) and 2.7 ± 0.2 (O31) of Pb.

Teno rocks: The laurel forest samples contain between 1.4 ± 0.1 µg/g (T12) and 3.7 ± 0.3 µg/g (T4b) of Pb, with an average of 2.5 ± 0.2 µg/g. The agricultural Pb levels range from 1.4 ± 0.1 µg/g (T26) to 2.2 ± 0.2 µg/g (T23), (average 1.9 ± 0.1 µg/g).

Soils

The laurel forests mean levels vary from 6.2 ± 0.4 µg/g to 38.9 ± 2.8 µg/g, with an average of 15.7 ± 1.1 µg/g (Fig.95). The 89 laurel forest soil horizons contain between 4.90 ± 0.35 µg/g and 58.30 ± 4.16 µg/g of Pb, with an average of 15.85 ± 1.13 µg/g. The fallow agricultural mean levels vary from 8.0 ± 0.6 µg/g to 18.8 ± 1.3 µg/g, (average 11.4 ± 0.8 µg/g) (Fig.95). The 35 fallow agricultural soil horizons contain between 5.10 ± 0.36 µg/g and 27.50 ± 1.96 µg/g of Pb, with an average of 11.33 ± 0.81 µg/g.

Anaga laurel forest soils: The mean Pb levels range from 7.6 ± 0.5 µg/g (A9) to 38.9 ± 2.8 µg/g (A8), with an average of 19.4 ± 1.4 µg/g. The two highest mean levels are determined at A17 (27.8 ± 2.0 µg/g) and A8 (38.9 ± 2.8 µg/g). The 54 soil horizons contain between 6.5 ± 0.5 µg/g and 58.3 ± 4.2 µg/g of Pb. The Pb levels decrease slightly with increasing depth within 7 of 10 profiles. The differences between the uppermost and the lowest horizon range from 1.5 ± 0.1 µg/g to 4.6 ± 0.3 µg/g. Nearly no variation has been determined at A2 and A16 (Fig.96). Profile A8 shows a clear Pb increase with increasing depth. The deviation is 19.9 ± 1.4 µg/g.

Anaga agricultural soils: The profiles contain mean Pb levels of 10.5 ± 0.8 µg/g (A30) and 10.7 ± 0.8 µg/g (A29). The 8 soil horizons contain between 10.0 ± 0.7 µg/g and 11.6 ± 0.8 µg/g of Pb, with an average of 10.6 ± 0.8 µg/g. Both profiles show nearly no Pb variation (Fig.96).

Orotava laurel forest soils: The mean Pb levels range from 10.0 ± 0.7 µg/g (O6) to 16.0 ± 1.1 µg/g (O7), with an average of 12.1 ± 0.9 µg/g. The 16 soil horizons contain between 8.0 ± 0.6 µg/g and 17.4 ± 1.2 µg/g of Pb. Two profiles (O6, O7) contain with increasing depth slightly decreasing Pb levels. Profile O5 shows nearly no variation (Fig.96).

Orotava agricultural soils: The profiles contain mean values of 8.8 ± 0.6 µg/g (O31) and 18.8 ± 1.4 µg/g (O28). The 8 soil horizons contain between 7.7 ± 0.5 µg/g and 19.1 ± 1.4 µg/g, with an average of 13.8 ± 1.0 µg/g. The Pb levels slightly decrease with increasing depth at O31 (Fig.96). The Pb levels of O28 are more or less homogenous.

Teno laurel forest soils: The mean Pb levels range from 6.2 ± 0.4 µg/g (T3) to 10.4 ± 0.7 µg/g (T4), with an average of 9.1 ± 0.6 µg/g. The 20 soil horizons contain between 4.9 ± 0.3 µg/g and 12.2 ± 0.9 µg/g. Two of four profiles contain with increasing depth a slight decrease of Pb (T3, T4). The deviations range from 2.2 ± 0.2 µg/g to 2.8 ± 0.2 µg/g. The remaining profiles are more or less homogenous and show nearly no variation (Fig.96).

Teno agricultural soils: The profiles contain mean Pb levels between 8.0 ± 0.6 µg/g (T27) and 13.1 ± 0.9 µg/g (T25), with an average of 10.6 ± 0.8 µg/g. The 19 soil horizons contain between 5.1 ± 0.4 µg/g and 27.5 ± 2.0 µg/g. The differences between the uppermost and the lowest soil horizon are quite small within 3 of 5 profiles. Only profile T25 shows a clear decrease of Pb with increasing depth. The deviation is 21.8 ± 1.6 µg/g.

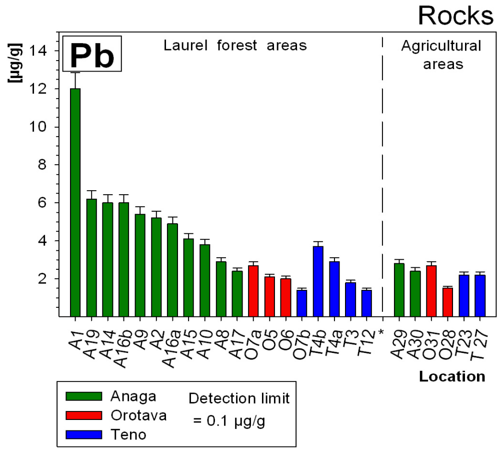


Fig.94 Histogram of the Pb rock results.

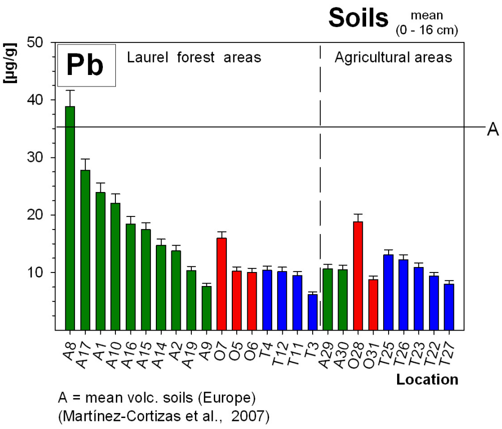


Fig.95 Histogram of the mean Pb topsoil results.

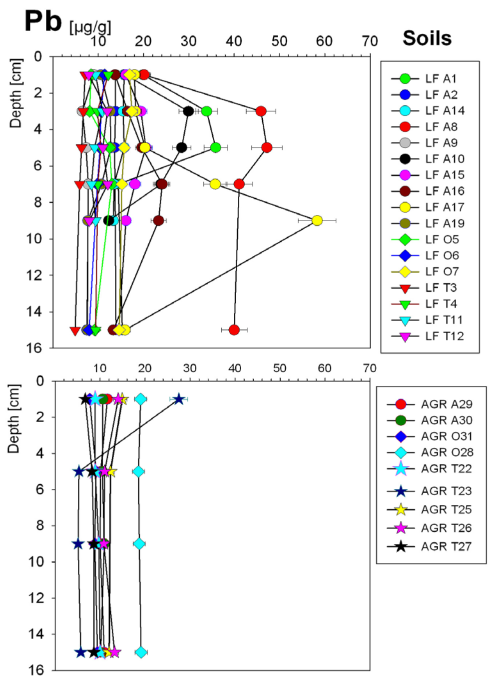


Fig.96 The Pb soil depth profiles.

Roots and leaves

The 42 *L. novocanariensis* leaf samples from the laurel forest contain between 0.04 ± 0.00 µg/g and 1.20 ± 0.09 µg/g of Pb, with an average of 0.26 ± 0.02 µg/g (Fig.97). The 16 *L. novocanariensis* root samples from

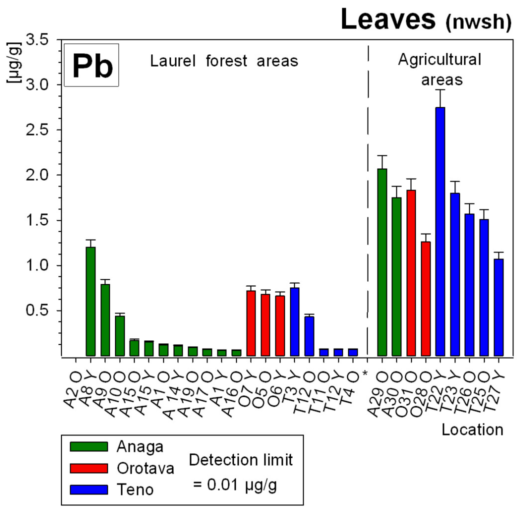


Fig.97 Histogram of the unwashed Pb leaf results.

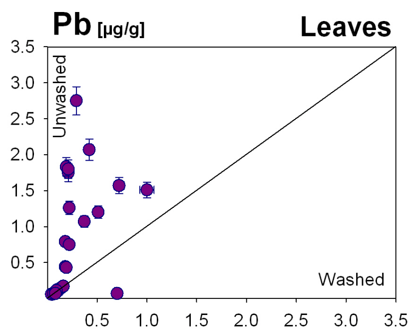


Fig.98 Plotted washed and unwashed Pb leaf results.

the laurel forest contain between 0.08 ± 0.01 µg/g and 2.82 ± 0.20 µg/g of Pb, with an average of 0.92 ± 0.07 µg/g. The 18 ***L. novocanariensis*** leaf samples from the fallow agricultural areas contain between 0.19 ± 0.01 µg/g and 2.75 ± 0.20 µg/g of Pb, with an average of 1.07 ± 0.08 µg/g (Fig.97).

Anaga laurel forest areas: The root samples contain between 0.15 ± 0.01 µg/g and 2.82 ± 0.20 µg/g, with an average value of 1.25 ± 0.09 µg/g. The Pb level of sample A2 is below the detection limit (<0.01 µg/g). The highest Pb root levels are determined for A1a, A1b, A8 and A10. The highest levels range from 1.97 ± 0.14 µg/g to 2.82 ± 0.20 µg/g. No significant differences are seen between the unwashed and washed leaves (Fig.98). Only the unwashed sample (1.20 ± 0.09 µg/g) of A8 contains a much higher value as the washed sample (0.51 ± 0.04 µg/g). The remaining 20 leaf samples contain between 0.04 ± 0.00 µg/g and 0.79 ± 0.06 µg/g of Pb, with an average of 0.16 ± 0.01 µg/g.

Anaga agricultural areas: There are significant differences between unwashed and washed leaves of both trees (Fig.98). The unwashed leaf value of A30 is 1.75 ± 0.13 µg/g. The washed 0.42 ± 0.03 µg/g. The unwashed value of A29 is 2.07 ± 0.15 µg/g. The washed 0.21 ± 0.02 µg/g.

Orotava laurel forest areas: The root samples contain between 0.22 ± 0.02 µg/g and 0.86 ± 0.06 µg/g, with an average of 0.54 ± 0.04 µg/g. There are significant differences seen between the 3 unwashed leaf values and the 3 washed leaf values. All of the washed leaves contain Pb levels below the detection limit. The 3 unwashed leaf samples contain between 0.66 ± 0.05 µg/g and 0.72 ± 0.05 µg/g of Pb, with an average of 0.69 ± 0.05 µg/g.

Orotava agricultural areas: There are significant differences seen between the unwashed and the washed leaves of both trees. The unwashed sample O28 contains 1.26 ± 0.09 µg/g and the washed sample 0.22 ± 0.02 µg/g of Pb (Fig.98). The unwashed sample of O31 contains 1.83 ± 0.13 µg/g and the washed contains 0.19 ± 0.01 µg/g of Pb.

Teno laurel forest areas: The root samples contain between 0.08 ± 0.01 µg/g and 1.27 ± 0.09 µg/g of Pb, with an average of 0.47 ± 0.03 µg/g. The highest value is determined at T3. No significant differences are seen between the unwashed and washed leaves (Fig.98). The 12 leaf samples contain between 0.07 ± 0.00 µg/g and 0.75 ± 0.05 µg/g of Pb, with an average of 0.24 ± 0.02 µg/g.

Teno agricultural areas: There are significant differences seen between the unwashed and the washed leaf samples (Fig.98). All unwashed samples contain higher amounts and range from 1.07 ± 0.07 µg/g to 2.75 ± 0.20 µg/g. The washed samples contain between 0.21 ± 0.02 µg/g and 1.00 ± 0.07 µg/g.

3.19 Molybdenum (Mo)

Volcanic rocks

The laurel forest samples contain between 0.20 ± 0.01 µg/g and 2.40 ± 0.16 µg/g, with an average of 1.23 ± 0.08 µg/g (Fig.99). The fallow agricultural samples contain between 0.50 ± 0.03 µg/g and 1.30 ± 0.09 µg/g of Mo, with an average of 0.92 ± 0.06 µg/g (Fig.99).

Anaga rocks: The Mo levels of the laurel forest rocks range from 0.20 ± 0.01 µg/g (A14) to 2.40 ± 0.16 µg/g (A2), with an average of 1.32 ± 0.09 µg/g. The results are dividable into two element ranges. Sample A14, A19 and A17 contain between 0.20 ± 0.01 µg/g and 0.60 ± 0.04 µg/g of Mo. The remaining 8 samples contain between 1.00 ± 0.07 µg/g and 2.40 ± 0.16 µg/g of Mo. The agricultural samples contain 0.80 ± 0.05 µg/g (A29) and 1.10 ± 0.08 µg/g (A30) of Mo.

Orotava rocks: The Mo values of the laurel forest rocks range from 0.90 ± 0.06 µg/g (O7b) to 2.40 ± 0.16 µg/g (O7a), with an average of 1.70 ± 0.11 µg/g. The two agricultural samples contain 0.50 ± 0.03 (O28) and 1.10 ± 0.08 (O31) of Mo.

Teno rocks: The Mo levels of the laurel forest samples range from 0.30 ± 0.02 µg/g (T4b) to 1.00 ± 0.07 µg/g (T11), with an average of 0.66 ± 0.05 µg/g. The agricultural samples contain between 0.50 ± 0.03 µg/g (T25) and 1.30 ± 0.09 µg/g (T23) of Mo, with an average of 0.96 ± 0.07 µg/g. The samples T23 and T27 have the highest Mo values of all agricultural sampling areas.

Soils

The laurel forests mean Mo levels vary from 0.4 ± 0.0 µg/g to 1.4 ± 0.1 µg/g, with an average of 0.8 ± 0.1 µg/g (Fig.100). The 89 laurel forest soil horizons contain between 0.30 ± 0.02 µg/g and 1.70 ± 0.12 µg/g of Mo, with an average of 0.77 ± 0.05 µg/g. The fallow agricultural mean Mo levels vary from 0.4 ± 0.0 µg/g to 0.9 ± 0.1 µg/g, with an average of 0.7 ± 0.0 µg/g (Fig.100). The 35 fallow agricultural soil horizons contain between 0.40 ± 0.03 µg/g and 1.00 ± 0.07 µg/g of Mo, with an average of 0.65 ± 0.04 µg/g.

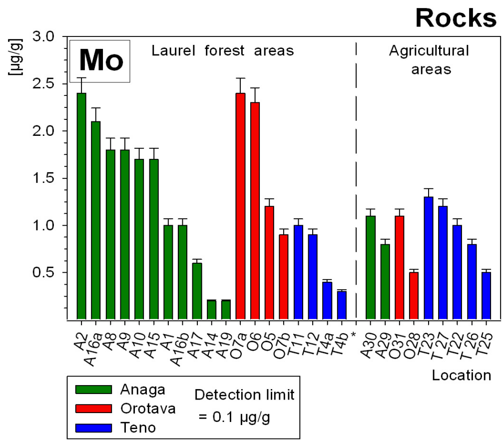


Fig.99 Histogram of the Mo rock results.

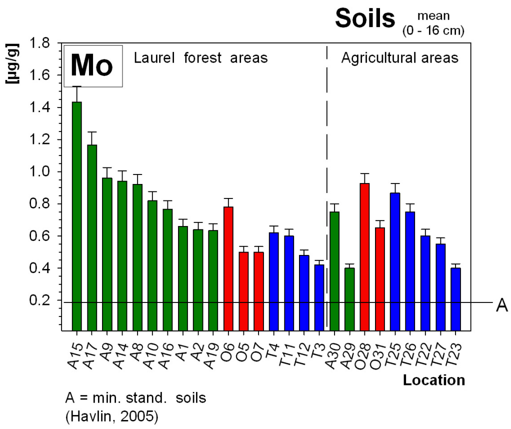


Fig.100 Histogram of the mean Mo topsoil results.

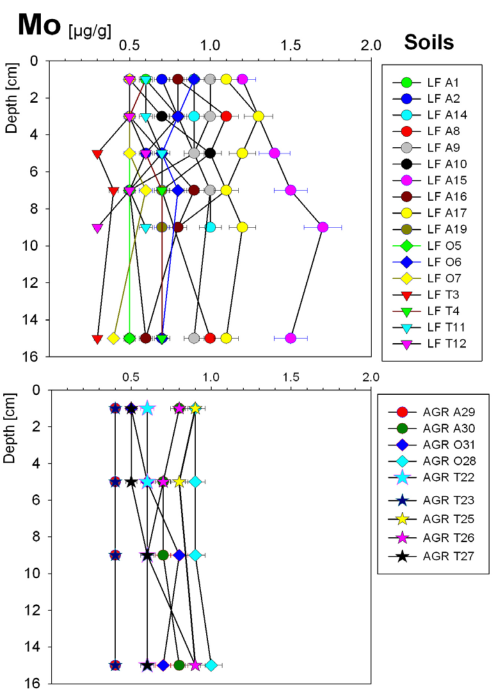


Fig.101 The Mo soil depth profiles.

Anaga laurel forest soils: The mean Mo levels range from 0.6 ± 0.0 µg/g (A2, A19) to 1.4 ± 0.1 µg/g (A15), with an average of 0.9 ± 0.1 µg/g. The 54 soil horizons contain between 0.5 ± 0.0 µg/g and 1.7 ± 0.1 µg/g of Mo. The Mo levels are all more or less homogenously distributed within the upper 15 cm.

Anaga agricultural soils: The agricultural profiles contain a mean of 0.4 ± 0.0 µg/g (A29) and 0.8 ± 0.1 µg/g (A30). The 8 soil horizons contain between 0.4 ± 0.0 µg/g and 0.8 ± 0.1 µg/g of Mo, with an average of 0.6 ± 0.0 µg/g. Both profiles contain a relative homogenous distribution of Mo within the upper 15 cm (Fig.101).

Orotava laurel forest soils: The mean Mo levels range from 0.5 ± 0.0 µg/g (O5, O7) to 0.8 ± 0.1 µg/g (O6), with an average of 0.6 ± 0.0 µg/g. The 16 soil horizons contain between 0.4 ± 0.0 µg/g and 0.9 ± 0.1 µg/g of Mo. All profiles contain a relatively homogenous distribution of Mo within the upper 15 cm (Fig.101).

Orotava agricultural soils: The profiles contain a mean of 0.7 ± 0.0 µg/g (O31) and 0.9 ± 0.1 µg/g (O28). The 8 soil horizons contain between 0.5 ± 0.0 µg/g and 1.0 ± 0.1 µg/g of Mo, with an average of 0.8 ± 0.1 µg/g. Both profiles contain a relative homogenous distribution of Mo within the upper 15 cm (Fig.101).

Teno laurel forest soils: The mean Mo levels range from 0.4 ± 0.0 µg/g (T3) to 0.6 ± 0.0 µg/g (T4), with an average of 0.5 ± 0.0 µg/g. The 20 soil horizons contain between 0.3 ± 0.0 and 0.7 ± 0.0 µg/g of Mo. Two profiles show with increasing depth a small increase of Mo (T3, T12). The remaining samples are more or less homogenous (Fig.101).

Teno agricultural soils: The profiles contain mean Mo levels between 0.4 ± 0.0 µg/g (T23) and 0.9 ± 0.1 µg/g (T25), with an average of 0.6 ± 0.0 µg/g. The 19 soil horizons contain between 0.3 ± 0.0 µg/g and 0.7 ± 0.0 µg/g. All profiles are more or less homogenous (Fig.101).

Roots and leaves

The 42 ***L. novocanariensis*** leaf samples from the laurel forest contain between 0.03 ± 0.00 µg/g and 0.58 ± 0.04 µg/g of Mo, with an average of 0.12 ± 0.01 µg/g (Fig.102). The 16 ***L. novocanariensis*** root samples from the laurel forest contain between 0.02 ± 0.00 µg/g and 0.71 ± 0.05 µg/g of Mo, with an average of 0.22 ± 0.02 µg/g. The 18 ***L. novocanariensis*** leaf samples from the fallow agricultural areas contain between 0.06 ± 0.00 µg/g and 0.62 ± 0.04 µg/g of Mo, with an average of 0.31 ± 0.02 µg/g.

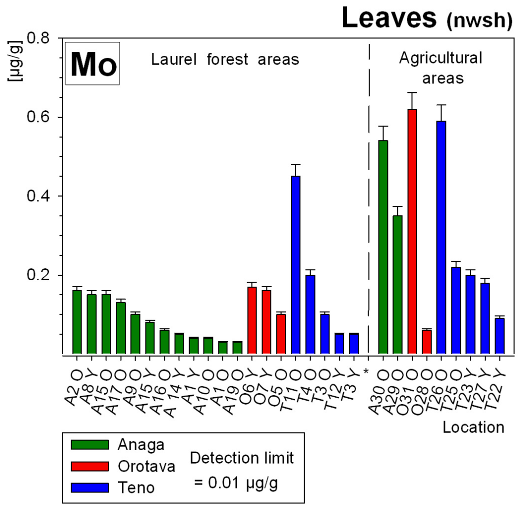


Fig.102 Histogram of the unwashed Mo leaf results.

Anaga laurel forest areas: The root samples contain between 0.05 ± 0.00 µg/g and 0.63 ± 0.03 µg/g of Mo, with an average of 0.16 ± 0.01 µg/g. The highest Mo root level is determined for A17. The remaining root samples are below 0.21 µg/g. No significant differences are seen between the unwashed and washed leaves (Fig.103). The 22 leaf samples contain between 0.03 ± 0.00 µg/g and 0.16 ± 0.01 µg/g of Mo, with an average of 0.08 ± 0.01 µg/g.

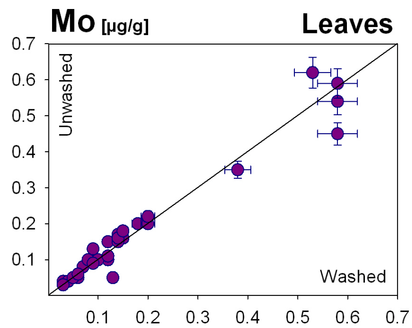


Fig.103 Plotted washed and unwashed Mo leaf results.

Anaga agricultural areas: No significant differences are seen between the unwashed and washed leaves (Fig.103). The 4 leaf samples contain between 0.35 ± 0.02 µg/g and 0.58 ± 0.04 µg/g of Mo, with an average of 0.46 ± 0.03 µg/g. The two highest Mo levels above 0.54 µg/g are determined at A30.

Orotava laurel forest areas: The root samples contain between 0.22 ± 0.02 µg/g and 0.38 ± 0.03 µg/g of Mo. The Mo level of sample O6 are below the detection limit (<0.01 µg/g). No significant differences are seen between the unwashed and washed leaves (Fig.103). The 6 leaf samples contain between 0.10 ± 0.01 µg/g and 0.17 ± 0.01 µg/g of Mo (mean 0.14 ± 0.01 µg/g).

Orotava agricultural areas: No significant differences are seen between the unwashed and washed leaves (Fig.103). The 4 leaf samples contain between 0.06 ± 0.00 µg/g and 0.62 ± 0.04 µg/g of Mo, with an average of 0.32 ± 0.02 µg/g.

Teno laurel forest areas: The root samples contain between 0.02 ± 0.00 µg/g and 0.71 ± 0.05 µg/g, with an average of 0.34 ± 0.02 µg/g. The highest Mo value is determined at T3. No significant differences are seen between the unwashed and washed leaves (Fig.103). The 12 leaf samples contain between 0.05 ± 0.00 µg/g and 0.58 ± 0.04 µg/g of Mo, with an average of 0.18 ± 0.01 µg/g. The highest Mo value, above 0.45 µg/g is determined at T11.

Teno agricultural areas: No significant differences are seen between the unwashed and washed leaves (Fig.103). The 10 leaf samples contain between 0.09 ± 0.01 µg/g and 0.59 ± 0.04 µg/g of Mo, with an average of 0.25 ± 0.02 µg/g. The two highest levels above 0.57 µg/g are determined at T26.

3.20 Antimony (Sb)

Volcanic rocks

The Sb levels are below the detection limit (<0.1 µg/g) at all laurel forest and agricultural samples.

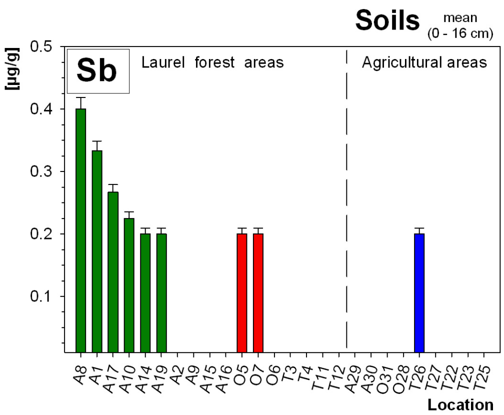


Fig.104 Histogram of the mean Sb topsoil results. The MDL is 0.1 µg/g.

Soils

The laurel forests mean Sb levels vary from 0.2 ± 0.0 µg/g to 0.4 ± 0.0 µg/g, with an average of 0.3 ± 0.0 µg/g (Fig.104). It has to be mentioned that only 8 of 17 laurel forest profiles contain Sb above the detection limit (<0.1). About 26 laurel forest soil horizons contain between 0.2 ± 0.0 µg/g and 0.6 ± 0.0 µg/g of Sb, with an average of 0.3 ± 0.0 µg/g. Furthermore, only one fallow agricultural profile contains Sb above the detection limit. The mean is 0.2 ± 0.0 µg/g (Fig.104). Only 2 agricultural soil horizons contain Sb. Both values are 0.2 ± 0.0 µg/g.

Anaga laurel forest soils: The mean Sb levels range from 0.2 ± 0.0 µg/g to 0.4 ± 0.0 µg/g (A8), with an average of 0.3 ± 0.0 µg/g. Only 21 of 54 soil horizons contain Sb. The distribution of Sb is very irregular. A few profiles contain only within one or two horizons Sb (Fig.105). Other profiles contain only in the upper soil horizon Sb. Within 4 profiles the Sb levels are all below the detection limit of 0.1 µg/g (A2, A9, A15, A16). Only profile A8 contains Sb within all soil horizons. In addition, the Sb levels of A8 are the highest of all. The levels in the upper soil horizon (0 – 4 cm) range between 0.5 ± 0.0 µg/g and 0.6 ± 0.0 µg/g.

Anaga agricultural soils: The Sb levels are below the detection limit.

Orotava laurel forest soils: Sb is detected only at profile O5 and O7. Profile O5 contains only in the uppermost horizon Sb and O7 within all horizon. The levels are always 0.2 ± 0.0 µg/g.

Orotava agricultural soils: The Sb levels are below the detection limit.

Teno laurel forest soils: The mean Sb levels are all below the detection limit of 0.1 µg/g.

Teno agricultural areas: The Sb levels of 4 profiles are below the detection limit. Only two soil horizons of T26 contain Sb (0.2 ± 0.0 µg/g) (Fig.105).

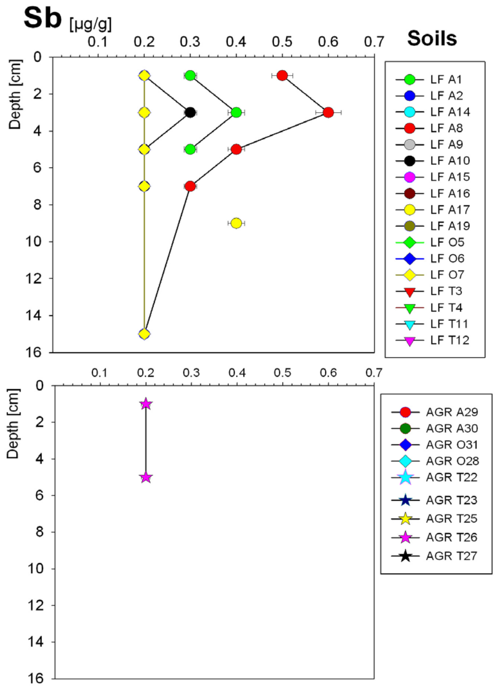


Fig.105 The Sb soil depth profiles.

Roots and leaves

The 42 *L. novocanariensis* leaf samples from the laurel forest contain between 0.05 ± 0.00 µg/g and 0.70 ± 0.03 µg/g of Sb, with an average of 0.19 ± 0.01 µg/g (Fig.106). The 12 *L. novocanariensis* root samples from the laurel forest contain between 0.05 ± 0.00 µg/g and 4.84 ± 0.22 µg/g of Sb, with an average of 0.69 ± 0.03 µg/g. The 18 *L. novocanariensis* leaf samples from the fallow agricultural areas contain between 0.02 ± 0.00 µg/g and 0.09 ± 0.00 µg/g of Sb, (average 0.05 ± 0.00 µg/g) (Fig.106).

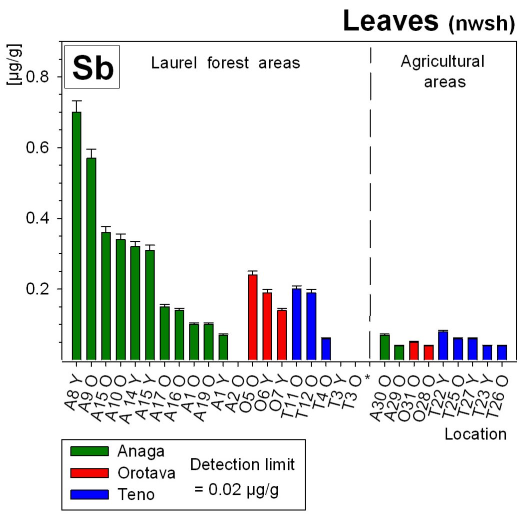


Fig.106 Histogram of the unwashed Sb leaf results.

Anaga laurel forest areas: The root samples contain between 0.10 ± 0.00 µg/g and 0.69 ± 0.03 µg/g of Sb, with an average of 0.34 ± 0.02 µg/g. The Sb levels of two root samples are below the detection limit of 0.02 µg/g. There are significant differences seen between 10 unwashed leaves and the 10 washed leaves (Fig.107). It is recognizable that the differences between unwashed and washed leaves are significantly higher if they contain more than 0.2 µg/g of Pb. That means, below 0.2 µg/g are no differences seen, but above 0.2 µg/g all unwashed leaf samples contain higher Sb levels as the corresponding washed leaves. Only two leaf samples are below the detection limit. The 20 leaf samples contain between 0.05 ± 0.00 µg/g and 0.70 ± 0.03 µg/g, with an average of 0.22 ± 0.01 µg/g.

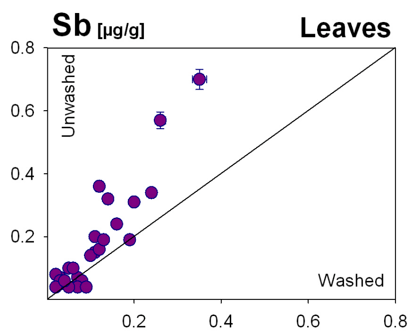


Fig.107 Plotted washed and unwashed Sb leaf results.

Anaga agricultural areas: No significant differences are seen between the unwashed and washed leaves

(Fig.107). The 4 leaf samples contain between 0.03 ± 0.00 µg/g and 0.07 ± 0.00 µg/g of Sb, with an average of 0.05 ± 0.00 µg/g.

Orotava laurel forest areas: The Sb levels of two root samples are below the detection limit. Sample O7 contains 0.07 ± 0.00 µg/g of Sb. No significant differences are seen between the unwashed and washed leaves (Fig.107). The 6 leaf samples contain between 0.10 ± 0.00 µg/g and 0.24 ± 0.01 µg/g of Sb, with an average of 0.17 ± 0.01 µg/g.

Orotava agricultural areas: No significant differences are seen between the unwashed and washed leaves (Fig.107). The 4 leaf samples contain between 0.03 ± 0.00 µg/g and 0.09 ± 0.00 µg/g of Sb, with an average of 0.05 ± 0.00 µg/g.

Teno laurel forest areas: The root samples contain between 0.05 ± 0.00 µg/g and 4.84 ± 0.22 µg/g of Sb, with an average of 1.55 ± 0.07 µg/g. The highest Sb value is determined at T4. No significant differences are seen between 5 unwashed and 4 washed leaves (Fig.107). The 9 leaf samples contain between 0.06 ± 0.00 µg/g and 0.20 ± 0.01 µg/g of Sb, with an average of 0.13 ± 0.01 µg/g. However, 3 Sb levels are below the detection limit (<0.02 µg/g).

Teno agricultural areas: No significant differences are seen between the unwashed and washed leaves. The leaf samples contain between 0.02 ± 0.00 µg/g and 0.08 ± 0.00 µg/g of Sb, with an average of 0.05 ± 0.00 µg/g.

3.21 Cadmium (Cd)

Volcanic rocks

Only 2 laurel forest samples contain Cd above the detection limit (<0.1 µg/g). Both samples contain 0.2 ± 0.0 µg/g (Fig.108). In addition, only 3 agricultural samples contain Cd. The Cd levels range from 0.2 ± 0.0 µg/g to 0.3 ± 0.0 µg/g (Fig.108).

Anaga rocks: Only 2 laurel forest rocks contain Cd levels above the detection limit of 0.1 µg/g. Both samples (A2, A9) contain 0.2 ± 0.0 µg/g of Cd. The agricultural sample A30 contains 0.2 ± 0.0 µg/g and sample A29 contains 0.3 ± 0.0 µg/g of Cd.

Orotava rocks: All rocks below the detection limit.
Teno rocks: Only the agricultural sample T23 contains Cd (0.2 ± 0.02 µg/g Cd).

Soils

The laurel forests mean Cd levels vary from 0.2 ± 0.0 µg/g to 0.4 ± 0.0 µg/g, with an average of 0.2 ± 0.0 µg/g (Fig.109). Only 57 laurel forest soil horizons contain Cd between 0.2 ± 0.0 µg/g and 0.5

± 0.0 µg/g, with an average of 0.2 ± 0.0 µg/g. The fallow agricultural mean levels vary from 0.2 ± 0.0 µg/g to 0.3 ± 0.0 µg/g, with an average of 0.2 ± 0.0 µg/g (Fig.109). The 35 fallow agricultural soil horizons contain between 0.2 ± 0.0 µg/g and 0.3 ± 0.0 µg/g of Cd, with a mean of 0.2 ± 0.0 µg/g.

Anaga laurel forest soils: The mean Cd levels range from 0.2 ± 0.0 µg/g to 0.4 ± 0.0 µg/g (A17), with an average of 0.3 ± 0.0 µg/g. Only 40 of 54 soil horizons contain Cd. The levels range from 0.2 ± 0.0 µg/g to 0.5 ± 0.0 µg/g. The highest levels occur within profile A17 (Fig.110).

Anaga agricultural soils: The profiles contain both 0.2 ± 0.0 µg/g of Cd.

Orotava laurel forest soils: The mean Cd levels are 0.2 ± 0.0 µg/g. Cd is above the detection limit at 7 of 16 soil horizons. Only one sample contains 0.3 ± 0.0 µg/g.

Orotava agricultural soils: The mean values are 0.2 ± 0.0 µg/g and 0.3 ± 0.0 µg/g.

Teno laurel forest soils: All mean Cd levels are 0.2 ± 0.0 µg/g. The levels of T3 are below the detection limit. Only 10 of 20 soil horizons contain Cd above the detection limit and only one sample contains 0.3 ± 0.0 µg/g of Cd (T11).

Teno agricultural soils: The mean Cd level of T22 and T23 is 0.2 ± 0.0 µg/g. The remaining three profiles have a mean of 0.3 ± 0.0 µg/g.

Roots and leaves

Only 14 *L. novocanariensis* leaf samples from the laurel forest contain Cd in the range of 0.02 ± 0.00 µg/g and 0.09 ± 0.01 µg/g, with an average of 0.04 ± 0.01 µg/g (Fig.111). The 16 *L. novocanariensis* root samples from the laurel forest contain be-

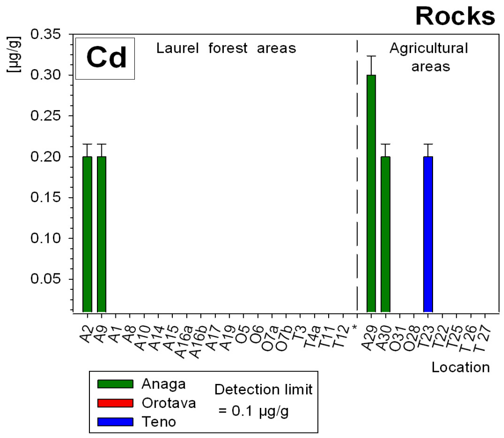


Fig.108 Histogram of the Cd rock results.

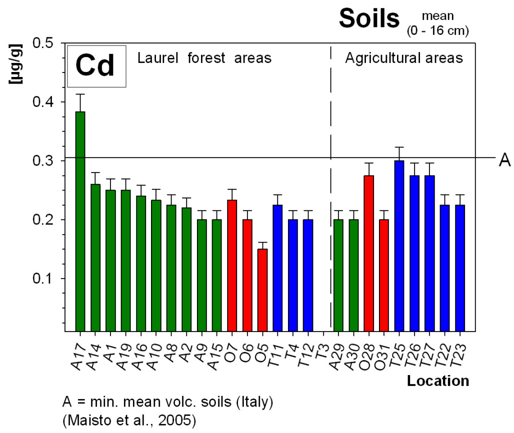


Fig.109 Histogram of the mean Cd topsoil results.

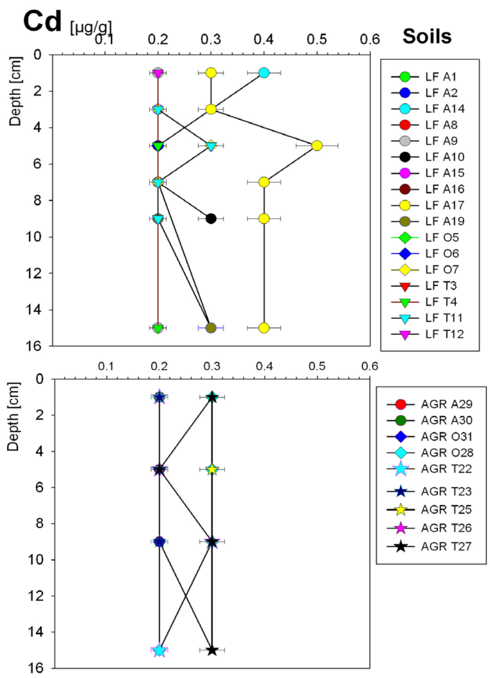


Fig.110 The soil depth profiles.

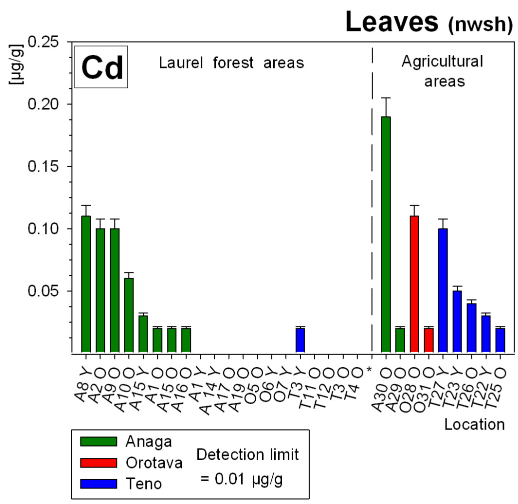


Fig.111 Histogram of the unwashed leaf results.

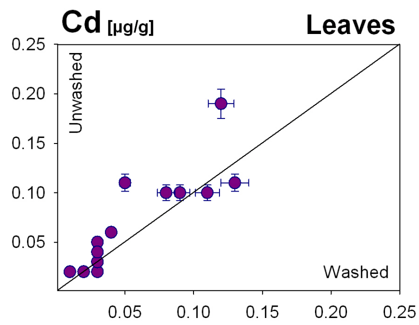


Fig.112 Plotted washed and unwashed leaf results.

tween 0.02 ± 0.00 µg/g and 0.15 ± 0.01 µg/g of Cd, with an average of 0.07 ± 0.01 µg/g. Only 16 ***L. novocanariensis*** leaf samples from the fallow agricultural areas contain Cd in the range of 0.02 ± 0.00 µg/g and 0.19 ± 0.01 µg/g, with an average of 0.06 ± 0.00 µg/g (Fig.111).

Anaga laurel forest areas: The root samples contain between 0.03 ± 0.00 µg/g and 0.15 ± 0.01 µg/g of Cd, with an average of 0.09 ± 0.01 µg/g. There are significant differences seen between the unwashed and the washed leaf values. Cadmium is only within 13 samples above the detection limit. The 13 leaf samples contain between 0.02 ± 0.00 µg/g and 0.11 ± 0.01 µg/g. Within the 13 results it is recognizable that most of them are determined at unwashed samples. That means the corresponding washed leaves contain Cd levels below the detection limit. The highest level of unwashed leaves is determined at sampling site A8 (0.11 ± 0.01 µg/g) (Fig.112). The second highest unwashed values are determined at A2 and A9 (0.08 ± 0.01 µg/g and 0.09 ± 0.01 µg/g).

Anaga agricultural areas: No significant differences are seen between the unwashed and washed leaves (Fig.112). The 4 leaf samples contain between 0.02 ± 0.00 µg/g and 0.19 ± 0.01 µg/g of Cd, with an average of 0.09 µg/g. The two highest values occur at A30 (0.12 ± 0.01 µg/g and 0.19 ± 0.01 µg/g).

Orotava laurel forest areas: The root samples contain between 0.03 ± 0.00 µg/g and 0.07 ± 0.01 µg/g of Cd, with an average of 0.05 ± 0.00 µg/g. The levels of all leaves are below the detection limit .

Orotava agricultural areas: No significant differences are seen between the unwashed and washed leaves (Fig.112). The 4 leaf samples contain between 0.02 ± 0.00 µg/g and 0.13 ± 0.01 µg/g of Cd, with an average of 0.07 ± 0.01 µg/g.

Teno laurel forest areas: The root samples contain between 0.02 ± 0.00 µg/g and 0.05 ± 0.00 µg/g of Cd, with an average of 0.04 ± 0.00 µg/g. The Cd levels of 11 leaf samples are below the detection limit of 0.01 µg/g. Only sample T3a contains 0.02 ± 0.00 µg/g.

Teno agricultural areas: No significant differences are seen between the unwashed and washed leaves (Fig.112). The Cd levels of 8 samples range from 0.02 ± 0.00 µg/g to 0.11 ± 0.01 µg/g, with an average of 0.04 ± 0.00 µg/g. Two samples are below the detection limit.

3.22 Mercury (Hg)

Volcanic rocks

Only 7 laurel forest samples contain Hg above the detection (<0.01 µg/g). The levels range from 0.02 ± 0.00 µg/g to 0.09 ± 0.01 µg/g, with an average of 0.05 ± 0.01 µg/g (Fig.113). Only 2 fallow agricultural samples contain between 0.02 ± 0.00 µg/g and 0.03 ± 0.00 µg/g of Hg (Fig.113).

Anaga rocks: Only 6 laurel forest samples contain Hg levels above the detection limit. The rocks contain between 0.02 ± 0.00 µg/g (A9) and 0.09 ± 0.01 µg/g (A19) of Hg, with an average of 0.05 ± 0.01 µg/g. Only one agricultural sample contains Hg above the detection limit (A29, 0.03 ± 0.00 µg/g).

Orotava rocks: The laurel forest samples are below the detection limit. Only the agricultural sample O28 contains 0.02 ± 0.00 µg/g of Hg.

Teno rocks: Only 1 laurel forest sample contains Hg above the detection limit. Sample T4b contains 0.03 ± 0.00 µg/g of Hg. All agricultural samples are also below the detection limit.

Soils

The laurel forests mean Hg levels vary from 0.08 ± 0.01 µg/g to 0.35 ± 0.05 µg/g, with an average of 0.17 ± 0.03 µg/g (Fig.114). The 89 laurel forest soil horizons contain between 0.06 ± 0.01 µg/g and 0.46 ± 0.07 µg/g of Hg, with an average of 0.17 ± 0.03 µg/g. The fallow agricultural mean Hg levels vary from 0.05 ± 0.01 µg/g to 0.13 ± 0.02 µg/g, with an average of 0.09 ± 0.01 µg/g (Fig.114). The 35 fallow agricultural soil horizons contain between 0.04 ± 0.01 µg/g and 0.16 ± 0.02 µg/g of Hg (mean 0.09 ± 0.01 µg/g).

Anaga laurel forest soils: The mean Hg levels range from 0.09 ± 0.01 µg/g (A2) to 0.35 ± 0.05 µg/g (A8), with an average of 0.20 ± 0.03 µg/g. The two highest mean levels are determined at profile A1 (0.24 ± 0.04 µg/g) and A8 (0.35 ± 0.05 µg/g). The 54 soil horizons contain between 0.07 ± 0.01 µg/g and 0.46 ± 0.07 µg/g of Hg. Regarding each profile separately shows that the Hg levels decrease slightly with increasing depth within 4 of 10 profiles (Fig.115). The variation between the uppermost and lowest soil horizon range from 0.15 ± 0.02 µg/g to 0.20 ± 0.02 µg/g.

Anaga agricultural soils: The agricultural profiles contain mean levels of 0.09 ± 0.01 µg/g (A30) and 0.10 ± 0.01 µg/g (A29). The 8 soil horizons contain between 0.08 ± 0.01 µg/g and 0.11 ± 0.02 µg/g of Hg, with an average of 0.09 ± 0.01 µg/g. Both proifles show nearly no variation within the upper 15 cm (Fig.115).

Orotava laurel forest soils: The mean Hg levels range from 0.08 ± 0.01 µg/g (O6) to 0.20 ± 0.03 µg/g (O7), with an average of 0.14 ± 0.02 µg/g. The 16 soil horizons contain between 0.06 ± 0.01 µg/g and

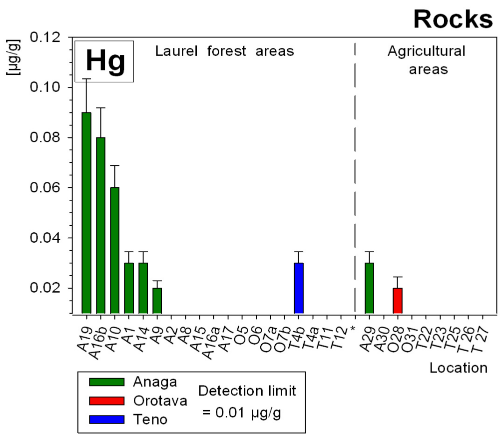


Fig.113 Histogram of the Hg rock results.

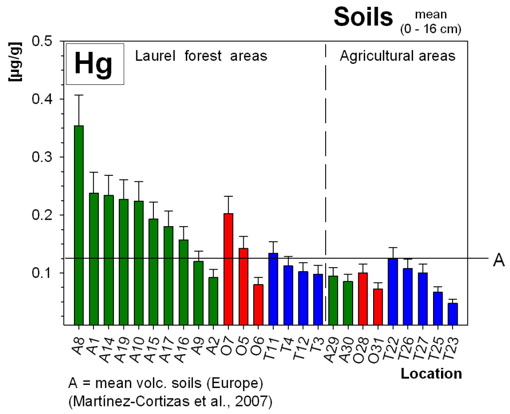


Fig.114 Histogram of the mean Hg topsoil results.

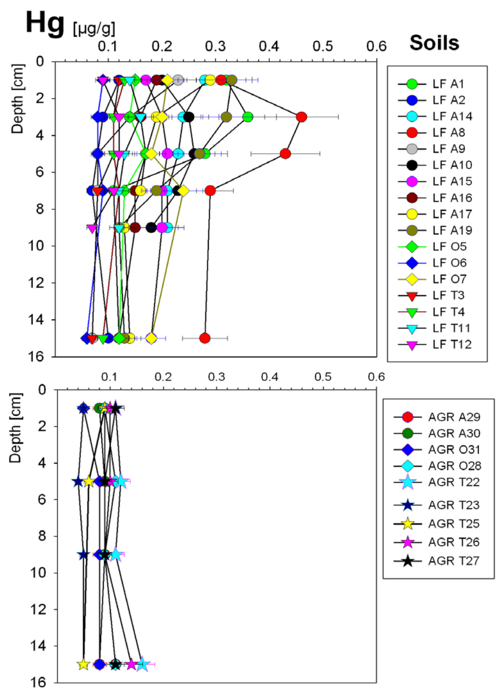


Fig.115 The Hg soil depth profiles.

0.24 ± 0.04 µg/g of Hg. The profiles show nearly no variation of Hg between the uppermost and lowest soil horizon.

Orotava agricultural soils: The profiles contain mean values of 0.07 ± 0.01 µg/g (O31) and 0.10 ± 0.01 µg/g (O28). The 8 soil horizons contain between 0.05 ± 0.01 µg/g and 0.11 ± 0.02 µg/g, with an average of 0.09 ± 0.01 µg/g. The profiles show nearly no variation (Fig.115).

Teno laurel forest soils: The mean Hg levels range from 0.10 ± 0.01 µg/g (T3, T12) to 0.13 ± 0.02 µg/g (T11), with an average of 0.11 ± 0.02 µg/g. The 20 soil horizons contain between 0.07 ± 0.01 µg/g and 0.16 ± 0.02 µg/g of Hg. The Hg levels show nearly no variation horizon (Fig.115).

Teno agricultural soils: The profiles contain mean Hg levels between 0.05 ± 0.01 µg/g (T23) and 0.13 ± 0.02 µg/g (T22), with an average of 0.09 ± 0.01 µg/g. The 19 soil horizons contain between 0.04 ± 0.01 µg/g and 0.16 ± 0.02 µg/g of Hg. The profiles show nearly no variation within the upper 15 cm (Fig.115).

Roots and leaves

The 42 leaf samples from the laurel forest contain between 0.007 ± 0.001 µg/g and 0.060 ± 0.009 µg/g of Hg, with an average of 0.034 ± 0.005 µg/g (Fig.116). The 16 roots from the laurel forest contain 0.003 ± 0.000 µg/g to 0.057 ± 0.008 µg/g of Hg (average 0.022 ± 0.003 µg/g). The 18 leaf samples from agricultural areas contain between 0.008 ± 0.001 µg/g and 0.026 ± 0.004 µg/g of Hg, with an average of 0.017 ± 0.003 µg/g (Fig.116).

Anaga laurel forest areas: The root samples contain between 0.006 ± 0.001 µg/g and 0.057 ± 0.008 µg/g of Hg, with an average of 0.026 ± 0.004 µg/g.

No significant differences are seen between the unwashed and washed leaves (Fig.117). The 22 leaf samples contain between 0.007 ± 0.001 µg/g and 0.059 ± 0.009 µg/g of Hg (average 0.035 ± 0.005 µg/g).

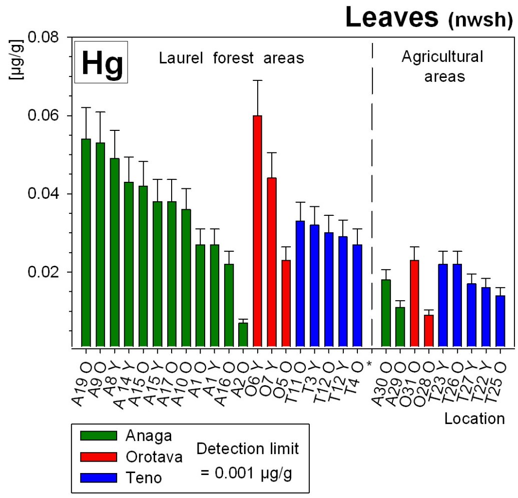


Fig.116 Histogram of the unwashed Hg leaf results.

Anaga agricultural areas: No significant differences are seen between the unwashed and washed leaves (Fig.117). The 4 leaf samples contain between 0.011 ± 0.002 µg/g and 0.020 ± 0.003 µg/g of Hg (average 0.016 ± 0.002 µg/g).

Orotava laurel forest areas: The root samples contain between 0.003 ± 0.000 µg/g and 0.020 ± 0.003 µg/g of Hg, with an average of 0.013 ± 0.002 µg/g. No significant differences are seen between the unwashed and washed leaves (Fig.117). The 6 leaf samples contain between 0.021 ± 0.003 µg/g and 0.060 ± 0.009 µg/g of Hg (average 0.040 ± 0.006 µg/g).

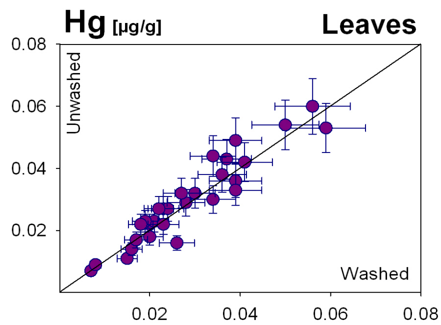


Fig.117 Plotted washed and unwashed Hg leaf results.

Orotava agricultural areas: No significant differences are seen between the unwashed and washed leaves (Fig.117). The 4 leaf samples contain between 0.008 ± 0.001 µg/g and 0.023 ± 0.003 µg/g of Hg, with an average of 0.015 ± 0.002 µg/g.

Teno laurel forest areas: The root samples contain between 0.003 ± 0.000 µg/g and 0.052 ± 0.008 µg/g of Hg, with an average of 0.022 ± 0.003 µg/g. No significant differences are seen between the unwashed and washed leaves (Fig.117). The 12 leaf samples contain between 0.022 ± 0.003 µg/g and 0.039 ± 0.006 µg/g of Hg, with an average of 0.030 ± 0.005 µg/g.

Teno agricultural areas: No significant differences are seen between the unwashed and washed leaves (Fig.117). The 10 leaf samples contain between 0.014 ± 0.002 µg/g and 0.026 ± 0.004 µg/g of Hg, with an average of 0.019 ± 0.003 µg/g.

4. Precedent discussions

The three main research aims will be discussed in the sections 5, 6, and 7. However, to achieve the main objectives of the present research work, such as the geochemical fingerprint or the anthropogenic impacts of the laurel forest soils, it is inevitable to consider first the degree of **rock alteration** and the amounts of **soil organic carbon** (SOC).

For example, alteration and weathering processes like hydration, hydrolysis, solution, carbonation, oxidation and reduction ensure the decomposition and alteration of rocks and minerals, which cause the disappearance of certain minerals as well as the formation of secondary products such as clay minerals, Al-Fe oxides, soluble cations, anions and others (Scheffer & Schachtschabel, 2010; Schaetzl & Anderson, 2005). For instance, the water that causes hydrolysis reactions often contains CO_2 (absorbed from the atmosphere). It can react directly with the minerals and causes the production of insoluble clay minerals, positively charged metal ions (Ca^{2+}, Mg^{2+}, Na^{+}, K^{+} etc.), negatively charged ions (OH^{-}, HCO^{3-}) as well as some soluble Si (Scheffer & Schachtschabel, 2010; Schaetzl & Anderson, 2005). The released ions can be absorbed by the surrounding vegetation and are therefore removed from the contributing environment (Scheffer & Schachtschabel, 2010; Schaetzl & Anderson, 2005).

Furthermore, several important facts can be determined by plotting the SOC against the element of interest. For example, for the discussion about geochemical fingerprints as well as for the discussion about anthropogenic impacts, it is necessary to determine whether the elements of interests are inorganically or organically bound within the soils. This information helps to discuss the origin and the interrelations of certain elements. In addition, increasing amounts of organic carbon can possibly decrease the concentrations of certain soil elements (Schaetzl & Anderson, 2005; Martinéz et al. 2007). This dilution effect can possibly affect the concentrations of the element of interest (Martinéz et al. 2007). In this case it is necessary to normalize the total element levels of the diluted element in order to discuss element affecting processes as well as element enrichment or depletion effects in a credible and realistic way.

4.1 Degree of rock alteration

Several chemical indices are usable to calculate the degree of rock weathering or alteration, such as the Weathering Potential Index (WPI; Reiche, 1943), the Sesquoxide content (SOC; Irfan, 1996), the Mobility Index (I_{mob} ; Irfan, 1996) and the Loss on Ignition (LOI; Suoeka et al., 1985). Generally, rock weathering processes (e.g. hydration) and clay formation processes can cause an increase of H_2O^+, especially under humid climate conditions (Ng et al., 2001).

Therefore, the LOI fits well to discuss the degree of rock alteration due to the fact that it reflects the H_2O^+ content in a sample (Suoeka et al., 1985). Within the present research work, the LOI levels have been determined for all laurel forest and fallow agricultural rock samples.

Generally, the laurel forest samples contain LOI values from 0.2 ± 0.0 wt.% to 23.4 ± 0.1 wt.%, with an average of 8.0 ± 0.0 wt.%. The fallow agricultural samples contain LOI levels from 1.4 ± 0.0 wt.% to 7.0 ± 0.0 wt.%, with an average of 3.0 ± 0.0 wt.%. Due to the fact that a high LOI reflects hydration and clay formation processes (Ng et al., 2001), each sampling area will now be described in detail.

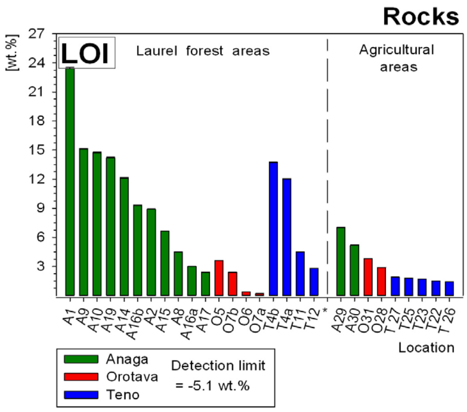


Fig.118 The histogram shows the determined LOI levels of the examined rocks.

Anaga rocks: The laurel forest LOI levels range from 2.4 ± 0.0 wt.% (A17) to 23.4 ± 0.1 wt.% (A1), with an average of 10.4 ± 0.0 wt.% (Fig.118). Furthermore, the determined levels show large variations even within the same sample location. In addition, the levels can be divided into two LOI ranges. The laurel forest samples A2, A15, A16a, A16b, A8, and A17 contain LOI values from 2.4 ± 0.0 wt.% to 9.3 ± 0.0 wt.%. The laurel forest samples A1, A14, A9, A10 and A19 contain levels from 12.1 ± 0.1 wt.% (A14) to 23.4 ± 0.1 wt.% (Fig.118). The highest levels are measured at A9, A10 and A1. The agricultural sample A30 contains a LOI of 5.2 ± 0.0 wt.% and A29 a LOI of 7.0 ± 0.0 wt.% (Fig.118).

Orotava rocks: The LOI of the laurel forest rocks range from 0.2 ± 0.0 wt.% (O7a) to 3.6 ± 0.0 wt.% (O5), with an average of 1.7 ± 0.0 wt.% (Fig.118). The agricultural samples contain a LOI of 2.9 ± 0.0 wt.% (O28) and 3.8 ± 0.0 wt.% (O31).

Teno rocks: The LOI of the laurel forest rocks range from 2.8 ± 0.0 wt.% (T12) to 13.7 ± 0.0 wt.% (T4b), with an average of 7.7 ± 0.0 wt.% (Fig.118). The agricultural samples contain LOI levels from 1.4 ± 0.0 wt.% (T26) to 1.9 ± 0.0 wt.% (T27) (average 1.7 ± 0.0 wt.%).

The several determined LOI levels showed clear differences between the sampling areas and sampling types. All Anaga rocks, including the fallow agricultral samples showed the larges variations within the LOI and only three samples are below 5 wt.%. (Fig.118). In comparison, all of the analysed volcanic rocks (>70 samples) from Thrilwall et al. (2000) and Longpré et al. (2009) contain LOI levels below 3.5 wt.%. Furthermore, both studies reported that a LOI of 3.5 wt.% indicates clearly the affecting influences of hydration and clay formation processes (cf. Thirlwall et al. 2000; Longpré et al., 2009). That means, all rock samples above 3.5 wt.% are already affected and as higher the values are as larger are the affecting influences of hydration and clay formation processes. However, the differences between the sampling areas are clearly visible. Most of the agricultural samples and most of the Teno and Orotava laurel forest samples are below 5 wt.%, which indicates that these rocks are not as strongly weathered as the Anaga rocks (Fig.119 a-b).

For example, the Si levels decrease and the Al levels increase with increasing LOI levels (Fig.119 a-b). This indicates the affecting influences of hydration and clay formation processes very well, which is reflected by the loss of Si and the fixation of Al in clay minerals. In addition, the elements Ti and Zr are not affected by increasing LOI levels, which indicates that Ti and Zr can be considered as immobile (Fig.119 c -d). This information is possibly necessary for the normalization of certain diluted elements. Furthermore, the different alteration stages can provide a hint for the upcoming discussions; due to the fact that rocks with higher LOI levels affected the surrounding environments possibly much more intense that other rocks with a lower degree of alteration.

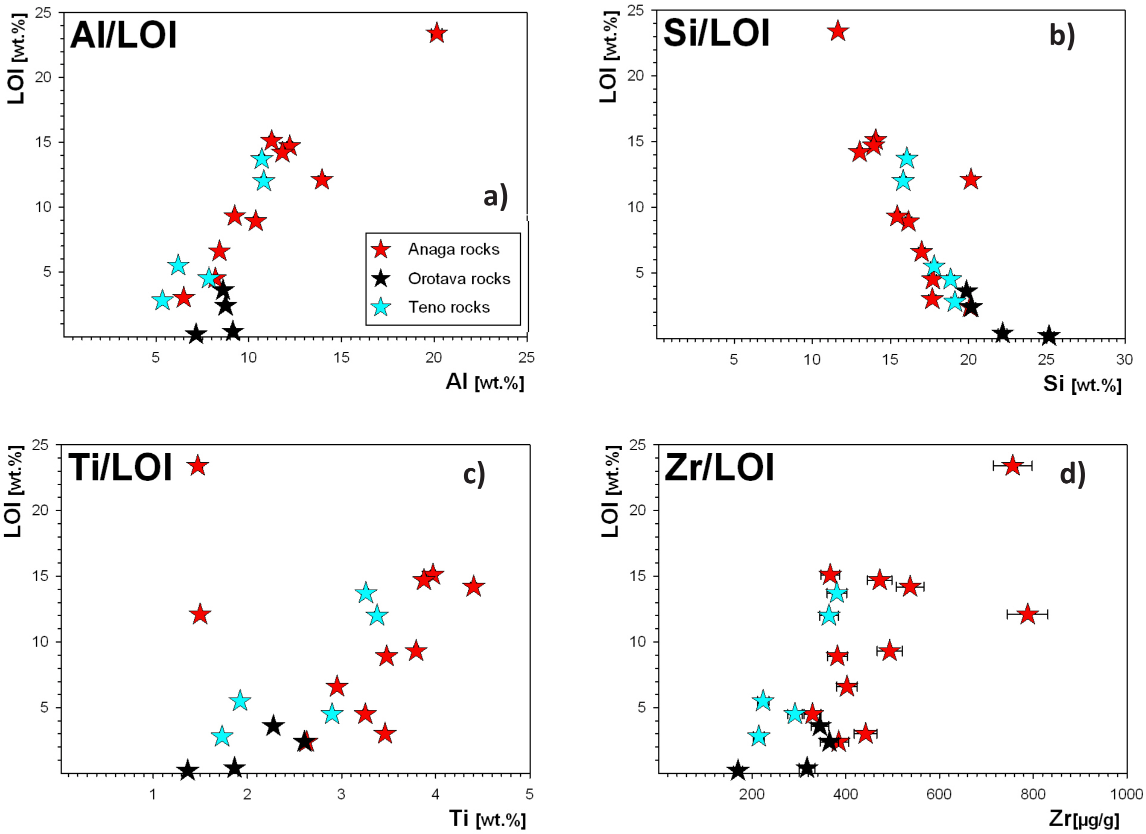


Fig.119 a) & b) The rock scatterplots show clearly that the Al levels increase and Si levels decrease with increasing LOI levels. The Si/LOI scatterplot shows clearly the loss of Si with an increase of the LOI. The lowest Si levels occur in the most strongly weathered Anaga rock samples. c) & d) The elements Ti and Zr are only slightly affected by increasing LOI levels.

4.2 Soil organic carbon

As already mentioned in the method section, the soil organic carbon (SOC) should be determined by measuring the C_{tot} of the 124 soil samples in which the inorganic carbon contents have been removed by using the hot concentrated hydrochloric acid digestion. However, during the acid digestion it was noticeable that there was nearly no observable effervescence within the 124 soil samples. In addition, none of the 124 samples showed such a reaction as the one observed within the prepared samples, which contained different amounts of calcite and dolomite (10 %, 1%, 0.5%).

For example, the prepared soil samples containing 10 % of carbonate (dolomite or calcite) are categorized as highly reactive. The reaction started immediately after contact with the acid. Samples containing 1 % of carbonate (dolomite or calcite) are categorized as moderately reactive. The observed effervescence also started right after the acid was added. The prepared soils containing 0.5 % of carbonate, being categorized as slightly reactive, reacted the same as the above. That means that it was even possible to detect 0.5 % of dolomite visually, which has a lower acid solubility as calcite. Furthermore, the pH of the aqueous soil extracts, which have been determined during the field campaign at six laurel forest profiles, range from pH 5.0 to pH 6.5.

The forest soils, as these results clearly show, are slightly acidic and calcite would already have been dissolved under these acidic conditions. Moreover, the carbonate test during the fieldwork also indicated no recognizable reactions. In addition, it can be excluded a priori that elemental carbon forms such as charcoal, graphite or coal are present in the examined soils due to the fact that none of the mentioned forms have been recognized throughout the fieldwork and the entire sample preparation. Considering all of the observed facts such as the low soil pH, the negative soil carbonate tests, as well as the missing occurrence of observable effervescence during the acid digestion, leads us to the assumption that the 124 soil samples contain less than 0.5 % of carbonate.

Furthermore, the calculated error range for the total carbon is 4.42 %, which therefore includes already the carbonate bias of 0.5%. This means that the total carbon levels possibly represent the amount of total organic carbon in soils. To verify this assumption it is possible to plot the C_{tot} soil levels against the soil LOI results, keeping in mind that the determined LOI levels (1000°C) may be affected by only a few LOI increasing components (cf. 2.6 on page 37) and not by the loss of inorganic carbon, which generally occurs at temperatures between 425 and 520 °C in minerals such as siderite, magnesite and dolomite (Heiri et al. 2001). Anyway, first the established LOI soil results have to be presented (Fig.120).

The laurel forests mean LOI levels range from 21.4 ± 0.1 wt.% to 64.4 ± 0.4 wt.%, with an average of 40.6 ± 0.2 wt.%. The 89 laurel forest soil horizons contain a LOI between 18.1 ± 0.1 wt.% and 85.3 ± 0.5 wt.%, with an average of 40.5 ± 0.2 wt.%. The fallow agricultural mean LOI levels range from 12.1 ± 0.1 wt.% to 36.8 ± 0.2 wt.%, with an average of 21.0 ± 0.1 wt.% (Fig.120). The 35 fallow agricultural horizons contain between 11.3 ± 0.1 wt.% and 47.4 ± 0.3 wt.%, with an average of 20.8 ± 0.1 wt.%.

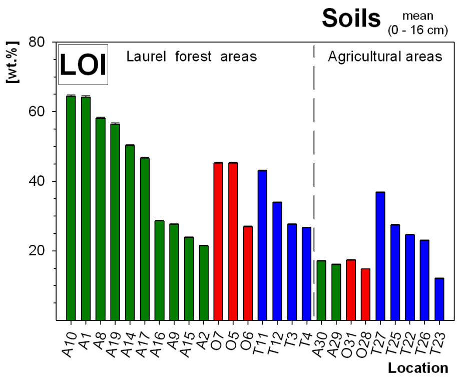


Fig.120 Histogram of the mean LOI topsoil levels.

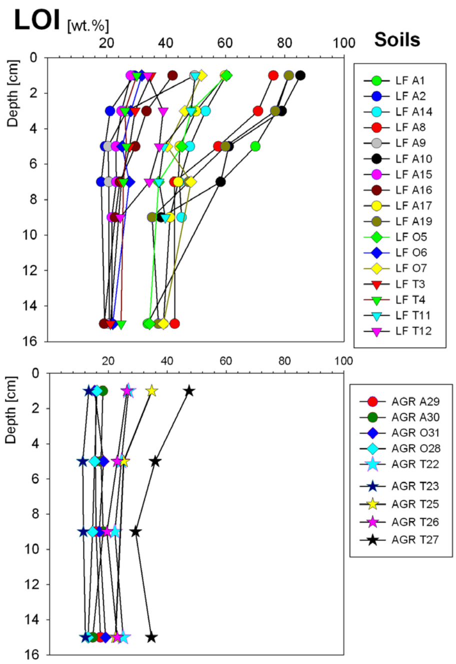


Fig.121 The soil depth profiles.

Anaga laurel forest soils: The mean LOI levels range from 21.4 ± 0.1 wt.% (A2) to 64.4 ± 0.4 wt.% (A10), with an average of 43.7 ± 0.2 wt.%. The samples A2, A9, A15 and A16 contain the lowest LOI levels between 21.4 ± 0.1 wt.% to 28.6 ± 0.2 wt.% (A16) (Fig.120). The remaining 6 profiles contain significantly higher mean LOI levels in the range of 46.5 ± 0.3 wt.% (A17) to 64.4 ± 0.4 wt.% (A10). The 54 soil horizons range from 18.1 ± 0.1 wt.% to 85.3 ± 0.5 wt.% and the highest LOI values are detected always in the upper organic rich soil horizons (0 – 2 cm, 2 – 4 cm) (Fig.121).

Anaga agricultural soils: Profile A29 contains a mean LOI value of 16.1 ± 0.1 wt.% and profile A30 a mean value of 17.1 ± 0.1 wt.%. Both soil profiles contain very homogenous values and show nearly no variation within the upper 15 cm (Fig.121).

Orotava laurel forest soils: The mean LOI levels range from 26.9 ± 0.2 wt.% (O6) to 45.2 ± 0.3 wt.% (O5, O7) (average 39.1 ± 0.2 wt.%). The 16 horizons contain a LOI between 22.0 ± 0.1 wt.% and 60.4 ± 0.3 wt.%. The highest amounts occur in the upper soil horizon (0 – 2 cm, 2 – 4 cm) (Fig.121).

Orotava agricultural soils: The profiles contain mean LOI values of 14.8 ± 0.1 wt.% (O28) and 17.4 ± 0.1 wt.% (O31). The LOI levels of the 8 soil horizons range from 13.1 ± 0.1 wt.% to 19.0 ± 0.1 wt.%, with an average of 16.1 ± 0.1 wt.%.

Teno laurel forest soils: The mean LOI levels range from 26.6 ± 0.2 wt.% (T4) to 42.9 ± 0.2 wt.% (T11), with an average of 32.8 ± 0.2 wt.%. Without T11, the variability of the mean values is substantially smaller, and more or less homogenous. The 20 soil horizons contain a LOI between 21.2 ± 0.1 wt.% and 49.8 ± 0.3 wt.% (T11). The maximum amounts are determined always in the upper soil horizons (0 – 2 cm, 2 – 4 cm) and decrease with increasing depth (Fig.121).

Teno agricultural soils: The profiles contain mean LOI values between 12.1 ± 0.1 wt.% (T23) and 36.8 ± 0.2 wt.% (T27), with an average of 24.6 ± 0.1 wt.%. The LOI amounts of the 19 soil horizons range from 11.3 ± 0.1 wt.% to 47.1 ± 0.3 wt.%. The highest levels are determined within the upper soil horizon of sample T27 (47.4 ± 0.3 wt.%).

The scatterplot C_{tot} vs. LOI shows clearly a positive trend (Fig.122). With an increase of C_{tot}, the LOI levels increase, too. The highest LOI and the highest Ctot levels are always to be detected within the organic rich uppermost (0 – 4 cm) soil horizons. Furthermore, the lower soil horizons always contain the lowest LOI and C_{tot} values, due to the fact that these soil horizons contain lower amounts of organic rich materials such as dead leaves and roots. Therefore, the scatterplot supports very well the assumption that the determined C_{tot} soil results represent the amount of soil organic carbon (SOC), which can be expressed by equation 14. It was actually not necessary to measure the C_{tot} levels of the acidified and carbonate free soil samples again by using the LECO Carbon Determinator.

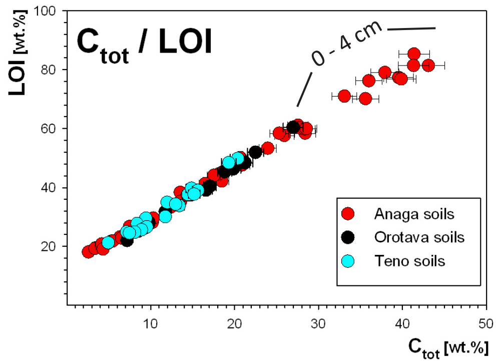


Fig.122 C_{tot} vs. LOI scatterplot. The highest LOI and C_{tot} levels occur within the uppermost soil horizons.

$$\text{Total carbon } (C_{tot}) = \text{Soil organic carbon (SOC)} \qquad (14)$$

5. Geochemical fingerprints of the laurel forest

For the present research work, the geochemical compositions of various rock, soil and vegetation samples have been analysed. These samples originate from 17 laurel forest locations, which are dispersed over the Anaga Mountains, the Orotava area and the Teno Mountains. Generally, the main research goal of this section is to determine distinguishable Anaga, Orotava or Teno fingerprints due to unique element combinations or element ratios. However, each rock, soil and vegetation sample comprises the results of 22 elements. The resulting element combination possibilities are incredibly high, if all elements are plotted against each other in order to determine distinguishable element ratios. Therefore it is inevitable to **narrow** down the range of promising **element combination** possibilities. Considering the pedological and geological facts of Tenerife (see 1.2 on page 9 and 1.3 on page 13), the upcoming section focuses particularly on the elements **Si, Al, Fe, Ca, Na, Mg, K, Ti, P, Mn, Sr, Zr, Ni** and **Cu**, which are commonly associated with occurring rock and soil minerals.

The **primary research goal** of this chapter is centered on the question, whether it is possible to distinguish the Anaga, Orotava and Teno topsoils from each other due to specific element ratios, which are either plotted (e.g. Na/K, Ca/Sr) or calculated (e.g. Na-to-K = 1:2, Ca-to-Sr = 2:1).

The **second goal** focuses on the question, whether the associated soil parent materials influenced the observed topsoil element ratios. Generally it cannot be said that the soil element ratios reflect one by one the parent rock ratios (Chesworth, 1979). There are several parameters, which can affect the genesis of soils, such as the degree of rock weathering, the incorporation of elements into clay-mineral structures, the loss of elements due to leaching processes (Chesworth, 1979). It is nevertheless interesting to know whether affecting interrelations exist between associated rock and soil samples. The plotted and calculated ratios of the topsoils are compared to the associated rock ratios.

Considering the distinguishable topsoil ratios, the **third goal** gravitates around the question, whether the associated ***L. novocanariensis*** vegetation samples reflect the topsoil fingerprints. If unique trends should exist, the plotted and calculated topsoil and vegetation ratios will be compared to each other. According to the primary research goal, it is necessary to determine the element bonding forms within the laurel forest topsoils (see 5.1). Furthermore, relating the observed trends to reported mineralogical facts such as common occurring minerals or typical element substitutions is the next step to narrow the range of the most promising element ratios (see 5.2).

5.1 Element bonding forms within the topsoils

Plotting the soil organic carbon (SOC) levels against the element of interest is the best way to determine whether an element is **inorganically** or **organically** bound within the topsoil. Inorganically bound elements and particularly those showing different correlation trends are the focus of the upcoming section. They can provide a first hint to narrow the range of area dependent geochemical differences. **Negative correlation** trends occur if low x-values (SOC) correspond to high y-values (e.g. Si) or high x-values correspond to low y-values. Negative trends indicate on the one hand that the element of interest is bound to inorganic components (e.g. olivine, clay minerals) and on the other hand that the element levels are affected (e.g. dilution) by increasing amounts of organic materials (e.g. leaves, roots, litter fall etc.). **Positive correlations** occur if high x-values (SOC) correspond to high y-values, indicating that the element is bound to organic components (humic, non-humic). The selected elements are plotted against the SOC levels according to their abundance in the lithosphere. The determined bonding forms, the observed trends and the area-dependent geochemical differences can be described as follows.

Silicon (Si) (Fig.123 a): The ratios are plotted in one negative trend, indicating that Si is inorganically bound. However, the Orotava ratios are plotted slightly steeper than the remaining ratios.

Aluminium (Al) (Fig.123 b): The negatively plotted ratios indicate that Al is inorganically bound. However, several individual Anaga samples from various horizons split of from the main trend. Also the Teno ratios of profile T3 and T12 split off from the remaining Teno ratios.

Iron (Fe) (Fig.123 c): The samples A8, A9, A10 and A19 split of from the main trend (B), creating a second trend (A). The remaining Anaga, nearly all Orotava and nearly all Teno ratios are plotted within trend (B). The ratios of O6 are plotted horizontally below trend B. Furthermore, the ratios of profile T3 are plotted closer to trend A and the ratios of T11 slightly split of from T4 and T12.

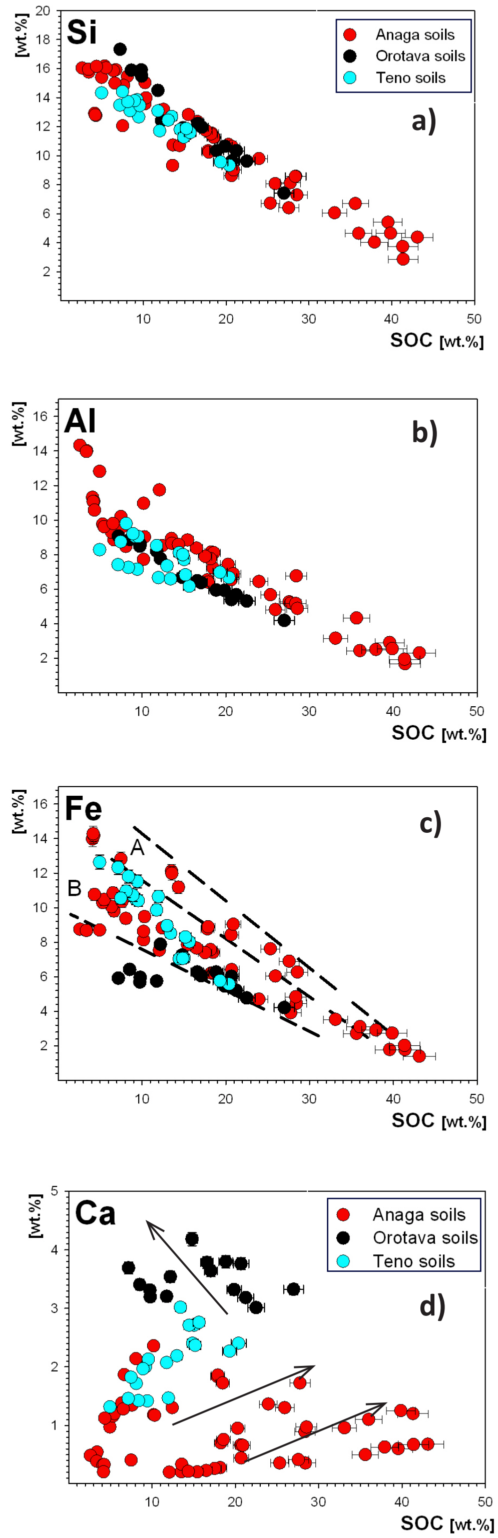


Fig.123 a) SOC vs.Si b) SOC vs. Al c) SOC vs. Fe d) SOC vs. Ca.

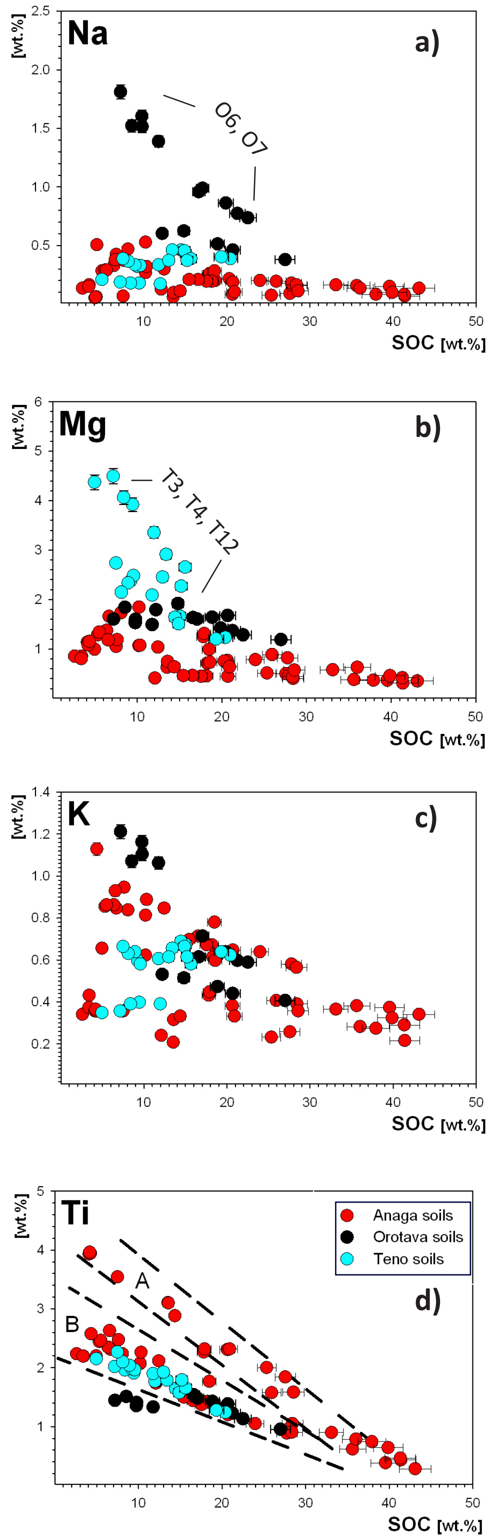


Fig.124 a) SOC vs.Na b) SOC vs. Mg c) SOC vs. K d) SOC vs. Ti

Calcium (Ca) (Fig.123 d): Positive plotted trends occur for profile A1, A2, A9, A10, A14, A15, A16, A17 and A19, indicating organically bound Ca. Negatively plotted trends occur only for profile O5, O6 and O7. It seems that Ca is organically bound within the Teno soils. However, a closer look indicates that the ratios are plotted more or less horizontally together with the ratios of profile A8.

Sodium (Na) (Fig.124 a): The Orotava ratios are plotted either in one steep negative trend (O6, O7 = highest Na levels) or in a slightly increasing negative trend (O5). The remaining ratios are plotted more or less horizontally, with exception of A16 (slightly negative) and A15 (slightly positive).

Magnesium (Mg) (Fig.124 b): Anaga and Orotava ratios are plotted either more or less horizontally or closely adjusted to each other. Different negatively plotted trends occur for the Teno profiles as well as the highest Mg levels (T3, T12).

Potassium (K) (Fig.124 c): Teno and Anaga ratios are plotted more or less horizontally. Only the ratios of O5, O6 and O7 show slightly negative trends, indicating inorganically bound K.

Titanium (Ti) (Fig.124 d): Nearly all ratios are plotted within the negative trend B. However, several Anaga ratios (A8, A9, A10, A19) are plotted within trend A and the ratios of profile (O6) are plotted more or less horizontally below the trend B.

Phosphor (P) (Fig.125 a): Three Teno profiles (T4, T11, T12), several Anaga profiles (A1, A8, A10, A14) and one Orotava profile (O6) contain negatively plotted ratios. The remaining ratios are plotted more or less horizontally, indicating that P is inorganically bound within mentioned profiles.

Manganese (Mn) (Fig.125 b): All ratios are negatively plotted mostly within one main trend. However, several Anaga samples as well as profile T3 split off from the main trend.

Strontium (Sr) (Fig.125 c): The Orotava ratios (O6, O7) are plotted in one negative trend. The remaining ratios are plotted more or less horizontally, indicating that Sr is inorganically bound within profile O6 and O7. Furthermore, the highest Sr levels occur within the Orotava (O5, O6, O7).

Zirconium (Zr) (Fig.125 d): The Anaga ratios are plotted mostly within trend (A), together with profile O7. The remaining ratios are plotted within trend (B). However, it seems that the ratios of profile T11 and O6 slightly splits of from trend B, following more or less trend A.

Nickel (Ni) (Fig.125 e): The Teno ratios are plotted in several steep negative trends (T3, T4, T12) and in one slightly negative trend (T11). In addition, the highest Ni levels occur at profile T3, T4 and T12. A few Anaga ratios (A8, A9, A10, A19) are also slightly negatively plotted. However, the remaining ratios are plotted more or less horizontally.

Copper (Cu) (Fig.125 f): All ratios are plotted more or less horizontally. The Teno samples (T3, T4, T12) contain the highest Cu levels.

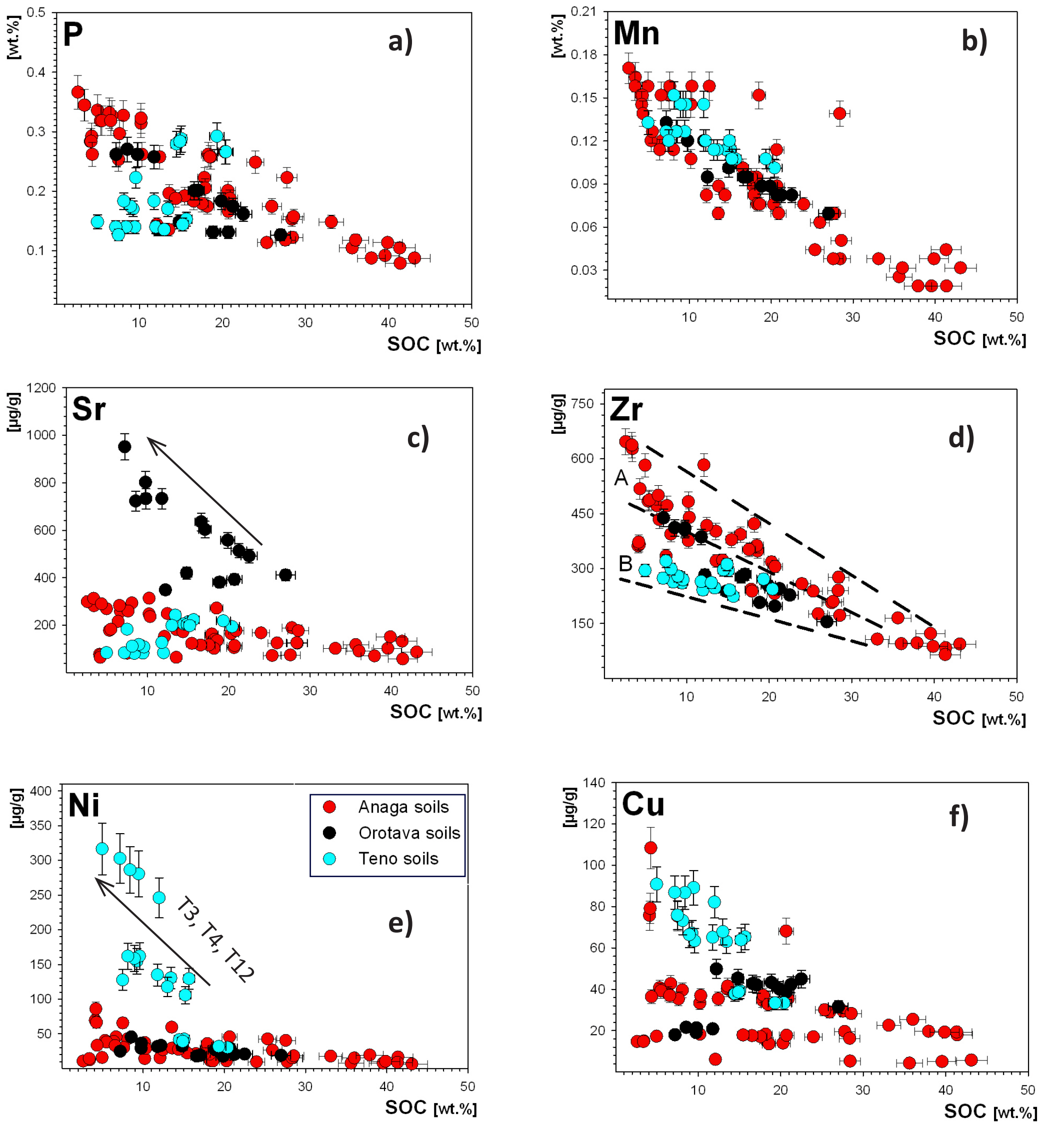


Fig.125 a) SOC vs. P b) SOC vs. Mn c) SOC vs. Sr d) SOC vs. Zr e) SOC vs. Ni f) SOC vs. Cu

5.2 Area-specific trends in relation to common minerals

The elements **Si, Al, Fe, Ti, Mn** and **Zr** are clearly **inorganically bound** at all examined topsoil samples. The elements **Ca, Na, Mg, K, P, Sr** and **Ni** are only **partly inorganically bound**, which is indicated due to several more or less horizontally plotted element ratios (see 5.1). In addition, Ca is also partly organically bound at a few samples. It is unclear if Cu is inorganically or organically bound, due to mostly horizontal plotted SOC/Cu ratios. Nevertheless, most of the elements showed either outstanding features (e.g. high concentrations) or different area dependent correlation trends. The observed trends and the area dependent geochemical differences are possibly related to common occurring rock and soil minerals. However, the present study comprises only the geochemical compositions of rocks and soils. The mineral contents are not determined for the examined topsoil and rock samples by the use of the X-Ray Diffraction (XRD) or the Scanning Electron Microscopy (SEM) technique. Therefore, it only can be assumed, which of the common occurring minerals have affected the observed trends of section 5.1.

5.2.1 Different Fe-Ti-Zr trends of Anaga and Teno topsoils

The elements Fe and Ti generated different trends for the Anaga and the Teno soils. In addition, several Anaga soil samples split of from the main Fe and Ti trends of the remaining Anaga samples (A8, A9, A10, A19). Considering the reported common minerals (cf. Introduction), varying degrees of Fe-Ti oxides possibly affected the observed Fe-Ti trends of the Anaga and Teno soils, such as rutile (TiO_2), ilmenite ($FeTiO_3$), magnetite (Fe_3O_4) or hematite (Fe_2O_3).

Generally, Fe-Ti oxides are more abundant in mafic volcanic rocks (e.g. basalts) than in silicic lavas (e.g. rhyolites) (Frost and Lindsley, 1991). Furthermore, differences exist also within the plotted SOC/Zr trends. The Teno soils showed a different Zr trend as the Anaga and Orotava soils. Generally, Zr is a lithophile metallic element and it is included within several minerals.

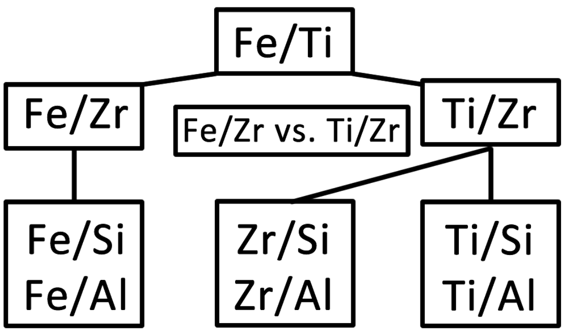


Fig.126 The narrowed range of the most promising Fe-Ti-Zr combination possibilities, in order to determine typical geochemical fingerprints.

However, Zr can substitute for Ti in ilmenite and rutile, and it is also present at trace levels within clinopyroxene and amphibole (Salminen et al. 2005). Trace quantities of authigenic zircon may also occur as adsorbed coatings on diagenetic clay minerals (Nicholls and Loring 1962). It is reported that secondary minerals, accumulated metastable, noncrystalline or short-range order materials are common in laurel forest soils (Tejedor et al. 2002, 2007). These secondary minerals and materials can affect the Fe trends as well as the Al and Si levels of the examined laurel forest soils (e.g illite, ferrihydrite etc.).

Considering the mentioned mineralogical facts, distinguishable element ratios possibly occur if Fe, Ti and Zr are plotted against each other and against common associated elements (Al, Si). Figure 126 shows the narrowed range of most promising element combination possibilities.

5.2.2 Different Mg-Ni-Cu trends of Teno topsoils

The scatterplots of section 5.1 indicated that the highest Mg and Ni levels are inorganically bound within the Teno topsoils T3, T4 and T12. However, it is not clearly determined if the highest Cu levels are inorganically bound within the soil samples of profile A9, T3, T4 and T12. Considering the high Mg and Ni levels of the Teno soils as well the different Fe trends, several common minerals affected possibly the observed correlation trends. In soils, Ni is mostly held in ferromagnesian silicate minerals (e.g. olivine), in primary Fe oxides, in hydrous Fe and Mn oxides and in several clay minerals (Salminen et al. 2005; Kabata-Pendias 2001; Manceau et al. 1992). Generally the Ni^{2+} ion is intermediate in size (69 pm) and ranges between Mg^{2+} and Fe^{2+} (72 and 61 pm respectively) for which it substitutes during fractionation (Salminen et al. 2005).

For example, Ni is commonly partitioned in olivine $(Mg,Fe)_2SiO_4$ (Salminen et al. 2005). In olivine, the ratios of Mg and Fe vary between the end members forsterite (Mg) and fayalite (Fe) (Deer et al., 1992). Weathering processes and the contact with hydrothermal fluids can transform olivine into serpentine $(Mg,Fe,Ni)_6Si_4O_{10}(OH)_8$, which also possibly contains Ni (Deer et al., 1992). Furthermore, Mn is also commonly associated with olivine (Deer et al., 1992). It is reported that Cu can widely dispersed at trace levels in biotite, pyroxene amphibole and olivine, thus showing a greater affinity for mafic than for felsic igneous rocks (Ure & Berrow, 1982; Salminen et al. 2005).

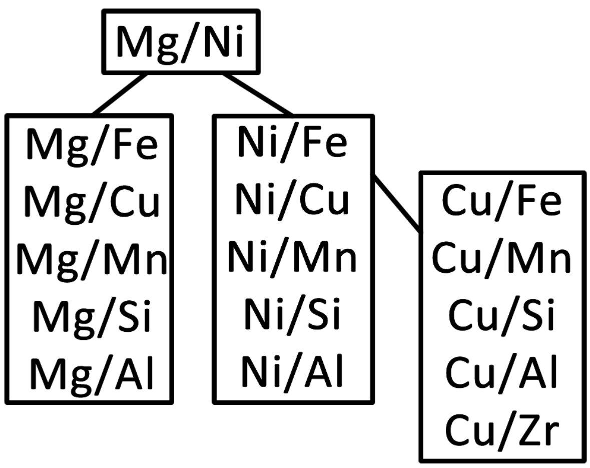


Fig.127 The narrowed range of the most promising Mg-Ni-Cu combination possibilities, in order to determine typical geochemical fingerprints.

Therefore, minerals such as olivine, pyroxene or amphibole possibly affected the observed Mg, Fe, Ni and Cu trends (Ure & Berrow, 1982; Salminen et al. 2005). Considering the mentioned mineralogical facts, distinguishable element ratios possibly occur if Mg, Ni and Cu are plotted against each other and against common associated elements (Fe, Mn, Si, Al etc.) Figure 127 shows the narrowed range of the most promising element combination possibilities.

5.2.3 Different Sr-Na-Ca trends of Orotava topsoils

The scatterplots of section 5.1 indicated that Na, Ca and Sr are clearly inorganically bound within the Orotava topsoils and the soils contain significantly higher Na, Ca and Sr levels as the remaining sampling areas. The presence of inorganically bound Ca and Na is a good indication for occurring plagioclase feldspars, which fits very well to the reported mineralogical facts of occurring plagioclase feldspars in the Orotava valley (coexisting Ca- and resorbed Na-plagioclase) (Ablay et al., 1998). The plagioclase feldspar series ranges from Albite ($NaAlSi_3O_8$) to Anorthit ($CaAl_2Si_3O_8$), where Na and Ca can substitute for each other in the mineral´s crystal structure (Deer et al., 1992).

Solid solutions between K-feldspar ($KAlSi_3O_8$) and albite are called alkali feldspar (Deer et al., 1992). The element Sr is often associated with the plagioclase feldspars (Bouseily & Sokkary, 1975; Salminen et al. 2005). Strontium associated with K-feldspar has not been reported. However, Martínez-Cortizas et al. (2007) reported that there is also a slight relation between Sr and K within volcanic soils, without a relation to K-feldspars. It can also be associated with Ca and Na in amphibole (Najorka et al. 1999; Leake et al. 1997, 2004).

Furthermore, it is reported that high amounts of Sr and Fe commonly occur within Orotava rocks (Ablay et al., 1998). Apatite ($Ca_5(PO_4)_3(F,Cl,OH)$) is also commonly occurring in the Orotava area and it is therefore also possible that apatite affected the Ca levels of the Orotava samples (Ablay et al., 1998; Arnalds et al. 2007). Considering the mentioned mineralogical facts, distinguishable element ratios possibly occur if Sr, Na and Ca are plotted against each other and against common associated elements (K, Si, Al, P, etc.) Figure 128 shows the narrowed range of the most promising element combination possibilities.

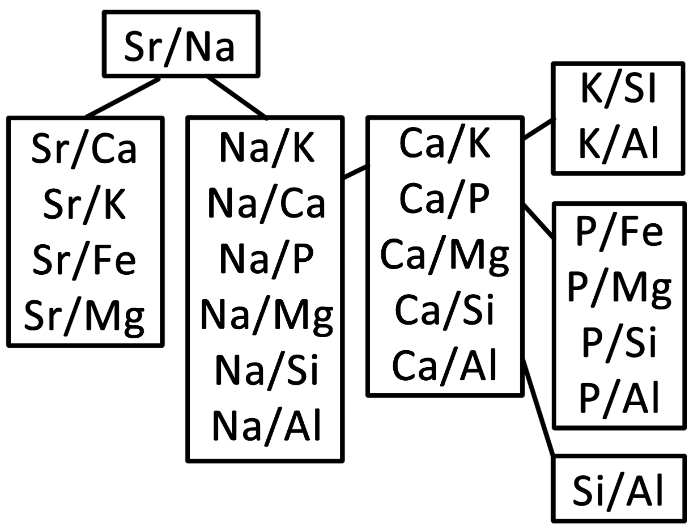


Fig.128 The narrowed range of the most promising Sr-Na-Ca combination possibilities, in order to determine typical geochemical fingerprints, including as well K and P combination possibilities.

5.3 Determining Fe-Ti-Zr fingerprints

Considering the mentioned mineralogical facts and element substitutions of section 5.2.1, the observed Anaga and Teno topsoils trends are possibly affected due to occurring Fe-Ti oxides, secondary minerals and Zr substitutions. The associated elements will be plotted against each other, in order to determine distinguishable Anaga and Teno fingerprints (Fe/Ti, Fe/Zr, Ti/Zr, Fe/Al, Fe/Si, Ti/Al, Ti/Si, Zr/Al, Zr/Si). Figure 126 shows the most promising element combination possibilities (Fig.126). The rock, soil, root and leaf ratios are attached in the appendix (Table 6 on page 213).

5.3.1 Plotting Fe, Ti and Zr against each other

Several linear trends are recognizable due to the plotted **Fe/Ti, Fe/Zr** and **Ti/Zr** topsoil ratios. The topsoil scatterplots show clearly the separation of various Anaga and Teno profiles. In addition, the separation is much clearer if the normalized Fe and Ti ratios are plotted against each other (**Fe/Zr vs. Ti/Zr**). Furthermore, the associated soil and rock samples contain often similarly plotted trends and element-to-element ratios, which underlines the affecting influences of the soil parent materials. Distinguishable differences are not determined, neither by the plotted ratios nor by the calculated element-to-element ratios, due to several overlapping Anaga and Teno ratios.

Fe vs. Ti (Fig.129 a to c):
Nearly all Anaga and Orotava soil ratios are plotted within one main trend, as well as the ratios of profile T11. The different SOC/Fe and SOC/Ti trends, which occurred due to the separation of the profile A8, A9, A10 and A19, do not exist any longer. The plotted T3 and T4 soil ratios are displaced from the main trend. The ratios of profile A17 and T12 are plotted between the main trend and the separated Teno profiles T4 and T3. The Anaga rock and soil element-to-element ratios are relatively similar, with exception of profile A17. The Anaga soil ratios range from 3.6:1 to 4.4:1 and the rock ratios from 3.1:1 to 4.1:1. The Orotava rock and soil ratios are in the range of the Anaga samples. The soil ratios of profile T3, T4 and T12 range from 4.7:1 to 6:1 and the rock ratios from 4.3:1 to 6.6:1. The plotted leaf and root ratios showed no negative or positive trend and no relation to the observed soil or rock dependencies. Even the calculated Fe-to-Ti ratios indicated no relation with the rock and soil ratios. The ratios indicate a large variation within all leaves and roots. Typical ratios are not determined.

Fe vs. Zr (Fig.130):
Several linear trends occur, separating the soil profiles into three combined groups with similar trends and element-to-element ratios. For example, the soil ratios of the first group (A8, A9, A10, A19, O5, T3, T4, T12) range from 304.8:1 to 441.7:1. The ratios of the second group (T11, O7, A14, A15, A16, A17) range from 179.4:1 to 229.2:1. The ratios of the third group (A1, A2, O6) range from 144.1:1 to 144.8:1. However, the rock ratios are not clearly dividable into these groups and a clear relation between soils and rocks does not exist. Furthermore, relations between soils and leaves are not determined.

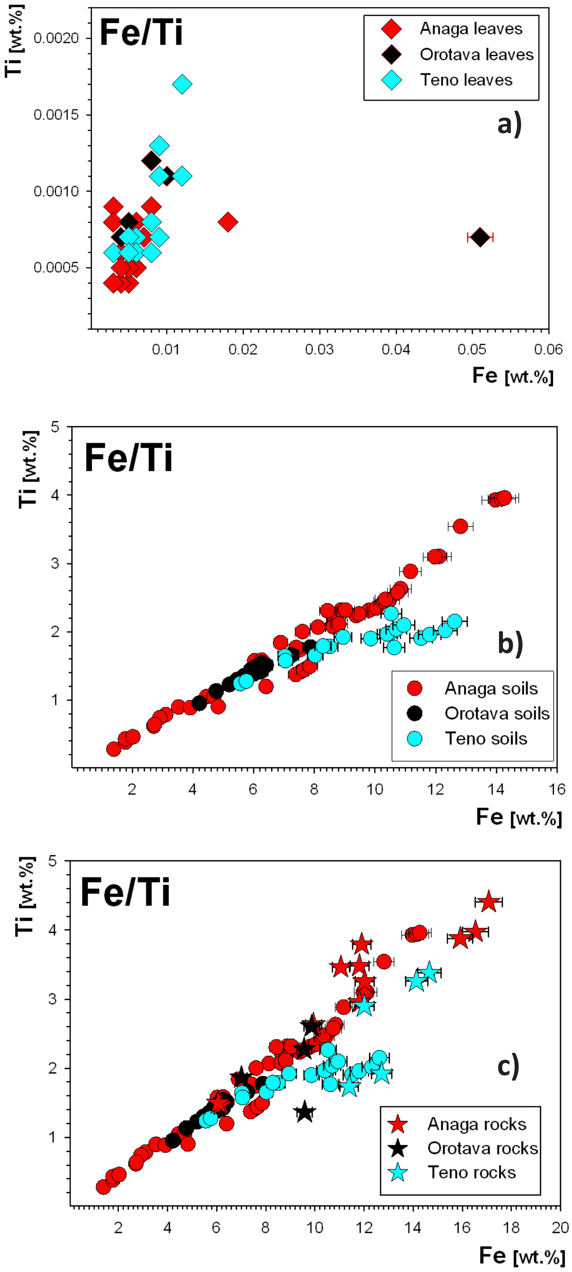


Fig.129 a) Plotted Fe/Ti leaf ratios. b) Plotted Fe/Ti soil ratios. c) Plotted Fe/Ti rock and soil ratios.

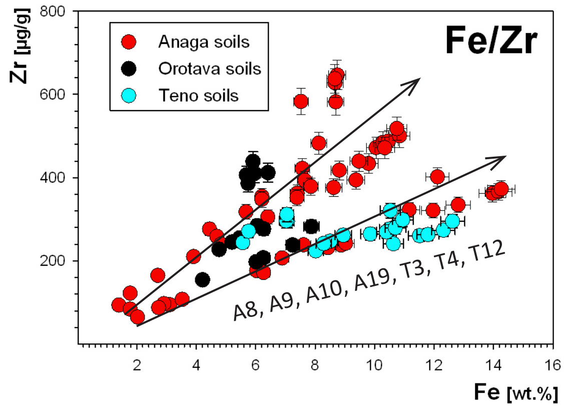


Fig.130 Plotted Fe/Zr soil ratios.

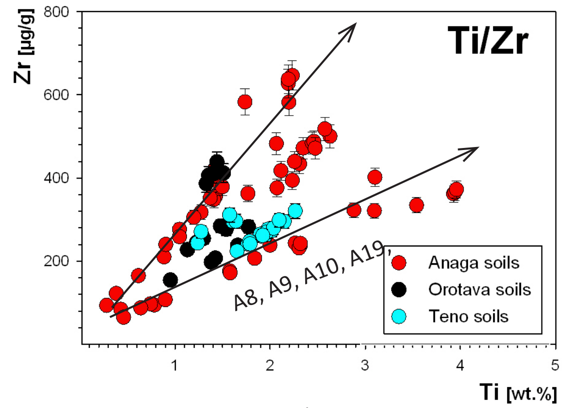


Fig.131 Plotted Ti/Zr soil ratios.

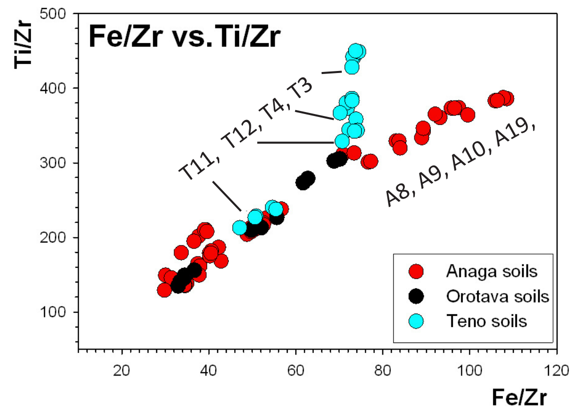


Fig.132 Plotted Fe/Zr - Ti/Zr soil ratios.

Ti vs. Zr (Fig.131)

Different linear trends occur, separating the soil profiles into several combined groups with similar trends and Ti-to-Zr ratios. The Ti-to-Zr soil ratios of profile A8, A9 and A19 range from 90.7:1 to 106:1. The soil ratios of profile A10, T3, T4 and T12 range from 71.8:1 to 79:1. The soil ratios of profile A15, A16, O7 and T11 range from 51:1 to 51.8:1. The soil ratios of profile A1, A2, A14, A17 and O6 range between 32.8: and 40.6:1. Not exactly assigned is profile O5 due to a mean soil ratio of 66.6:1. In addition, only profile A8, A9 and O6 show a relation between soils and rocks. The remaining rock and soil samples show no relations to each other due to varying element ratios.

Fe/Zr vs. Ti/Zr (Fig.132):
Normalizing Fe and Ti shows much clearly the separation of profile T3, T4 and T12. Furthermore, it is clearly recognizable that profile T11 splits of from the remaining Teno samples and it seems that T11 belongs to the Orotava or Anaga area. That is an interesting fact, due to short distance (approx. 150 m) between the sampling sites T4, T11 and T12. Obvious explanations do not exist for this separation. However, the scatterplot shows that the Anaga soil ratios are divided into two groups. Profile A8, A9, A10 and A19 contain higher Fe/Zr - Ti/Zr ratios as the sampling sites A1, A2, A14, A15, A16 and A17. Visible gaps occur also between the plotted Orotava ratios. In addition, all rock samples are plotted in one direction, including sample T3, T4 and T12.

5.3.2 Plotting Fe against Si and Al

The scatterplots are shown at Fig.133 a to b. Several linear trends are recognizable due to the plotted **Fe/Si** and **Fe/A**l topsoil ratios. Furthermore, various profiles split of from the main trends. This makes it impossible to distinguish the sampling areas from each other. For example, the Fe/Si and Fe/Al topsoil ratios indicate large differences between the Anaga profiles.
In addition, the calculated Fe-to-Si and Fe-to-Al soil ratios are not useable to distinguish the sampling areas from each other, due to several overlapping ratios. However, several profiles show a relation between rocks and soils due to the plotted and calculated ratios, which underlines the affecting influences of the soil parent materials. The observed trends and the determined results are described in the appendix (13.1 on page 201).

5.3.3 Plotting Ti against Si and Al

The scatterplots are shown at Fig.133 c to d. Several linear trends are recognizable due to the plotted **Ti/Si** and **Ti/Al** topsoil ratios. Furthermore, various profiles split of from the main trends. This makes it impossible to distinguish the sampling areas from each other due to the plotted ratios. Considering the plotted and the calculated Ti-to-Al topsoil ratios, the profiles can be combined into four groups due to their ratios.
For example, the mean soil ratios range from 1:5.7 to 1:6.8 within group 1 (A1, A2, A14, A17, O6), from 1:4.1 to 1:5 within group 2 (O5, O7, T4, T11), from 1:3.7 to 1:3.9 within group 3 (A15, A16, T3, T12) and from 1:2.8 to 1:3.0 within group 4 (A8, A9, A10, A19). However, neither the Ti/Si ratios nor the Ti/Al ratios are useable to distinguish the sampling areas from each other. The observed trends and the determined results are described in the appendix (13.2 on page 202).

5.3.4 Plotting Zr against Si and Al

The scatterplots are shown at Fig.133 e to f. Linear trends exist for the plotted **Zr/Si** and **Zr/Al** topsoil ratios, indicating clearly the relation between those elements. Furthermore, it is recognizable that the Zr/Si ratios of profile T3, T4 and T12 slightly split off from the remaining ratios. Only the ratios of profile T11 are plotted close to the Anaga ratios.

In addition, most of the Zr/Al ratios are plotted in one direction, with exception of a few Anaga and Teno ratios. However, neither the plotted Zr/Si nor the Zr/Al topsoil ratios are useable to distinguish the sampling areas from each other. However, the calculated Zr-to-Al ratios are useable to distinguish the Anaga and Teno sampling areas from each other. For example, the Anaga topsoil ratios range from 1:221 to 1:258 and the Teno ratios range from 1:275 to 1:305. The Orotava ratios range inbetween. The observed trends and the determined results are described in the appendix (13.3 on page 202).

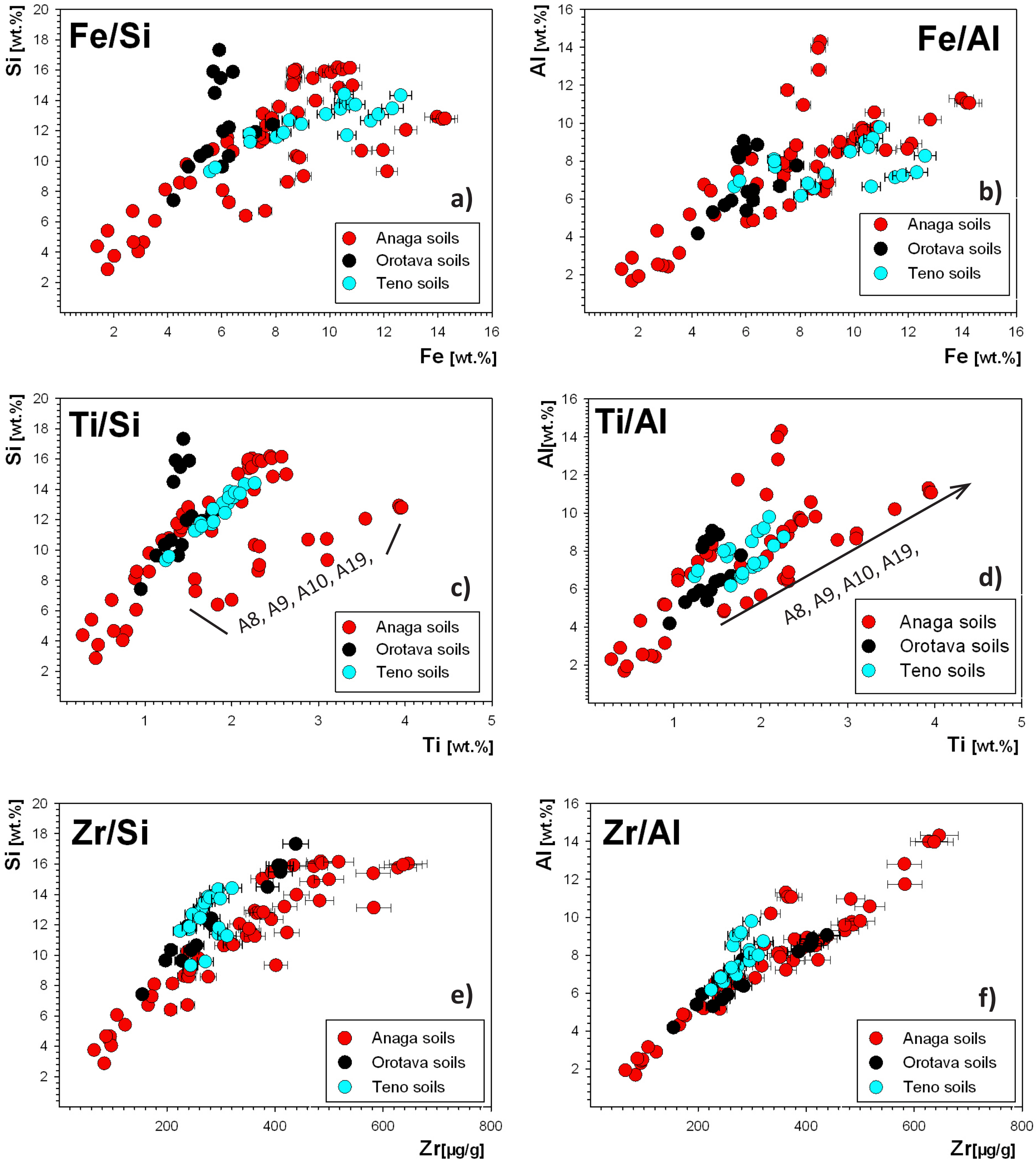


Fig.133 a) Plotted Fe/Si soil ratios. b) Plotted Fe/Al soil ratios. c) Plotted Ti/Si soil ratios. d) Plotted Ti/Al soil ratios. e) Plotted Zr/Si soil ratios. f) Plotted Zr/Al soil ratios. The profiles A8, A9, A10 and A19 regularly split of from the remaining Anaga profiles.

5.4 Determining Mg-Ni-Cu fingerprints

Considering the mentioned mineralogical facts and element substitutions of section 5.2.2, occurring minerals such as olivine, pyroxene or amphibole have possibly affected the observed Mg, Fe, Ni and Cu trends within the Teno topsoils (Ure & Berrow, 1982; Salminen et al. 2005). The associated elements will be plotted against each other, in order to determine distinguishable Anaga or Teno fingerprints (Mg/Ni, Mg/Fe, Mg/Cu, Mg/Mn, Mg/Si, Mg/Al, Ni/Cu, Ni/Fe, Ni/Mn, Ni/Si, Ni/Al, Cu/Fe, Cu/Mn, Cu/Si, Cu/Al). Figure 127 shows the most promising element combination possibilities (Fig.127). The calculated rock, soil, root and leaf ratios are attached in the appendix (Table 7 on page 218; Table 8 on page 222; Table 9 on page 227).

5.4.1 Plotting Mg against Ni and Fe

Different linear trends occur due to the plotted Mg/Ni and Mg/Fe topsoil ratios. However, distinguishable topsoil ratios exist only if several profiles are not considered. For example, the Teno topsoils are clearly distinguishable from the remaining areas, if profile T11 is not considered. However, it is possible to distinguish the sampling areas due to the calculated Mg-to-Fe topsoil ratios, including profile T11. For example, the Teno Mg-to-Fe ratios range from 1:2.9 to 1:4.5, the Orotava ratios from 1:3.6 to 1:3.8 and the Anaga ratios from 1:6.3 to 1:15.4. Furthermore, several soils affected the associated leaves due to higher Mg-Ni soil contents. The observed results are described below.

Mg vs. Ni (Fig.134 a to c):
Both elements are associated to each other within all Teno profiles (T3, T4, T11, T12) and two Anaga profiles (A9, A10), which is indicated by several linear trends. Furthermore, the ratios are plotted in the same linear trend at profile T3 and T4. Profile T11 shows only a slightly linear trend. The ratios of T12 are slightly displaced from profile T3 and T4 (Fig.134 b). The Orotava samples showed no linear trends. In addition, the Mg/Zr vs. Ni/Zr scatterplot shows that the mentioned Mg/Ni trends are not changing and effects of dilution and weathering can therefore be excluded (see Fig.137 f on page 125). The Teno rock and soil ratios are plotted in the same positive trend, indicating the affecting influences of the associated rock samples (Fig.134 c). The Mg-to-Ni soil ratios range from 141:1 to 213:1 at profile T3, T4 and T12. The corresponding rock ratios range from 146:1 to 189:1. However, the mean soil (391:1) and rock ratio (879:1) fit not together at profile T11. The calculated ratios of profile T11 fit much better to the mean soil and rock ratios of the Anaga and Orotava samples.
The Anaga and Orotava soil ratios range from 296:1 to 766:1 and the rock ratios from 727:1 to 4148:1. The Mg-to-Ni ratios of profile A9 and A10 are not comparable to the remaining Anaga or Orotava samples. The ratios range from 84:1 to 155:1 and fit much better to the three Teno profiles. The plotted leaf ratios show no linear trends (Fig.134 a). However, the leaf samples A9, A10, T3 and T12 are distinguishable due to different Mg and Ni uptakes.

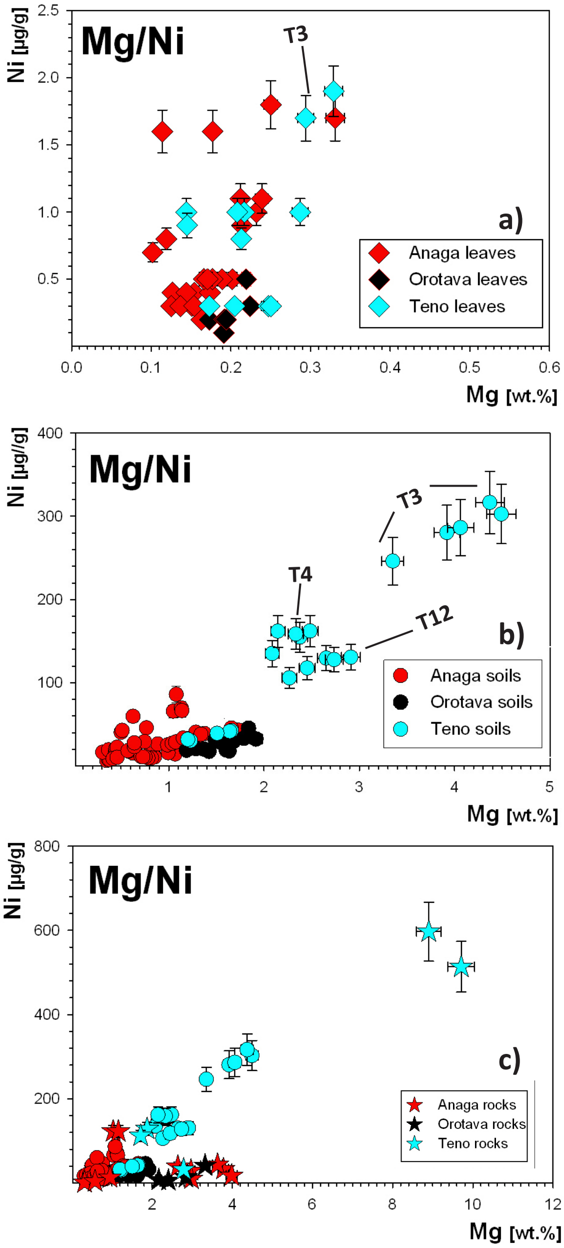


Fig.134 a) Plotted Mg/Ni leaf ratios. b) Plotted Mg/Ni soil ratios. c) Plotted Mg/Ni rock and soil ratios. Profile T11 always split of from the remaining Teno samples.

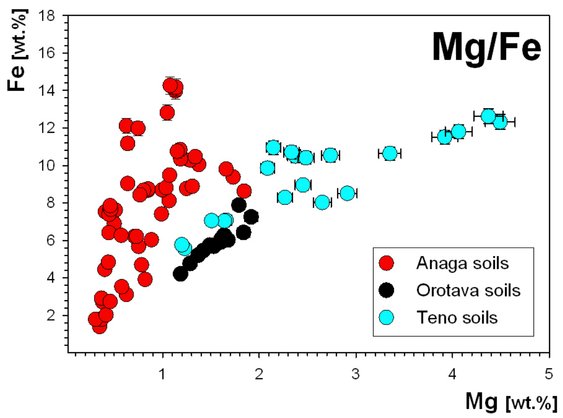


Fig.135 Plotted Mg/Fe soil ratios.

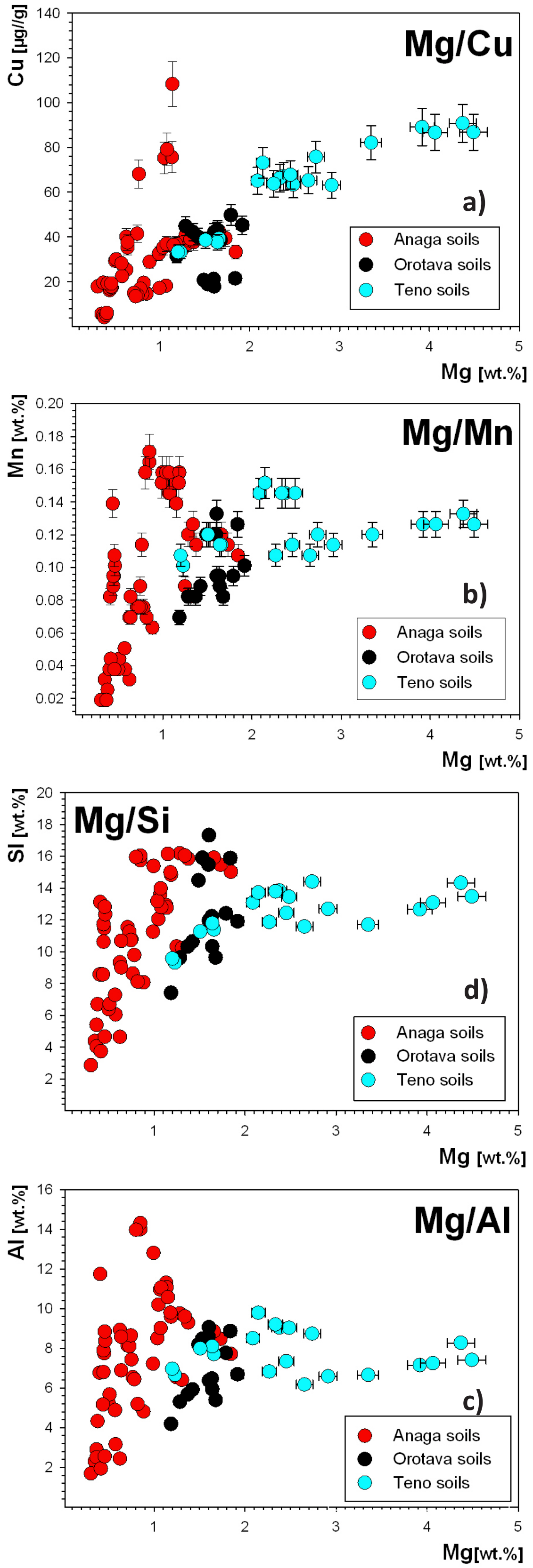


Fig.136 a) Plotted Mg/Cu soil ratios. b) Plotted Mg/Mn soil ratios. c) Plotted Mg/Si soil ratios. d) Plotted Mg/Al soil ratios.

Mg vs. Fe (Fig.135):
Linear trends are recognizable at profile T3, O5, O6 and O7. The remaining Teno and Anaga soils showed no linear trends and no relation between Mg and Fe. In addition, the calculated Orotava and Teno element-to-element soil ratios are clearly distinguishable from the Anaga samples. However, a differentiation between Teno and Orotava soils is not possible. For example, the Teno soil ratios range from 1:2.9 to 1:4.5. The Orotava soil ratios range from 1:3.6 to 1:3.8. The Anaga soil ratios range instead from 1:6.3 to 1:15.4. Therefore, the Mg/Fe soil ratios are usable to distinguish the Anaga samples from the other areas. However, clear relations between rock and soil ratios exist only for profile O5, O6, and O7. The associated Orotava rock ratios range from 1:2.8 to 1:4.4. In addition, in comparison to all remaining rock samples, clear difference exists for profile T3 and T12. The rock ratios range from 1:1.1 to 1:1.4. Anaga rock ratios range instead from 1:3.2 to 1:19.2.

5.4.2 Plotting Mg against Cu, Mn, Si and Al

The scatterplots are shown at Fig.136 a to d. The plotted Teno, Orotava or Anaga **Mg/Cu** soil ratios showed no linear trends. Several linear trends occur due to the plotted **Mg/Mn, Mg/Si** and **Mg/Al** ratios. Furthermore, the plotted ratios of the Teno profiles T3, T4 and T12 are always distinguishable from the remaining areas due to the high Mg levels. However, typical sampling area specific element combinations are not determined by the plotted ratios or by the calculated Mg-to-Cu, Mg-to-Mn or Mg-to-Si ratios, due to several overlapping results. For example, profile T11 is always separated from the remaining Teno profiles. This makes it impossible to determine unique Teno ratios, which match for all profiles. Only the calculated Mg-to-Al topsoil ratios distinguish the sampling areas from each other, including profile T11. For example, the Anaga soil ratios range from 1:5.4 to 1:7.7, the Orotava ratios from 1:3.5 to 1:4.7 and the Teno ratios from 1:2.1 to 1:5.1. In addition, affecting interrelations between rocks and soils are only determined for a few sampling sites. Clear affecting relations are not determined between rock, soil and vegetation samples. The observed trends and the determined results are described in the appendix (13.4 on page 204).

5.4.3 Plotting Ni against Fe, Cu, Mn, Si and Al

The scatterplots are shown at Fig.137 a to c. The plotted **Ni/Fe, Ni/Cu, Ni/Mn** ratios showed clear linear trends only for profile T3. However, the profiles T3, T4 and T12 are always distinguishable from the remaining areas due to their higher Ni contents. Furthermore, linear trends occur for the plotted **Ni/Si** and **Ni/A**l ratios of profile T3, T4 and T12, indicating a relation between those elements (Fig.137 d, e). Nevertheless, neither the plotted topsoil ratios nor the calculated soil ratios are useable to distinguish the sampling areas clearly from each other due to several overlapping ratios. Only, the calculated Ni/Mn and Ni/Al soil and rock ratios of profile T3, T4 and T12 are clearly distinguishable from the remaining areas. The rock ratios range between 1:2.2 and 1:12. The mean soil ratios range between 1:4.4 and 1:9.4. The remaining rock and soil ratios are completely different and vary widely. Furthermore, profile T11 fits much better to the Anaga and Orotava area. The observed trends and the determined results are described in the appendix (13.5 on page 204).

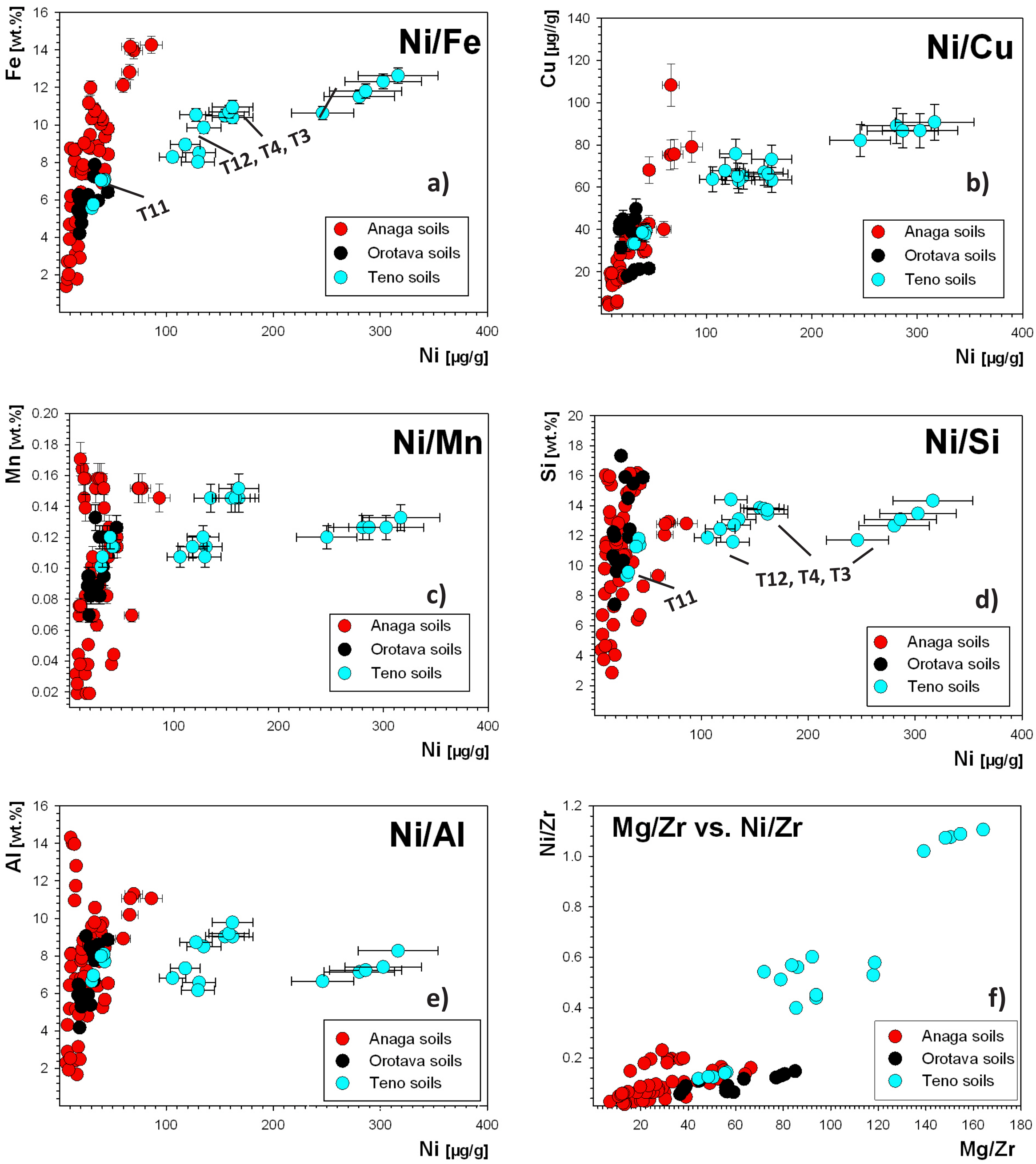


Fig.137 a) Plotted Ni/Fe soil ratios. b) Plotted Ni/Cu soil ratios. c) Plotted Ni/Mn soil ratios. d) Plotted Ni/Si soil ratios. e) Plotted Ni/Al soil ratios. Profile T11 always splits of from the remaining Teno profiles. The ratios fit much better to the Anaga or Orotava area. f) Plotted Mg/Zr-Ni/Zr ratios. The normalized plot shows no effects of dilution.

5.4.4 Plotting Cu against Fe, Mn, Si, Al and Zr

The scatterplots are shown at Fig.138 a to e. At first glance it seems that positive trends occur for the plotted **Cu/Fe** Teno soil ratios, but a closer look indicates that the ratios are plotted without a clear trend (Fig.138 a). In addition, the plotted and calculated rock ratios indicate no relation to the associated soils or between Cu and Fe. Linear **Cu/Mn** trends exist only for the plotted soil ratios of profile T3 and T12 (Fig.138 b).

Furthermore, there is no relation between Cu and Si in the Anaga or Orotava soils. However, it is recognizable that a few Anaga soils split of from the remaining Anaga samples. The Teno soils of profile T3, T4 and T12 are plotted in a slightly linear trend and show possibly a relation between **Cu** and **Si** (Fig.138 c). Furthermore, the **Cu/Al** ratios are plotted widely dispersed and linear trends are only recognizable for profile O6 and a few Anaga samples (Fig.138 d). In addition, only the **Cu/Zr** soil ratios of T3 and T12 are plotted in a slightly positive trend, indicating a relation between Cu and Zr (Fig.138 e). However, the various plotted Cu combinations, as well the calculated soil ratios are not useable to distinguish the sampling areas from each other, due to several overlapping ratios. Only the Cu-to-Zr rock ratios distinguish the Anaga and Teno samples from each other. The Teno rock ratios range from 1:2 to 1:2.7. The Anaga rock ratios range from 1:5.3 to 1:143.3, with exception of sample A9 (1:3.1). The ratios of A9 fit much better to the Teno rock ratios. The observed trends and the determined results are described in the appendix (13.6 on page 206).

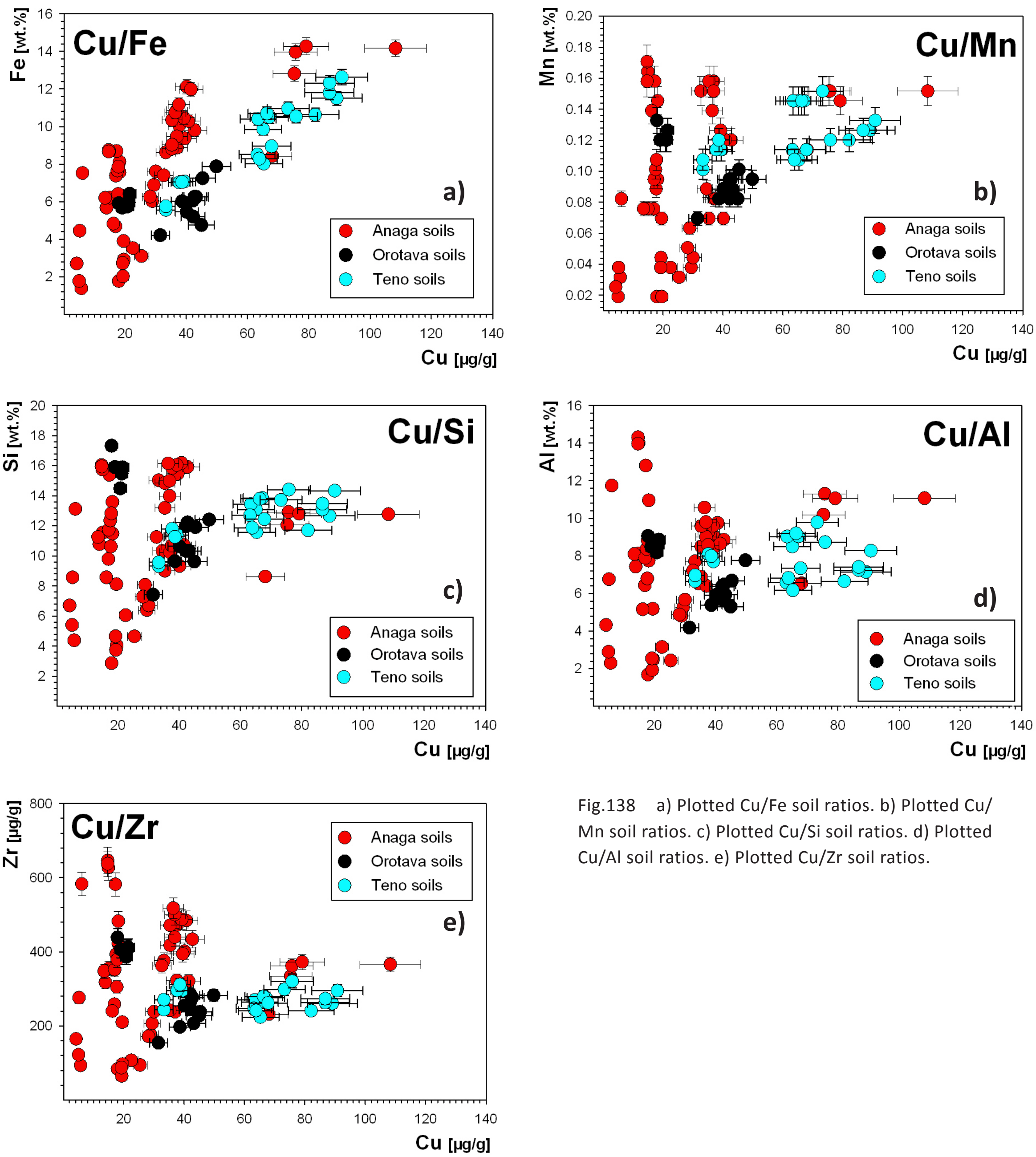


Fig.138 a) Plotted Cu/Fe soil ratios. b) Plotted Cu/Mn soil ratios. c) Plotted Cu/Si soil ratios. d) Plotted Cu/Al soil ratios. e) Plotted Cu/Zr soil ratios.

5.5 Determining Sr-Na-Ca-K-P fingerprints

Considering the mentioned mineralogical facts and element substitutions of section 5.1.3, occurring minerals such as plagioclase feldspar, amphibole or apatite and commonly associated elements have possibly affected the observed Orotava topsoil trends. It is obvious to plot all elements against each other, in order to determine typical Orotava fingerprints (Sr/Ca, Sr/Na, Sr/K, Sr/Fe, Sr/Mg, Na/Ca, Na/K, Na/P, Na/Mg, Na/Al, Na/Si, Ca/K, Ca/Mg, Ca/P, Ca/Si, Ca/Al, K/Si, K/Al, Si/Al, P/Fe, P/Al, P/Mg). The most promising combination possibilities are shown in Fig.128. The calculated rock, soil, root and leaf ratios are attached in the appendix (Table 10 on page 231; Table 11 on page 236; Table 12 on page 240).

5.5.1 Plotting Sr against Ca and Na

Several linear trends are recognizable within the two topsoil scatterplots (Sr/Ca, Sr/Na), indicating clearly a Sr relation with Ca and Na. Furthermore, the plotted Sr/Ca ratios as well the calculated Sr-to-Ca ratios are usable to distinguish the Orotava topsoil samples clearly from the remaining areas. For example, the Sr-to-Ca ratios range from 1:42 to 1:95 for the Orotava topsoils and from 1:116 to 1:171 for the Teno topsoils. However, plotted and calculated Sr/Na ratios are not useful to distinguish the sampling areas from each other due to several overlapping soil and rock ratios. Nevertheless, most of the associated rock and soil ratios fit very well together, indicating clearly the influences of the soil parent materials.

Sr vs. Ca (Fig.139 a to c)
Several linear trends are recognizable for the plotted topsoil ratios, indicating clearly a relation between Sr and Ca. Furthermore, the plotted Orotava topsoil ratios (O5, O6, O7) are clearly distinguishable from the remaining sampling areas due to increasing positive trends (Fig.139 b). The Anaga and Teno ratios show also positive trends but the ratios are plotted below the Orotava samples due to lower Sr and Ca levels. Plotting the rock and soil ratios together shows the affecting influences of the soil parent materials (Fig.139 c). The rock and mean soil Sr-to-Ca ratios fit together at profile O6 (rock 1:37 / soil 1:42) and O7 (rock 1:57 / soil 1:60). The ratios of O5 show larger variations (rock 1:80 / soil 1:95). The remaining areas contain completely different Sr-to-Ca ratios due to lower Sr or Ca levels, which makes the calculated Orotava ratios clearly distinguishable. The Teno mean soil ratios range from 1:116 (T12) to 1:171 (T3, T4). The Teno rock ratios range from 1:93 (T4a) to 1:233 (T3).
Considering the vegetation samples, positive trends occur for the plotted washed and unwashed Orotava leaves, which are clearly distinguishable from the other samples due to their higher Sr levels (Fig.139 a). It is recognizable that the high Sr soil contents affected the associated Orotava leaf samples. Furthermore, most of the Anaga ratios are plotted close together in the tip of the slightly triangular shaped scatterplot. The Sr/Ca ratios of the Anaga, Orotava and Teno roots are plotted in different positive trends, but a relation to the described soil or rock ratios is not recognizable. The comparison of the Sr-to-Ca ratios indicates that all leaf and root samples contain different ratios in comparison to each other and in comparison to the related soils and rocks. The leaves of profile O5,

O6 and O7 are distinguishable from the remaining areas due to the Sr-to-Ca ratios. The Orotava leaf ratios range from 1:40 to 1:55 and the Anaga and Teno ratios from 1:65 to 1:158. An interesting observation is made, considering the interrelations between soils and leaves. For example, profile O5 contains lower Sr topsoil levels than profile O6 and O7, but the leaves of profile O5 contain clearly higher Sr levels than the leaves of profile O6 and O7. It seems that the Sr uptake in plants depend not only on the soil Sr contents rather on the soil Ca levels. O5 contains higher topsoil Ca levels as well as higher leaf levels than profile O6 and O7. This observation fits to the reported fact that Ca increases the Sr uptake in plants due to Ca-Sr substitutions (Kirkby, 1979).

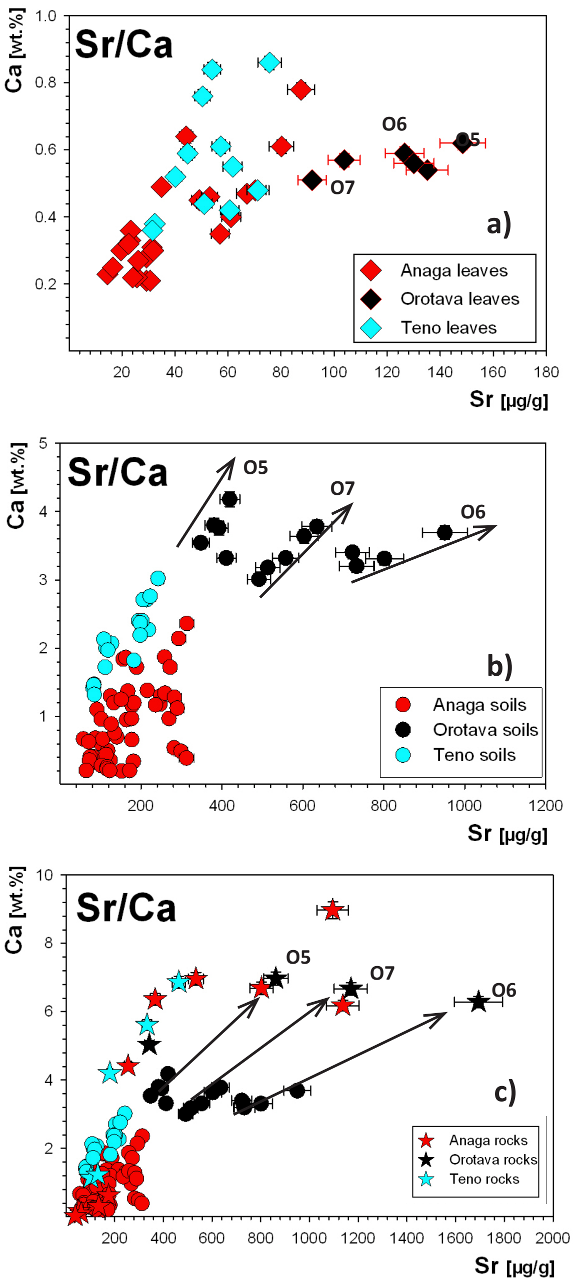


Fig.139 a) Plotted Sr/Ca leaf ratios. b) Plotted Sr/Ca soil ratios. c) Plotted Sr/Ca rock and soil ratios.

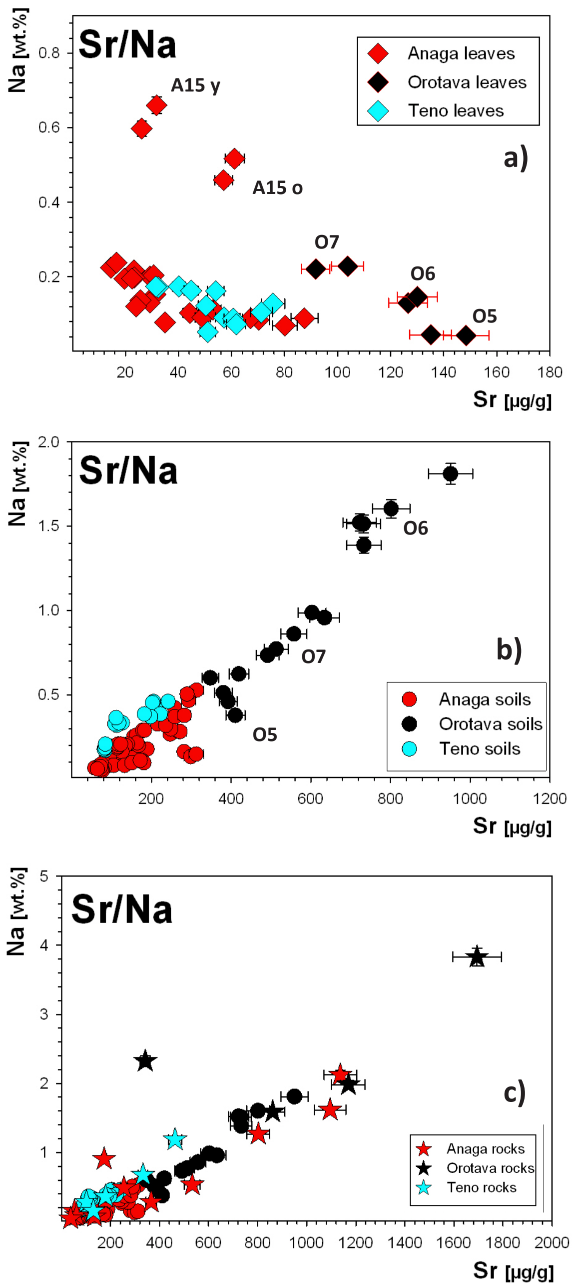


Fig.140 a) Plotted Sr/Na leaf ratios. b) Plotted Sr/Na soil ratios. c) Plotted Sr/Na rock and soil ratios.

Sr vs. Na (Fig.140 a to c):
It seems that several linear trends exist for the plotted Anaga, Orotava and Teno ratios. Regarding each profile separately indicates positive trends for the plotted ratios of profile O6, O7 and A15 as well one negative trend for the plotted ratios of profile O5 (Fig.140 a). The scatterplot indicates that Sr is associated with Na at profile O5, O6, O7 and A15. The remaining Anaga and Teno ratios are plotted either horizontally or close together without any trends. The Sr-to-Na ratios fit very well together within most of the associated rock and soil samples, indicating the affecting influences of the soil parent materials, with exception of the rock and soil samples of sampling site A1, A2, A9, A14, and A15, which showed much larger differences. It is not possible to distinguish the Anaga, Orotava or Teno soils or rocks from each other due to several overlapping ratios, including the plotted ratios as well the calculated Sr-to-Na ratios (Fig.140 a, b). Considering the Sr-to-Na soil ratios, the Orotava samples range from 1:13.1 to 1:19.8, the Anaga samples from 1:6 to 1:16.4 and the Teno samples from 1:18.9 to 1:29.
Considering the vegetation samples, the plotted leaf ratios indicate that the Orotava samples O5, O6 and O7 contain the highest Sr levels. In addition, the samples A15 y and A15 o contain the highest Na levels (Fig.140 c). It seems that the positive Sr/Na soil trend of sample O6, O7 and A15 are now changed into a negative Sr/Na leaf trend. The Sr/Na ratios of the roots showed no relation to the leaf, soil or rock ratios. The highest Sr root levels are measured at sample A16, followed by O7. The remaining root ratios are plotted confused. The comparison of the Sr-to-Na ratios indicates that all leaf and root samples contain different ratios in comparison to each other and in comparison to the related soils and rocks.

5.5.2 Plotting Sr against K, Fe and Mg

The scatterplots are shown at Fig.141 a to c. The plotted **Sr/K** topsoil ratios show only for profile O6 and O7 positive trends as well one negative trend for profile O5, which indicates a relation between Sr and K. Furthermore, the plotted **Sr/Fe** ratios show a slightly negative trend for profile O5 and a slightly positive trend for profile O6. The remaining Sr/K and Sr/Fe ratios are plotted without clear trends and only the Orotava profiles show a relation between Sr, K and Fe. In addition, the plotted **Sr/Mg** topsoil ratios showed no clear linear trends and no clear relation between Sr and Mg. However, the plotted Sr/K, Sr/Fe and Sr/Mg ratios are not useful to distinguish the sampling areas clearly from each other, due to several overlapping ratios. The same observation is made for the calculated Sr-to-Fe and Sr-to-Mg ratios, which showed also several overlapping results. For example, the soil Sr-to-Mg ratios of the Anaga samples range from 1:32.3 to 1:128.1. The Orotava ratios are ranging between 1:20.4 and 1:42. The Teno ratios range from 1:69.1 to 1:487.9. The calculated Sr-to-K ratios of the Orotava soils are clearly distinguishable from the remaining ratios. For example, the Orotava soils contain mean Sr-to-K ratios between 1:11 and 1:14. The Anaga and Teno ratios range from 1:20 to 1:57. In addition, only the Orotava rock and soil Sr/K ratios fit together, indicating the affecting influences of the soil parent materials within this area. Affecting influences between soils and vegetation samples are not determined, without considering the higher Sr levels of the Orotava samples. Detailed descriptions are attached in the appendix (13.7 on page 207).

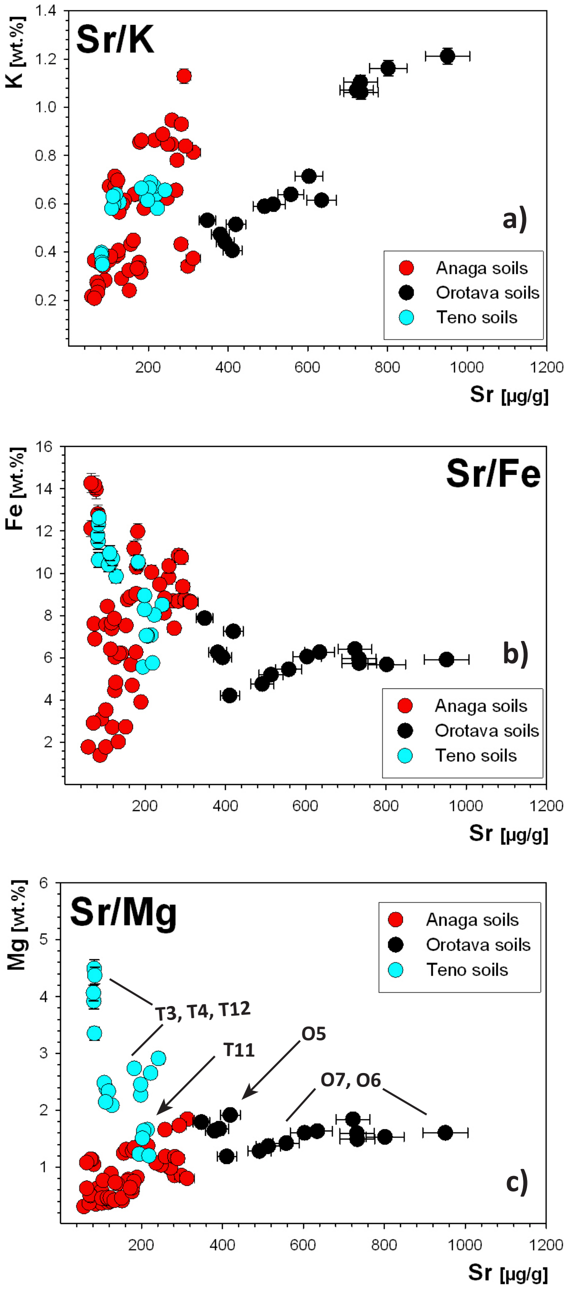


Fig.141 a) Plotted Sr/K soil ratios. b) Plotted Sr/Fe soil ratios. c) Plotted Sr/Mg soil ratios.

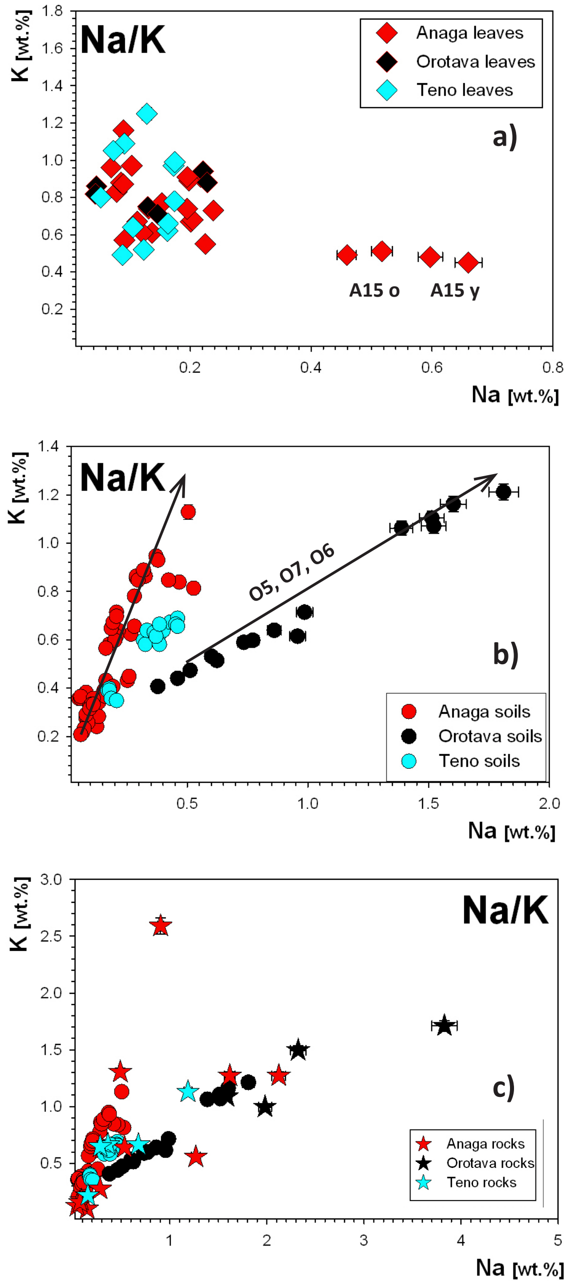


Fig.142 a) Plotted Na/K leaf ratios. b) Plotted Na/K soil ratios. c) Plotted Na/Kg rock and soil ratios.

5.5.3 Plotting Na against K, Ca and P

The plotted element ratios indicate several linear trends for the Orotava samples, which make them always distinguishable from the remaining areas. In addition, the calculated Na-to-K and Na-to-P ratios of the Orotava soils and rocks are clearly distinguishable from the remaining ratios. Furthermore, several affecting relations between rock, soil and vegetation samples are determined for the Orotava samples.

Na vs. K (Fig.142 a to c)

There are several positive linear trends recognizable due to the plotted topsoil ratios. One straight linear trend occurs for all plotted Orotava ratios, which makes them distinguishable from the Anaga and Teno soils (Fig.142 b). In addition, the Orotava rock ratios are plotted within the same positive direction as the soil ratios, indicating clearly the relation between rocks and soils (Fig.142 c). Furthermore, the Orotava topsoils are even distinguishable from the Anaga and Teno topsoils, due to the calculated Na-to-K ratios. For example, the Na-to-K soil ratios range from 1:1 to 1.3:1 for the Orotava samples, from 1:1.5 to 1:2 for the Teno samples and from 1:1.9 to 1:5.6 for the Anaga samples. In addition, the Orotava soil ratios fit very well to the associated rock ratios, which range from 1.4:1 to 2.2:1. It is reported that Anaga and Teno rocks contain different Na/K ratios, due to occurring rock alteration effects, which caused the loss of Na and K (Thirlwall et al. 2000). Furthermore, it is reported that high LOI levels can indicate that elements other than water and CO_2 may have been mobilized during alteration (Thirlwall et al. 2000). The highest LOI rock levels are determined for several Anaga and Teno rocks. The Orotava samples contained much lower LOI levels. It can be assumed that the Orotava rock ratios are distinguishable, due to the fact that the Orotava samples are not as strongly alterated as several Anaga and Teno rocks.

Considering the vegetation samples, no relation between the observed soil and rock ratio trends are determined due to the plotted leaf ratios (Fig.142 a). Most of the Na/K leaf ratios are plotted close together. In addition, the plotted leaf ratios indicate that profile A15 contains the larges amounts of Na. The calculated Na-to-K ratios vary significantly, without distinguishing the sampling areas from each other. The Na-to-K ratios indicate a relation between roots and leaves of the Orotava sampling sites O6 and O7. The Na-to-K ratios of the roots and leaves range from 1:3.7 to 1:3.8 at profile O6 and from 1:5 to 1:4.7 at profile O7. The root and leaf ratios of profile O5 range from 1.1:1 to 1:19 and indicate that the leaves installed larger amounts of K than the leaves of profile O6 and O7. This observation fits to the observed Sr/Na and Sr/Ca ratios of the leaves from profile O5. The higher amounts of Ca increased the uptake of Sr and Na and it assumes that they also increased the K uptake.

Na vs. Ca (Fig.143 a, b):

The scatterplot looks nearly similar to the Sr/Ca scatterplot. The Orotava soils are clearly distinguishable from the other areas due to the plotted Na/Ca ratios (Fig.143 a). All plotted Orotava ratios show a positive trend and a relation between Ca and Na. The rock ratios of the Orotava samples are plotted in the same positive trend, which indicates the influences of the soil parent material. It is not possible to determine typical Na-to-Ca ratios for the Anaga, Orotava or Teno rocks or soils due to relatively similar and overlapping ratios at profile A14, A17, A19, O5, O6, O7, T4, T11 and T12. For example, the mean soil ratios of the Anaga samples range from 1:2 to 1:7.7 and the Orotava ratios from 1:2.1 to 1:7.2. The Teno ratios range between 1:5.8 and 1:7.7. Affecting influences between rocks, soils and leaves are not determined. The observed trends are not recognizable within the leaves or within the roots.

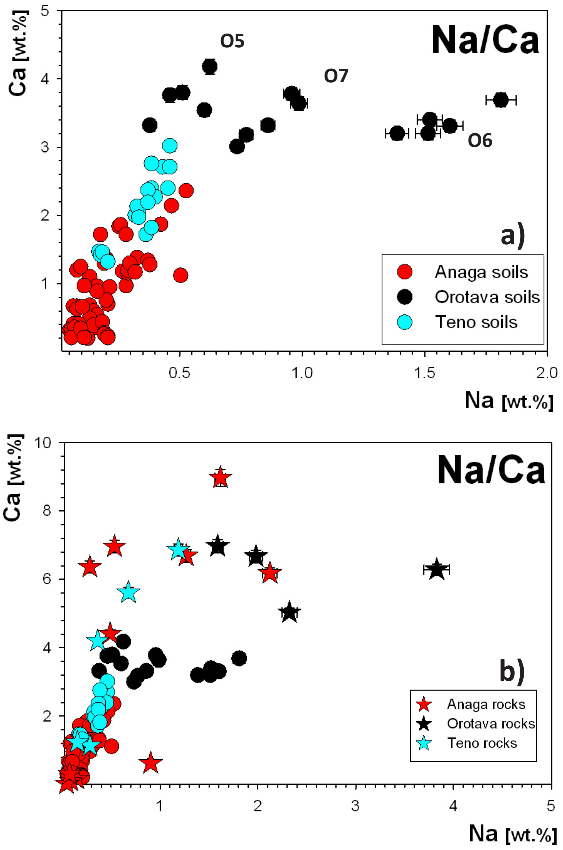


Fig.143 a) Plotted Na/Ca soil ratios. b) Plotted Na/Ca rock and soil ratios.

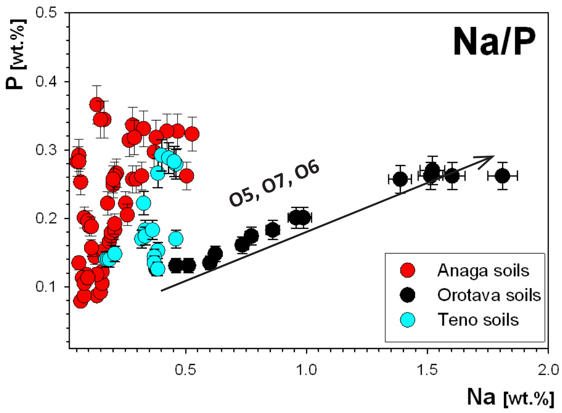


Fig.144 Plotted Na/P soil ratios.

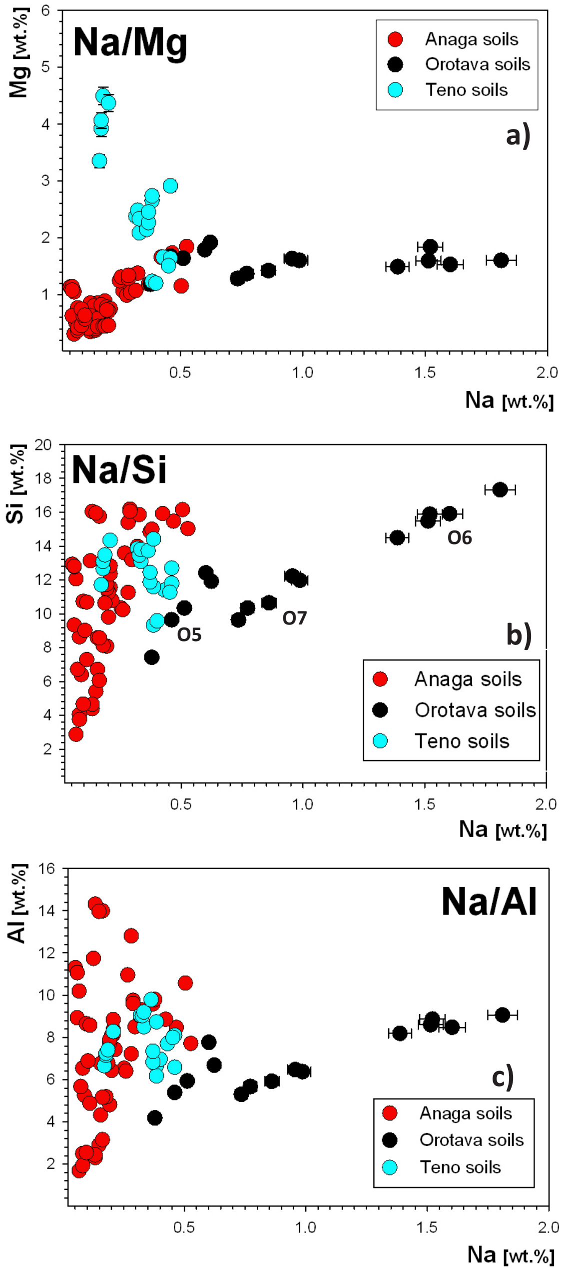


Fig.145 a) Plotted Na/Mg soil ratios. b) Plotted Na/Si soil ratios. c) Plotted Na/Al soil ratios.

Na vs. P (Fig.144):
The Orotava Na/P topsoil ratios are plotted in one linear trend, which makes them clearly distinguishable from the remaining areas. The Anaga and Teno ratios are plotted either horizontally (Teno samples) or without a clear trend (Anaga profiles) (Fig.144). Even the calculated Na-to-P ratios are useable to distinguish the Orotava topsoils from the remaining topsoils. The Anaga and Teno topsoils contain Na-to-P ratios between 1:1 and 2.7:1. The Orotava mean topsoil ratios range from 4.6:1 to 5.9:1. However, large differences exist within the Na-to-P rock ratios due to several overlapping ratios, which make them not distinguishable from each other. In addition, relations between rocks, soils, roots and leaves are not determined due to the plotted or the calculated vegetation ratios.

5.5.4 Plotting Na against Mg, Si and Al

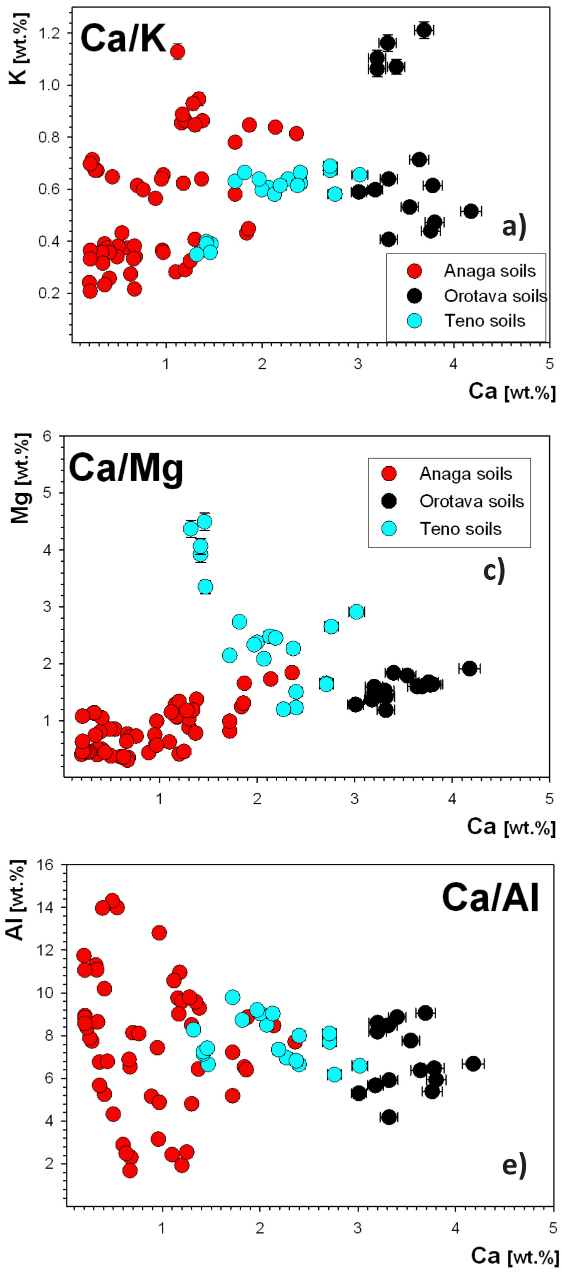
The scatterplots are shown at Fig.145 a to c. Considering the **Na/Mg** ratios, the topsoils are plotted in a triangular shape, due to the high Mg and low Na levels of the Teno soils and the high Na and low Mg levels of the Orotava soils. A clear relation between Na and Mg is determined only for profile O7 and O5 (Fig.145 a). Considering the Na/Si ratios, positive linear relations exist for all Orotava soils, indicating a relation between both elements. However, distinguishable **Na/Mg** and **Na/Si** trends are not determined neither by the plotted ratios nor by the calculated soil or rock ratios, due to several overlapping results. However, the Na/Al ratios show positive topsoil trends for the plotted ratios of profile O5, O6 and O7 (Fig.145 c). It is clearly visible that the plotted ratios of profile O5 split of from the other Orotava ratios. Nevertheless, the Orotava **Na/Al** trends are completely different. This observation fits also for the calculated Orotava Na-to-Al soil ratios, which range from 1:5.5 to 1:11.6. The Anaga and Teno ratios range from 1:18 to 1:157.1. The detailed descriptions are attached in the appendix (13.8 on page 208).

5.5.5 Plotting Ca against K, P, and Mg

The scatterplots are shown at Fig.146 a to c. Considering the **Ca/K** and **Ca/Mg** ratios, linear correlation trends are not recognizable for the Teno and Anaga topsoils and only slightly positive **Ca/K** trends for the Orotava samples, indicating a relation between both elements. The **Ca/P** ratios showed several positive and negative trends for the Anaga, Orotava and Teno topsoil samples, indicating clearly the different Ca and P associations within the sampling areas. The plotted topsoil ratios of profile O5, O6 and O7 are clearly distinguishable from the remaining locations. However, the ratios of profile T12 are plotted in the same direction as the ratios of profile O7, which makes it difficult to differentiate the Orotava and Teno samples from each other. The plotted Ca/K, Ca/P and Ca/Mg ratios as well the calculated ratios are not useable to distinguish the sampling areas from each other due to several overlapping results. Relations between leaves, soils and rocks do also not exist. The detailed descriptions are attached in the appendix (13.9 on page 209).

5.5.6 Plotting Ca against Si and Al

The scatterplots are shown at Fig.146 d and e. Both plotted **Ca/Si** and **Ca/Al** topsoil ratios indicated different trends for the Orotava, Anaga and Teno samples. For example, positive trends occur only for the Orotava ratios. The Anaga ratios are plotted always in clear negative directions and the Teno profiles showed no clear trends. Furthermore, the Orotava topsoils are mostly distinguished due to the plotted Ca/Si and Ca/Al ratios. However, several Teno samples show overlapping ratios with profile O7. Therefore, clear unique Orotava fingerprints ratios are not determined due to the plotted ratios. Furthermore, unique calculated Ca-to-Si ratios are also not determined due to overlapping samples. However, the calculated Ca-to-Al soil ratios are usable to distinguish the Orotava soils from the remaining areas. For example, the Teno Ca-to-Al soil ratios range from 1:2.9 to 1:5.1, the Anaga ratios from 1:3.3 to 1:25.8 and the Orotava ratios range from 1:1.6 to 1:2.5. In addition, the calculated Ca-to-Al ratios of the Orotava rocks and soils fit very well together, indicating clearly the affecting influences of the soil parent materials. The detailed descriptions are attached in the appendix (13.10 on page 211).



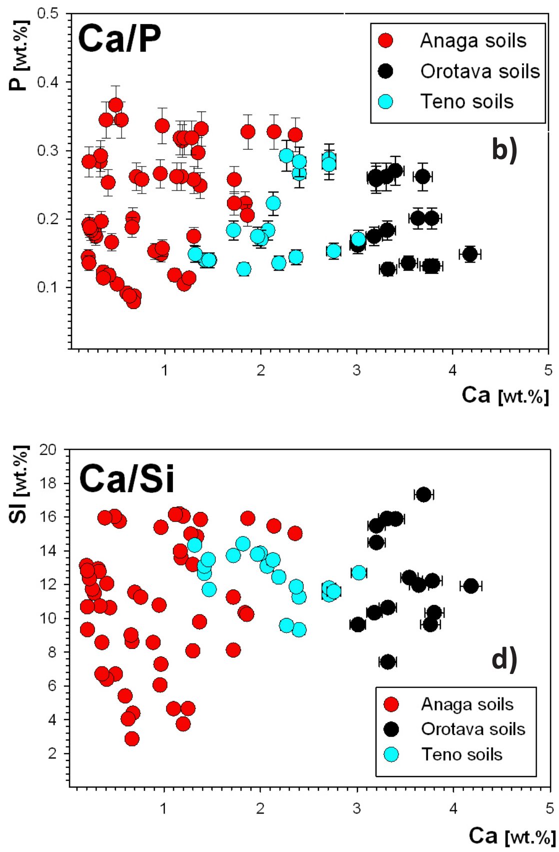


Fig.146 a) Plotted Ca/K soil ratios. b) Plotted Ca/P soil ratios. c) Plotted Ca/Mg soil ratios. d) Plotted Ca/Si soil ratios. e) Plotted Ca/Al soil ratios.

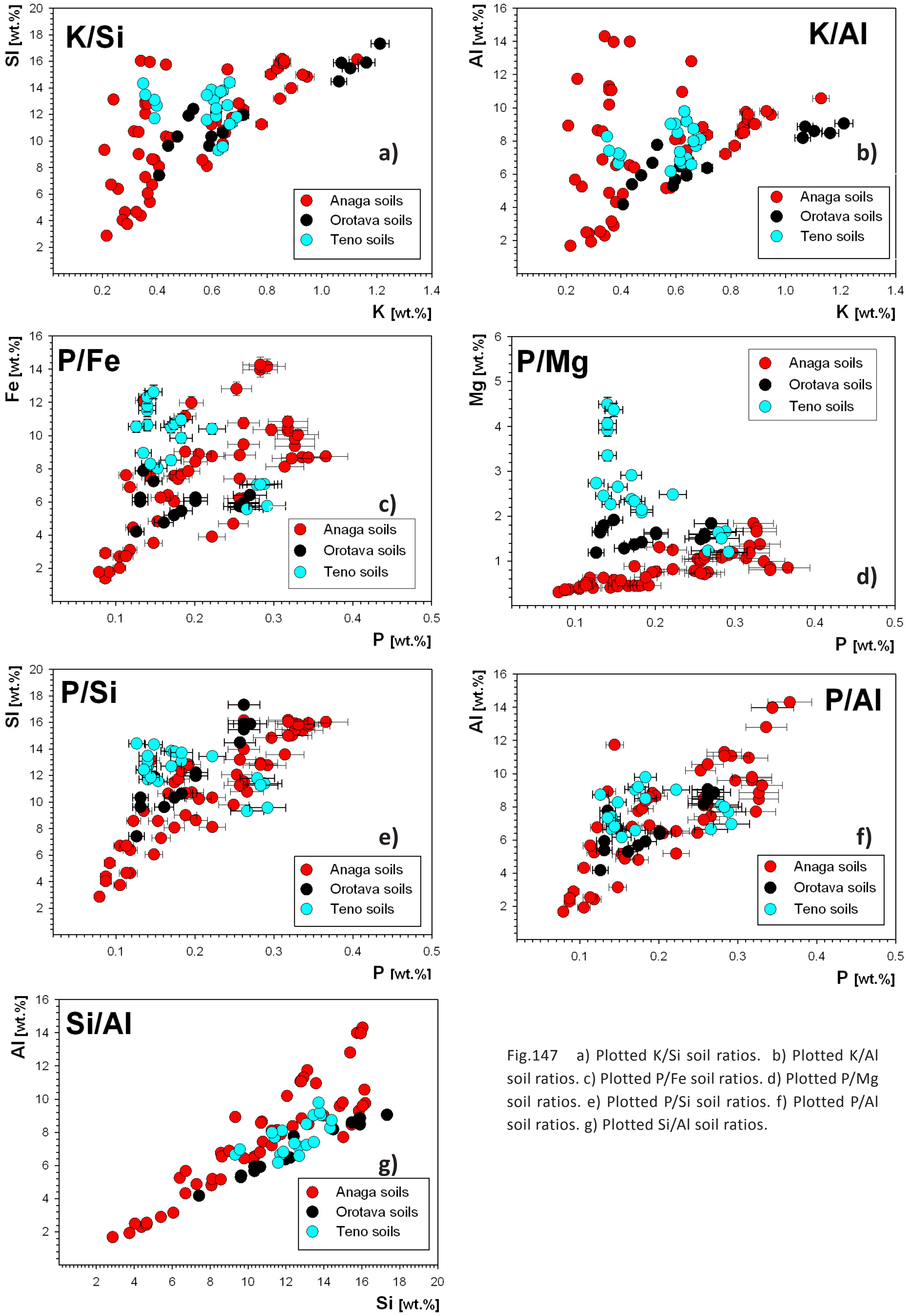


Fig.147 a) Plotted K/Si soil ratios. b) Plotted K/Al soil ratios. c) Plotted P/Fe soil ratios. d) Plotted P/Mg soil ratios. e) Plotted P/Si soil ratios. f) Plotted P/Al soil ratios. g) Plotted Si/Al soil ratios.

5.5.7 Plotting K against Si and Al

Considering the **K/Si** ratios, several linear trends occur for the plotted topsoil ratios (Fig.147 a). However, neither the plotted ratios nor the calculated ratios are useable to distinguish the main sampling areas from each other. Clear relations are not recognizable between associated rock and soil samples. Considering the **K/Al** ratios, positive and negative trends occur due to the plotted topsoil ratios (Fig.147 b). The plotted ratios are not useful to distinguish the main sampling areas from each other. Relations between associated rock and soil samples are not determined, neither for the plotted ratios nor for the calculated K-to-Al ratios. The detailed descriptions are attached in the appendix (13.11 on page 212).

5.5.8 Plotting P against Fe, Mg, Si and Al

Only a few linear trends are recognizable for the plotted **P/Fe** topsoil ratios, including several Anaga soils and profile O7 (Fig.147 c). The plotted **P/Mg** soil ratios indicate several linear trends for a few Anaga profiles and two Orotava profiles (O6, O7) (Fig.147 d). The plotted **P/Si** soil ratios indicate several linear trends for the Anaga, Orotava and Teno topsoil samples (Fig.147 e). The plotted **P/Al** soil ratios indicate several linear trends for a few Anaga and Orotava samples (Fig.147 f). The plotted ratios as well the calculated ratios are not useable to distinguish the main sampling areas from each other. Clear relations between rocks, soils, roots and leaves are not recognizable due to the plotted or calculated ratios. The detailed descriptions are attached in the appendix (13.12 on page 212).

5.5.9 Plotting Si against Al

The plotted **Si/Al** ratios show positive trends for all topsoil (Fig.147 g). It seems that a few Anaga profiles split of from the main positive trend. However, the calculated rock and mean soil ratios as well the plotted ratios are not useable to distinguish the main sampling areas from each other.

5.6 Summary and conclusions

5.6.1 Geochemical fingerprints of Anaga and Teno sampling sites

Unfortunately, plotting the most promising element combinations against each other (e.g. **Mg/Ni, Ni/Cu, Mg/Cu Fe/Ti, Fe/Zr**) created no distinguishable trends due to several overlapping Anaga and Teno ratios (A8, A9, A10, A19, T3, T4, T12, T11) or due to a few profiles, which deviate from the main trends. For example, profile T11 contains completely different ratios as the remaining Teno profiles. The same problem occurs in the Anaga profiles A8, A9, A10 and A19, which regularly deviate from the main Anaga trends (e.g. Fe/Ti, Fe/Zr). In addition, plotting the highest element contents against each other (e.g. Sr/Mg) created no distinguishable trends for Teno or Anaga samples, too. In either case, the geochemical differences of each area will be discussed individually.

It is, however, possible to differentiate between Anaga and Teno topsoils due to the calculated **Zr-to-Al**, **Mg-to-Fe** and **Mg-to-Al** topsoil ratios, including the separated profiles (e.g. A8, A9, A10, A19, T11). The Anaga **Zr-to-Al** ratios range from **1:221 to 1:258**, the Teno ratios from **1:275 to 1:305**. The Teno **Mg-to-Fe** topsoil ratios range from **1:2.9 to 1:4.5** and the Anaga ratios from **1:6.3 to 1:15.4**. The Anaga **Mg-to-Al** ratios range from **1:5.4 to 1:7.7** and the Teno ratios from **1:2.1 to 1:5.1**.

In addition, the following element-to-element ratios can be used to distinguish the sampling areas from each other if several profiles are excluded. For example, the Anaga **Na-to-Mg** soil ratios range from **1:2.3 to 1:5.7**, without profile A9. The Orotava soil ratios range from **1:1 to 1:3**. The Teno **Na-to-Mg** soil ratios range from **1:6.5 to 1:22**, without T11. The same holds true for **Sr-to-Mg**. The Anaga **Sr-to-Mg** soil ratios range from **1:47.7 to 1:73.1**, without A1, A2 and A9. The Orotava soil ratios range from **1:20.4 to 1:42**. The Teno **Sr-to-Mg** soil ratios range from **1:124.9 to 1:487.2**, without T11.

Nevertheless, typical geochemical fingerprints exist for three of four Teno profiles (T3, T4, T12) due to the following plotted element combinations: Mg/Ni, Mg/Fe, Mg/Mn, Mg/Si, Mg/Al, Ni/Cu, Ni/Fe, Ni/Mn and Fe/Zr-Ti/Zr. Furthermore, the associated rock and soil ratios of profile T3, T4 and T12 mostly fit well together, which stresses the affecting influences of the soil parent materials up to the uppermost soil horizons. However, only a few Anaga topsoils showed clear relations to the associated rocks, which is possibly related to different rock alteration degrees.

Also, neither the plotted nor the calculated geochemical topsoil fingerprints are reflected one by one within the associated vegetation samples. Only the leaves of sampling site T3, T4 and T12 show the high Mg/Ni topsoil ratios, which is indicated by the highest Ni leaf contents. In addition, the roots of sampling site A8, A9, A10 and A17 distinguish themselves clearly from the remaining samples due to higher Fe/Ti ratios. Yet the remaining ratios showed no clear relations between soils, roots and leaves.

5.6.2 Geochemical fingerprints of Orotava sampling sites

Several plotted element ratios separate the Orotava topsoils clearly from the remaining areas and can therefore be considered as typical Orotava fingerprints. Distinguishable trends occurred for example for the plotted **Sr/Ca, Na/Ca, Na/K** and **Na/P** ratios. The Sr/Ca, Na/Ca and Na/K rock ratios are always plotted in the same direction as the corresponding soil, which indicates that the **rocks influenced** the **soils** up to the uppermost soil horizons. Several calculated element-to-element ratios also distinguish the Orotava topsoils clearly from the remaining areas. For example, the **Sr-to-Ca** ratios of the Orotava topsoils range from **1:42 to 1:95**. The Teno ratios range from **1:116 to 1:171**. Furthermore, the leaves of profile O5, O6 and O7 are distinguishable from the remaining areas due to the Sr-to-Ca ratios. The Orotava **leaf ratios** range from **1:40 to 1:55** and the Anaga and Teno ratios from **1:65 to 1:158**.

In addition, the **Sr-to-K** ratios of the Orotava topsoils range form **1:11 to 1:14**. The Anaga and Teno ratios range from **1:20 to 1:57**. The Orotava **Na-to-Al** soil ratios range from **1:5.5 to 1:11.6** and the Anaga and Teno ratios range from **1:18 to 1:157.1**. The Teno **Ca-to-Al** soil ratios range from **1:2.9 to 1:5.1**, the Anaga ratios from **1:3.3 to 1:25.8** and the Orotava ratios range from **1:1.6 to 1:2.5**. Furthermore, the Orotava **Na-to-K** soil ratios range from **1:1 to 1.3:1**, the Teno ratios from **1:1.5 to 1:2** and the Anaga ratios from **1:1.9 to 1:5.6**. The calculated **Na-to-K** ratios indicate a relation between roots and leaves of the Orotava sampling sites O6 and O7. The Na-to-K ratios of the roots and leaves range from **1:3.7 to 1:3.8** at profile O6 and from **1:5 to 1:4.7** at profile O7. The Anaga and Teno topsoils contain **Na-to-P** ratios between **1:1 and 2.7:1** and the Orotava ratios range from **4.6:1 to 5.9:1**.

Moreover the high Orotava rock and soil Na, Ca and Sr levels influenced the uptake of Na, Ca, K and Sr within the associated leaves. For example, it is recognizable that profile O5 contains lower amounts of Sr, Na and K within the topsoil as the remaining Orotava samples. The leaves of profile O5 on the other hand contain the highest amounts of Sr, Ca, Na and K. It seems that the Sr uptake in plants depends not only on the soil Sr contents, but rather on the soil Ca levels. This observation fits the reported fact that Ca increases the Sr uptake in plants due to Ca-Sr substitutions (Kirkby, 1979). Also, the higher amounts of Ca increased the uptake of Na. One can assume that the K levels increased due to the higher Sr uptake. Thus, the **Sr/Ca, Sr/Na, Na/Ca** and **Na/K** fingerprints of the rocks and soils affected the associated leaves.

5.6.3 Area-specific differences and interrelations

Considering the **Anaga sampling sites**, large differences exist between the examined Anaga element ratios and several soil profiles deviating from the main trends. One example is the plotted SOC/Fe and SOC/Ti trends, which clearly showed that profile A8, A9, A10 and A19 deviate from the remaining Anaga sampling sites due to different Fe and Ti bonding forms. It was assumed that different Fe-Ti oxides mainly caused this separation (see 5.2.1). All Fe/Ti ratios are plotted in one linear trend, however, which excludes affecting influences of Fe-Ti oxides. The various plotted Fe, Ti and Zr ratios showed that several elements are clearly associated with each other, such as Fe-Zr, Fe-Al, Fe-Si, Ti-Zr, Ti-Al, Ti-Si, Zr-Al and Zr-Si. It can only can be assumed whether Fe oxides, Ti-oxides, amphiboles, pyroxenes, clay minerals or secondary minerals caused the observed separations. It is nevertheless possible to combine the separated Anaga profiles into groups with relatively similar trends and element-to-element ratios, which enables us to distinguish the groups due to their own geochemical fingerprints. For example, the Fe/Zr ratios can be used to distinguish between group one (A8, A9, A10, A19), group two (A14, A15, A16, A17) and group three (A1, A2). In the same vein, the Fe/Zr-Ti/Zr ratios are used to differentiate the soils of profile A8, A9, A10 and A19 from the soils of profile A1, A2, A14, A15, A16 and A17. The plotted Ti/Al and the calculated topsoil ratios allow for distinction between group one (A1, A2, A14, A17), group two (A15, A16) and group three (A8, A9, A10, A19).

When focussing on the **Teno sampling sites**, profile T11 shows completely different element ratios than the remaining Teno areas, which makes it impossible to determine typical Teno fingerprints. The rock and soil ratios of T11 also fit much more to the ratios of the Anaga and Orotava area. There is no obvious explanation for the difference of T11, which is located a few 100 m far from the other Teno sampling sites. There could not be established any differences during the fieldwork itself. Nevertheless, the observed variations clearly indicate that even within the same sampling area the profiles can contain completely different element ratios. Considering the high Mg and Ni contents, all Teno profiles showed a relation between Mg and Ni, but only profile T3 contains clear dependencies between Mg, Mn, Fe, Ni, Cu and Si. In fact, olivine possibly influenced the observed and always distinguishable element ratios of profile T3, while it remains unclear if olivine did so with the other Teno samples. Profile T4 and T12 showed only linear relations between Mg-Ni, Mg-Si and Fe-Si, but no relation between Ni-Si, Ni-Fe or Ni-Mn. Furthermore, the various scatterplots indicated that the element Mg, Ni, Fe, Mn and Si are bound together within the rocks and soils of profile T3.

When taking into account the **Orotava sampling sites**, it shows that the elements Ca, Na and Sr are related to each other and display clear differences with increasing or decreasing amounts of one of the mentioned elements. Also the elements K, Al and Si are related to Ca, Na and Sr. Nevertheless, this is not always clearly seen for all Orotava soils. Actually, relations exist between Ca and P as well between Na and P. The scatterplots showed that there is no clear relation between Sr-Fe, Sr-Mg, Na-Mg and Ca-Mg, too. Which minerals (e.g. plagioclase, K-feldspars, apatites) actually caused these unique ratios and trends within the Orotava samples can only be guessed at. It is not clear if K and Sr are associated with each other. Generally, K-feldspars are not associated with Sr, in contrast to the plagioclase feldspars. Anyway, it is reported that K and Sr are related to each other within volcanic soils in Tenerife, without being associated with to K-feldspars (Arnalds et al. 2007; Martínez-Cortizas et al. 2007).

6. Anthropogenic impacts within the laurel forest

Two non-essential transition metals (**Cd, Hg**), one non-essential post-transition metal (**Pb**) and one non-essential metalloid (**Sb**) were selected for the upcoming discussion since they share the fact that natural processes or anthropogenic emissions possibly affected the determined element levels, as these elements are used for a variety of industrial products (e.g. electroplating, battery production, plastic manufacture etc.).

The upcoming section focuses on several important environmental questions. Are the determined trace element levels present in normal, enriched or even excessive amounts in the laurel forest soils? Are the determined element levels affected either by geogenic sources (e.g. weathering of volcanic rocks, Saharan dust impacts etc.), anthropogenic sources (traffic, road surface abrasion, waste disposal, fertilisers etc.) or both? Do enriched rock element levels affect the possible polluted topsoils, and are there any relations between rocks, soils and the associated vegetation samples? The collected rock, soil and vegetation samples originate from several laurel forest areas with different sampling site characteristics, including remote forest areas far from roads or more or less frequently travelled mountain tracks as well as popular touristic areas. The detailed sampling site descriptions are given in section 2.1. The summary and conclusions of each element are listed at the end of this chapter. In addition, the calculated I_{geo} values are listed in the appendix (14.5 on page 283).

6.1 Cadmium (Cd)

6.1.1 Topsoil contents in comparison to reported element ranges

The soils contain mean Cd levels between 0.2 ± 0.0 and 0.4 ± 0.0 µg/g (Fig.109 on page 101). Only a few Anaga soil horizons contain Cd above 0.3 µg/g (e.g. A17 0.5 ± 0.0 µg/g). Reported Cd values, particularly for the laurel forest soils, are not available. In soils, the **worldwide average Cd** content ranges from **0.06 µg/g** to **1.1 µg/g** and the estimated global mean surface soil content is **0.53 µg/g** (Salminen et al., 2005; Kabata-Pendias, 2001). **European topsoils** contain between **0.01 µg/g** and **14.1 µg/g** of Cd, with an average of 0.145 µg/g (Salminen et al., 2005). Italian volcanic soils contain mean Cd levels between 0.31 ± 0.05 µg/g and 0.42 ± 0.06 µg/g in the upper soil horizons (0 – 5 cm) (Maisto et al., 2006). Kabata-Pendias (2001) reported that Cd levels above 0.53 µg/g reflect possible anthropogenic influences.

At first glance the determined mean soil levels are present in natural amounts and show nearly no degree of pollution (I_{geo} 0 - 1) due to the comparison with the reported levels and due to the geoaccumulation index, which has been calculated by using two different background values (**A = 0.145 µg/g**, mean content of European topsoils; **B = 0.2 µg/g**, lowest determined mean content) (Table 27 on page 283).

6.1.2 Affecting geogenic interrelations of rock and soil minerals

Considering the determined rock levels, the emerging question is, how can it be that all topsoils contain Cd even if only two rock samples contain Cd slightly above the detection limit of 0.1 µg/g (A2 = 0.2 ± 0.0 µg/g; A9 = 0.2 ± 0.0 µg/g) (Fig.108 on page 100). Generally, it is not unusual to determine low Cd levels due to the rather low average crustal abundance (from 0.1 to 0.2 µg/g of Cd) and the reported low Cd levels of igneous rocks (e.g. basalt 0.13 µg/g) (Fergusson 1990; Smith 1999b; Salminen et al., 2005). It is therefore still possible that the rocks contain Cd below the detection limit.

For example, silicate minerals such as biotite and amphibole can contain trace amounts of Cd (Salminen et al., 2005). Both minerals commonly occur within the rocks of the main sampling areas. The Anaga rocks are strongly affected by weathering processes (see 4.1) and they have possibly released Cd to the examined soils (Tejedore et al., 2007; Thrilwall et al., 2000). However, relations between Cd, Si, Al and Fe are not determined within the topsoils (Fig.148 a to c). Generally, the Cd activity in soils is strongly affected by the pH. In acidic soils (pH 4.5 to 5.5) the mobility of Cd is significantly higher than in soil with higher pH levels (Salminen et al., 2005). In addition, the Cd solubility in soils is largely control by organic matter and sesquioxides (e.g. Al_2O_3) (Salminen et al., 2005). Clay minerals and iron oxyhydroxide coatings can adsorb the released Cd ions (Hem, 1992; Salminen et al., 2005).

It is reported that Cd shows a good correlation with Zn and Pb, and a weak correlation with Sb and Hg (Salminen et al., 2005). The plotted **Cd/Zn, Cd/Pb, Cd/Sb** and **Cd/Hg** soil ratios indicated no relation between those elements due to the mostly horizontally plotted ratios (Fig.148 d to g).

An interesting fact revealed the **Cd/Sb** scatterplot, which shows that Sb and Cd occur within the upper 10 cm of A8 (Fig.148 f). Profile A8 is therefore the only one, which contains Sb and Cd together within 4 soil horizons. There is evidence of a Cd affinity with organic matter due to selective adsorption and complexation by humic compounds (Salminen et al., 2005). Litter fall, soil microbial activities and soil texture can also affect the Cd accumulation in surface soils (Kabata-Pendias and Pendias, 1992; Tuháćková et al., 2001). Generally, Cd is one of those elements, which shows systematic enrichment in topsoils similar to Pb, Hg, and Sb (Salminen et al., 2005). But a relation between increasing soil organic carbon levels are not determined by the plotted **SOC/Cd** levels (Fig.148 h). The normalized (**Cd/Zr**) profiles show enrichment within the upper cm of profile A8 and A14 (Fig.148 i).

6.1.3 Vegetation samples, washed leaves vs. unwashed leaves

The analysed roots contain between 0.03 ± 0.00 µg/g and 0.15 ± 0.01 µg/g of Cd, with an average of 0.09 ± 0.01 µg/g. The washed and unwashed leaf samples contain between 0.02 ± 0.00 µg/g and 0.11 ± 0.01 µg/g of Cd (Fig.111 on page 101). It is recognizable that Cd is determined mostly in the unwashed leaf samples (Fig.112 on page 101) Furthermore, the Cd level are mostly below the detection limit in the corresponding washed leaves. The highest Cd level is determined at sampling site A8 (0.11 ± 0.01 µg/g) in the unwashed leaves. The second highest values are determined at A2 and A9 (0.08 ± 0.01 µg/g and 0.09 ± 0.01 µg/g). Cadmium levels are not reported for laurel forest trees,

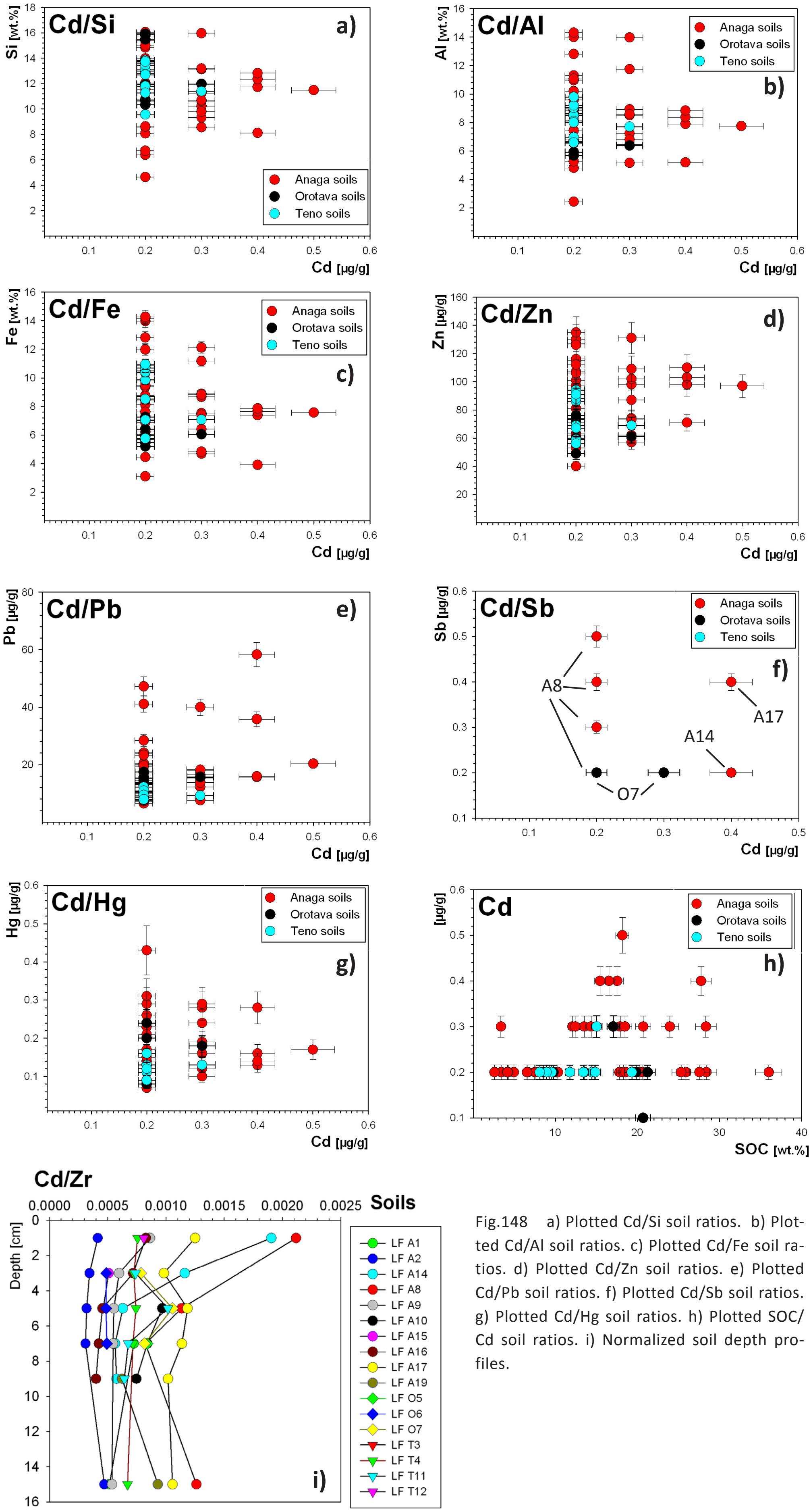


Fig.148 a) Plotted Cd/Si soil ratios. b) Plotted Cd/Al soil ratios. c) Plotted Cd/Fe soil ratios. d) Plotted Cd/Zn soil ratios. e) Plotted Cd/Pb soil ratios. f) Plotted Cd/Sb soil ratios. g) Plotted Cd/Hg soil ratios. h) Plotted SOC/Cd soil ratios. i) Normalized soil depth profiles.

only for *Pinus canariensis* trees in Tenerife. They contain between 0.015 µg/g and 0.039 µg/g of Cd, with an average of 0.031 µg/g (Tausz et al. 2005). Leaves of common deciduous trees of southeast Europe contain between 0.014 µg/g and 0.033 µg/g of Cd (Tomašević & Aničic, 2010). In comparison to the reported Cd range, the leaves of sampling site A8, A9 and A2 contain clearly higher levels. In addition, Cd particles are possibly present on the leaf surface due to the fact that clear differences exist between washed and unwashed leaves.

6.2 Mercury (Hg)

6.2.1 Topsoil contents in comparison to reported element ranges

The Hg levels of the 89 soil horizons range from 0.07 ± 0.01 µg/g to 0.46 ± 0.07 µg/g and the highest mean soil levels are determined at profile A1 (0.24 ± 0.04 µg/g) and A8 (0.35 ± 0.05 µg/g). Profile A8 is located in the popular touristic Anaga area Pico del Ingles. Profile A1 is located in the remote northeastern part of the Anaga Mountains. European volcanic soils contain within the upper soil horizons (0 – 20 cm) mean Hg levels between 0.01 µg/g and 0.32 µg/g, with an average of 0.12 µg/g (Martínez-Cortizas et al. 2007).

The volcanic topsoils in Tenerife contain between 0.01 µg/g and 0.16 µg/g of Hg, with an average of 0.08 µg/g (Martínez-Cortizas et al., 2007; Tejedor et al., 2007). European agricultural topsoils (0 - 20 cm) contain between 0.003 µg/g and 1.56 µg/g of Hg, (average 0.030 µg/g) (Ottesen et al., 2013). Generally, the pollution limit of Hg is 0.2 µg/g for forest soils (Steinnes, 1995). Considering the highest Hg level of European volcanic soils (0.32 µg/g) as the natural upper limit for Hg indicates that profile A8 contains already unnatural Hg levels (Fig.114 on page 103). There are several other profiles, which contain mean Hg levels only slightly below the assumed upper natural limit (A1). A few soil horizons from various soil profiles contained Hg even above 0.3 µg/g (Fig.115 on page 103).

For the calculation of the geoaccumulation index three different background values have been used (**A:** Highest content of European topsoils, 0.32 µg/g; **B:** Highest Hg level of volcanic soils from Tenerife, 0.16 µg/g: C Lowest determined mean level, 0.08 µg/g). Using **background A** shows that nearly all soils are unpolluted (I_{geo} 0). Using **background B** shows also that all soils unpolluted (I_{geo} 0 - 1). Using **background C** indicates that profiles A8, A1, A14, A19, and A10 are slightly polluted (I_{geo} 2).

6.2.2 Affecting geogenic interrelations of rock and soil minerals

Mercury is detected only within 7 rock samples (Fig.113 on page 103). Six of them originate from the Anaga Mountains. The 7 samples contain between 0.02 ± 0.00 µg/g (A9) and 0.09 ± 0.01 µg/g (A19) of Hg, with an average of 0.05 ± 0.01 µg/g. The Hg levels of the remaining 10 rock samples are below the detection limit (<0.01 µg/g). Comparing the 7 rock samples with the associated soils shows clearly that all soils contain higher Hg amounts than the related rock samples.

Generally, this is not unusual for volcanic soils due to different occurring geogenic processes, which can affect the Hg rock levels (e.g. weathering, low pH levels, mobilization and accumulation within the organic matter) (Steinnes, 1995).

The scatterplot **SOC/Hg** indicates that Hg is organically bound up to a level of 0.3 µg/g within the laurel forest soils (Fig.149). This observation fits to the reported fact that the accumulation of Hg is mainly related to the levels of organic C and S in soil (Salminen et al., 2005). Organic soils have generally a higher Hg content than mineral soils due to the binding capacity of raw humus (Salminen et al., 2005). Above 0.3 µg/g it is not clearly visible, if increasing SOC levels affect the Hg levels.

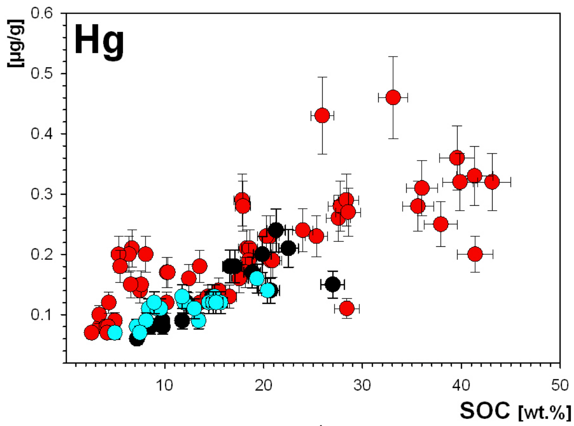
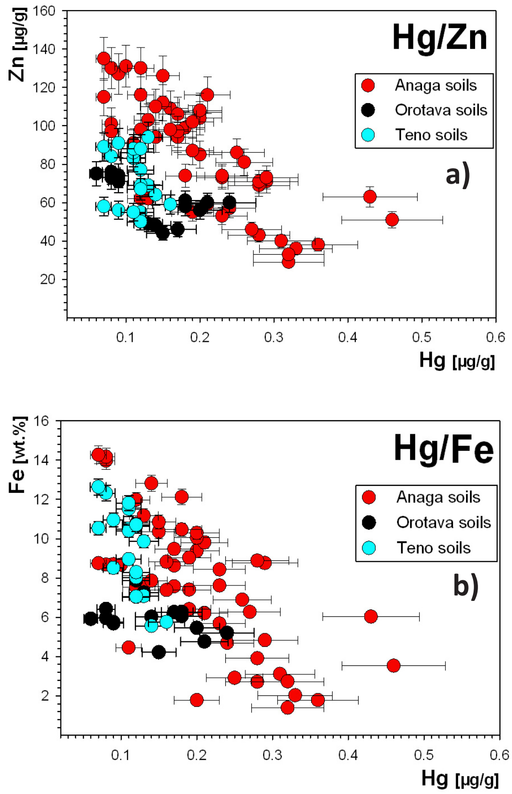


Fig.149 Plotted SOC/Hg soil ratios.

Therefore, the 7 rock samples possibly affected and increased the Hg levels of the associated soils (A1, A9, A10, A14, A16, A19, T4). The remaining 10 profiles (A2, A8, A15, A17, O5, O6, O7, T3, T11, T12), obtained Hg from other geogenic or anthropogenic sources. For example, volcanic hot springs and sedimentary rocks altered by phreatic activity are possible geogenic Hg source in volcanic regions (Salminen et al., 2005). The principal Hg mineral is cinnabar HgS, along with the metacinnabar group in which variable amounts of Zn and Fe substitute for Hg (Salminen et al., 2005).

The scatterplot **Hg/Zn** shows a relation between Hg and Zn within several profiles (Fig.150 a). Clear linear trends occur at profile T12, T11, T3, O5, A1, A2, A9, A14, A15, A16, A17, A19. For the remaining profiles it is not possible to determine any linear trends, including profile A8, A10, O6, O7 and T4.

The scatterplot **Hg/Fe** shows a relation between Hg and Fe within all soils. Clear linear trends occur even at profile A8, A10, O6, O7 and T4 (Fig.150 b). Therefore, both scatterplots indicated that Hg is bound to Zn and Fe containing minerals affecting anthropogenic sources can clearly be excluded. The normalized soil depth profiles (**Hg/Zr**) indicated that the Anaga profiles A1, A8, A10 and A19 are clearly enriched in the upper 6 cm (Fig.150 c). Enriched Hg/Zr ratios occur in the Orotava profile O5 and O7. The Teno profiles T11 and T12 are slightly enriched (Fig.150 d). The enriched ratios fit to the observation that Hg is accumulated in the organic matter. Anyway, topsoil enrichment can also indicate anthropogenic inputs. To determine possible affecting atmospheric impacts, it is necessary to regard the washed and unwashed leaves and roots.



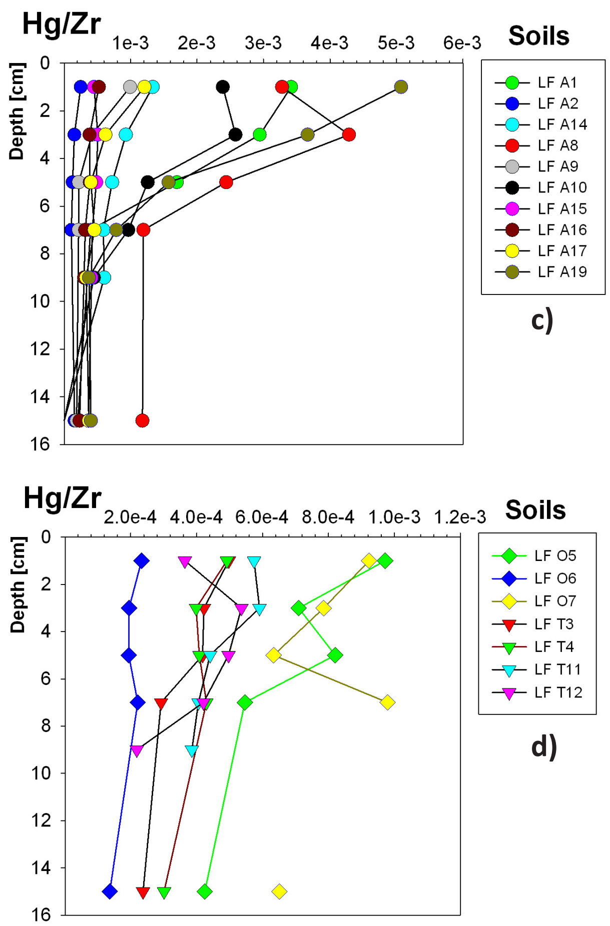


Fig.150 a) Plotted Hg/Zn soil ratios. b) Plotted Hg/Fe soil ratios. c) Normalized Anaga soil depth profiles. d) Normalized Orotava and Teno soil depth profiles. The profiles A1, A19, A8, A10, O5 and O7 show a clear increase of Hg within the upper 7 cm.

6.2.3 Vegetation samples, washed leaves vs. unwashed leaves

The roots contain between 0.003 ± 0.000 µg/g and 0.057 ± 0.008 µg/g of Hg, with an average of 0.026 ± 0.004 µg/g. In addition, all unwashed and washed *L. novocanariensis* leaves contain between 0.007 ± 0.001 µg/g and 0.060 ± 0.009 µg/g of Hg, with an average of 0.035 ± 0.005 µg/g (Fig.116 on page 104). Particles on the leaf surface are not recognizable (Fig.117 on page 104). Reported Hg levels for typical laurel forest trees are not available, only for *Pinus canariensis* trees in Tenerife. They contain between 0.026 µg/g and 0.049 µg/g of Hg and the highest amounts (>0.040 µg/g) are determined for trees grown close to roads (Tausz et al., 2005). Different tropical tree species contain between 0.063 µg/g and 0.196 µg/g of Hg (Aidid, 1988). Considering the highest *P. canariensis* Hg level (0.049 µg/g) as the upper normal Hg limit, unusual Hg amounts are determined only in leaf samples from touristically affected areas (A8, A9, A10, A19, O6).

6.3 Lead (Pb)

6.3.1 Topsoil contents in comparison to reported element ranges

The laurel forests mean levels vary from 6.2 ± 0.4 µg/g to 38.9 ± 2.8 µg/g, with an average of 15.7 ± 1.1 µg/g (Fig.95 on page 92). The 89 laurel forest soil horizons contain between 4.90 ± 0.35 µg/g and 58.30 ± 4.16 µg/g of Pb, with an average of 15.85 ± 1.13 µg/g. European volcanic topsoils contain between 0.40 µg/g and 103.90 µg/g of Pb, with an average of 35.86 µg/g (Martínez-Cortizas et al., 2007). Volcanic topsoils in Tenerife contain between 3.00 µg/g and 28.00 µg/g of Pb, with an average of 15.75 µg/g (Martínez-Cortizas et al., 2007; Tejedor et al., 2007). Northern European agricultural topsoils contain a mean Pb level of 10 µg/g (Reimann et al. 2012). The mean level of southern European agricultural soils is 20 µg/g (Reimann et al. 2012). On a global scale, mean Pb level of 25 µg/g for surface soils are considered as normal and levels above 25 µg/g suggest an anthropogenic influence (Kabata-Pendias 2001).

Considering 30 µg/g of Pb as the upper natural limit for volcanic soils indicates increased amounts at profile A1, A8 and A17, reaching even up to 58.3 µg/g (Fig.95 on page 92). For the calculation of the geoaccumulation index three different background values have been used (**A:** highest Pb level of volcanic soils in Tenerife, 30 µg/g; **B:** lowest mean level of the analysed soil profiles, 6.2 µg/g; **C:** average mean levels of all analysed profiles, 16.0 µg/g). Using **background A** shows that all soils are unpolluted (I_{geo} 0). Using **background B** shows that profile A8 is heavy polluted (I_{geo} 4). Profile A17, A1, A10, A16 and A15 are slightly to heavily polluted (I_{geo} 3). Using **background C** indicates that profile A8, A17, A1 and A10 are slightly polluted (I_{geo} 2). Generally, it can be assumed that the soils are anthropogenically affected, particularly those of popular touristic areas (e.g. A8, A9, A10). However, profile A1 is located in a more or less remote area of the Anaga Mountains and anthropogenic impacts are not obvious. Therefore, it is necessary determine any affecting relations of geogenic sources or processes.

6.3.2 Affecting geogenic interrelations of rock and soil minerals

The analysed laurel forest rocks contain between 1.4 ± 0.1 µg/g (T12, O7) and 12.0 ± 0.9 µg/g (A1) of Pb, with an average of 5.4 ± 0.4 µg/g (Fig.94 on page 92). Reported Anaga Mountains levels range from 0.6 ± 0.3 µg/g to 10.0 ± 0.3 µg/g (Thirlwall et al. 2000). Teno rocks contain between 1.1 ± 0.3 µg/g and 10.0 ± 1.0 µg/g of Pb (Longpré et al. 2009; Thirlwall et al. 2000). The Pb level of sampling site A1 is significantly higher in comparison to the reported and the determined rock contents. None of the remaining laurel forest rocks contains more than 6.2 ± 0.4 µg/g of Pb. Therefore, soil profile A1 is possibly affected due to the high Pb content in the rock. However, profile A8 and A17 are not related to high rock contents. Generally, increased and enriched topsoils are evidence to suggest anthropogenic impacts, particularly in human affected areas (A8, A17) (Zimdahl & Skogerboe, 1977) (Fig.96 on page 92).

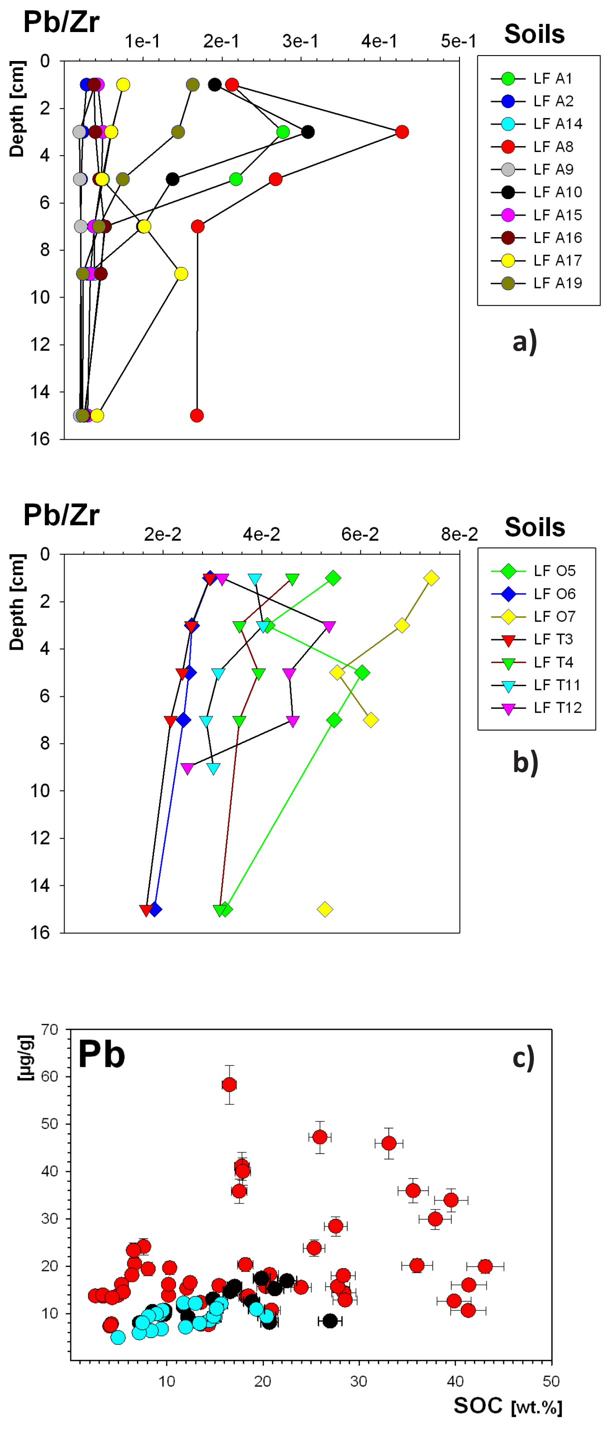


Fig.151 a) Normalized Anaga soil depth profiles. b) Normalized Orotava and Teno soil depth profiles. c) Plotted SOC/Pb soil ratios.

The normalized scatterplots (**Pb/Zr**) indicate enrichment within the upper 6 cm at profile A1, A8, A10, A19, O5, O7, T11 and T12 (Fig.151 a, b). Therefore, enrichment occurs within remote forest areas as well as in more or less popular touristic areas. It is reported that Pb shows an affinity to organic matter and accumulates often within the upper 10 cm (Salminen et al., 2005).

The scatterplot **SOC/Pb** shows slightly positive trends, indicating organically bound Pb within the Teno and Orotava soils (Fig.151 c). However, the Anaga soil ratios are plotted without any clear trends. In addition, Pb levels above 20 µg/g are exclusively detected in the Anaga soils A1, A8, A10, A16 and A17. Affecting anthropogenic sources are not obvious for those soil profiles due to the use of unleaded fuel, which excludes vehicle exhausts and road-dusts in the form of tetraethyl Pb (Salminen et al., 2005). Metalliferous mining (especially sulphide ores), metallic detritus, Pb-bearing glass and pottery glazes, batteries, old lead-based paints, the corrosion of lead pipes in areas of soft water and sewage sludge are also excluded due to the missing connection to laurel forest (Salminen et al., 2005).

Therefore, it is possible that geogenic sources or processes affected the Anaga soils. Lead forms several important minerals, including galena PbS, anglesite $PbSO_4$, and cerussite $PbCO_3$ (Salminen et al., 2005).

It is also widely dispersed at trace levels in a range of other minerals, including K–feldspar, plagioclase, mica, zircon and magnetite (Salminen et al., 2005). The Pb^{2+} ion (119 pm) is intermediate in size between K^+ (138 pm) and Ca^{2+} (100 pm) and so it replaces these ions in K-feldspar, mica and to lesser extent, plagioclase and apatite (Salminen et al., 2005). In soils it is mainly associated with clay minerals, Mn-oxides, Fe- and Al-hydroxides and organic matter (Kabata-Pendias 2001; Salminen et al., 2005).

Pb vs. K: (Fig.152 a) Profile O6 shows clearly a linear trend and a relation between Pb and K. The profiles O5 and O7 show instead no relation to K. The Teno ratios are plotted close together and show no relation between Pb and K. The Anaga ratios are also plotted close together and linear trends are only visible at profile A10 and A17. Furthermore, it is visible that profile A8 shows no relation between Pb and K.

Pb vs. Ca: (Fig.152 b) All Teno profiles and profile O5, O7, A1, A17 and A15 show a relation between Pb and Ca due to several plotted linear trends. The remaining soils show no linear trends.

Pb vs. Fe: (Fig.152 c) Clear linear trends occur for all Teno ratios and for the profiles O5, O7 and A15. Clearly no relation between Pb and Fe is seen in the samples of profile A1, A8, A17 and A10. The remaining ratios are plotted closely together without trends.

Pb vs. Ti: (Fig.152 d) Clear linear trends occur for all Teno ratios and for O5, O7, A10, A15 and A19. It seems that several other linear trends exist, but the ratios belong to different sampling sites.

Pb vs. P: (Fig.152 e) Regarding each profile separately indicates that none of the plotted ratios are showing any linear trends and no relation between Pb and P.

Pb vs. Mn: (Fig.152 f) A relation between Mn and Pb is visible for all Teno soils and for profile O6, O7 and A15. The remaining soil ratios are plotted closely together.

Pb vs. Al: (Fig.152 g) A relation between Al and Pb is visible for all Teno soils and for profile O6, O7, A15 and A19. The ratios are plotted all with linear trends. Clearly no relation exists within the soils of profile A8, A10, A17 and A19. Possible relations exists at profile A1 and A2, but it is difficult to determine clear linear trend due to close together plotted ratios.

Pb vs. Si: (Fig.152 h) A relation between Si and Pb is visible only for profile O6 and A19. Clearly no relation exists for profile A8, A10 and A17. The remaining soil ratios are plotted closely together and linear trends are not recognizable.

The plotted ratios indicate clearly that not all elements are associated with Pb. Differences exist even within in the same sampling area. The results indicate geogenic affected Pb ratios for most of the soils. Only a few Anaga soils showed no clear relation. However, the scatterplots indicated clearly no relation between Pb and any other element at sampling site A8 and geogenic affecting sources are not determined. The following results and relations of Pb to other elements are determined due to recognizable linear trends:

Anaga soils: **A1** (Ca, Al), A10 (K, Ti), **A15** (Ca, Fe, Ti, Mn, Al), **A17** (K, Ca), **A19** (Ti, Al).
Orotava soils: **O5** (Ca, Fe, Ti, Mn, Al), **O6** (K, Fe, Si), **O7** (Ca, Fe, Ti, Mn, Al).
Teno soils: **T3, T4, T11, T12** (Ca, Fe, Ti, Mn, Al).

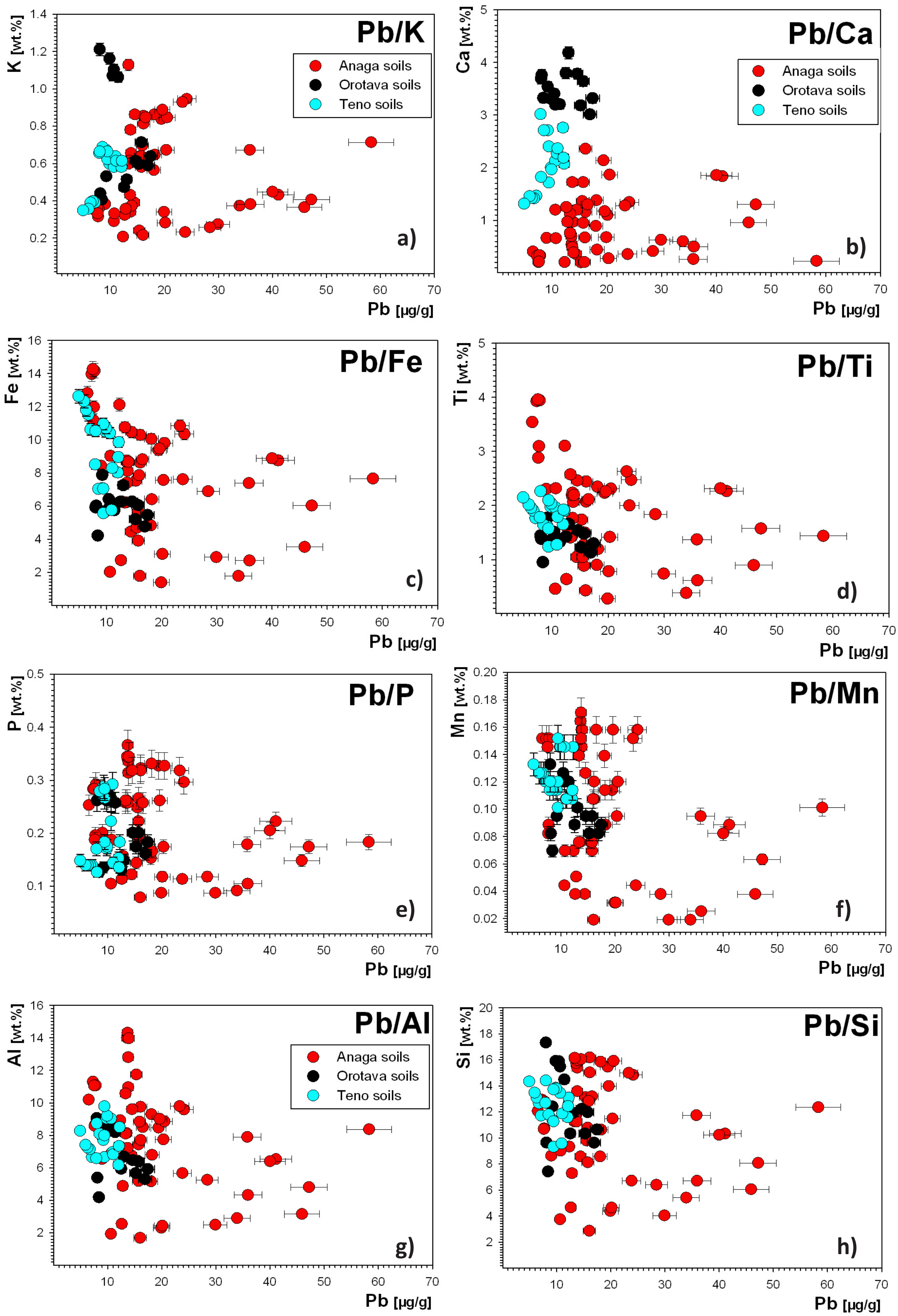


Fig.152 a) Plotted Pb/K soil ratios. b) Plotted Pb/Ca soil ratios. c) Plotted Pb/Fe soil ratios. d) Plotted Pb/Ti soil ratios. e) Plotted Pb/P soil ratios. f) Plotted Pb/Mn soil ratios. g) Plotted Pb/Al soil ratios. h) Plotted Pb/Si soil ratios. It seems that several linear trends occur for the Anaga profiles. However, the plotted ratios belong to different sampling sites and it is therefore only an optical effect.

6.3.3 Vegetation samples, washed leaves vs. unwashed leaves

The highest Pb levels are determined for the roots A1a, A1b, A8 and A10. The highest levels range from 1.97 ± 0.14 µg/g to 2.82 ± 0.20 µg/g. The highest Pb levels are detected in the unwashed leaves of sampling site A8 (1.20 ± 0.09 µg/g) (Fig.97 on page 93). The related washed leaves contain a much lower value (0.51 ± 0.04 µg/g). All of the remaining Anaga samples showed no significant differences between both sample types. The remaining Anaga, Orotava and Teno leaf samples range from 0.07 ± 0.00 µg/g to 0.79 ± 0.06 µg/g of Pb. Significant differences between washed and unwashed leaves are also seen at sampling site O5, O6 and O7 (Fig.98 on page 93). The Pb levels are below the detection limit of all washed Orotava leaves, which indicates clearly the presence of particles on the leaf surface. Leaves of common deciduous trees of southeast Europe contain between 0.86 µg/g and 2.60 µg/g of Pb (Tomašević & Aničic, 2010). ***Pinus canariensis*** in Tenerife contains Pb in the range of 0.286 µg/g and 0.574 µg/g, with a mean of 0.393 µg/g (Tausz et al. 2005).

6.4 Antimony (Sb)

6.4.1 Topsoil contents in comparison to reported element ranges

The laurel forests mean Sb levels vary from 0.2 ± 0.0 µg/g to 0.4 ± 0.0 µg/g, with an average of 0.3 ± 0.0 µg/g (Fig.104 on page 97). It has to be mentioned that only 8 of 17 laurel forest profiles contain Sb above the detection limit (<0.1). About 26 laurel forest soil horizons contain between 0.2 ± 0.0 µg/g and 0.6 ± 0.0 µg/g of Sb, with an average of 0.3 ± 0.0 µg/g. The Sb containing profiles are located mostly in the Anaga Mountains. Furthermore, only profiles A8 and O7 contain Sb above the detection limit within all soil horizons and the highest determined levels occur in the upper soil horizons (0 – 4 cm) of profile A8 (0.5 ± 0.0 µg/g to 0.6 ± 0.0 µg/g) (Fig.105 on page 98). The Teno soils are all below the detection limit.

In European topsoils, the median Sb content is 0.60 µg/g and the levels range from 0.02 to 31.1 µg/g (Salminen et al., 2005). Reported average soil Sb values range from 0.09 to 1.0 µg/g (Wedepohl, 1978; Kabata- Pendias 2001). Generally, unpolluted soil concentrations range from 0.3 to 8.4 µg/g (LABO, 1995, Crommentuijn et al., 1997; Kabata-Pendias, 1992). Three different background values have been used for the calculation of the geoaccumulation index (A: Mean of European topsoils 0.6 µg/g; B: lowest determined mean 0.2 µg/g; C: average of all analysed profiles 0.3 µg/g). Using background A shows that all soils are unpolluted (I_{geo} 0). Using background B shows that profile A8 and A1 are moderately polluted (I_{geo} 2) and all other profiles are unpolluted (I_{geo} 0). Using background C indicates that all profiles are unpolluted (I_{geo} 0 - 1). The comparison with the published Sb values as well as the calculated geoaccumulation index indicated no pollution, or any unusual high Sb levels.

6.4.2 Affecting geogenic interrelations of rock and soil minerals

The Sb levels of all rock samples are below the detection limit (<0.1 µg/g) and a relation to the observed soil contents is not possible. Generally, Sb can be enriched in the surface horizons due to the tendency of Sb to become sorbed to organic matter (Ure and Berrow 1983; Salminen et al., 2005). Enrichment can occur in the lower horizons as a result of strong adsorption and absorption by hydrous Fe-oxides and clay minerals (Boyle & Jonasson 1984; Salminen et al., 2005).

Plotting the soil organic carbon against Sb shows clearly that no relations exist due to increasing or decreasing SOC levels and linear trends are not recognizable (Fig.153 a). However, the normalized (**Sb/Zr**) soil depth profiles indicate clearly that enrichment occurs in the upper horizons of profile A8 and slightly at profile A10 and A1 (Fig.153 b). The remaining profiles are plotted mostly in the same range and showed no variations with increasing depth. It seems that accumulated Sb in the upper 6 soil cm of profile A8 occur without a relation the organic matter.

Generally, Sb is a low-abundance chalcophile element forming several rather rare minerals, including stibnite Sb_2S_3, valentinite Sb_2O_3 and kermesite Sb_2S_2O. Antimony is usually more present at trace levels in minerals such as ilmenite, Mg- olivine, galena, sphalerite and pyrite due to magmatic processes where Sb can substitute Fe in minerals such as olivine and ilmenite (Ure and Berrow, 1983).

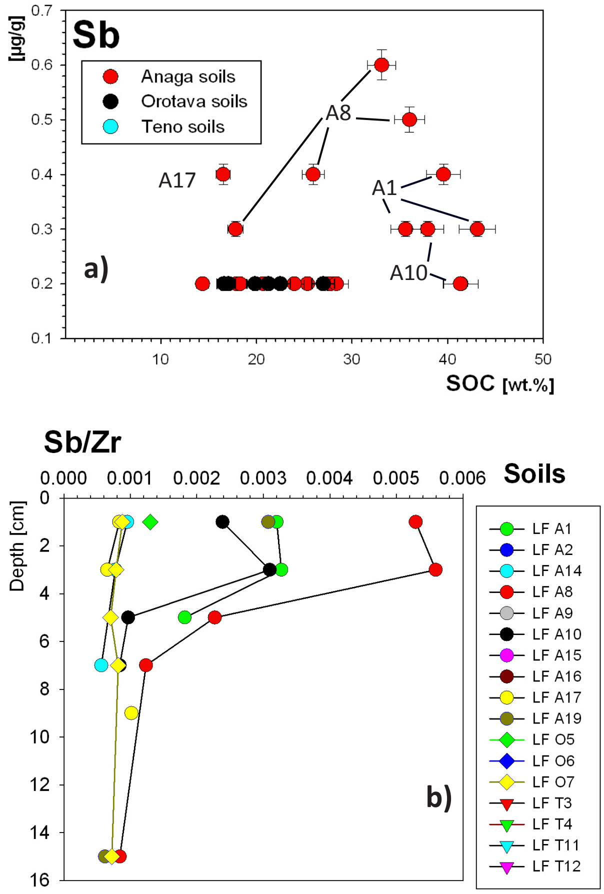


Fig.153 a) Plotted SOC/Sb soil ratios. b) Normalized soil depth profiles.

Furthermore, it has a good correlation with Pb and Hg as well a weak correlation with As, Cd, Cu and Zn (Salminen et al., 2005). The enhanced correlation with Pb, Hg, Zn, Cu and Cd in topsoils is commonly related to mineralisation and contamination processes of heavy metals (Salminen et al., 2005).

As already mentioned, only profile O7 and A8 contain Sb within all soil horizons. Profile O7 shows no variation with increasing depth and the values are always 0.2 µg/g. It makes therefore sense to plot only the results of profile A8 against the mentioned elements (Fig.154 a to g).

The various scatterplots indicated that several relations exists between Sb and Fe, Mg, Ti, Zn, Cu at profile A8 (Fig.154 a to g). Therefore, affecting geogenic relations are also possible for this location. Anthropogenic impacts are nevertheless still possible for location A8.

For example, anthropogenic Sb is associated with metalliferous mining (gold and sulphides) and metal smelting industries (Edwards et al. 1995). It is also associated with coal combustion, urban waste and car exhaust fumes and it is used in the manufacture of brake discs, lead solder, batteries, arms and tracer bullets, composite car body panels and dashboards (Reimann and de Caritat, 1998), as well as flame- proofing compounds, paints, ceramic enamels and pottery (Salminen et al., 2005). For location A8 the only obvious sources are car exhaust fumes and the emissions of brake discs.

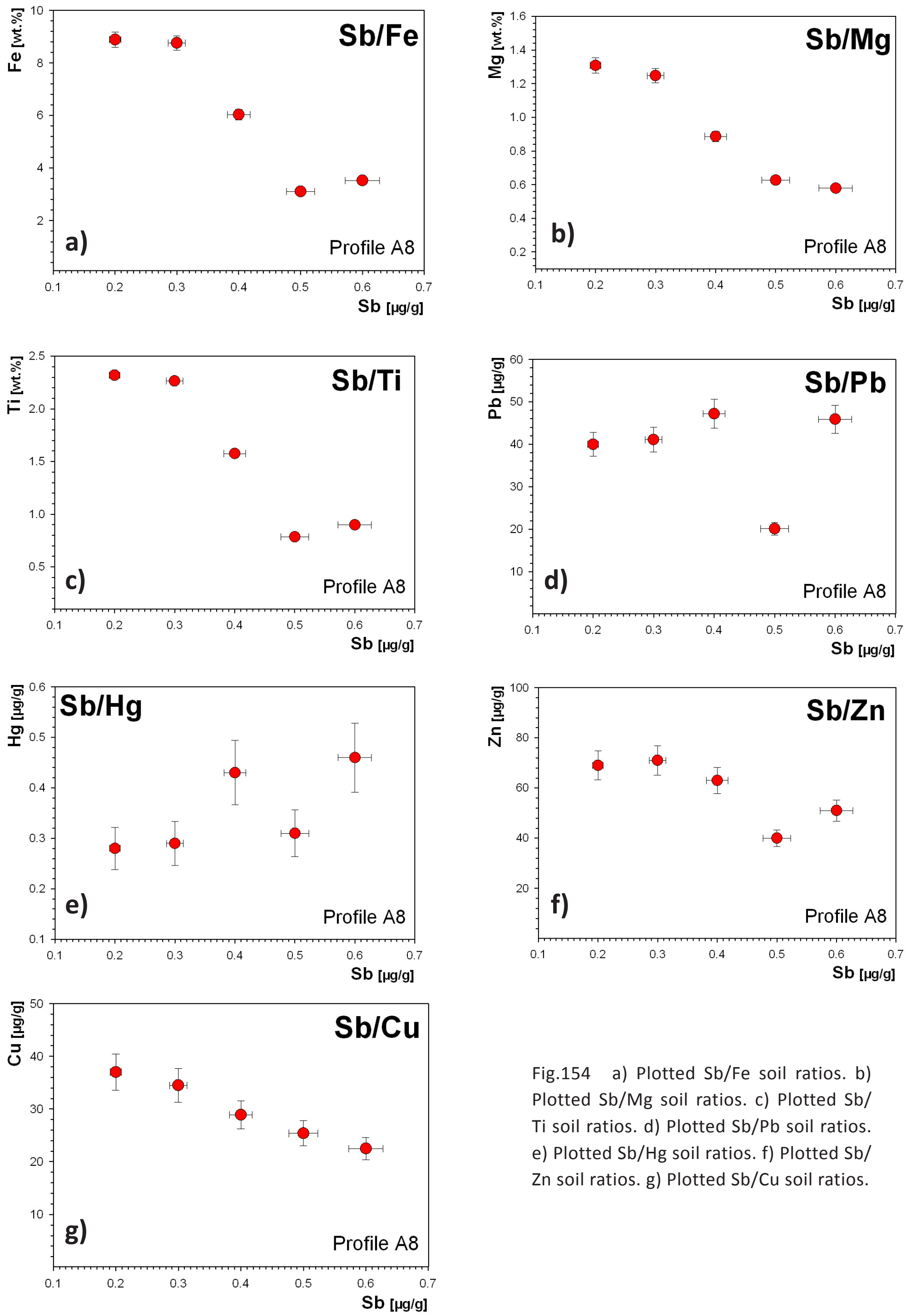


Fig.154 a) Plotted Sb/Fe soil ratios. b) Plotted Sb/Mg soil ratios. c) Plotted Sb/Ti soil ratios. d) Plotted Sb/Pb soil ratios. e) Plotted Sb/Hg soil ratios. f) Plotted Sb/Zn soil ratios. g) Plotted Sb/Cu soil ratios.

6.4.3 Vegetation samples, washed leaves vs. unwashed leaves

Generally, background Sb contents of terrestrial vascular plants range from 0.002 µg/g to 0.050 µg/g (Brooks, 1972, Bowen, 1979; Coughtrey et al., 1983). The reported Sb plant levels show a large variability (0.1 – 490 µg/g) (Kist et al., 1986; Markert, 1996). Edwards et al. (1995) reported a general Sb range of 0.02 µg/g and 0.20 µg/g in plants. Different tropical tree species contain between 0.05 µg/g and 2.20 µg/g of Sb (Aidid, 1988). The ***L. novocanariensis*** leaf samples contain between 0.05 ± 0.00 µg/g and 0.70 ± 0.03 µg/g of Sb, with an average of 0.22 ± 0.01 µg/g (Fig.106 on page 98).

The highest Sb levels are determined at sampling site A8, A9 and A10. In addition, the unwashed leaves always contain higher Sb levels than the associated washed samples. Generally, no unusual high levels are seen in the analysed samples in comparison to the reported Sb values. However, it is recognizable that the differences between unwashed and washed leaf contents are significantly higher above 0.2 µg/g than below 0.2 µg/g (Fig.107 on page 98). Above 0.2 µg/g the unwashed leaf samples contain always higher Sb levels as the corresponding washed leaves. Below 0.2 µg/g exist nearly no differences between washed and unwashed contents.

It seems that up to 0.2 µg/g of Sb are normally installed within the leaves and levels above 0.2 are affected by particles on the leaf surface. It is reported that regularly occurring dust events can distribute Sb particles over the Canary Islands and therefore possibly also over the laurel forests (Rodrıguez et al. 2009).

6.5 Summary and conclusions

Considering **Cadmium (Cd)**, the different results indicated that the Cd soil levels are present within a normal range. The highest levels were determined in the Anaga Mountains; affecting geogenic relations were not clearly established for those areas, mostly due to horizontal plotted element ratios and are therefore not generally excludable. It is nevertheless possible that various kinds of geogenic or anthropogenic air pollutants affected the soils and leaves due to the fact that Cd is extensively used in industrial processes worldwide (e.g. electroplating, paint, plastic manufacture) (Adriano, 1986; Alfani et al., 1996; Sheu et al., 1997; Maisto et al., 2004a; Salminen et al., 2005). Aerosol particles are distributed over large distances and the soil and leaf Cd concentrations can result from the integration of long-term exposure to aerial contamination (Maisto et al., 2003, 2004b). The leaves of sampling site A8 and A9 can give an important hint to anthropogenic atmospheric impacts, since they were collected in a very popular touristic part of the laurel forest called Pico del Ingles. Several hundreds of tourists visit this sightseeing spot area per month, which was obvious during the field campaigns. Also, in this area traffic is much higher than in any other parts of the Anaga Mountains; Cd particles can be found on the surface of the leaves of these touristic areas. It can thus be assumed that anthropogenic impacts affected the soil and leaf Cd levels in those areas, affecting geogenic processes however cannot be excluded in general.

Considering **Mercury (Hg)**, the area specific Hg levels are linked to different geogenic processes, which are indicated by the established results and scatterplots. The different area specific soil Hg levels are related to increasing or decreasing amounts of Fe and Zn, while the determined topsoil enrichment is clearly related to accumulation processes within the organic matter. There are no atmospheric impacts determined on the leaf surfaces. Therefore, only geogenic sources and processes affected the observed Hg levels even in popular touristic areas.

Considering **Lead (Pb)**, the different results, scatterplots and soil depth profiles indicated that Pb is associated to different elements (e.g. Ca, Fe, Ti, Mn, Al), which indicates that most of the determined topsoil levels are geogenically affected. It was not possible to determine any geogenic relation between Pb and other elements at sampling site A8, however. The leaves of sampling site A8 contained Pb particles on the leaf surface, so it can be safely assumed that anthropogenic impacts affected sampling site A8 due to the determined particles on the leaf surface and due to the fact that sampling site A8 is located in the most popular touristic area of the laurel forest. Nevertheless, anthropogenic impacts can be excluded for the remaining sampling sites due to the occurrence of Pb within the rocks and due to the relations of Pb with different elements (K, Ca, Fe, Mn, Al, Si etc.). It remains unclear why the washed leaves of the Orotava sampling sites are below the detection limit.

Considering **Antimony (Sb)**, the different results lead to the assumption that anthropogenic or geogenic atmospheric impacts affected most of the observed area-specific Sb features. For example, affecting geogenic processes of occurring soil or rock minerals were excluded due to the fact that all rocks contain Sb below the detection limit and relations between Sb and SOC, Fe, Mg, Ti, Pb, Hg, Zn, Cu, and Cd are not indicated by the plotted ratios. In addition, all leaf samples contain Sb and they have therefore received Sb either from geogenic or anthropogenic sources. Possible geogenic sources are for example dust particles (Rodrıguez et al. 2009). The only exception is seen for profile A8. It seems that geogenic relations exist between Sb, Cu, Fe, Mg and Ti, which have possibly affected the topsoil of profile A8. There is also a clear enrichment recognizable within the upper soil horizon of profile A8. However, it is an interesting fact that the leaves of profile A8 contain the highest determined levels and clear differences exist between washed and unwashed samples. As already mentioned, profile A8 is located in the most popular touristic Anaga area called Pico del Ingles. It can thus be inferred that geogenic processes and anthropogenic impacts affected the leaves and soils of this area due to the facts mentioned above. For the remaining and Sb containing soils and leaves it is not possible to clearly determine whether geogenic of anthropogenic impacts affected the observed concentrations.

7. Plant essential nutrients

The upcoming discussion focuses particularly on the plant essential nutrient contents of the examined *L. novocanariensis* leaves and soils, including laurel forest and fallow agricultural samples (**K, P, Ca, Mg, S, Fe, Mn, Zn, Cu, Mo, Ni**). When looking at the determined element contents, big differences and variations are recognizable between the 26 sampling sites, including laurel forest and fallow agricultural areas. The comparison of the results indicates that the element contents are heterogeneously distributed within each sampling site and sampling area. According to the established facts of section 4 and 5, various area-specific geogenic conditions exist which clearly have affected the element contents, such as different occurring soil minerals, varying degrees of rock alteration, soil dilution effects or distinct geogenic fingerprints. *L. novocanariensis*, however, grows and flourishes entirely unimpressed by the various affecting processes, which is the main fact uniting all 26 sampling sites.

The **first objective** thus consists in the question whether the determined leaf and soil nutrient contents are considered normal and as sufficient for the plants. All results are therefore compared with reported nutrient levels in order to investigate sufficient, insufficient or even excessive nutrient contents. To discuss the results in a realistic view, the reported nutrient ranges have to be suitable and considered as normal. The **second objective** consists in the fact that the laurel forest vegetation has once covered the nine fallow agricultural sampling sites.

The area-specific trends and features of the examined fallow agricultural areas thus have to be pointed out, including affecting geogenic relations or fertilizer residues as well as the element distribution within the upper soil horizons. The determined nutrient ranges and the highlighted differences should provide fundamental insight, which is possibly useful when the examined fallow agricultural areas are chosen for a renaturation program in the upcoming future.

It has to be mentioned that the determined soil levels exclusively reflect the in long-term available nutrient amounts and not the immediately available amounts of nutrients as well the “locked-up” or stored nutrients. For this purpose, it is necessary to determine the element concentrations with separate extractions of water and ethylene-diaminetetraacetic acid (EDTA) (Mora et al., 2012).

7.1 Reported nutrient contents of soils and plants

To achieve the main objectives it is inevitable to use only those reported nutrient levels for the comparisons in section 7.2, which are related and suitable to the examined sample types. Since the determined results and the reported data ranges are very comprehensive, it is important to keep the information volume as compact as possible. Therefore, the most important studies are described in the following sections, in order to reduce the size of chapter 7.2. Furthermore, detailed information is additionally described in the appendix, concerning various reported geochemical compositions (11.2 on page 190).

Element compositions of various soil types: Several geochemical results are reported according to Martínez-Cortizas et al. (2007). The study determined the geochemical composition of 20 volcanic topsoils (0 – 20 cm) from Europe, including three typical volcanic forest soils from Tenerife, which are reported together with Tejedor et al. (2007). For example, the first Tenerife profile is located in the Fayal-Brezal near the city Tacoronte, which lies between the Orotava valley and the Anaga Mountains. The second profile is located in the laurel forest near Las Mercedes in the area of the sampling sites A17, A19, A29 and A30 (Anaga Mountains). The third profile is located on the southern slope within the Pine forest near the village Guia de Isora. In addition, a recent major study analysed and interpreted the geochemical composition of 60 volcanic soil horizons (0 – 2 cm) in the laurel forest of La Gomera (Mora et al., 2012). Furthermore, Piqué et al. (1996) analysed the micronutrient contents of agricultural soils (0 – 25 cm) from 5 organic farms in Tenerife. However, several other studies are mentioned within section 7.2, considering either volcanic soils or agricultural soils.

Nutrient compositions of various plant species: Several geochemical studies are mentioned dealing either with the laurel forest vegetation or with tropical and subtropical tree species as well with common European deciduous trees. For example, Mora et al. (2012) analysed the geochemical composition of the phytomass (leaves, twigs) several plant species from the laurel forest in La Gomera, including the species Ilex canariensis, Viburnum rigidum and ***L. novocanariensis***. In addition, Köhl et al. (1996) analysed the geochemical composition of ***L. novocanariensis*** leaves from 5 trees in Tenerife. Tausz et al. (2005) analysed the geochemical composition of 55 Pinus canariensis trees in Tenerife. Furthermore, Drechsel & Zech (1991) analysed the geochemical composition of 40 broad-leaved tropical and subtropical tree species, as well as the nutrient ranges for occurring deficiency symptoms. In addition, several other studies are mentioned, dealing with the geochemical compositions of various suitable plant species.

7.1.1 Functions and deficiency symptoms of plant essential nutrients

Plants require 17 essential elements for their growth and development, including 3 non-mineral nutrients (C, H, O) and 14 mineral nutrients (N, P, K, Ca, Mg, S, Fe, Zn, Mn, Cu, B, Mo, Cl, Ni) (Brown et al. 1987; Uchida, 2000; Frey & Lösch, 2010). Plants receive C, H and O from the atmosphere and the soil water, instead of the remaining 14 essential elements, which are supplied either from soil minerals and soil organic matter or by organic or inorganic fertilizers (Uchida, 2000; Havlin et al., 2005). However, light, heat, and water must be sufficiently supplied to utilize these nutrients efficiently, not to forget the soil pH, which plays an important role in respect of making nutrients available to plants (Uchida, 2000; Frey & Lösch, 2010). The optimum nutrient range as well the minimum requirement differs from one plant species to another plant species (Uchida, 2000; Frey & Lösch, 2010). Nevertheless, all plants start to show nutrient deficiency symptoms if the nutrient levels are below the minimum requirement level (Uchida, 2000). Excessive nutrient uptake can also cause a reduced growth due to possibly reached toxicity levels (Uchida, 2000). Detailed information about functions and deficiency symptoms are described at 12.1 on page 197.

7.2 Leaf and soil results versus reported nutrient ranges

Potassium (K)

For plants, the reported K levels range from 1.28 wt.% to 3.16 wt.% for ***L. novocanariensis*** leaves and from 0.31 wt.% to 2.60 wt.% for tropical and subtropical trees, with occurring deficiency symptoms between 0.10 wt.% and 0.57 wt.% (Köhl et al. 1996; Drechsel & Zech, 1991). The results of the 60 leaf samples range from 0.45 ± 0.01 wt.% to 1.33 ± 0.04 wt.%. An average of 0.77 ± 0.02 wt.% is calculated for laurel forest and fallow agricultural samples. The comparison indicates that the results are in the normal range of tropical-subtropical trees and mostly below the range of ***L. novocanariensis*** leaves.

For volcanic topsoils, the reported mean K levels range from 0.66 wt.% to 5.41 wt.% (average 2.50 wt.%) for Europe and from 1.88 wt.% to 2.98 wt.% (average 2.47 wt.%) for Tenerife (Martínez-Cortizas et al., 2007; Tejedor et al., 2007). Unfertilized agricultural soils contain between 0.5 wt.% and 2.5 wt.% of K (Havlin et al., 2005). The 26 mean soil results range from 0.24 ± 0.01 wt.% to 1.87 ± 0.05 wt.%, with average values of 0.57 ± 0.02 wt.% (17 LF profiles) and 0.79 ± 0.02 wt.% (9 AGR profiles). The comparison indicates that the results are in the normal range of volcanic topsoils at 6 laurel forest and 6 agricultural profiles. However, 11 laurel forest profiles (A1, A2, A8, A9, A10, A14, A19, O5, O7, T3, T4) and 3 agricultural profiles (A29, A30, T27) contain mean K levels below the reported minimum level of 0.66 wt.%. Generally, low K levels are not unusual for humid soils due to distinct leaching and soil degradation processes (Havlin et al., 2005; Cardoso & Kuyper, 2006).

Phosphor (P)

For tropical and subtropical trees, the reported P levels range from 0.08 wt.% to 0.32 wt.%, with occurring deficiency symptoms between 0.03 wt.% and 0.11 wt.% (Drechsel & Zech, 1991). Generally, sufficient amounts range from 0.1 wt.% to 0.5 wt.% (Havlin et al., 2005). The results of the 60 leaf samples range from 0.072 ± 0.006 wt.% to 0.205 ± 0.016 wt.%, with average values of 0.129 ± 0.010 wt.% (42 LF samples) and 0.123 ± 0.010 wt.% (18 AGR samples). The comparison indicates that the results are in the normal range of tropical-subtropical trees. The reported fact of high P levels causing Zn deficiencies is not determined by the P/Zn scatterplot within plants (McCauley et al., 2003).

For volcanic topsoils, the reported mean P levels range from 0.03 wt.% to 1.88 wt.% (average 0.44 wt.%) for Europe, from 0.22 wt.% to 1.88 wt.% (average 0.84 wt.%) for Tenerife, and 0.23 wt.% for a typical laurel forest (Martínez-Cortizas et al., 2007; Tejedor et al., 2007). The 26 mean P levels range from 0.08 ± 0.01 wt.% to 0.34 ± 0.03 wt.%, with average values of 0.21 ± 0.02 wt.% (17 LF profiles) and 0.22 ± 0.02 wt.% (9 AGR profiles). All results are in the range of volcanic topsoils.

Calcium (Ca)

For plants, the reported Ca levels range from 0.079 wt.% to 0.550 wt.% for ***L. novocanariensis*** leaves and from 0.25 wt.% to 2.67 wt.% for tropical and subtropical trees, with occurring deficiency symptoms between 0.16 wt.% and 0.51 wt.% (Köhl et al., 1996; Drechsel & Zech, 1991). Considered as sufficient are amounts from 0.05 wt.% to 0.5 wt.% (Epstein, 1965; Frey & Lösch, 2010). The results of the 60 leaf samples range from 0.21 ± 0.01 wt.% to 1.03 ± 0.03 wt.%, with average values of 0.46 ± 0.01 wt.% (42 LF samples) and 0.68 ± 0.02 wt.% (18 AGR samples). Deficiency symptoms such as necrotic leaf margins or curled leaves are not determined (Simon, 1978). The comparison indicates that all results are in the normal range of tropical-subtropical trees and in the range of ***L. novocanariensis*** leaves.

For volcanic topsoils, the reported mean Ca levels range from 0.33 wt.% to 8.54 wt.% (average 2.37 wt.%) for Europe, from 0.33 wt.% to 8.16 wt.% for Tenerife, and 0.33 wt.% for a typical laurel forest (Martínez-Cortizas et al., 2007; Tejedor et al., 2007). The 26 mean Ca levels range from 0.39 ± 0.01 wt.% to 4.59 ± 0.12 wt.%, with average levels of 1.62 ± 0.04 wt.% (17 LF profiles) and 3.11 ± 0.08 wt.% (9 AGR profiles). The comparison indicates that all results are in the range of volcanic topsoils.

Magnesium (Mg)

For plants, the reported Mg levels range from 0.025 wt.% to 0.170 wt.% for ***L. novocanariensis*** leaves and from 0.12 wt.% to 0.94 wt.% for tropical and subtropical tress, with occurring deficiency symptoms between 0.07 wt.% and 0.13 wt.% (Köhl et al., 1996; Drechsel & Zech, 1991). A common deficiency symptom is leaf vein chlorosis (Hermans et al. 2010). The results of the 60 leaf samples range from 0.073 ± 0.003 wt.% to 0.279 ± 0.010 wt.%, with average values of 0.194 ± 0.007 wt.% (42 LF samples) and 0.148 ± 0.005 wt.% (18 AGR samples). A relation is determined between soil and leaf contents of location T3 and T12 due to affecting geogenic conditions (see 5.). The comparison indicates that all results are in the range of tropical-subtropical trees and mostly the range of ***L. novocanariensis*** leaves.

For volcanic topsoils, the reported mean Mg levels range from 0.38 wt.% to 1.80 wt.% (average 0.83 wt.%) for Europe and from 0.80 wt.% to 1.80 wt.% (average 1.19 wt.%) for Tenerife (Martínez-Cortizas et al., 2007; Tejedor et al., 2007). The 26 Mg levels range from 0.38 ± 0.01 wt.% to 4.49 ± 0.15 wt.%, with average values of 1.37 ± 0.05 wt.% (17 LF profiles) and 2.14 ± 0.17 wt.% (9 AGR profiles). The results are in the range of volcanic topsoils, with exception of profile T3, T4, T11, T12, O31, T23 and T26 (> 1.80 wt.%).

Total Sulphur (S_{tot})

For tropical and subtropical trees, the reported S_{tot} levels range from 0.09 wt.% to 0.86 wt.%, with occurring deficiency symptoms between 0.03 wt.% and 0.05 wt.% (Drechsel & Zech, 1991). Considered as sufficient are amounts from 0.1 wt.% to 1.0 wt.% (Epstein, 1965; Frey & Lösch, 2010). The results of the 60 leaf samples range from 0.07 ± 0.01 wt.% to 0.23 ± 0.02 wt.%, with average values of 0.16 ± 0.01 wt.% (42 LF samples) and 0.12 ± 0.01 wt.% (18 AGR samples).

The comparison indicates that all results are in the range of tropical-subtropical trees, with exception of sample A29 and T25 (<0.09 wt.%). Deficiency symptoms are not determined (e.g. leaf chlorosis Uchida, 2000).

For topsoils of humid regions, the reported S_{tot} levels range from 0.01 wt.% to 0.07 wt.% for Europe, from 0.040 ± 0.001 wt.% to 0.135 ± 0.004 wt.% for South America and from 0.113 ± 0.004 wt.% to 0.168 ± 0.038 wt.% for agricultural South American soils (Scheffer & Schachtschabel, 2010; Aguilera et al. 2000; Bowen, 1979). International standards for agricultural soils range from 0.006 wt.% to 0.06 wt.% (average 0.03 wt.%) (Tabatabai & Bremner, 1972; Tabatabai, 1982). Values of 0.17 wt.% to 0.20 wt.% are reported for surface soils under conifer and hardwood forest (David et al., 1982). The 26 mean S_{tot} levels range from 0.03 ± 0.00 wt.% to 0.13 ± 0.01 wt.%, with average values of 0.06 ± 0.00 wt.% (17 LF profiles) and 0.05 ± 0.00 wt.% (9 AGR profiles). The results are in the normal ranges of humid topsoils.

Iron (Fe)

For plants, the reported Fe levels range from 0.064 wt.% to 0.084 wt.% for ***L. novocanariensis*** leaves and from 0.0027 wt.% to 0.1310 wt.% for tropical and subtropical tress (Köhl et al., 1996; Drechsel & Zech, 1991). The results of the 60 leaf samples range from 0.003 ± 0.000 wt.% to 0.051 ± 0.002 wt.%, with average values of 0.007 ± 0.000 wt.% (42 LF samples) and 0.009 ± 0.000 wt.% (18 AGR samples). The comparison indicates that the results are below the range of ***L. novocanariensis*** leaves (<0.064 wt.%) and in the range of tropical-subtropical trees.

For volcanic topsoils, the reported mean Fe levels range from 1.67 wt.% to 12.41 wt.% (average 5.37 wt.%) for Europe, from 6.17 wt.% to 12.41 wt.% (average 8.91 wt.%) for Tenerife and from 2.05 ± 0.48 wt.% to 3.13 ± 0.58 wt.% for La Gomera (Martínez-Cortizas et al., 2007; Tejedor et al., 2007; Mora et al., 2012). Agricultural topsoils contain between 0.03 wt.% and 0.09 wt.% of Fe (Piqué et al., 1996). The 26 mean Fe levels range from 3.57 ± 0.11 wt.% to 12.95 ± 0.42 wt.%, with average values of 7.74 ± 0.25 wt.% (17 LF profiles) and 9.53 ± 0.31 wt.% (9 AGR profiles). The results are in the range of volcanic topsoils. Only the Fe contents of profile A9, T3 and A30 are slightly above the reported range (> 12.41 wt.%).

Manganese (Mn)

For plants, the reported Mn levels range from 47 µg/g to 66 µg/g for ***L. novocanariensis*** leaves, from 25 µg/g to 880 µg/g for tropical and subtropical tress, with occurring deficiency symptoms between 9 µg/g and 16 µg/g (Köhl et al., 1996; Drechsel & Zech, 1991). A mean of 143 ± 28 µg/g is reported for the laurel forest phytomass (Mora et al., 2012). The results of the 60 leaf samples range from 23 ± 1 µg/g to 698 ± 44 µg/g, with average values of 173 ± 11 µg/g (42 LF samples) and 84 ± 5 µg/g. (18 AGR samples). Deficiency symptoms, such as interveinal chlorosis, are not determined (Uchida, 2000). The comparison indicates that all results are in the normal range of tropical and subtropical trees and mostly above the reported range of ***L. novocanariensis*** leaves (> 66 µg/g).

For volcanic topsoils, the reported mean Mn levels range from 0.04 wt.% to 1.00 wt.% for Europe, from 0.19 wt.% to 0.26 wt.% (average 0.21 wt.%) for Tenerife and from 0.046 ± 0.004 wt.% to 0.062 ± 0.013 wt.% for La Gomera (Martínez-Cortizas et al., 2007; Tejedor et al., 2007; Mora et al., 2012). The 26 mean Mn levels range from 0.04 ± 0.00 wt.% to 0.23 ± 0.01 wt.%, with average values of 0.10 ± 0.01 wt.% (17 LF profiles) and 0.16 ± 0.01 wt.% (9 AGR profiles). All results are in the normal range of volcanic topsoils.

Zinc (Zn)

For tropical and subtropical trees, the reported levels range from 10 µg/g to 101 µg/g, with occurring deficiency symptoms between 3 µg/g and 13 µg/g (Drechsel & Zech, 1991). A mean of 23.1 ± 3.0 µg/g is reported for the laurel forest phytomass (Mora et al., 2012). The results of the 60 leaf samples range from 8.2 ± 0.7 µg/g to 112.8 ± 9.4 µg/g, with average values of 31.7 ± 2.6 µg/g (42 LF samples) and 22.4 ± 1.9 µg/g (18 AGR samples). Significant variations exist between the associated washed and unwashed leaf levels of location A10 (nwsh = 112.8 ± 9.4 µg/g / wsh= 86.0 ± 7.2 µg/g). The comparison indicates that the results are in normal range of tropical-subtropical trees, with exception of A10.

For volcanic topsoils, the reported mean Zn levels range from 50.0 µg/g to 185.2 µg/g for Europe, from 141.0 µg/g to 160.0 µg/g (average 155.0 µg/g) for Tenerife and from 47 ± 7 µg/g to 49 ± 8 µg/g for La Gomera (Martínez-Cortizas et al., 2007; Tejedor et al., 2007; Mora et al., 2012). Agricultural topsoils contain between 1.1 µg/g and 21.5 µg/g of Zn (Piqué et al., 1996). The 26 mean Zn levels range from 47 ± 4 µg/g to 113 ± 9 µg/g, with average values of 78 ± 6 µg/g (17 LF profiles) and 79 ± 7 µg/g (9 AGR profiles). The comparison indicates that all results are in the normal range of volcanic topsoil.

Copper (Cu)

For tropical and subtropical trees, the reported Cu levels range from 4 µg/g to 49 µg/g, with occurring deficiency symptoms between 2 µg/g and 5 µg/g (Drechsel & Zech, 1991). The results of the 60 leaf samples range from 3.24 ± 0.30 µg/g to 8.33 ± 0.77 µg/g, with average values of 5.39 ± 0.50 µg/g (42 LF samples) and 5.36 ± 0.50 µg/g (18 AGR samples). Common deficiency symptoms, such as light-green leaves or unrolled younger leaves are not determined (Uchida, 2000). The comparison indicates that the results are in the normal range of tropical-subtropical trees.

For volcanic topsoils, the reported mean Zn levels range from 11.1 µg/g to 79.0 µg/g for Europe and from 20.0 µg/g to 79.0 µg/g (average 45.2 µg/g) for Tenerife (Martínez-Cortizas et al., 2007; Tejedor et al., 2007). Agricultural topsoils contain between 3.7 µg/g and 11.9 µg/g of Cu (Piqué et al., 1996). The 26 mean Cu levels range from 5.2 ± 0.5 µg/g to 87.1 ± 8.1 µg/g, with average values of 38.8 ± 3.6 µg/g (17 LF profiles) and 41.6 ± 3.9 µg/g (9 AGR profiles). The comparison indicates that the results are in the normal range of volcanic topsoil, with exception of the highest Teno levels, which are affected due to typical geogenic conditions (see 5.4.4 on page 125).

Molybdenum (Mo)

For plants, the reported Mo levels range from 0.035 µg/g to 0.153 µg/g for Pinus canariensis trees (average 0.091 µg/g) and from 0.05 µg/g to 1.00 µg/g for tropical and subtropical trees, with occurring deficiency symptoms below 0.03 µg/g (Tausz et al., 2005; Drechsel & Zech, 1991). The results of the 60 leaf samples range from 0.03 ± 0.00 µg/g to 0.62 ± 0.04 µg/g, with average values of 0.12 ± 0.01 µg/g (42 LF samples) and 0.31 ± 0.02 µg/g (18 AGR samples). The comparison indicates that the results are in the normal range of Pinus canariensis trees and tropical-subtropical trees.

For tropical Asian volcanic soils, the reported Mo levels range from 2.3 µg/g to 3.3 µg/g (average 2.9 µg/g) and from 0.74 ± 0.25 µg/g to 2.13 ± 0.70 µg/g (Domingo & Kyuma, 1983; Takahashi, 1972). Common European and North American soils contain Mo between 0.2 µg/g to 5.0 µg/g (Taber, 2009; Havlin, 2005; Chester, 1990; Bowen, 1979). The 26 mean Mo levels range from 0.4 ± 0.0 µg/g to 1.4 ± 0.1 µg/g , with average values of 0.8 ± 0.1 µg/g (17 LF profiles) and 0.7 ± 0.0 µg/g (9 AGR profiles). The results are generally in the range of European and North American soils. However, the results are quite low.

Nickel (Ni)

A mean of 2.18 µg/g is reported for the laurel forest phytomass (Mora et al., 2012). Leaves of common deciduous trees of southeast Europe contain between 0.65 µg/g and 1.06 µg/g of Ni (Tomašević & Aničic, 2010). Generally, plants contain very low amounts of Ni, such as flowering plants like Stellaria graminea (2 µg/g) or common corn plants (0.4 µg/g) (Salpeteur et al. 2006). The results of the 60 leaf samples range from 0.2 ± 0.0 µg/g to 2.9 ± 0.3 µg/g, with average values of 0.7 ± 0.1 µg/g (42 LF samples) and 0.7 ± 0.1 µg/g (18 AGR samples). A common deficiency symptom, such as leaf necrosis is not determined (Brown, 2006). The comparison indicates that most of the results are in the reported normal ranges. Only a few samples contain very low Ni amounts (<0.6 µg/g).

For volcanic topsoils, the reported mean Ni levels range from 1.0 µg/g to 173.9 µg/g for Europe, from 9.2 µg/g to 173.9 µg/g (average 65.1 µg/g) for Tenerife and from 29 ± 7 µg/g to 39 ± 13 µg/g for La Gomera (Martínez-Cortizas et al., 2007; Tejedor et al., 2007; Mora et al., 2012). The 26 mean Ni levels range from 10.4 ± 1.2 µg/g to 286.4 ± 33.7 µg/g, with average values of 56.0 ± 6.6 µg/g (17 LF profiles) and 53.3 ± 6.3 µg/g (9 AGR profiles). The comparison indicates that all results are in the normal range of volcanic topsoils, with exception of profile T3, T4 and T12, which are affected by typical geogenic trends.

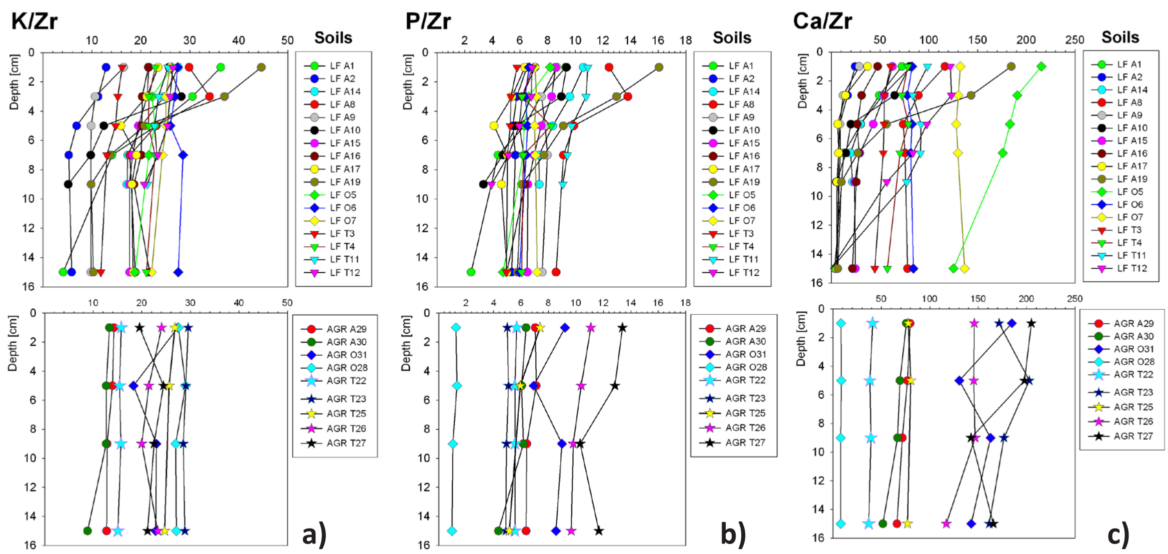
7.3 Differences within the nutrient distribution

The results of section 5.1 on page 111 indicated that several elements are diluted due to increasing amounts of organic materials. It is therefore necessary to use the normalized and dilution free nutrient levels in order to discuss in a realistic view the element variations within the upper soil horizons. When it comes to the normalized macro-, and micronutrient levels, distinct differences can be recognized within the soil depth profiles of the 17 laurel forest profiles and the 9 fallow agricultural profiles in terms of heterogeneously or homogenously distributed nutrient contents.

For example, each laurel forest profile contains heterogeneously distributed P, Ca, S, Fe, Mn, Zn and Mo levels, and the plotted normalized levels (e.g. Fe/Zr) show clear variations with increasing depth. All K/Zr levels are homogenously distributed and only a few profiles consist of varying Cu/Zr and Ni/Zr levels (Fig.155 a to j). Significant nutrient variations could not be established within the 9 fallow agricultural topsoils, neither by the plotted total levels nor by the plotted normalized levels. The nutrients are more or less homogenously distributed within the upper soil horizons and only a few sampling sites show slight variations with increasing depth, such as profile O31, T23, T26 and T27 (Fig.155 a to j).

The different normalized soil depth profiles indicate that former ploughing possibly still affect the fallow agricultural soils. Slightly varying **K/Zr** and **Mo/Zr** levels are recognizable only at profile O31, for example. The remaining profiles contain more or less homogenously distributed K and Mo levels, the **P/Zr** levels of profile T27 and O31 show slight variations within the upper soil horizons.

It seems that the Ca levels are slightly enriched in the upper 10 cm of profile T23, T26, T27, and O31 due to increasing and varying **Ca/Zr** levels. The remaining profiles showed no enrichment of Ca, recognizable **Mg/Zr** variations exist only in the profiles O31, T23 and T26. The **Mn/Zr** and **Zn/Zr** levels show slight variations only at profile A30. Furthermore, the **Cu/Zr** levels show slight variations only at profile T26 and slight **Ni/Zr** variations are recognizable only at profile T27.



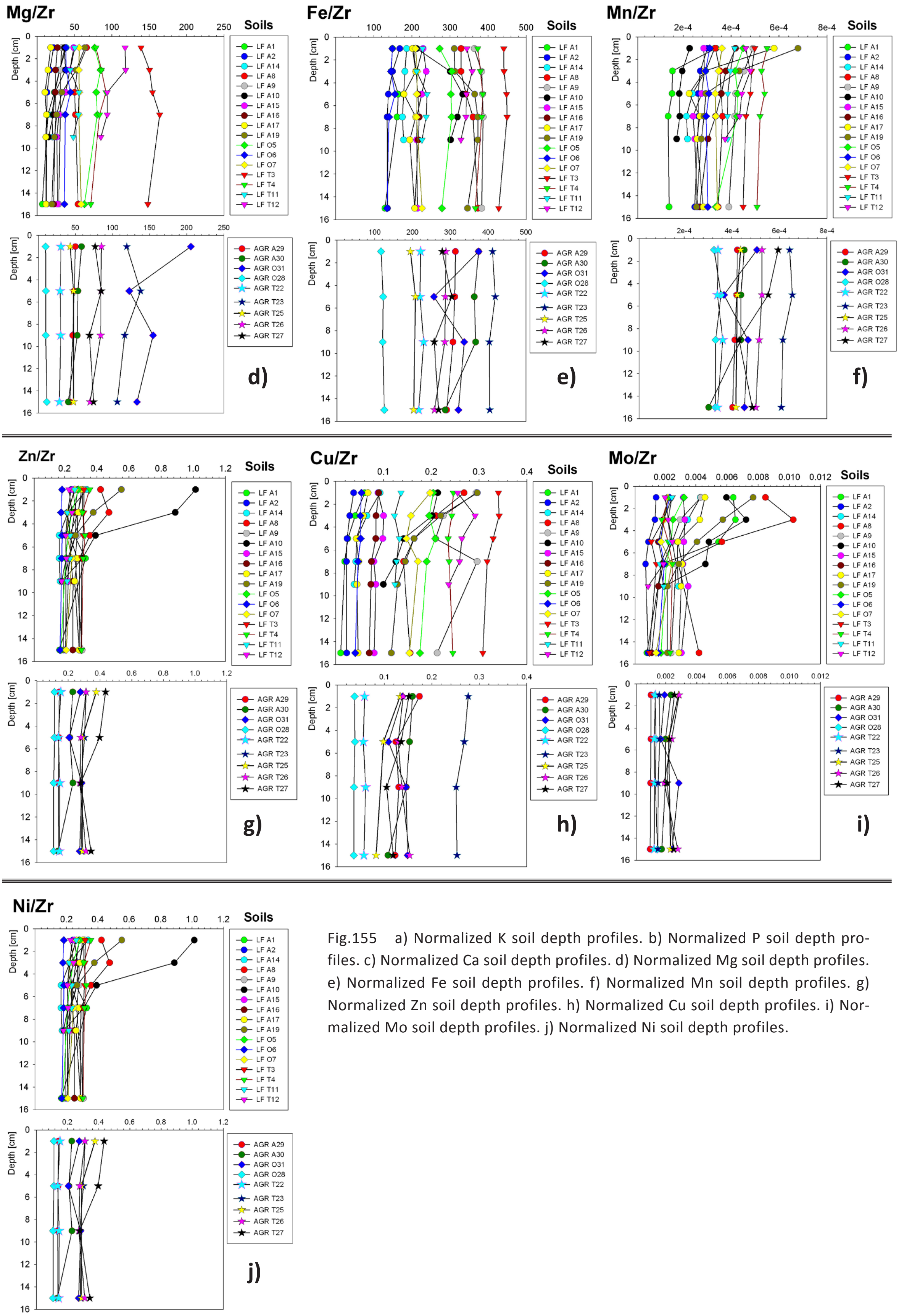


Fig.155 a) Normalized K soil depth profiles. b) Normalized P soil depth profiles. c) Normalized Ca soil depth profiles. d) Normalized Mg soil depth profiles. e) Normalized Fe soil depth profiles. f) Normalized Mn soil depth profiles. g) Normalized Zn soil depth profiles. h) Normalized Cu soil depth profiles. i) Normalized Mo soil depth profiles. j) Normalized Ni soil depth profiles.

7.4 Area-specific differences within agricultural topsoils

Most of the determined fallow agricultural nutrient levels are within the range of the laurel forest results, such as the P, S, Zn, Cu, Mo and Ni levels. However, several profiles contain clearly higher K, Ca, Mg, Fe and Mn levels than the examined laurel forest topsoils. Clear differences also exist even within each fallow agricultural sampling site. The higher amounts as well as the area specific differences are possibly affected either by typical geogenic trends, such as within the laurel forest soils, or by occurring fertilizer residues.

For example, profile O28 contains the highest mean K and Mn levels as well as the highest Si and Zr levels of all 26 examined soil profiles, as well as the lowest determined P levels of all soil profiles (see 3 on page 42). First of all, enrichment is not detectable within the soil depth profile O28, neither by the Mn/Zr levels nor the K/Zr levels (Fig.155 a and f).

Considering the lowest determined P levels as well as the observed facts, the possibility of affecting fertiliser residues can be excluded. This leads us to the assumption that distinct soil minerals, containing K, Mn, Si and Zr, affect the determined element levels of profile O28, such as within the laurel forest soils (see. 5).

However, between K, Mn, Si and Zr there are no geogenic interrelations recognizable due to the plotted element ratios (**Mn/K, Mn/Si, Mn/Zr, K/Si, K/Al**), neither for profile O28 nor for the remaining fallow agricultural profiles (Fig.156 a to e). Nevertheless, excluding the occurrence of affecting soil minerals is not possible either, due to the plotted and closely adjusted element ratios, which reflects the influences of former ploughing and homogenising processes.

As already mentioned, the Ca, Mg and Fe levels show also clear area-specific differences, which are possibly related to occurring geogenic interrelations. It is recognizable that the highest determined mean Ca levels (>4.00 wt.%) occur at profile O31, T23, T26 and T27, which are clearly above the range of the laurel forest soil levels (Fig.27 on page 51). In addition, the Mg levels of profile O31 is above the level of the laurel forest soils and even profile T23 and T26 contain similar levels as the laurel forest Teno soils. The mean Fe amounts of profile A29 and A30 are as high as those of the laurel forest soils A9 and T3, as it is. Due to distinct occurring laurel forest soil minerals, several laurel forest soils contained Ca, which is associated to Sr, Na, Al and K.

In addition, several laurel forest soils showed that Mg can be bound to Si, Mn, Fe, Cu and Ni as well as associated Fe, Ti and Zr levels (see 5 on page 110). It is therefore the best way to plot all the fallow agricultural element ratios against each other in order to determine geogenic element associations such as within the laurel forest soils.

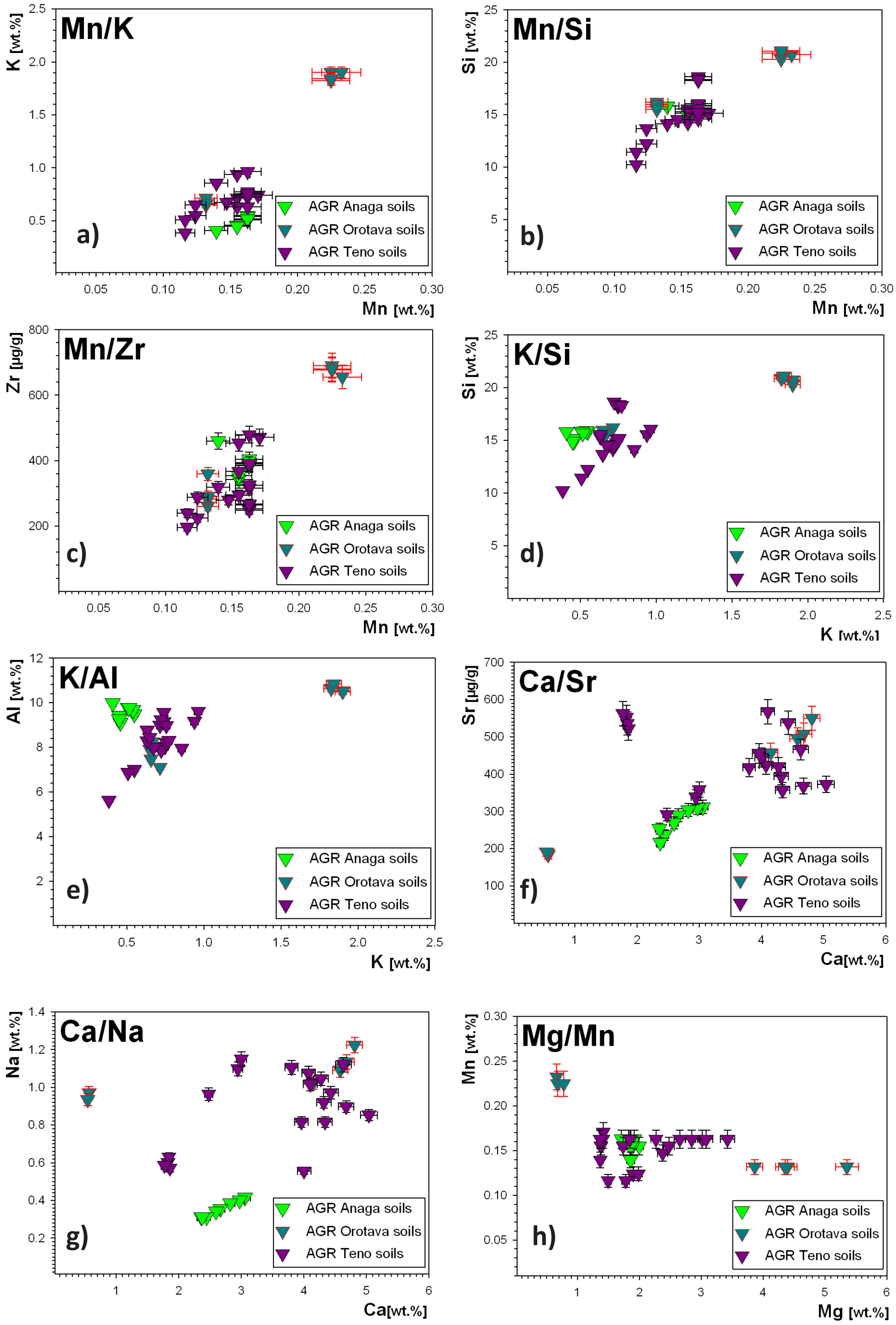
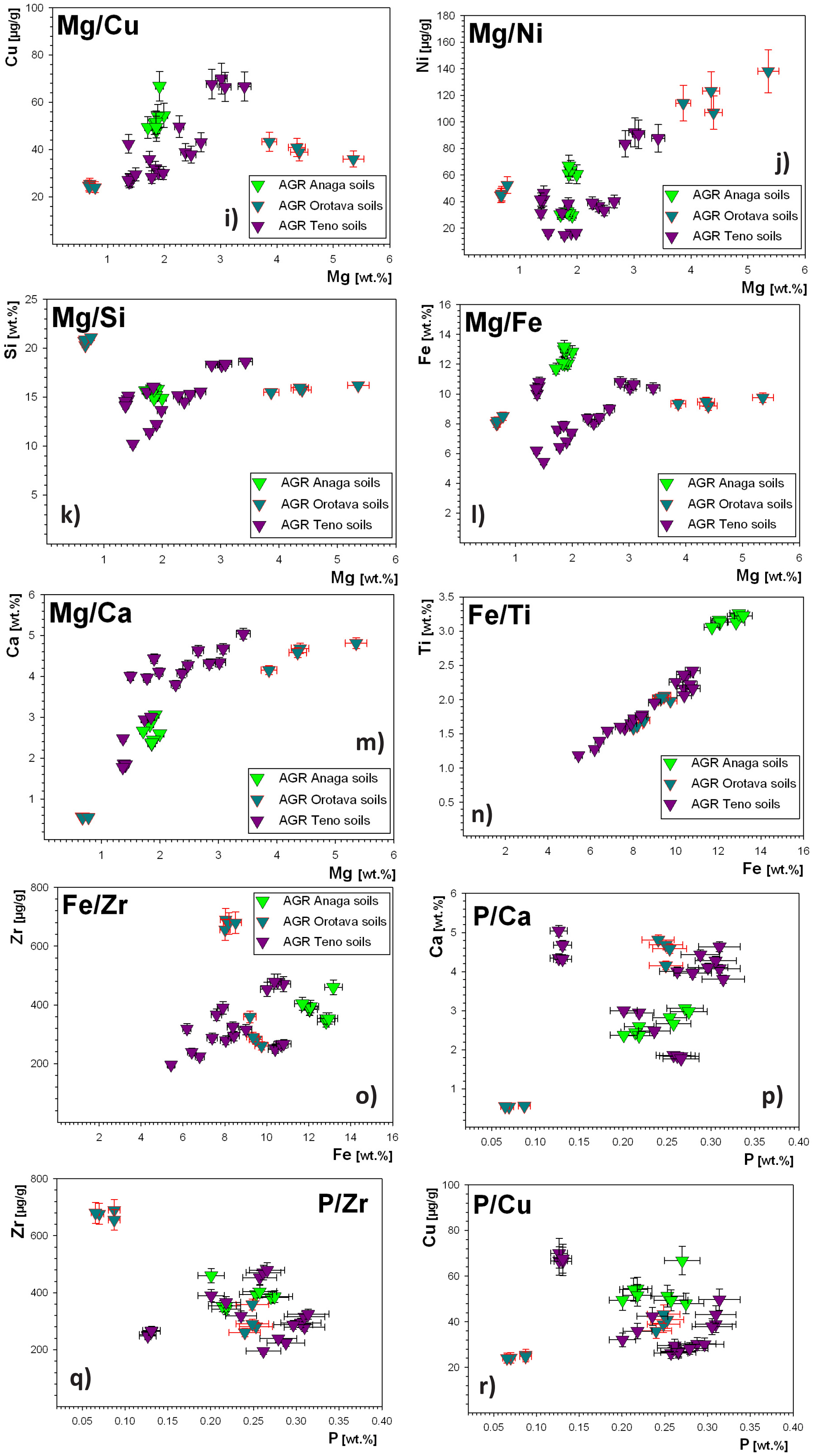


Fig.156 The various scatterplots show the plotted fallow agricultural element ratios. a) Plotted Mn/K soil ratios. b) Plotted Mn/Si soil ratios. c) Plotted Mn/Zr soil ratios. d) Plotted K/Si soil ratios. e) Plotted K/Al soil ratios. f) Plotted Ca/Sr soil ratios. g) Plotted Ca/Na soil ratios. h) Plotted Mg/Mn soil ratios.



Continuation Fig. 156 i) Plotted Mg/Cu soil ratios. j) Plotted Mg/Ni soil ratios. k) Plotted Mg/Si soil ratios. l) Plotted Mg/Fe soil ratios. m) Plotted Mg/Ca soil ratios. n) Plotted Fe/Ti soil ratios. o) Plotted Fe/Zr soil ratios. p) Plotted P/Ca soil ratios. q) Plotted P/Zr soil ratios. r) Plotted P/Cu soil ratios.

The plotted **Ca/Sr** and **Ca/Na** ratios showed positive linear trends at profile A29, A30 and O31, as well as negative trends at profile T23 and T26 (Fig.156 f, g), while none of the profiles showed a relation between K and Al. It seems that Sr and Na containing minerals influenced the Ca amounts of these agricultural soils. Furthermore, the plotted **Mg/Mn, Mg/Cu** and **Mg/Ni** ratios indicated no affecting relations between those elements, neither for profile O31, T23 and T26 nor for the remaining profiles (Fig.156 h to j), only the profiles T26 and T27 showing linear relations between Mg, Si and Fe (**Mg/Si, Mg/Fe**) (Fig.156 k, l). Recognizable relations exist due to the plotted **Mg/Ca** ratios of profile O31, T23, T26 and T27 (Fig.156 m).

Within all agricultural soils Fe and Ti are associated to each other instead of Fe and Zr, which did not display any linear trends (Fig.156 n, o). Last but not least, the fallow agricultural soil ratios (P/Ca, P/Al, P/Zn, P/Cu) showed no relations between P, Ca, Al, Zn and Cu, too. Only profile T27 shows a relation between P and Fe (Fig.156 p to r). Nevertheless, it is difficult to determine clear trends, such as within the laurel forest soils, due to the fact that most of the agricultural element ratios are plotted always closely adjusted to each other.

7.5 Conclusions

Considering the 60 ***L. novocanariensis*** leaf samples, the determined K, P, Ca, Mg and S levels are within the reported nutrient ranges of tropical and subtropical broad-leaved tree species (Drechsel & Zech, 1991), Mg and Ca levels even within the reported range for ***L. novocanariensis*** trees in Tenerife (Köhl et al. 1996). Furthermore, the determined Fe, Mn, Zn, Cu and Mo levels are within the reported nutrient ranges of tropical and subtropical broad-leaved tree species (Drechsel & Zech, 1991), the same holds true for determined Mo levels and ***P. canariensis*** trees in Tenerife (Tausz et al., 2005). Considering laurel tree species or tropical-subtropical tree species, no appropriate Ni levels have been published for the comparison with ***L. novocanariensis*** leaves so far. Most of the leaf samples contain Ni within the reported Ni range of common deciduous tree species (Tomašević & Aničic, 2010). Regularly occurring nutrient deficiency symptoms could not be observed during the field and laboratory work.

Considering the laurel forest and the fallow agricultural topsoils, the established P, Ca, Mg, Fe, Zn, Cu and Ni levels are within or even slightly above the reported nutrient ranges of European volcanic topsoils, the determined K rather below the reported minimum level of volcanic topsoils. The determined S levels were found to be within the reported range of topsoils from humid regions. Considering volcanic topsoils or humid topsoils, no appropriate Mo levels have been published for the comparison with the examined topsoils so far. Anyway, the topsoil samples contain Mo within the reported range of common European and North American soils (Taber, 2009; Havlin, 2005; Chester, 1990; Bowen, 1979). It can be generally assumed that the examined 30 ***L. novocanariensis*** trees are growing on laurel forest and fallow agricultural soils, which contain normal amounts of macro-, and micronutrients.

It showed that all agricultural soils contained P, S_{tot}, Cu, Zn, Mo and Ni amounts in the range of the laurel forest soils. The only irregularities were observed for the K, Ca, Mg, Fe and Mn levels in terms of slightly higher nutrient amounts than the examined laurel forest soils, these higher nutrient levels being caused and affected by common occurring soil minerals.

Therefore, these higher nutrient levels still can be considered as normal and sufficient for the surrounding vegetation. Considering the nutrient distribution, it is obvious that the fallow agricultural soils contain more or less homogenously distributed nutrient contents within the upper soil horizons, which is possibly due to former soil ploughing processes. Soil fertilizer residues were not determined within the examined topsoils. The results of this work unfortunately cannot be used directly for the further development of renaturation concepts. They provide fundamental information, however, which is useful if the examined fallow agricultural areas are chosen for a renaturation program in the upcoming future.

8. Final conclusions

8.1 The geochemical fingerprints of the laurel forest

The primary research aim was centred on the question, whether it is possible to distinguish the Anaga, Orotava and Teno topsoils clearly from each other due to plotted or calculated element ratios. The first aim focused also on the affecting interrelations between associated rock, soil and vegetation samples. The examined element combinations revealed that several ratios exist, which distinguish the Orotava sampling sites clearly from the Teno and Anaga sampling areas.

The Sr/Ca, Na/Ca and Na/K ratios can be considered as the geochemical fingerprints of the examined Orotava topsoils. Furthermore, the associated rock and soil ratios are plotted in the same direction, which indicates that the soil parent materials affected even the Sr/Ca, Na/Ca and Na/K ratios of the uppermost soil horizons. Furthermore, the rocks and soils affected the associated L. novocanarienis leaf samples. For example, Orotava soils and rocks contained the highest Sr, Ca and Na levels. The results revealed that the Sr leaf contents depended not only on high Sr soil levels, rather on specific Sr/Ca soil ratios. However, typical Teno or Anaga topsoil fingerprints are not determined due to several overlapping element ratios.

Nevertheless, several element combinations exist, which distinguish three of four Teno sampling sites (T3, T4, T12) clearly from the remaining areas, such as Mg/Ni and Mg/Cu. The three Teno sampling sites contained the highest rock, soil and leaf Ni contents of all sampling areas and it was clearly recognizable that the rocks and soils affected the associated vegetation samples. Furthermore, it was possible to distinguish the Anaga, Teno and Orotava topsoils from each other, due to the calculated Na-to-P ratios, which can be used as a universal geochemical fingerprint for all sampling areas. For example, the Anaga topsoil ratios range from 1:1 to 1:4.1, the Orotava ratios range from 3.8:1 to 5.9:1 and the Teno ratios range from 1.2:1 to 2.7:1. In addition, the discussions revealed that large differences existed not only between the Anaga, Orotava and Teno sampling sites, also within the same sampling area occurred large variations.

8.2 Anthropogenic impacts within the laurel forest

The second research goal treated the question, whether anthropogenic impacts affected the laurel forest topsoils and L. novocanariensis tree species. In this context it was inevitable to differentiate between anthropogenically and geogenically affected element contents.

Research revealed that geogenic processes affected the determined Pb and Hg topsoil levels. For example, both elements are bound to several elements, such as Ca, Fe, Ti, Mn, Al and Zn. In addition, clear interrelations could be established between associated rocks and topsoils and it was obvious that the organic matter accumulated Hg within the upper soil horizons. Therefore, anthropogenic Pb and Hg impacts can be excluded for most of the sampling sites. The determined Cd and Sb levels were present in normal amounts within the examined topsoils and leaves. Geogenic influences were excluded for most of the profiles due to the fact that only two rock samples contained Cd above, and all rocks contained Sb below the detection limit. Furthermore, both elements were not associated with SOC, Fe, Mg, Ti, Pb, Hg, Zn and Cu. Particles on the leaf surface were examined for most of the analysed leaves. The results and discussions lead to the assumption that the observed area specific Sb and Cd contents were caused by various kinds of anthropogenic or geogenic impacts. This, however, can only be assumed, since distinct evidences could not established. Samples from the most popular touristic area of the laurel forest (Pico del Ingles), on the other hand, always contained the highest Sb, Cd, and Pb levels. It was thus not possible to determine clearly whether the samples A9 and A10 from Pico del Ingles were geogenically or anthropogenically affected. Only the results of profile A8 indicated that geogenic processes and anthropogenic impacts affected the examined soil and leaf samples.

8.3 The plant essential nutrient contents

The third research aim focused on the question, whether the fallow agricultural and laurel forest leaf and soil nutrient contents are considered normal and sufficient for plant growth. Therefore all results were compared with reported nutrient levels in order to establish sufficient, insufficient or even excessive nutrient contents. The third research goal also focused on the area-specific trends and features of the examined fallow agricultural areas including affecting geogenic relations, fertilizer residues as well the element distribution within the upper soil horizons. As to the laurel forest and fallow agricultural areas, all examined ***L. novocanariensis*** leaf samples contained macro-, and micronutrients in the range of the reported levels. For example, the K, P, Ca, Mg, S, Fe, Mn, Zn, Cu, Mo and Ni levels were within the reported nutrient ranges of tropical and subtropical broad-leaved tree species (Drechsel & Zech, 1991). The determined Mg and Ca levels were even within the reported range for ***L. novocanariensis*** trees in Tenerife (Köhl et al. 1996). In addition, most of the laurel forest and the fallow agricultural topsoils contained macro-, and micronutrients either in the range of the various reported nutrient levels or even slightly above the reported ranges. Only the K levels were below the reported minimum level of volcanic topsoils.

Furthermore, the fallow agricultural topsoils contained P, S_{tot}, Cu, Zn, Mo and Ni in the range of the laurel forest. Irregularities were observed for the K, Ca, Mg, Fe and Mn levels, which were slightly higher within the agricultural soils due to common geogenic processes. The nutrients were more or less homogenously distributed within the fallow agricultural topsoils; fertilizer residues were not determined.

Generally speaking, the examined 30 ***L. novocanariensis*** trees are growing on soils with sufficient macro-, and micronutrient amounts. The results cannot be used directly for the further development of renaturation concepts. They provide fundamental information, however, which might be useful if the examined areas are chosen for a renaturation program in the upcoming future.

9. References

9.1 A to Z

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10. Funding and research background

The present research work is part of the research project ***Global Change and Globalization*** at the University of Heidelberg. The presented results are part of the Research Group III ***Element Cycles and Socioeconomic Dynamics – Understanding Global Processes on a Local Scale (Canary Islands)***, which includes the findings of biodiversity biologists, palaeontologists, remote sensing geographers and economists. The determination, interpretation and understanding of interacting geochemical, biological and socio-economic dynamics and processes are the main research aims of Group III. Detailed information can be found under the following link: ***http://www.iup.uni-heidelberg.de/Exzellenzinitiative/group3.html***. To achieve these objectives, it was necessary to work in an interdisciplinary environment of Geologists, Geographers, Biologists and Economists, exchanging important information and results.

Research Group III consists of the following 5 research projects:

Project 1: ***Cycles of elements, nutrients and pollutants, and formation age of soil and sediments on the Canary Islands***. Ulrich A. Glasmacher, Markus Heidak (Research Group Thermochronology and Archaeometry), Bernd Kober (Research Group Isotope Geochemestry), Heinz Friedrich Schöler (Research Group Organic Biogeochemistry) and Mario Trieloff (Research Group Geo- and Cosmochemestry), Institute for Earth Sciences.

Project 2: ***The laurel forest: An example of relict biodiversity hotspots threatened by human impact and global change***. Marcus A. Koch, Anja Landau, Institute for Plant Science (HIP) and Mike Thiv, State Museum of Natural History Stuttgart.

Project 3: ***Carbonates as indicators for ocean acidification events***. Stefan Götz and Enric Pascual Cebrian (Research Group Quantitative Paleobiology and Carbonate Sedimentology), Institute for Earth Sciences.

Project 4: ***Growth, Conservation and Sustainability in a Globalized World***. Timo Goeschl and Larissa Weidert, Research Centre for Environmental Economics.

Project 5: ***Modeling and valuation of ecological impacts of land cover and land use changes on the Canary Islands***. Alexander Siegmund , Simone Naumann and Sebastian Günthert, Research Group for Earth Observation: Department of Geography at University of Education Heidelberg.

Appendix

11. Appendix: Geochemical backgrounds

As already described in the introduction, the research work focuses on the geochemical fingerprints, the anthropogenic impacts and on the plant essential nutrients. For the upcoming discussions, it is necessary to get an overview about reported and appropriate geochemical element ranges, particularly for volcanic rocks, volcanic soils, laurel tree species or subtropical tree species, in order to obtain an idea whether the determined rock, soil and vegetation results are present either in increased, decreased or even in normal amounts. For the present research work, the following elements have been analysed and sorted according to their abundance in the lithosphere: **Si, Al, Fe, Ca, Na, Mg, K, Ti, P, Mn, Sr, S_{tot}, C_{tot}, Zr, Ni, Zn, Cu, Pb, Mo, Sb, Cd, Hg, (LOI)**. Therefore, the upcoming section summarizes the appropriate geochemical results of several comprehensive studies.

11.1 Reported geochemical compositions of volcanic rocks

The following element ranges are summarized according to the reported results from Thrilwall et al. (2000) and Longpré et al. (2009). Thirlwall et al. (2000) analysed the geochemical composition of 42 Anaga rock samples and 46 Teno rock samples. Longpré et al. (2009) analysed the geochemical composition of 22 Teno rocks. Therefore, the Anaga rock results are reported after Thrilwall et al. (2000) and the Teno rock results are reported after both studies. In addition, figure 10 shows the sampling sites from Longpré et al. (2009).

Silicon (Si): Anaga rocks contain between 19.41 ± 0.2 wt.% and 27.90 ± 0.2 wt.% of Si. Teno rocks contain between 19.67 ± 0.20 wt.% and 27.34 ± 0.20 wt.% of Si.

Aluminium (Al): Anaga rocks contain between 5.03 ± 0.10 wt.% and 10.69 ± 0.10 wt.% of Al Teno rocks contain between 4.96 ± 0.10 wt.% and 10.68 ± 0.10 wt.% of Al.

Iron (Fe): Anaga rocks contain between 3.07 ± 0.15 wt.% and 11.07 ± 0.15 wt.% of Fe. Teno rocks contain between 3.55 ± 0.06 wt.% and 10.65 ± 0.15 wt.% of Fe.

Calcium (Ca): Anaga rocks contain between 2.23 ± 0.10 wt.% and 10.44 ± 0.10 wt.% of Ca. Teno rocks contain between 2.12 ± 0,02 wt.% and 8.60 ± 0.10 wt.% of Ca.

Sodium (Na): Anaga rocks contain between 1.14 ± 0.10 wt.% and 5.06 ± 0.10 wt.% of Na. Teno rocks contain between 0.89 ± 0.10 wt.% and 5.07 ± 0.10 wt.% of Na.

Magnesium (Mg): Anaga rocks contain between 0.56 ± 0.15 wt.% and 7.46 ± 0.15 wt.% of Mg. Teno rocks contain between 0.55 ± 0.15 wt.% and 10.18 ± 0.15 wt.% of Mg.

Potassium (K): Anaga rocks contain between 0.286 ± 0.006 wt.% and 3.103 ± 0.006 wt.% of K. Comparing the 42 published K values with each other, shows that they are dividable into two groups. The first group contains between 0.294 ± 0.006 wt.% and 1.752 ± 0.006 wt.% of K. The second group contains between 2.213 ± 0.006 wt.% and 3.102 ± 0.006 wt.% of K. Teno rocks contain between 0.434 ± 0.006 wt.% and 2.810 ± 0.230 wt.% of K.

Titanium (Ti): Anaga rocks contain between 1.60 ± 0.02 wt.% and 3.05 ± 0.02 wt.% of Ti. Teno rocks contain between 0.53 ± 0.03 wt.% and 2.63 ± 0.02 wt.% of Ti.

Phosphorus (P): Anaga rocks contain between 0.103 ± 0.008 wt.% and 0.826 ± 0.008 wt.% of P. Teno rocks contain between 0.080 ± 0.008 wt.% and 0.645 ± 0.008 wt.% of P.

Manganese (Mn): Anaga rocks contain between 0.12 ± 0.01 wt.% and 0.18 ± 0.01 wt.% of Mn. Teno rocks contain between 0.10 ± 0.01 wt.% and 0.17 ± 0.01 wt.% of Mn.

Strontium (Sr): Anaga rocks contain between 343.0 ± 3.4 µg/g and 1706.0 ± 17.0 µg/g of Sr. Teno rocks contain between 419.0 ± 4.1 µg/g and 1468.0 ± 14.6 µg/g of Sr.

Zirconium (Zr): Anaga rocks contain between 136.0 ± 1.3 µg/g and 1033.0 ± 10.3 µg/g of Zr. Teno rocks contain between 146.0 ± 1.4 µg/g and 706.0 ± 7.0 µg/g of Zr.

Nickel (Ni): Anaga rocks contain between 4.0 ± 0.1 µg/g and 275.0 ± 0.1 µg/g of Ni. The comparison of the 42 analytical results shows that the published values are dividable into three groups with different element ranges. Several samples are ranging between 13.0 ± 0.1 µg/g and 22.0 ± 0.1 µg/g. Other samples contain between 68.0 ± 0.1 µg/g and 115.0 ± 0.1 µg/g. The remaining samples are ranging between 136.0 ± 0.1 µg/g and 275.0 ± 0.1 µg/g. Teno rocks contain between 4.0 ± 1.0 µg/g and 430.0 ± 1.0 µg/g. They can also be divided into three groups ranging from 9.0 - 68.0 ± 1.0 µg/g to 87.0 - 205.0 ± 1.0 µg/g and 263.0 – 495.0 ± 1.0 µg/g.

Zinc (Zn): Anaga rocks contain between 79.0 ± 1 µg/g and 162.0 ± 1 µg/g of Zn. Teno rocks contain between 89.0 ± 1.0 µg/g and 142.0 ± 1.0 µg/g of Zn.

Copper (Cu): Anaga rocks contain between 1.0 ± 0.1 µg/g and 127.0 ± 0.1 µg/g of Cu. Teno rocks contain between 10.0 ± 1 µg/g and 173.0 ± 1 µg/g Cu.

Lead (Pb): Anaga rocks contain between 0.6 ± 0.3 µg/g and 10.0 ± 0.3 µg/g of Pb. Teno rocks contain between 1.1 ± 0.3 µg/g and 10.0 ± 1.0 µg/g of Pb.

Molybdenum (Mo): There are no geochemical analyses available, which include the Mo concentrations of volcanic rocks from Tenerife. Therefore, the determined results of this study can be regarded as an important supplement to the published data from Thirlwall et al. (2000) and Longpré et al. (2009). However, there are several publications dealing with Mo levels of volcanic rocks from Iceland. Kuroda and Sandell (1954) determined within 38 Basalts a range of 0.2 to 3.1 µg/g of Mo. Arnórsson (1969) reported for 22 Icelandic basalts a Mo range between 0.5 and 2.0 µg/g. Carmichael and McDonald (1961) determined for 16 acidic volcanic rocks a Mo range between 1.3 and 3.4 µg/g, (average of 2.6 µg/g). A recent study of Arnórsson & Óskarsson (2006) determined a large Mo variation within their 40 samples (Iceland). The values vary from 0.03 µg/g and 4.0 µg/g.

Loss on ignition (LOI): Anaga rocks have a LOI range of 0.13 ± 0.0 wt.% and 3.13 ± 0.2 wt.%. Teno rocks have a LOI range of 0.31 ± 0.20 wt.% and 2.80 ± 0.28 wt.%.

11.2 Reported geochemical compositions of soils

The upcoming section includes several reported geochemical element ranges from various comprehensive studies about volcanic soils. For example, several results are reported according to Martínez-Cortizas et al. (2007). They analysed the geochemical composition of 20 volcanic topsoils (0 – 20 cm) from Europe. The study includes also geochemical data of three forest soils from Tenerife. One profile is located in the Fayal-Brezal near the city Tacoronte, which lies between the Orotava valley and the Anaga Mountains. One profile is located in the laurel forest near Las Mercedes in the area of the sampling sites A17 and A19 (Anaga Mountains). The last profile is located on the southern slope in the Pine forest near the village Guia de Isora. In addition, a recent major study analysed and interpreted the geochemical composition of 60 volcanic soils (0 – 2 cm) in the laurel forest of La Gomera (Mora et al., 2012). Furthermore, Piqué et al. (1996) analysed the micronutrient contents of agricultural soils (0 – 25 cm) from 5 organic farms in Tenerife. In addition, several other studies are mentioned within the following section, considering either volcanic soils or agricultural soils.

Silicon (Si): European volcanic soils contain mean Si levels between 6.32 wt.% and 29.23 wt.%, with an average content of 19.96 wt.% (Martínez-Cortizas et al., 2007). Volcanic soils from Tenerife contain mean Si values between 13.08 wt.% and 18.20 wt.%, with an average of 16.03 wt.% (Martínez-Cortizas et al., 2007; Tejedor et al., 2007). The laurel forest soil profile contains a mean Si level of 15.92 wt.% (Martínez-Cortizas et al., 2007; Tejedor et al., 2007).

Aluminium (Al): European volcanic soils contain mean Al levels between 6.04 wt.% and 16.51 wt.%, with an average content of 9.68 wt.%. Volcanic soils from Tenerife contain mean Al values between 9.61 wt.% and 16.51 wt.%, with an average of 11.91 wt.% (Martínez-Cortizas et al., 2007; Tejedor et al., 2007). The laurel forest soil profile contains a mean of 11.67 wt.% (Martínez-Cortizas et al., 2007; Tejedor et al., 2007). The laurel forest soils in La Gomera contain between 2.36 ± 0.74 wt.% and 3.52 ± 0.89 wt.% of Al, with a mean of 3.06 ± 0.81 wt.% (Mora et al., 2012).

Iron (Fe): European volcanic soils contain mean Fe levels between 1.67 wt.% and 12.41 wt.%, with an average of 5.37 wt.% (Martínez-Cortizas et al., 2007). The highest mean Fe values of all investigated soils are determined in Tenerife (Martínez-Cortizas et al., 2007). The three volcanic topsoils from Tenerife contain between 6.17 wt.% and 12.41 wt.% of Fe, with an average of 8.91 wt.% (Martínez-Cortizas et al., 2007; Tejedor et al., 2007). The highest mean Fe value of all investigated European volcanic soils is determined in the Fayal-Brezal soil profile (Martínez-Cortizas et al., 2007). The reported mean Fe levels of laurel forest soils in La Gomera vary between 2.05 ± 0.48 wt.% to 3.13

± 0.58 wt.%, with a mean content of 2.50 ± 0.54 wt.% (Mora et al., 2012). Agricultural soils from organic farms in Tenerife contain between 0.03 wt.% and 0.09 wt.% of Fe, with an average of 0.05 wt.% (Piqué et al., 1996).

Calcium (Ca): European volcanic soils contain mean Ca levels in the range of 0.33 wt.% and 8.54 wt.%, with an average mean content of 2.37 wt.% (Martínez-Cortizas et al., 2007). Volcanic soils from Tenerife contain between 0.33 wt.% and 8.16 wt.% of Ca, with an average content of 3.28 wt.% (Martínez-Cortizas et al., 2007; Tejedor et al., 2007). The laurel forest soil profile contains a mean Ca level of 0.33 wt.%.

Sodium (Na): European volcanic soils contain mean Na levels between 0.28 wt.% and 2.20 wt.%, with an average content of 1.13 wt.% (Martínez-Cortizas et al., 2007). The volcanic soils in Tenerife contain between 0.30 wt.% and 1.45 wt.% of Na, with an average content of 0.87 wt.% (Martínez-Cortizas et al., 2007; Tejedor et al., 2007). The laurel forest soil profile contains a mean of 0.33 wt.%.

Magnesium (Mg): European volcanic soils contain mean Mg levels between 0.38 wt.% and 1.80 wt.%, with an average mean content of 0.83 wt.%. The volcanic soils from Tenerife contain between 0.80 wt.% and 1.80 wt.% of Mg, with an average content of 1.19 wt.% (Martínez-Cortizas et al., 2007; Tejedor et al., 2007). The highest mean Mg value of all investigated European volcanic soils is determined in the Pine forest in Tenerife (Martínez-Cortizas et al., 2007). The laurel forest soil profile contains 0.80 wt.% of Mg (Martínez-Cortizas et al., 2007; Tejedor et al., 2007).

Potassium (K): European volcanic soils contain mean K levels between 0.66 wt.% and 5.41 wt.%, with an average mean content of 2.50 wt.%. The reported mean K levels of the volcanic soils from Tenerife vary between 1.88 wt.% and 2.98 wt.%, with an average content of 2.47 wt.% (Martínez-Cortizas et al., 2007; Tejedor et al., 2007). The laurel forest soil profile in the area of Las Mercedes (Anaga Mountains) contains 1.88 wt.% of K.

Titanium (Ti): European volcanic soils contain mean Ti levels between 0.19 wt.% and 5.41 wt.%, with an average mean content of 1.33 wt.% (Martínez-Cortizas et al., 2007). The mean Ti values of the three volcanic soils in Tenerife vary between 1.79 wt.% and 5.41 wt.%, with an average content of 3.36 wt.% (Martínez-Cortizas et al., 2007; Tejedor et al., 2007). The highest mean Ti value of all investigated European soils has been determined in the Fayal-Brezal soil profile (Martínez-Cortizas et al., 2007; Tejedor et al., 2007). The reported Ti level of the laurel forest soil is 2.59 wt.% (Martínez-Cortizas et al., 2007; Tejedor et al., 2007).

Phosphorus (P): European volcanic soils contain between 0.03 wt.% and 1.88 wt.% of P, with an average content of 0.44 wt.% (Martínez-Cortizas et al., 2007). The highest mean P values of all investigated soils are determined in Tenerife (Martínez-Cortizas et al., 2007). The reported values vary between 0.22 wt.% and 1.88 wt.%, with an average of 0.84 wt.% (Martínez-Cortizas et al., 2007; Tejedor et al., 2007). The reported P level of the laurel forest soil is 0.23 wt.% (Martínez-Cortizas et al., 2007; Tejedor et al., 2007).

Manganese (Mn): European volcanic soils contain between 0.04 wt.% and 1.00 wt.% of Mn, with an average content of 0.20 wt.% (Martínez-Cortizas et al., 2007). The volcanic topsoils from Tenerife vary between 0.19 wt.% and 0.26 wt.% of Mn, with an average of 0.21 wt.% (Martínez-Cortizas et al., 2007; Tejedor et al., 2007). The reported Mn level of the laurel forest soil is 0.19 wt.% (Martínez-Cortizas et al., 2007; Tejedor et al., 2007). The laurel forest soils in La Gomera contain between 0.046 ± 0.004 wt.% and 0.062 ± 0.013 wt.% of Mn, with a mean of 0.052 ± 0.010 wt.% (Mora et al., 2012). Agricultural soils from organic farms in Tenerife contain between 0.001 wt.% and 0.007 wt.% of Mn, with an average of 0.002 wt.% (Piqué et al., 1996).

Strontium (Sr): European volcanic soils contain between 71.6 µg/g and 965.0 µg/g of Sr, with an average mean content of 330.3 µg/g (Martínez-Cortizas et al., 2007). The reported mean Sr values of volcanic soils in Tenerife vary between 86.0 µg/g and 965.0 µg/g, with an average content of 487.0 µg/g (Martínez-Cortizas et al., 2007; Tejedor et al., 2007). The highest mean Sr value of all investigated European volcanic soils is determined in the Pine forest in Tenerife. The laurel forest soil profile contains 165.0 µg/g of Sr (Martínez-Cortizas et al., 2007).

Total Sulphur (S_{tot}): Soils of humid regions can contain between 0.01 wt.% and 0.07 wt.% of S_{tot} (Scheffer & Schachtschabel, 2010; Bowen, 1979). Humid volcanic topsoils from South America contain mean S_{tot} levels between 0.040 ± 0.001 wt.% and 0.135 ± 0.004 wt.% of (Aguilera et al. 2000). Humid volcanic topsoils from South America, which are used for crop productions contain between 0.113 ± 0.004 wt.% and 0.168 ± 0.038 wt.% of S_{tot} (Aguilera et al. 2000). International standards for agricultural soils range from 0.006 wt.% to 0.06 wt.% with a mean value of 0.03 wt.% (Tabatabai & Bremner, 1972; Tabatabai, 1982). Values of 0.17 wt.% to 0.20 wt.% have been reported for surface soils under conifer and hardwood forest (David et al., 1982). Total-S contents of 0.01 wt.% and 0.05 wt.% have been reported for semi humid or humid agricultural soils (Stevenson, 1986; Stevenson & Cole, 1999)

Zirconium (Zr): European volcanic soils contain between 118.3 µg/g and 652.0 µg/g of Zr, with an average mean content of 296.8 µg/g. Volcanic soils from Tenerife contain between 364.0 µg/g and 652.0 µg/g of Zr, with an average content of 460.0 µg/g (Martínez-Cortizas et al., 2007; Tejedor et al., 2007). The highest mean Zr value of all investigated soils has been determined in the Fayal-Brezal (Martínez-Cortizas et al., 2007). The laurel forest soil profile contains mean Zr level of 439.0 µg/g (Martínez-Cortizas et al., 2007; Tejedor et al., 2007).

Nickel (Ni): European volcanic soils contain between 1.0 µg/g and 173.9 µg/g of Ni, with an average mean content of 33.1 µg/g (Martínez-Cortizas et al., 2007). Volcanic soils in Tenerife contain between 9.2 µg/g and 173.9 µg/g of Ni, with an average content of 65.1 µg/g (Martínez-Cortizas et al., 2007; Tejedor et al., 2007). The highest mean Ni value of all investigated soils has been determined in the Fayal-Brezal (Martínez-Cortizas et al., 2007). The laurel forest soil profile contains a mean Ni level of 46.1 µg/g (Martínez-Cortizas et al., 2007; Tejedor et al., 2007). The reported mean Ni levels of the laurel forest in La Gomera vary between 29 ± 7 µg/g and 39 ± 13 µg/g, with a mean content of 34 ± 10 µg/g (Mora et al., 2012

Zinc (Zn): European volcanic soils contain between 50.0 µg/g and 185.2 µg/g of Zn, with an average content of 114.2 µg/g (Martínez-Cortizas et al., 2007). Volcanic soils in Tenerife contain between 141.0 µg/g and 160.0 µg/g of Zn, with an average content of 155.0 µg/g (Martínez-Cortizas et al., 2007; Tejedor et al., 2007). The laurel forest soil profile contains a mean Zn level of 159.0 µg/g (Martínez-Cortizas et al., 2007; Tejedor et al., 2007). The laurel forest soils in La Gomera contain between 47 ± 7 µg/g and 49 ± 8 µg/g of Zn, with a mean content of 48 ± 7.5 µg/g (Mora et al., 2012). A value of 50 ± 9 µg/g is reported for the uppermost soil horizon of a healthy laurel forest in La Gomera (Mora et al., 2012). Generally, the range of humid European soils is 10 µg/g to 105 µg/g (Nriagu, 1980; Angelone & Bini, 1992; Kabata-Pendais, 2001). Agricultural soils from organic farms in Tenerife contain between 1.1 µg/g and 21.5 µg/g of Zn, with an average of 10.1 µg/g (Piqué et al., 1996).

Copper (Cu): European volcanic soils contain between 11.1 µg/g and 79.0 µg/g of Cu, with an average content of 45.2 µg/g. Volcanic soils in Tenerife contain between 20.0 µg/g and 79.0 µg/g of Cu, with an average content of 45.8 µg/g (Martínez-Cortizas et al., 2007; Tejedor et al., 2007). The highest mean Cu value of all investigated soils is determined in the Fayal-Brezal near Tacoronte (Martínez-Cortizas et al., 2007). The laurel forest soil profile contains a mean Cu level of 32.0 µg/g (Martínez-Cortizas et al., 2007; Tejedor et al., 2007). The laurel forest soils in La Gomera contain mean Cu levels between 6.0 ± 4.0 µg/g and 9.0 ± 4.0 µg/g, with a mean content of 7.5 ± 4.0 µg/g (Mora et al., 2012). Agricultural soils from organic farms in Tenerife contain between 3.7 µg/g and 11.9 µg/g of Cu, with an average of 6.6 µg/g (Piqué et al., 1996).

Lead (Pb): European volcanic soils contain between 0.40 µg/g and 103.90 µg/g of Pb, with an average content of 35.86 µg/g (Martínez-Cortizas et al., 2007). Volcanic soils in Tenerife contain between 3.00 µg/g and 28.00 µg/g of Pb, with an average content of 15.75 µg/g (Martínez-Cortizas et al., 2007; Tejedor et al., 2007). The laurel forest soil profile contains a mean Pb level of 28.0 µg/g (Martínez-Cortizas et al., 2007; Tejedor et al., 2007). Agricultural soils (0 – 20 cm) from Western Europe contain between 1.6 µg/g and 1309 µg/g of Pb, with a mean content of 16 µg/g (Reimann et al. 2012). Northern European agricultural soils contain a mean Pb level of 10 µg/g. The mean level of southern European agricultural soils is 20 µg/g (Reimann et al. 2012).

Molybdenum (Mo): A comprehensive study of tropical Asian soils reported Mo levels between 2.3 µg/g and 3.3 µg/g, with an average of 2.9 µg/g (Domingo & Kyuma, 1983). Various soil types from the United States contain mean Mo levels between 0.5 µg/g and 3 µg/g (Taber, 2009). A compressive study about 25 volcanic soils from Asia reported mean Mo levels between 0.74 ± 0.25 µg/g and 2.13 ± 0.70 µg/g (Takahashi, 1972). Other soil studies reported a general Mo range of 0.2 µg/g and 5.0 µg/g (Havlin, 2005; Chester, 1990; Bowen, 1979).

Antimony (Sb): Generally, the reported Sb levels of unpolluted soils vary between 0.3 µg/g and 8.4 µg/g (LABO, 1995, Crommentuijn et al., 1997; Kabata-Pendias, 1992).

Cadmium (Cd): A study about Italian volcanic soils reported within the upper soil horizons (0 – 5 cm) mean Cd levels between 0.31 ± 0.05 µg/g and 0.42 ± 0.06 µg/g (Maisto et al., 2006).

Mercury (Hg): European volcanic soils contain between 0.01 µg/g and 0.32 µg/g of Hg, with an average content of 0.12 µg/g. Volcanic soils in Tenerife contain between 0.01 µg/g and 0.16 µg/g of Hg, with an average content of 0.08 µg/g (Martínez-Cortizas et al., 2007; Tejedor et al., 2007). The laurel forest soil profile contains a mean Hg level of 0.090 µg/g (Martínez-Cortizas et al., 2007; Tejedor et al., 2007). A comprehensive study reported within 2108 European agricultural topsoil samples between 0.003 µg/g and 1.56 µg/g of Hg, with an average content of 0.030 µg/g (Ottesen et al., 2013).

11.3 Reported geochemical compositions of plant species

Within the upcoming section, several geochemical studies are mentioned dealing with the laurel forest. For example, Mora et al. (2012) analysed the geochemical composition of several plant samples of the laurel forest in La Gomera, including the species ***Ilex canariensis, Viburnum rigidum*** and ***L. novocanariensis***. In addition, Köhl et al. (1996) analysed the geochemical composition of leaves from 5 ***L. novocanariensis*** trees in Tenerife. Tausz et al. (2005) analysed the geochemical composition 55 ***Pinus canariensis*** trees in Tenerife. Furthermore, Drechsel & Zech (1991) analysed the geochemical composition of 40 broad-leaved tropical and subtropical tree species. Several other studies are mentioned, which deal with the geochemical compositions of various appropriated plant species.

Iron (Fe): Mora et al. (2012) reported a mean Fe level of 0.245 ± 0.069 wt.% for the phytomass (leaves, twigs) of a healthy laurel forest. Köhl et al. (1996) reported for ***L. novocanariensis*** leaves mean Fe levels between 0.064 wt.% and 0.084 wt.%. Broad-leaved tropical and subtropical tree species contain between 0.0027 wt.% and 0.1310 wt.% of Fe (Drechsel & Zech, 1991). A common deficiency symptom is interveinal chlorosis (Uchida, 2000).

Calcium (Ca): Reported ***L. novocanariensis*** leaf levels range from 0.079 wt.% to 0.550 wt.% (Köhl et al., 1996). Generally, sufficient amounts range from 0.05 wt.% to 0.5 wt.% of Ca (Epstein, 1965; Frey & Lösch, 2010). Tropical and subtropical broad-leaved tree species contain between 0.25 wt.% and 2.67 wt.% of Ca, with occurring deficiency symptoms between 0.16 wt.% and 0.51 wt.% (Drechsel & Zech, 1991). Common deficiency symptoms are necrotic leaf margins and curled leaves (Simon, 1978).

Sodium (Na): Tausz et al. (2005) reported for ***P. canariensis*** trees in Tenerife between 0.007 wt.% and 0.024 wt.% of Na. Leaves of common deciduous trees of north Europe contain between 0.012 wt.% and 0.052 wt.% of Na (Ovington & Madgwick, 1958). A comprehensive study on different tropical tree species determined Na leaf levels in the range of 0.001 wt.% and 0.008 wt.% (Aidid, 1988).

Magnesium (Mg): Reported Mg levels range from 0.025 wt.% to 0.170 wt.% for ***L. novocanariensis*** leaves (Köhl et al., 1996). Tropical and subtropical broad-leaved tree species contain between 0.12 wt.% and 0.94 wt.% of Mg, with occurring deficiency symptoms between 0.07 wt.% and 0.13 wt.% (Drechsel & Zech, 1991). A common deficiency symptom is leaf vein chlorosis (Hermans et al. 2010).

Potassium (K): In Tenerife, reported ***L. novocanariensis*** leaf contents range from 1.28 wt.% to 3.16 wt.% (Köhl et al. 1996). Generally, sufficient K amounts range from 0.5 wt.% to 6.0 wt.% (Havlin et al., 2005; Epstein, 1965). Tropical and subtropical broad-leaved tree species contain between 0.31 wt.% and 2.60 wt.% of K, with occurring deficiency symptoms between 0.10 wt.% and 0.57 wt.% (Drechsel & Zech, 1991). Common deficiency symptoms are leaf vein chlorosis and rolled leaf tips (Datnoff et al, 2007).

Phosphorus (P): Tropical and subtropical broad-leaved tree species contain between 0.08 wt.% and 0.32 wt.% of P, with occurring deficiency symptoms between 0.03 wt.% and 0.11 wt.% (Drechsel & Zech, 1991). Common deficiency symptoms are discoloured leaves, brown leaf tips and curled leaves (Datnoff et al, 2007). Sufficient P amounts range from 0.1 wt.% to 0.5 wt.% (Havlin et al., 2005).

Manganese (Mn): Reported Mn levels range from 47 µg/g to 66 µg/g for ***L. novocanariensis*** leaves (Köhl et al., 1996). A mean of 143 ± 28 µg/g is reported for the phytomass (leaves, twigs) of a healthy laurel forest (La Gomera), including ***Ilex canariensis, Viburnum rigidum*** and ***L. novocanariensis*** (Mora et al., 2012). Tropical and subtropical broad-leaved tree species contain between 25 µg/g and 880 µg/g of Mn, with occurring deficiency symptoms between 9 µg/g and 16 µg/g (Drechsel & Zech, 1991). A common deficiency symptom is interveinal chlorosis (Uchida, 2000).

Strontium (Sr): Tausz et al. (2005) reported for ***P. canariensis*** trees Sr levels between 21.3 µg/g and 43.9 µg/g, with a mean level of 33.9 µg/g. Aidid (1988) reported between 39 µg/g and 189 µg/g of Sr for different tropical tree species.

Total Sulphur (S_{tot}): Tropical and subtropical broad-leaved tree species contain between 0.09 wt.% and 0.86 wt.% of S_{tot}, with occurring deficiency symptoms between 0.03 wt.% and 0.05 wt.% (Drechsel & Zech, 1991). A common deficiency symptom is chlorosis (light green to yellow leaves) (Uchida, 2000). Sufficient amounts range from 0.1 wt.% to 1.0 wt.% (Epstein, 1965; Frey & Lösch, 2010).

Nickel (Ni): A mean of 2.18 µg/g is reported for the phytomass (leaves, twigs) of a healthy laurel forest (La Gomera), including ***Ilex canariensis, Viburnum rigidum*** and ***L. novocanariensis*** (Mora et al., 2012). Leaves of common deciduous trees of southeast Europe contain between 0.65 µg/g and 1.06 µg/g of Ni (Tomašević & Aničic, 2010). Generally, plants Ni level are very low, such as for flowering plants like Stellaria graminea (2 µg/g) or for common corn plants (0.4 µg/g) (Salpeteur et al. 2006). A common deficiency symptom is leaf necrosis, starting from the leaf tips (Brown, 2006).

Zinc (Zn): Mora et al. (2012) reported a mean Zn level of 23.1 ± 3.0 µg/g for the phytomass (leaves, twigs) of a healthy laurel forest. Tropical and subtropical broad-leaved tree species contain between 10 µg/g and 101 µg/g of Zn, with occurring deficiency symptoms between 3 µg/g and 13 µg/g (Drechsel & Zech, 1991). Dusty brown spots or interveinal chlorosis are common Zn deficiency symptoms (Uchida, 2000).

Copper (Cu): Tropical and subtropical broad-leaved tree species contain between 4 µg/g and 49 µg/g of Cu (Drechsel & Zech, 1991). Deficiency symptoms occurred between 2 µg/g and 5 µg/g (Drechsel & Zech, 1991).

Lead (Pb): Tausz et al. (2005) reported for ***P. canariensis*** trees in Tenerife between 0.286 µg/g and 0.574 µg/g of Pb, with a mean level of 0.393 µg/g. Leaves of common deciduous trees of southeast Europe contain between 0.86 µg/g and 2.60 µg/g of Pb (Tomašević & Aničic, 2010).

Molybdenum (Mo): In Tenerife, reported Mo levels range from 0.035 µg/g to 0.153 µg/g for Pinus canariensis trees, with an average of 0.091 µg/g (Tausz et al., 2005). Tropical and subtropical broad-leaved tree species contain between 0.05 µg/g and 1.00 µg/g of Mo, with occurring deficiency symptoms below 0.03 µg/g (Drechsel & Zech, 1991). A common deficiency symptom is interveinal chlorosis (Weir, 2004).

Antimony (Sb): Background Sb contents in terrestrial vascular plants range from 0.002 µg/g to 0.050 µg/g (Brooks, 1972, Bowen, 1979; Coughtrey et al., 1983). The variability is wide within the reported Sb plant levels (0.1 – 490 µg/g) (Kist et al., 1986; Markert, 1996). Edwards et al. (1995) reported a general Sb range of 0.02 µg/g to 0.2 µg/g in plants. Aidid (1988) reported for different tropical tree species a large variation of Sb leaf levels. The reported Sb levels range between 0.05 µg/g and 2.20 µg/g.

Cadmium (Cd): Tausz et al. (2005) reported for ***P. canariensis*** trees in Tenerife between 0.015 µg/g and 0.039 µg/g of Cd, with a mean level of 0.031 µg/g. Leaves of common deciduous trees of south-east Europe contain between 0.014 µg/g and 0.033 µg/g of Cd (Tomašević & Aničic, 2010).

Mercury (Hg): Tausz et al. (2005) reported for ***P. canariensis*** trees in Tenerife between 0.026 µg/g and 0.049 µg/g of Hg, with a mean level of 0.037 µg/g. In addition, the highest Hg levels above 0.040 µg/g are reported for ***P. canariensis*** trees grown next to roads (Tausz et al., 2005). Aidid (1988) reported for leaves of tropical tree species between 0.063 µg/g and 0.196 µg/g of Hg.

12. Appendix: Plant essential nutrients

12.1 Functions and deficiency symptoms of plant essential nutrients

Plants require 17 essential elements for their growth and development, including 3 non-mineral nutrients (C, H, O) and 14 mineral nutrients (N, P, K, Ca, Mg, S, Fe, Zn, Mn, Cu, B, Mo, Cl, Ni) (Brown et al. 1987; Uchida, 2000; McCauley et al., 2009; Frey & Lösch, 2010). Plants receive carbon, hydrogen and oxygen from the atmosphere and the soil water, instead of the remaining 14 essential elements, which are supplied either from soil minerals and soil organic matter or by organic or inorganic fertilizers (Uchida, 2000; Havlin et al., 2005). However, light, heat, and water must be sufficiently supplied to utilize these nutrients efficiently, not to forget the soil pH, which plays an important role in respect of making nutrients available to plants (Uchida, 2000; McCauley et al., 2009; Frey & Lösch, 2010). The optimum nutrient range as well as the minimum requirement level differs from one plant species to another plant species, whether they are subtropical forest species or food crops (Uchida, 2000; Frey & Lösch, 2010). Nevertheless, all plants start to show nutrient deficiency symptoms if the nutrient levels are below the minimum requirement level (Uchida, 2000; McCauley et al., 2009). Furthermore, excessive nutrient uptake can also cause a reduced growth because of possibly reached toxicity levels (Uchida, 2000; McCauley et al., 2009). The upcoming section will briefly describe the main characteristics of the 14 essential nutrients, including their chemical forms in which the elements are available to plants, their general functions in plants and typical occurring deficiencies symptoms. The description is sorted according to the mean nutrient levels in plants, starting with the macronutrients, which are dividable into primary (N, K, P) and secondary (Ca, Mg, S) macronutrients and followed by the micronutrients (Cl, Fe, B, Mn, Zn, Cu, Mo, Ni) (Epstein, 1965; 1972). The nutrient information is described according to the comprehensive report about Nutrient Functions and Deficiency Symptoms from Uchida (2000), with exception of the Ni information. They are reported according to the study of Brown et al. (1987) about Ni as a micronutrient for higher plants.

Nitrogen (N)

Availability and functions: Available to plants as nitrate ions (NO^{3-}) and ammonium ions (NH^{4+}) ions. Nitrogen is biologically combined with C, H, O, and S to create amino acids, which are the building blocks of proteins. Amino acids are used in forming protoplasm, the site for cell division and thus for plant growth and development. Since all plant enzymes are made of proteins, N is needed for all of the enzymatic reactions in a plant. Nitrogen is a major part of the chlorophyll molecule. **Possibly deficiency symptoms**: Stunted growth caused by reduction in cell division. Pale green to light yellow colour (chlorosis) of the leaf tips, which could possibly result in the death and/or the dropping of the leaves. This is caused by the translocation of N from the older to the younger tissues.

Potassium (K)

Availability and functions: Available to plants as K^+ ion. Unlike N and P, K does not form any vital organic compounds in the plant. However, it is vital for plant growth due to it function as an enzyme activator that promotes photosynthesis and the translocation of photosythates (sugars). It assists in regulating the plant's use of water by controlling the opening and closing of leaf stomata's. It improves disease resistance and the size of grains and seeds. **Possibly deficiency symptoms:** The most common symptom is chlorosis along the edges of leaves (leaf margin scorching) and slow and stunted growth.

Phosphor (P)

Availability and functions: Available to plants as orthophosphate ions (HPO_4^{2-}, $H_2PO_4^{-}$). Phosphor is needed in photosynthesis, respiration, energy storage and transfers (ADP - ATP / DPN – TPN), supports root, seed and fruit development, and is part of RNA and DNA. **Possibly deficiency symptoms:** The initial overall symptom is slow, weak, and stunted growth. Phosphor is relatively mobile in plants and can be transferred to sites of new growth, causing symptoms of dark to blue-green coloration on older leaves. Lack of P can cause delayed maturity and poor seed and fruit development.

Calcium (Ca)

Availability and functions: Available to plants as the ion Ca^{2+}. Calcium supports: the formation of the cell wall membrane and its plasticity, integrity and permeability. It is an activator of several enzyme systems in protein synthesis and carbohydrate transfer and it combines with anions of organic acids, sulphates, and phosphates. Calcium improves pH levels by reducing soil acidity. **Possibly deficiency symptoms**: Generally, Ca deficiency is not often observed in plants due to occurring secondary effects of high soil acidity. These usually limit plant growth in advance, before any clear signs of deficiency occur. Anyway, Ca deficiency causes: newly emerging leaves to stick together at the margins, tearing of the leaves.

Magnesium (Mg)

Availability and functions: Available to plants as the ion Mg^{2+}. The predominant role of Mg is as a major constituent of the chlorophyll molecule. Therefore, it is actively involved in photosynthesis. It is a co-factor in several enzymatic reactions that activate the phosphorylation processes. It is required to stabilize ribosome particles and supports the movement of sugars within plants. **Possibly deficiency symptoms:** Leaf tissue between the veins may be yellowish, bronze, or reddish, while the leaf veins remain green. Leaves can appear yellow-striped with green veins. In severe cases, premature leaves may drop. Symptoms occur most frequently in acid soils and soils receiving high amounts of K or Ca fertilizer.

Sulphur (S)

Availability and functions: Available to plants as the sulphate ion SO_4^{2}-. Sulphur is essential in forming plant proteins because it is a constituent of certain amino acids. It supports seed production, chlorophyll formation, and stabilizing protein structure. **Possibly deficiency symptoms:** Younger leaves are chlorotic with evenly, lightly coloured veins. Growth rates can be retarded and maturity is delayed. Plant stems are stiff, thin, and woody. Symptoms may be similar to N deficiency and are most often found in sandy soils that are low in organic matter and received moderate to heavy rainfall.

Chlorine (Cl)

Availability and functions: Available to plants as the chloride ion, Cl^{-}. It is essential in photosynthesis, where it is involved in the evolution of oxygen. It increases cell osmotic pressure and the water content of plant tissues. **Possibly deficiency symptoms**: Chlorosis of younger leaves and wilting of the plant. However, deficiency seldom occurs because Cl is found in the atmosphere and in rainwater.

Iron (Fe)

Availability and functions: Available to plants as Fe^{2+}, Fe^{3+}. Iron is essential in the heme enzyme system in plant metabolism (photosynthesis and respiration). It is part of protein ferredoxin and is required in nitrate and sulphate reductions. It is essential in the synthesis and maintenance of chlorophyll. **Possibly deficiency symptoms**: Interveinal chlorosis in younger leaves. The youngest leaves maybe white, because Fe, like Mg, is involved in chlorophyll production. Usually observed in alkaline or over-limed soils.

Boron (B)

Availability and functions: Available to plants as borate, H_3BO_3. It is necessary in the synthesis of one of the bases for RNA formation and in cellular activities. It promotes root growth and is essential for pollen germination and the growth of pollen tubes. **Possibly deficiency symptoms**: Stunted growth with first symptoms on the growing point of younger leaves. The leaves tend to be thickened and may curl.

Manganese (Mn)

Availability and functions: Available to plants as Mn^{2+}, Mn^{3+}. It is part of the plant enzyme system, activating several metabolic functions. It is involved in the oxidation-reduction process in photosynthesis. **Possibly deficiency symptoms:** Symptoms first appear as chlorosis in young tissues in form of tiny yellow spots or greenish-grey specks, which appear at the lower base of younger leaves.

Zinc (Zn)

Availability and functions: Available to plants as Zn^{2+}. It is required in the synthesis of tryptophan, which in turn is necessary for the formation of indole acetic acid in plants. It is an essential component of several metallo-enzymes in plants (variety dehydorgenases). It has a role in RNA and protein synthesis.**Possibly deficiency symptoms:** Interveinal chlorosis at younger leaves, similar to Fe deficiency. However, Zn deficiency is more defined, appearing as banding at the basal part of the leaf, whereas Fe deficiency results in interveinal chlorosis along the entire length of the leaf.

Copper (Cu)

Availability and functions: Available to plants as the ion Cu^{2+}. Copper is essential in several plant enzyme systems involved in photosynthesis. It is part of the chloroplast protein plastocyanin. It is involved in the synthesis and stability of chlorophyll and other pigments. **Possibly deficiency symptoms:** Reduced growth, distortion of younger leaves and possible necrosis of the apical meristem. In trees, multiple sprouts occur at growing points, resulting in a bushy appearance.

Molybdenum (Mo)

Availability and functions: Available to plants as molybdate, MoO_4. It is a component of two major enzymes, which are required for normal assimilation of N. **Possibly deficiency symptoms:** Older and middle leaves become chlorotic, the leaf margins roll inwards and necrotic spots appear at the leaf margins. Deficient plants are stunted, flower formation restricted.

Nickel (Ni)

Availability and functions: Available to plants as $NiSO_4$ or Ni^{2+}. Nickel is a component of the enzyme urease. It supports: the transport of nutrients, the movement of Fe into cells, disease resistance and participates in N metabolism (Walker et al., 1985; Graham et al., 1985). **Possibly deficiency symptoms:** Deficient plants can accumulate toxic levels of urea in their leaf tips (Eskew et al., 1984).

13. Appendix: Geochemical fingerprints

13.1 Iron (Fe) combinations with Si and Al

Fe vs. Si: The scatterplot shows linear trends for all four Teno soils. In addition, the trends of T11, T12 and T4 are plotted in the same direction. The ratios of T3 are slightly displaced and not in the same trend line like the other Teno soils. Large variations in the plotted soil ratios occur in the Anaga soils. Also the Orotava soils are plotted in different areas of the scatterplot. The calculated mean soil ratios give no clear hint for a typical Anaga, Orotava or Teno trend. The ratios are quite similar between the sampling areas and between the related rock and soils. The plotted rock ratios are shown at Fig.157 a.

Fe vs. Al: The scatterplot shows that nearly all ratios are plotted in a positive direction. However, the Anaga ratios, the Orotava ratios and the Teno ratios are plotted in different trends and there is no common Anaga, Orotava or Teno trend. Furthermore, the Orotava ratios showed no clear linear trends. The Teno soil ratios of profile T12 and T4 are plotted in the same linear trend. The other Teno soil ratios are plotted above or below T12 and T4. However, the calculated Fe to Al ratios indicates no typical ratio for the different sampling areas. The only differences occur between the separated Anaga and Teno soils. For example, the mean soil ratios range from 1:1 to 1:1.5 at profile A1, A2, A14, A15, A16, A17, O5, O6, O7 and T11. The mean soil ratios range from 1.1:1 to 1.6:1 in the separated Anaga and Teno profiles A8, A9, A10, A19, T3, T4 and T12. A relation between rocks and soils occurs nearly for all samples. The plotted rock ratios are shown at Fig.157 b.

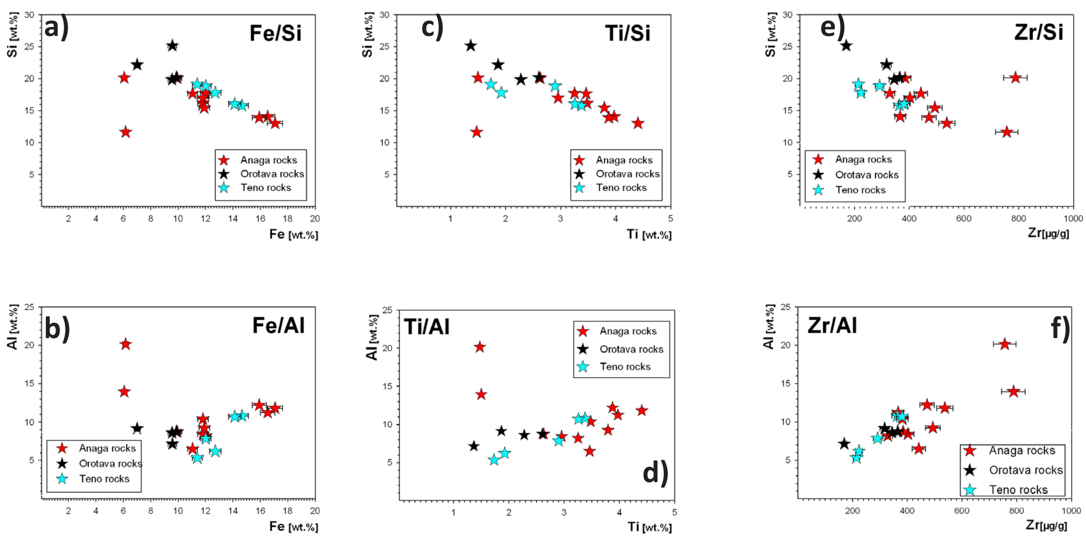


Fig.157 a) Plotted Fe/Si rock ratios. b) Plotted Fe/Al rock ratios. c) Plotted Ti/Si rock ratios. d) Plotted Ti/Al rock ratios. e) Plotted Zr/Si rock ratios. f) Plotted Zr/Al rock ratios.

13.2 Titanium (Ti) combinations with Si and Al

Ti vs. Si: Linear trends occur within all Anaga soils, but the ratios are plotted with a much larger distance to one another due to the large variations of the Si levels. Positive trends occur for all Teno and Orotava soils. The scatterplots indicates that Ti and Si are associated to each other within all soil samples. The plotted ratios show that several Anaga soils split of from the main trend (A8, A9, A10, A19), which is reflected also within the calculated mean soil ratios (1:3.3 and 1:5). The remaining ratios are dividable into the following ranges: from 1:6.1 to 1.7.2 includes profile T3, T4, T11, T12, O5, A2, A15 and A16. From 1.8.2 to 1:11.2 includes profile A1, A14, A17, O6 and O7. In addition, a few rock ratios are nearly similar to the related soil ratios (O6, A8, A9, A10). The remaining rock ratios are not related to the soil ratios, which is possibly caused by different weathering degrees. The plotted rock ratios are shown at Fig.157 c.

Ti vs. Al: The topsoil scatterplot looks nearly similar to the Fe/Al plot due to the same occurring linear trends and separations within the sampling areas. It is recognizable that the Anaga ratios are plotted in three separable groups, which split off from the remaining Anaga ratios. Also the Teno and Orotava ratios split off from the remaining samples. Generally, the plotted Ti/Al ratios are dividable into four groups. This effect is clearly pointed out due to the calculated ratios. For example, the mean soil ratios range from 1:5.7 to 1:6.8 within group 1 (A1, A2, A14, A17, O6), from 1:4.1 to 1:5 within group 2 (O5, O7, T4, T11), from 1:3.7 to 1:3.9 within group 3 (A15, A16, T3, T12) and from 1:2.8 to 1:3.0 within group 4 (A8, A9, A10, A19). However, typical Ti/Al ratios are not determined for the Teno, Orotava or Anaga areas. The plotted rock ratios are shown at Fig.157 d.

13.3 Zircon (Zr) combinations with Si and Al

Zr vs. Si: Linear trends occur for all plotted topsoil ratios, indicating clearly the relation between Zr and Si. Furthermore, it is recognizable that the ratios of profile T3, T4 and T12 slightly split off from the remaining ratios. Only the ratios of profile T11 are plotted close to the Anaga ratios. The Orotava ratios are plotted between the Anaga and Teno samples, following one Orotava trend. The plotted topsoil ratios are not useable to distinguish the sampling areas from each other. However, the rock and soil ratios show a relation between each other for most of the plotted samples, indicating the affecting influences of the soil parent materials. In addition, the calculated Zr-to-Si ratios are not useable to distinguish the sampling areas from each other due to several overlapping topsoil ratios. The plotted rock ratios are shown at Fig.157 e.

Zr vs. Al: Linear trends occur for all plotted topsoil ratios. In addition, most of the ratios are plotted in one direction with exception of a few Anaga and Teno ratios. The plotted topsoil ratios are not useable to distinguish the sampling areas from each other. However, the rock and soil ratios show a relation between each other for most of the plotted samples, indicating the affecting influences of the soil parent materials. However, the calculated Zr-to-Al ratios are useable to distinguish the Anaga and Teno sampling areas from each other. For example, the Anaga topsoil ratios range form 1:221 to

1:258 and the Teno ratios range from 1:275 to 1:305. The Orotava ratios range between the Anaga and Teno samples. In addition, the rock ratios indicate the affecting influences of the soil parent materials. The plotted rock ratios are shown at Fig.157 f.

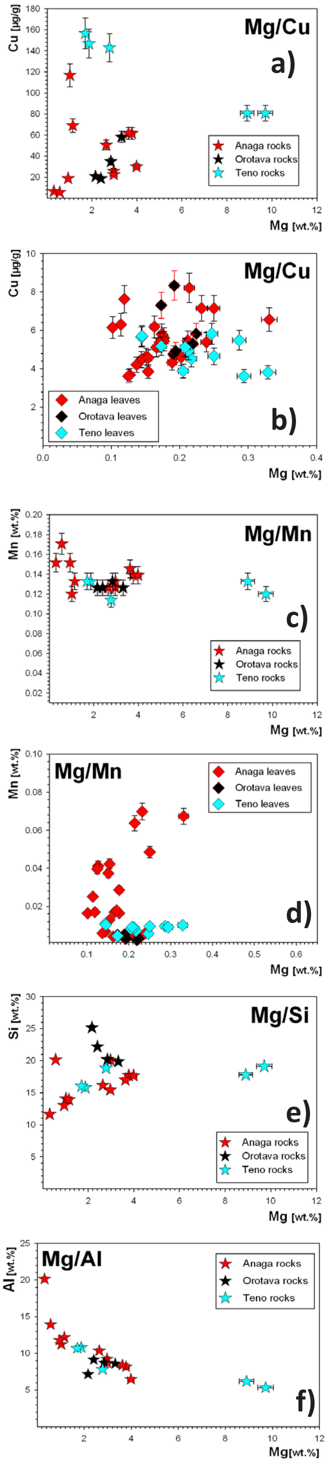


Fig.158 a) Plotted Mg/Cu rock ratios. b) Plotted Mg/Cu leaf ratios. c) Plotted Mg/Mn rock ratios. d) Plotted Mg/Mn leaf ratios. e) Plotted Mg/Si rock ratios. f) Plotted Mg/Al rock ratios.

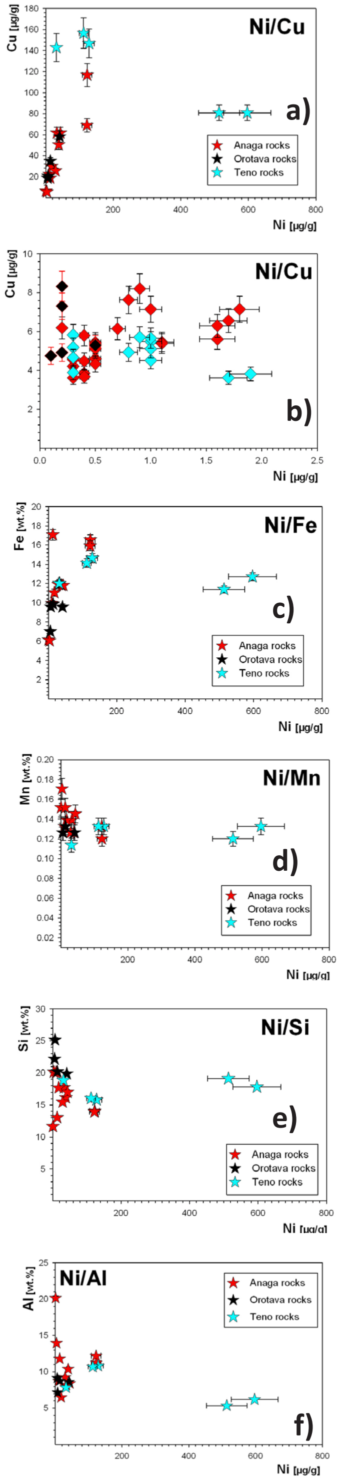


Fig.159 a) Plotted Ni/Cu rock ratios. b) Plotted Ni/Cu leaf ratios. c) Plotted Ni/Fe rock ratios. d) Plotted Ni/Mn rock ratios. e) Plotted Ni/Si rock ratios. f) Plotted Ni/Al rock ratios.

13.4 Magnesium (Mg) combinations with Cu, Mn, Si and Al

Mg vs. Cu: The scatterplot shows no linear trends within the Teno, Orotava or Anaga soils. The ratios are plotted either closely together without clear trends or even horizontally. None of the soils showed a clear relation between Cu and Mg. In addition, the calculated rock and soil ratios show a large variation within the sampling areas and between rocks and soils. It is not possible to determine typical Teno, Orotava or Anaga ratios. The leaf scatterplot indicate no clear affects or a relation between the soil ratios. The plotted rock and leaf ratios are shown at Fig.158 a and b.

Mg vs. Mn: The Mg/Mn scatterplot indicates several linear trends. There is a slightly positive trend at profile T3 and T12. The ratios of profile T4 are plotted more or less horizontally. Different strongly increasing trends occur in the Anaga soils and no trends occur in the Orotava soils. The calculated Mg to Mn ratios showed no relation between rock and soils within all samples. The variations are large either between each sampling site or between rocks and soils. However, the mean soil and rock ratios of profile T3 and T12 are clearly distinguishable from the remaining areas. The mean soil ratios range between 23:1 and 32:1. The rock ratios range between 67:1 and 80:1. For example the mean soil levels of profile T4 and T11 are in the range of Orotava and Anaga soils. The soil ratios of vary between 4.3:1 and 18.8:1 in the Anaga and Orotava area. The above-observed separation is not visible within the plotted and calculated ratios of the leaves and roots. The rock and leaf ratios are shown at Fig.158 c and d.

Mg vs. Si: The scatterplots shows that there is a linear trend within soil profile T3. No clear trends and relations between Mg and Si are seen at the other Teno samples. However, the remaining Anaga and Orotava soils show also linear trends, but the increase is much stronger as at profile T3. However, the calculated soil ratios identify no typical Mg-to-Si ratio for the several sampling areas. The plotted rock ratios are shown at Fig.158 e.

Mg vs. Al: The topsoil ratios of profile T3, T4 and T12 are clearly distinguishable from the remaining areas due to their higher Mg levels. However, T11 is also plotted close to the Orotava and Anaga ratios and splits of clearly from the remaining Teno profiles. Therefore, it is not possible to determine typical Teno Mg/Al ratios. Linear trends are no clearly recognizable. However, the calculated Mg-to-Al ratios are useable to distinguish the sampling areas from each other. For example, the Anaga soil ratios range from 1:5.4 to 1:7.7, the Orotava ratios from 1:3.5 to 1:4.7 and the Teno ratios from 1:2.1 to 1:5.1. The rock ratios show no clear relation to the soils of the Anaga and Teno area. Only the Orotava rocks show a relation to the soils. The Orotava rocks range from 1:2.7 to 1:3.3. The plotted rock ratios are shown at Fig.158 f.

13.5 Nickel (Ni) combinations with Cu, Fe, Mn, Si and Al

Ni vs. Cu: The scatterplot shows that the highest Ni/Cu ratios occur within the soils of profile T3, T4, T12 and A9. It seems that there is a slightly positive trend within the soils of T3 and A9. However, this is not clearly determined and unique trends are not indicated due to the calculated ratios or the plotted ratios. Relations between rocks and soils are not determined. The rock and leaf ratios are shown at Fig.159 a and b.

Ni vs. Fe: The scatterplot indicates clearly that Ni and Fe are bound together at profile T3. That means Fe, Ni, Mn and Mg are bound together within soil profile T3. No clear relation is seen at profile T4 and T12. Only the higher Ni levels makes both profiles distinguishable from the Anaga or Orotava soils. None of the Anaga and Orotava soil ratios generated linear trends. The scatterplot indicated therefore no typical geogenic fingerprint. However, the calculated mean soil ratios of profile T3, T4 and T12 are distinguishable from the remaining ratios, which is caused by the high amounts of Ni. In addition, clear relations between rocks and soils are not seen in the calculated ratios. The rock ratios are shown at Fig.159 c.

Ni vs. Mn: The scatterplot shows a strongly increasing positive trend at profile T3. However, linear trends do not exist for profile T4, T12 and the remaining areas. That means, Mn and Ni are bound together only at profile T3. This is a possible hint for the mineral olivine, where Mg, Ni and Mn are often associated to each other. However, typical geogenic trends have not been determined. Only, the calculated mean soil and rock ratios of profile T3, T4 and T12 are clearly distinguishable from the remaining areas. The rock ratios range between 2.2:1 and 12:1. The mean soil ratios range between 4.4:1 and 9.4:1. The rock and soil ratios of the remaining areas are completely different and vary widely. The mean soil levels of the Anaga samples range between 10.6:1 and 118.6:1. The mean soil levels of the Orotava samples range between 31:1 and 46.3:1. In addition, the mean soil ratios (30:1) of profile T11 fit also much better to the Anaga and Orotava area as to the other Teno samples. Nevertheless, the plotted leaf ratios show no clear relation between rocks and soils. The rock ratios are shown at Fig.159 d.

Ni vs. Si: The elements Ni and Si are bound together within the soils of T3, T4 and T12, but they show not the same trends. Profile T4 has even a positive trend. That means the high Mg and Ni amounts of profile T3 are associated with Mn, Fe and Ni. It can therefore be assumed that occurring olivine minerals affected the soil of T3. However, both elements are not related to each other within the remaining soils and typical geogenic fingerprints are not determined. The rock ratios are shown at Fig.159 e.

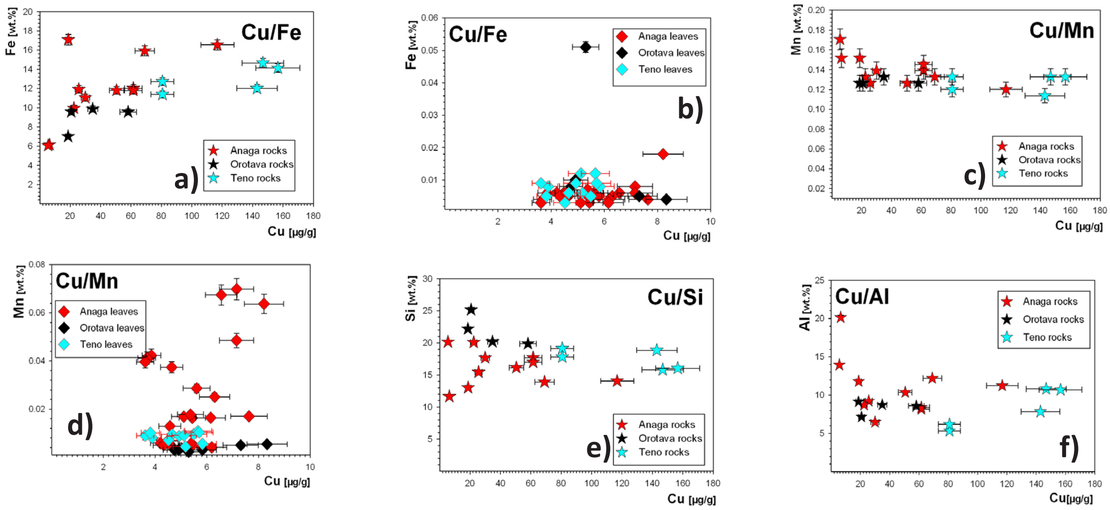
Ni vs. Al: The plotted topsoil ratios of profile T3, T4 and T12 are clearly distinguishable from the remaining areas. However, profile T11 is also plotted close to the Anaga and Orotava ratios, which makes it impossible to determine a clear Teno trend. The Orotava and Anaga ratios are plotted mostly vertical without a clear linear trend. In addition, it is only possible to distinguish the three Teno profile from the remaining areas due to the calculated Ni-to-Al ratios. As already mentioned, T11 fits much better to the Anaga and Orotava areas. For example, the mean soil ratio of T11 is 1:2035. The ratios of profile T3, T4 and T12 range from 1:309 to 1:582. Therefore, even the calculated ratios are not useable to distinguish the sampling areas from each other. Clear relations between rocks and soils are not determined. The plotted rock ratios are shown at Fig.159 f.

13.6 Copper (Cu) combinations with Fe, Mn, Si, Al and Zr

Cu vs. Fe: At first glance it seems that positive trends occur for the plotted Teno soil ratios, but a closer look indicates that the ratios are plotted without a clear trend. The same applies to the remaining soil samples. In addition, the plotted and calculated rock ratios show no relation to the soils or between Cu and Fe. The calculated rock and soil ratios show also no relation to each other or any significant differences between the sampling areas. The leaf and root scatterplots indicate also no relation between Cu and Fe. The plotted rock and leaf ratios are shown at Fig.160 a and b.

Cu vs. Mn: The scatterplot indicates positive linear trends within the soils of profile T3 and T12. The remaining soil ratios are plotted either nearly vertically or closely together. It seems, Mn and Cu are related to each other within the soils of profile T3 and T12. No linear trend occurs within profile A9, which contains also high Cu levels. The plotted rock ratios show no positive trends and no relation to the plotted soil ratios. The calculated rock and soil ratios show no clear differences between the sampling areas. Within each profile there are also no relation between rock and soil ratios. In addition, the leaf and root scatterplots indicate no relation between the observed trends or between the calculated element ratios. Plotted rock and leaf ratios are shown at Fig.160 c, d.

Cu vs. Si: There is no relation between Cu and Si in the Anaga or Orotava soils. Most of the soil ratios are plotted more or less vertically. However, it is recognizable that a few Anaga soils split of from the remaining Anaga samples. The Teno soils of profile T3, T4 and T12 are plotted in a slightly linear trend and show maybe a relation between Cu and Si. The plotted rock ratios indicated no relation between Cu and Si within the Anaga, Orotava or Teno samples. Also the calculated Cu-to-Si ratio indicates no relation between rock and soils. A typical Teno or Anaga Cu/Si ratio has not been determined. The rock ratios are shown at Fig.160 e.



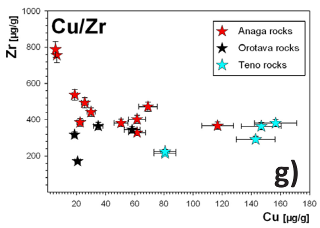


Fig.160 a) Plotted Cu/Fe rock ratios. b) Plotted Cu/Fe leaf ratios c) Plotted Cu/Mn rock ratios. d) Plotted Cu/Mn leaf ratios. e) Plotted Cu/Si rock ratios. f) Plotted Cu/Al rock ratios. g) Plotted Cu/Zr rock ratios.

Cu vs. Al: The topsoil ratios are plotted widely dispersed and it is not possible to distinguish the sampling areas from each other. Furthermore, linear trends are only recognizable for profile O6 and several Anaga profiles. The plotted topsoil ratios are not useable to distinguish the sampling areas from each other. In addition, a clear relation between rocks and soils are not determined due to the plotted ratios. Furthermore, the calculated Cu-to-Al ratios are not useable to distinguish the sampling areas from each other due to overlapping ratios. However, excluding profile T11 distinguishes the remaining Teno profiles clearly from the other areas. For example, the ratios of T3, T4 and T12 range from 1:977 to 1:1077 and the ratios of the remaining areas range from 1:1321 to 1:4005. The mean soil ratio of T11 is 1:2090. The rock ratios are shown at Fig.160 f.

Cu vs. Zr: The elements Ni and Mg show no relation to Zr in none of the samples. However, the Cu/Zr ratios are plotted nearly vertical in the Anaga soils. At first glance it seems that the Orotava soils shown a positive trend, but this is not the case. Only the soil ratios of T3 and T12 are plotted in a slightly positive trend. But this is not clearly determined because of the error range and the closely together plotted values. However, different rock ratios for the Anaga and Teno samples are determined due to the calculated element-to-element Cu/Zr ratios. The Teno rock ratios range from 1:2 to 1:2.7. The Anaga rock ratios range from 1:5.3 to 1:143.3, with exception of sample A9 (1:3.1). The ratios of A9 fit much better to the Teno rock ratios. In addition, it is possible to divide the Anaga ratios into two ranges. The rock ratios range between 1:5.3 and 1:7.5 at the sampling site A2, A8, A10 and A15. The remaining rock ratios range between 1:14.7 and 1:143.3. Nevertheless, it is necessary to know that the Anaga rocks are dividable into two groups because of different Zr ratios. The rock ratios are shown at Fig.160 g.

13.7 Strontium (Sr) combinations with K, Fe and Mg

Sr vs. K: The plotted Sr/K topsoil ratios indicate two positive trends for profile O6 and O7 and a negative trend for profile O5, as already observed at the Sr/Na ratios. The calculated Sr-to-K ratios of the Orotava soils are totally different in comparison to the remaining soils, which make them clearly distinguishable. For example, the Orotava soils contain mean Sr-to-K ratios between 1:11 and 1:14. The Anaga and Teno soils contain mean ratios between 1:20 to 1:57. In addition, the rock and soil ratios fit together in the Orotava samples (Fig.161 a). The remaining rock ratios are either higher or significantly lower as the related soil ratios. Nevertheless, the scatterplots and the calculated ratios indicate a relation between K and Sr in the Orotava rocks and soils. The plotted leaf ratios indicate different Sr/K ratios in the Orotava samples. The roots show no clear dependency between Sr and K (Fig.161 b). Only the calculated ratios of Sr to K indicate clear differences between the sampling areas. The Orotava leaf ratios range between 1:55 and 1:102. The Anaga leaf ratios range between 1:107 to 1:392 and the Teno ratios between 1:90 and 1:314.

Sr vs. Fe: The Anaga and Teno soil ratios are plotted more or less in strongly increasing positive trends. The Sr/Fe ratios of the three Orotava profiles are plotted in different directions. For example, the ratios of profile O6 are plotted more or less horizontally. The ratios of profile O7 are plotted slightly positive and the ratios of O5 in a clear negative direction. However, the Orotava samples O6 and O7

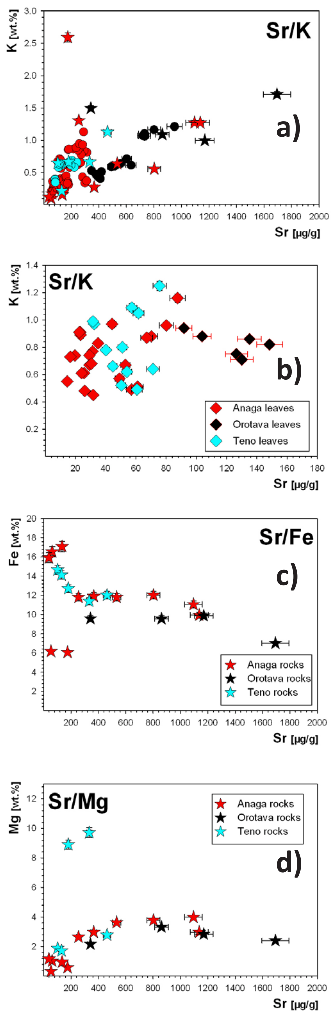


Fig.161 a) Plotted Sr/K rock and soil ratios. b) Plotted Sr/K leaf ratios c) Plotted Sr/Fe rock ratios. d) Plotted Sr/Mg rock ratios.

are clearly distinguishable due to the large variation within the Sr levels. All of the three profiles show different relations with Fe. Anyway, a typical Orotava fingerprint is not determined due to the plotted ratios. Also the calculated Sr-to-Fe ratios are not useful to distinguish the topsoils from each other. The plotted rock ratios are shown at Fig.161 c.

Sr vs. Mg: The Sr/Mg ratios are plotted in a triangular shape and the ratios can be accurately allocated to the three main sampling areas, due to the high Mg and low Sr levels of the Teno soils and the high Sr and lower Mg levels of the Orotava soils. The Anaga Sr/Mg ratios are accumulated in the tip of the triangle and clearly distinguishable from the other areas. However, there is no clear positive or negative linear trend visible neither for the Orotava ratios nor for the remaining areas. In addition, the ratios are plotted nearly similar to the Sr/Fe ratios. The ratios of profile O6 are more or less horizontally plotted, profile O7 slightly positive and O5 in a clear negative direction. However, the Orotava samples are clearly distinguishable due to of the large variation within the Sr levels. All of the three profiles show different relations with Fe. However, a typical Orotava, Anaga or Teno fingerprint is not recognizable due to the calculated soil and rock ratios. For example, the mean soil ratios of the Anaga samples range from 1:32.3 to 1:128.1. The Orotava ratios are ranging between 1:20.4 and 1:42. The Teno ratios range between 1:69.1 and 1:487.9. The plotted rock ratios are shown at Fig.161 d.

13.8 Sodium (Na) combinations with Mg, Si and Al

Na vs. Mg: The Na/Mg topsoil ratios are plotted also in a triangular shape, such as the Sr/Mg ratios due to the high Mg and low Na levels of the Teno soils and the high Na and low Mg levels of the Orotava soils. A clear relation between Na and Mg is determined only for profile O7 and O5. Both ratios are plotted in different positive trends. Profile O6 contains more or less horizontally plotted Na/Mg ratios. However, typical trend are not determined neither by the plotted ratios nor by the calculated mean soil and rock ratios. In addition, a relation between rocks, soils, roots and leaves are not determined. Furthermore, the calculated vegetation ratios are not useful to distinguish the sampling areas from each other. The plotted rock ratios are shown at Fig.162 a.

Na vs. Si: The scatterplot looks quite similar to the above-described Na/Al plot. The plotted ratios indicate also clear positive linear relations between Na and Si for all Orotava soils. It is recognizable that the positive trends show a stronger increase at profile O6 and O7 as at profile O5. Anyway, all profiles show clear positive trends, instead of the remaining soils, which are mostly vertical plotted. A few profiles show even a negative trend. The calculated Na-to-Si ratios of the rocks and soils fit not perfectly together. The ratios show large variations between rocks and soils. The rock and mean soil Na/Si ratio are 1:12.5 and 1:20 at profile O5, 1:5.7 and 1:10 at profile O6 and 1:10.1 and 1:12.7 at profile O7. The ratios of the Teno and Anaga rocks and soils show even much larger variations and the ratios are completely different. For example, the Teno rock and soil ratios range from 1:28 to 1:102. However, the scatterplot and the calculated ratios identify a Na and Si relation between Orotava rocks and soils. The plotted rock ratios are shown at Fig.162 b.

Na vs. Al: Positive Na/Al trends occur for the plotted topsoil ratios of profile O5, O6 and O7. It is clearly visible that the plotted ratios of profile O5 split off from the other Orotava ratios. In addition, only a few of the remaining soils show positively plotted trends. However, the occurring Orotava trends are completely different and clearly distinguishable form the remaining areas. This observation fits also to the calculated Orotava mean soil Na-to-Al ratios, which range from 1:5.5 to 1:11.6. The Na/Al ratios of the Anaga and Teno soils range from 1:18 to 1:157.1. The scatterplot and the calculated ratios indicate that Na and Al are associated within the Orotava soils. In addition, the plotted rock and soil ratios fit together and indicate that the associated rocks influenced the Na/Al ratios of the Orotava soils. The plotted rock ratios are shown at Fig.162 b.

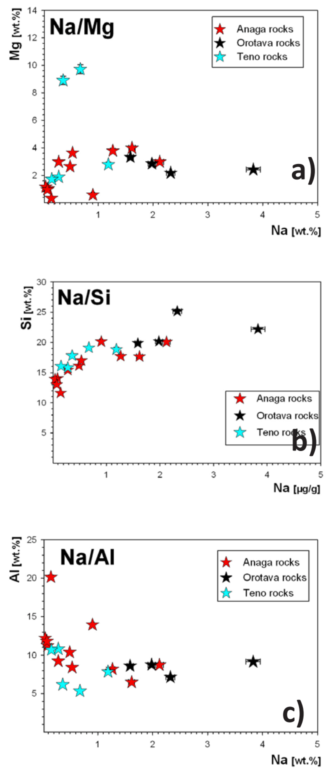
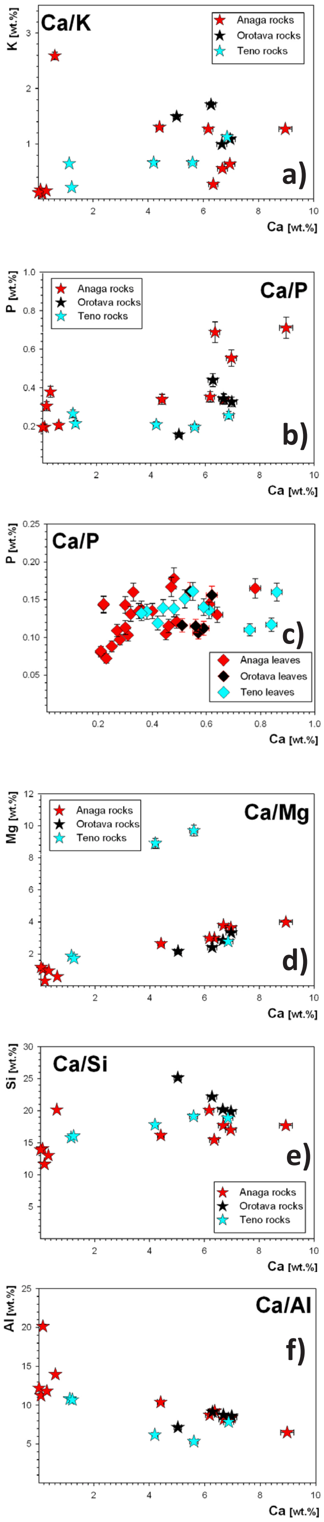


Fig.162 a) Plotted Na/Mg rock ratios. b) Plotted Na/Si rock ratios c) Plotted Na/Al rock ratios.

13.9 Calcium (Ca) combinations with K, P, and Mg

Ca vs. K: Clear linear relations are not recognizable for the plotted ratios of the Anaga and Teno topsoil samples. Furthermore, the plotted Orotava ratios show only slightly positive trends and it can only be assumed if Ca and K are related to each other within this area. In addition, the plotted ratios as well the Ca-to-K ratios are not clearly distinguishing the main sampling areas from each other due to several overlapping results or displaced plotted ratios. Furthermore, the plotted vegetation ratios, including roots and leaves show no relation to the rock or soil ratios as well no relation to the calculated Ca-to-K ratios. The plotted rock ratios are shown at Fig.163 a.

Ca vs. P: Several positive and negative trends occur due to the plotted ratios of the Anaga, Orotava and Teno topsoil samples, indicating clearly the different Ca and P associations within the sampling areas. For example, the Anaga ratios are plotted more or less in different negative directions instead of the plotted Orotava ratios, which reveal three positive trends. The plotted ratios of profile O5, O6 and O7 are clearly distinguishable from the remaining locations due to the higher Ca soil con-



tents, which indicates that Ca and P are related to each other. The remaining Teno profiles show no clear positive or negative trends, with exception of profile T12. The soil ratios of profile T12 are plotted in the same direction as the ratios of profile O7. Considering the Ca-to-P ratios of profile O5, O6, O7 and T12, the calculated soil and rock ratios fit very well together and are clearly distinguishable from the remaining areas. For example, the mean soil range from 12.7:1 to 27.7:1 and the associated rock ratios range from 14.2:1 and 28.6:1.

However, distinguishable ratios are not determined due to the overlapping profiles O5, O6, O7 and T12. Furthermore, the variations of the calculated Ca-to-P ratios are too large within the Anaga and Teno samples. In addition, relations between rock, soil and vegetation samples are not determined due to the plotted vegetation ratios, including leaves and roots. Also the calculated values indicate no typical root or leaf ratio for the individual areas. The plotted rock and leaf ratios are shown at Fig.163 b and c.

Ca vs. Mg: The plotted Ca/Mg ratios show no trends within the Orotava, Teno and Anaga soils. The Orotava ratios are plotted close together instead of the Teno or Anaga soil ratios. Nevertheless, the scatterplots indicate that Ca is not associated with Mg in the Orotava, Teno and Anaga soils. Also a relation between leaves, soils and rocks does not exist. The plotted rock ratios are shown at Fig.163 d.

Fig.163 a) Plotted Ca/K rock ratios. b) Plotted Ca/P rock ratios c) Plotted Ca/P leaf ratios. d) Plotted Ca/Mg rock ratios. e) Plotted Ca/Si rock ratios. f) Plotted Ca/Al rock ratios.

13.10 Calcium (Ca) combinations with Si and Al

Ca vs. Si: The scatterplot shows that completely different trends occur for the plotted Ca/Si ratios of the Orotava soils. Profile O5, O6 and O7 show a positive Ca/Si trend instead of the Anaga and Teno profiles, which show all negative trends. The Ca/Si trends indicate that both elements are bound together within the Orotava soils. The calculated Ca-to-Si ratios of the Orotava rocks and soils fit very well together and indicate clearly the relation between rocks and soils. The mean soil Ca-to-Si ratios range from 1:2.7 to 1:4.7 and the rock ratios range from 1:2.8 to 1:3.5. The rocks and soils ratios of the Teno and Anaga samples show much larger variations. However, typical area specific trends or Ca-to-Si ratios are not determined due to several overlapping results of Orotava and Teno samples. The plotted rock ratios are shown at Fig.163 e.

Ca vs. Al: Positive trends occur for the plotted topsoil ratios of the Orotava profiles. The Anaga and Teno ratios are plotted all in negative trends. All soils show a relation between Ca and Al. Furthermore, the Orotava topsoils are clearly distinguishable due to the plotted ratios. In addition, the calculated Ca-to-Al ratios of the Orotava rocks and soils fit very well together, indicating clearly the affecting influences of the soil parent materials. The mean soil ratios of the Orotava samples range from 1:1.6 to 1:2.5 and the rock ratios from 1:1.2 to 1:1.4. The ratios of the Teno and Anaga rocks and soils show much larger variations. However, the calculated mean soil ratios are usable to differentiate between the Orotava soils and the remaining areas. The Teno mean soil range from 1:2.9 to 1:5.1 and the Anaga ratios from 1:3.3 to 1:25.8. The plotted rock ratios are shown at Fig.163 f.

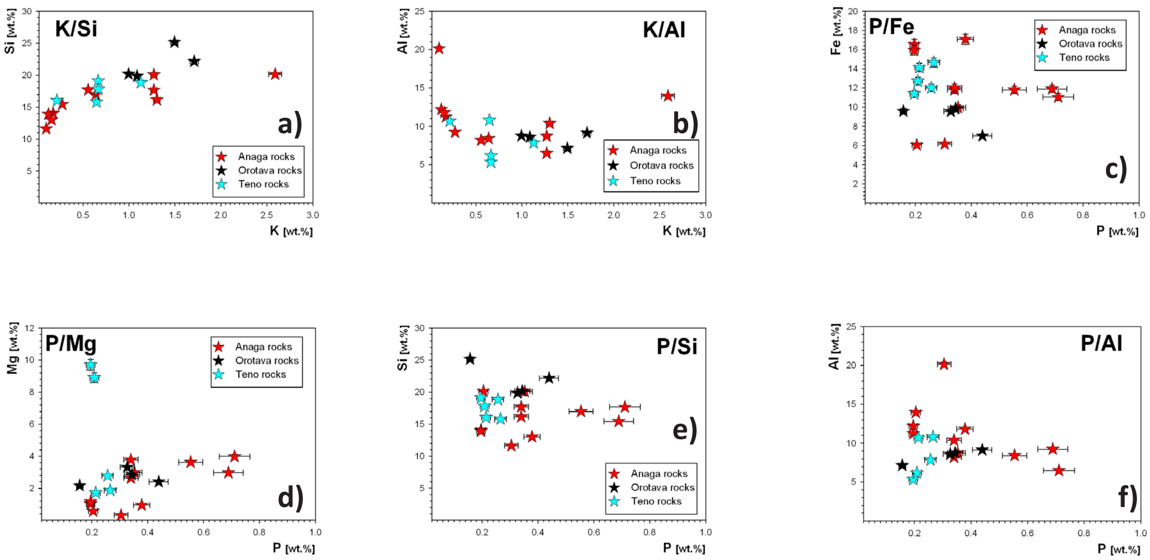


Fig.164 a) Plotted K/Si rock ratios. b) Plotted K/Al rock ratios c) Plotted P/Fe rock ratios. d) Plotted P/Mg rock ratios. e) Plotted P/Si rock ratios. f) Plotted P/Al rock ratios.

13.11 Potassium (K) combinations with Si and Al

K vs. Si: The plotted K/Si ratios show linear trends within the Anaga and Orotava soils. The Teno soil ratios are plotted slightly vertical. Clear differences between the sampling areas are not visible due to the plotted ratios. However, it is recognizable that K is associated with Si in the Orotava soils. In addition, the calculated K-to-Si ratios show no typical sampling area specific features. The plotted rock ratios are shown at Fig.164 a.

K vs. Al: The plotted K/Al ratios show positive trends within the profiles O5, O6 and O7. In addition, negative trends are seen at profile T3, T4, T11 and T12. The plotted K/Al ratios show different positive trends and one negative trend within the Anaga soil profiles. Positive trends are seen at profile A1, A8, A9, A10, A14, A15, A19, A17 and A19. The plotted rock ratios show no clear relation or influence to the K/Al soil ratios. Anyway, it is recognizable that K is associated with Al within the Orotava rocks and soils. The plotted rock ratios are shown at Fig.164 b.

13.12 Phosphor (P) combinations with Fe, Mg, Si and Al

P vs. Fe: Only a few linear trends are recognizable for the plotted topsoil ratios, including several Anaga soils and profile O7. A clear differentiation between the several sampling areas is not possible. Furthermore, the calculated P-to-Fe ratios show also no distinguishable ratios due to the large variations between each sampling site. The plotted rock ratios are shown at Fig.164 c.

P vs. Mg: The plotted P/Mg soil ratios indicate several linear trends for a few Anaga profiles and two Orotava profiles (O6, O7). A clear differentiation between the several sampling areas is possible because of the separation of the Teno samples. As already mentioned, they contain the highest Mg levels. Typical geogenic ratios are not determined for the Orotava area. The plotted rock ratios are shown at Fig.164 d.

P vs. Si: The plotted P/Si soil ratios indicate several linear trends for the Anaga, Orotava and Teno topsoil samples. However, a clear differentiation between the several sampling areas or a determination of typical geogenic trends is not possible. However, the scatterplot indicates a relation between P and Si within most of the topsoils. The plotted rock ratios are shown at Fig.164 e.

P vs. Al: The plotted P/Al soil ratios indicate several linear trends for a few Anaga and Orotava samples. A clear differentiation between the several sampling areas or a determination of typical geogenic trends is not possible. However, the scatterplot indicates a relation between P and Al within a few profiles. The plotted rock ratios are shown at Fig.164 f.

14. Appendix: Tables

14.1 The element-to-element ratios

Table 6 Fe/Ti, Fe/Zr, Fe/Al, Ti/Zr, Ti/Si, Ti/Al, Zr/Si and Zr/Al element-to-element ratios.

Nr	Type	Fe/Ti	Fe/Zr	Fe/Si	Fe/Al	Ti/Zr	Ti/Si	Ti/Al	Zr/Si	Zr/Al
A1	0 - 2 cm	4,9;1	149,1;1	1;3,1	1;1,6	30;1	1;15,5	1;8,1	1;467,5	1;245,5
A1	2 - 4 cm	4,6;1	145,7;1	1;3	1;1,6	31,3;1	1;14,1	1;7,5	1;442,1	1;237
A1	4 - 6 cm	4,3;1	164,4;1	1;2,4	1;1,5	37,4;1	1;10,8	1;7	1;406,3	1;262,4
A1	6 - 8 cm	4,2;1	161,1;1	1;1,9	1;1,5	37,9;1	1;8,1	1;6,4	1;310,3	1;244,6
A1	14 - 16 cm	4,3;1	129,1;1	1;1,7	1;1,5	29,8;1	1;7,5	1;6,7	1;225,2	1;201,4
A1	Soil MEAN	4,3;1	144,1;1	1;2,1	1;1,5	32,8;1	1;9,3	1;6,8	1;307,9	1;226
A1	Rock	4,1;1	81,4;1	1;1,8	1;3,2	19,4;1	1;7,8	1;13,6	1;153,8	1;266,2
A1 O	Leaves nwsh	12;1	1200;1			100;1				
A1 O	Leaves wsh	12,5;1	1250;1			100;1				
A1 Y	Leaves nwsh	10;1	1000;1			100;1				
A1 Y	Leaves wsh	7,5;1	750;1			100;1				
A1 O	Roots	10,6;1	246,1;1		1;2,5	23;1		1;26,6		1;615,3
A1 Y	Roots	9,7;1	254,6;1		1;1,9	26;1		1;19		1;496,8
A2	0 - 2 cm	3,9;1	168,3;1	1;1,6	1;1,3	42,8;1	1;6,5	1;5,3	1;281,4	1;227
A2	2 - 4 cm	3,9;1	149,4;1	1;1,7	1;1,4	37,7;1	1;6,9	1;5,8	1;264,3	1;220
A2	4 - 6 cm	3,9;1	138,2;1	1;1,8	1;1,6	34,9;1	1;7,1	1;6,3	1;251	1;223
A2	6 - 8 cm	3,9;1	135,2;1	1;1,8	1;1,6	34,5;1	1;7,1	1;6,4	1;248,1	1;221,3
A2	14 - 16 cm	3,9;1	136;1	1;1,8	1;1,6	34,4;1	1;7,2	1;6,3	1;250,3	1;219
A2	Soil MEAN	3,9;1	144,1;1	1;1,7	1;1,5	36,5;1	1;7	1;6	1;257,8	1;221,8
A2	Rock	3,3;1	309,1;1	1;1,3	1,1;1	91;1	1;4,6	1;2,9	1;422,7	1;271,6
A2 O	Leaves nwsh	8,5;1	1538,4;1			179,4;1				
A2 O	Leaves wsh	8,5;1	1714,2;1			200;1				
A2 O	Roots	6,5;1	1520;1		1;1,5	232;1		1;10,3		1;2400
A8	0 - 2 cm	3,9;1	329,1;1	1;1,4	1,2;1	83;1	1;5,9	1;3,1	1;491,7	1;257,5
A8	2 - 4 cm	3,9;1	328,9;1	1;1,7	1,1;1	83,7;1	1;6,7	1;3,5	1;564,4	1;293,8
A8	4 - 6 cm	3,8;1	342,1;1	1;1,3	1,2;1	89,3;1	1;5,1	1;3	1;457,9	1;272,7
A8	6 - 8 cm	3,8;1	360,4;1	1;1,1	1,3;1	93,1;1	1;4,5	1;2,8	1;425,2	1;268,6
A8	14 - 16 cm	3,8;1	373,6;1	1;1,1	1,3;1	97,4;1	1;4,4	1;2,7	1;430,2	1;269,1
A8	Soil MEAN	3,8;1	352,9;1	1;1,2	1,2;1	91,2;1	1;5	1;2,9	1;458	1;271,5
A8	Rock	3,6;1	365,4;1	1;1,4	1,4;1	98,9;1	1;5,4	1;2,5	1;538,5	1;249,2
A8 Y	Leaves nwsh	8,8;1	1000;1			112,5;1				
A8 Y	Leaves wsh	22,5;1	2000;1			88,8;1				
A8 Y	Roots	9,1;1	719,6;1		1;1,4	78,7;1		1;13,4		1;1060,6

Continuation: Table 6

Nr	Type	Fe/Ti	Fe/Zr	Fe/Si	Fe/Al	Ti/Zr	Ti/Si	Ti/Al	Zr/Si	Zr/Al
A9	0 - 2 cm	3,6;1	363,9;1	1;1	1,2;1	99,5;1	1;3,7	1;2,8	1;372,2	1;282,3
A9	2 - 4 cm	3,6;1	383,1;1	1;1	1,2;1	105,8;1	1;3,4	1;2,8	1;360,5	1;304,6
A9	4 - 6 cm	3,5;1	385,6;1	1;1	1,2;1	108,5;1	1;3,2	1;2,8	1;356,8	1;312
A9	6 - 8 cm	3,5;1	387,3;1	1,1;1	1,2;1	107,7;1	1;3,2	1;2,8	1;349	1;302,6
A9	14 - 16 cm	3,6;1	383,2;1	1,1;1	1,2;1	106,3;1	1;3,2	1;2,7	1;343,9	1;297,1
A9	Soil MEAN	3,6;1	381,9;1	1;1	1,2;1	106;1	1;3,3	1;2,8	1;355,1	1;301
A9	Rock	4,1;1	451,1;1	1,1;1	1,4;1	108,3;1	1;3,5	1;2,8	1;383,3	1;306,4
A9 O	Leaves nwsh	7,5;1	1500;1			200;1				
A9 O	Leaves wsh	10;1	2000;1			200;1				
A9 O	Roots	5,2;1	457,6;1		1,1;1	87,4;1		1;4,6		1;407,5
A10	0 - 2 cm	4,1;1	212,7;1	1;1,6	1;1	51,4;1	1;6,6	1;3,9	1;341,6	1;200,7
A10	2 - 4 cm	3,9;1	300,8;1	1;1,3	1,1;1	76,6;1	1;5,4	1;3,3	1;416,3	1;257,6
A10	4 - 6 cm	3,7;1	333,4;1	1;1	1,3;1	88,9;1	1;3,4	1;2,8	1;309,5	1;254,3
A10	6 - 8 cm	3,8;1	319,5;1	1,1;1	1,3;1	83,9;1	1;3,3	1;2,8	1;281,9	1;238
A10	8 - 10 cm	3,9;1	301,7;1	1,2;1	1,3;1	77,2;1	1;3	1;2,8	1;232,1	1;222,1
A10	Soil MEAN	3,8;1	304,8;1	1;1	1,3;1	79;1	1;3,6	1;2,9	1;285,5	1;233,9
A10	Rock	4,1;1	336,9;1	1,1;1	1,3;1	82;1	1;3,5	1;3,1	1;294,4	1;258,3
A10 O	Leaves nwsh	10;1	1500;1			150;1				
A10 O	Leaves wsh	10;1	833,3;1			83,3;1				
A10 O	Roots	16,7;1	986,7;1		1,8;1	58,8;1		1;9		1;530,9
A14	0 - 2 cm	4,4;1	186,4;1	1;2	1;1,3	42,2;1	1;9,1	1;5,8	1;386,7	1;246,8
A14	2 - 4 cm	4,4;1	181,7;1	1;2	1;1,3	40,5;1	1;9,3	1;6,1	1;378,9	1;248,9
A14	4 - 6 cm	4,4;1	178,6;1	1;1,8	1;1,3	40,1;1	1;8,4	1;5,8	1;339,2	1;233,7
A14	6 - 8 cm	4,3;1	175,1;1	1;1,8	1;1,3	40,1;1	1;8	1;5,7	1;325,3	1;229,3
A14	8 - 10 cm	4,4;1	178,5;1	1;1,8	1;1,3	40,4;1	1;7,9	1;5,7	1;323,5	1;232,9
A14	Soil MEAN	4,4;1	179,4;1	1;1,9	1;1,3	40,6;1	1;8,5	1;5,8	1;345,8	1;237
A14	Rock	4;1	76,9;1	1;3,3	1;2,2	18,9;1	1;13,4	1;9,3	1;255,5	1;176,9
A 14 Y	Leaves nwsh	7,1;1	1666,6;1			233,3;1				
A 14 Y	Leaves wsh	6,6;1	1333,3;1			200;1				
A 14 Y	Roots	7,3;1	159;1		1;2,1	21,5;1		1;15,7		1;340,9
A15	0 - 2 cm	4,1;1	229,4;1	1;1,7	1,1;1	55,1;1	1;7,2	1;3,7	1;399,6	1;205,1
A15	2 - 4 cm	4,1;1	237,8;1	1;1,6	1,1;1	56,6;1	1;6,9	1;3,7	1;392,4	1;214,7
A15	4 - 6 cm	4,2;1	225,9;1	1;1,6	1,1;1	53,2;1	1;6,8	1;3,8	1;366,9	1;204
A15	6 - 8 cm	4,2;1	213;1	1;1,5	1;1	49,7;1	1;6,7	1;3,9	1;335,8	1;196,8
A15	8 - 10 cm	4,2;1	212,4;1	1;1,5	1;1	50,4;1	1;6,6	1;3,9	1;334	1;201,4
A15	14 - 16 cm	4,2;1	214,7;1	1;1,5	1;1	50,5;1	1;6,5	1;3,8	1;329,4	1;197
A15	Soil MEAN	4,2;1	221,3;1	1;1,6	1;1	52,4;1	1;6,8	1;3,8	1;356,9	1;202,7
A15	Rock	3,9;1	293,3;1	1;1,4	1,4;1	73,3;1	1;5,7	1;2,8	1;422,2	1;209,1
A15 Y	Leaves nwsh	8,5;1	750;1			87,5;1				
A15 Y	Leaves wsh	7,1;1	555,5;1			77,7;1				
A15 O	Leaves nwsh	6,2;1	833,3;1			133,3;1				
A15 O	Leaves wsh	6,2;1	714,2;1			114,2;1				

Continuation: Table 6

Nr	Type	Fe/Ti	Fe/Zr	Fe/Si	Fe/Al	Ti/Zr	Ti/Si	Ti/Al	Zr/Si	Zr/Al
A16	0 - 2 cm	4,1;1	204,2;1	1;1,5	1;1	48,7;1	1;6,3	1;4	1;310,4	1;199
A16	2 - 4 cm	4,1;1	211;1	1;1,4	1;1	50,6;1	1;6,2	1;4	1;315,8	1;203,6
A16	4 - 6 cm	4,1;1	215,4;1	1;1,4	1;1	51,3;1	1;6,1	1;3,9	1;318	1;205
A16	6 - 8 cm	4,1;1	219,3;1	1;1,4	1;1	52,4;1	1;5,9	1;3,8	1;314,7	1;203,1
A16	8 - 10 cm	4,1;1	216,7;1	1;1,3	1,1;1	52,5;1	1;5,7	1;3,7	1;299,8	1;195,7
A16	14 - 16 cm	4,1;1	207,6;1	1;1,5	1;1	49,7;1	1;6,2	1;4,1	1;311,7	1;204,1
A16	Soil MEAN	4,1;1	212,7;1	1;1,4	1;1	51;1	1;6,1	1;3,9	1;311,5	1;201,8
A16a	Rock	3,1;1	250;1	1;1,5	1,7;1	78,2;1	1;5,1	1;1,8	1;399,5	1;146,7
A16b	Rock	3,1;1	241;1	1;1,2	1,2;1	76,7;1	1;4	1;2,4	1;312,5	1;187,1
A16 O	Leaves nwsh	3,3;1	600;1			180;1				
A16 O	Leaves wsh	3,7;1	1000;1			266,6;1				
A16 O	Roots	24,7;1	3466,6;1		1;1,1	140;1		1;28,5		1;4000
A17	0 - 2 cm	5,3;1	201,6;1	1;1,7	1;1	37,7;1	1;9,4	1;5,7	1;357	1;215,2
A17	2 - 4 cm	5,3;1	209,9;1	1;1,6	1;1	39,2;1	1;8,8	1;5,6	1;348,1	1;222,6
A17	4 - 6 cm	5,3;1	179,3;1	1;1,5	1;1	33,6;1	1;8	1;5,4	1;272,1	1;183,6
A17	6 - 8 cm	5,3;1	210;1	1;1,5	1;1	38,9;1	1;8,5	1;5,7	1;333,5	1;224,3
A17	8 - 10 cm	5,3;1	194,7;1	1;1,6	1;1	36,5;1	1;8,5	1;5,8	1;314,3	1;213
A17	14 - 16 cm	5,2;1	207,5;1	1;1,6	1;1,1	39,5;1	1;8,5	1;5,9	1;338,7	1;233,4
A17	Soil MEAN	5,3;1	199,5;1	1;1,6	1;1	37,4;1	1;8,6	1;5,7	1;323,3	1;214,3
A17	Rock	3,7;1	258,2;1	1;2	1,1;1	68,3;1	1;7,6	1;3,3	1;521,8	1;226,9
A17 O	Leaves nwsh	7,5;1	1000;1			133,3;1				
A17 O	Leaves wsh	8;1	1333,3;1			166,6;1				
A17 O	Roots	10,8;1	402,9;1		1;1	37,1;1		1;11,2		1;417,6
A19	0 - 2 cm	4,3;1	311,3;1	1;1,8	1;1	70,8;1	1;8,1	1;4,1	1;575,3	1;297,4
A19	2 - 4 cm	4,2;1	313;1	1;1,7	1;1	73,4;1	1;7,2	1;3,9	1;533,3	1;291,4
A19	4 - 6 cm	3,9;1	364,9;1	1;1,1	1,2;1	92;1	1;4,6	1;3	1;424	1;283,8
A19	6 - 8 cm	3,8;1	373;1	1;1	1,3;1	95,7;1	1;3,8	1;2,9	1;372,2	1;284,4
A19	8 - 10 cm	3,8;1	373,1;1	1,1;1	1,3;1	96,5;1	1;3,4	1;2,7	1;334,2	1;269,3
A19	14 - 16 cm	3,8;1	346,2;1	1;1	1,3;1	89,3;1	1;3,7	1;2,9	1;331,2	1;265,8
A19	Soil MEAN	3,9;1	357,1;1	1;1	1,2;1	90,7;1	1;4,1	1;3	1;381,1	1;276,6
A19	Rock	3,8;1	317,8;1	1,3;1	1,4;1	81,9;1	1;2,9	1;2,6	1;242,4	1;219,7
A19 O	Leaves nwsh	8,5;1	857,1;1			100;1				
A19 O	Leaves wsh	10;1	777,7;1			77,7;1				
A19 O	Roots	17,3;1	5500;1		1;2,4	316,6;1		1;42,1		1;13333,3
O5	0 - 2 cm	4,4;1	273,1;1	1;1,7	1;1	61,7;1	1;7,7	1;4,3	1;480,6	1;271,1
O5	2 - 4 cm	4,3;1	305,1;1	1;1,6	1,1;1	70,1;1	1;6,9	1;3,8	1;488,5	1;273
O5	4 - 6 cm	4,3;1	302,2;1	1;1,6	1;1	68,8;1	1;7,2	1;4,1	1;498,7	1;286,4
O5	6 - 8 cm	4,3;1	304,5;1	1;1,6	1;1	69,7;1	1;7,1	1;4	1;500,7	1;280,7
O5	14 - 16 cm	4,4;1	278,9;1	1;1,5	1;1	62,7;1	1;7	1;4,3	1;439,5	1;274,8
O5	Soil MEAN	4,3;1	293;1	1;1,6	1;1	66,6;1	1;7,1	1;4,1	1;479,2	1;277,5
O5	Rock	4,2;1	277,4;1	1;2	1,1;1	66;1	1;8,7	1;3,7	1;576,3	1;249,9
O5 O	Leaves nwsh	6,2;1	500;1			80;1				
O5 O	Leaves wsh	5,7;1	444,4;1			77,7;1				
O5 O	Roots	6,9;1	240;1		1;2,7	34,6;1		1;19,2		1;666,6

Continuation: Table 6

Nr	Type	Fe/Ti	Fe/Zr	Fe/Si	Fe/Al	Ti/Zr	Ti/Si	Ti/Al	Zr/Si	Zr/Al
O6	0 - 2 cm	4,3;1	148,7;1	1;2,5	1;1,4	34,4;1	1;10,8	1;6,1	1;375,2	1;212
O6	2 - 4 cm	4,2;1	145,4;1	1;2,5	1;1,4	34,3;1	1;10,9	1;6,1	1;377,4	1;209,6
O6	4 - 6 cm	4,2;1	155,8;1	1;2,4	1;1,3	36,6;1	1;10,5	1;5,8	1;385,8	1;215,2
O6	6 - 8 cm	4,2;1	140,1;1	1;2,7	1;1,4	33,3;1	1;11,7	1;6,2	1;391,7	1;208,8
O6	14 - 16 cm	4;1	134,8;1	1;2,9	1;1,5	32,9;1	1;12	1;6,2	1;395,2	1;206,5
O6	Soil MEAN	4,2;1	144,8;1	1;2,6	1;1,4	34,3;1	1;11,2	1;6,1	1;385,3	1;210,4
O6	Rock	3,7;1	221;1	1;3,1	1;1,3	58,7;1	1;11,9	1;4,9	1;699	1;288,1
O6 Y	Leaves nwsh	6,6;1	170,2;1			25,5;1				
O6 Y	Leaves wsh	9;1	212,7;1			23,4;1				
O6 Y	Roots	6,8;1	125;1		1;2,3	18,2;1		1;15,7		1;288,4
O7	0 - 2 cm	4,2;1	209,6;1	1;2	1;1,1	49,7;1	1;8,4	1;4,6	1;423	1;233
O7	2 - 4 cm	4,2;1	214,4;1	1;1,9	1;1	51;1	1;8,1	1;4,5	1;417,8	1;232,5
O7	4 - 6 cm	4;1	213;1	1;1,9	1;1	52;1	1;8	1;4,3	1;421,1	1;224,1
O7	6 - 8 cm	4,2;1	212,5;1	1;1,9	1;1	50,1;1	1;8,4	1;4,6	1;421,8	1;231,4
O7	14 - 16 cm	4;1	226,6;1	1;1,9	1;1	55,6;1	1;7,9	1;4,2	1;441,6	1;233,9
O7	Soil MEAN	4,1;1	215,5;1	1;1,9	1;1	51,8;1	1;8,2	1;4,4	1;425,3	1;230,8
O7a	Rock	7;1	563,3;1	1;2,6	1,3;1	80,2;1	1;18,4	1;5,2	1;1478,6	1;420,7
O7b	Rock	3,7;1	270,4;1	1;2	1,1;1	71,3;1	1;7,7	1;3,3	1;552,8	1;239,8
O7 Y	Leaves nwsh	13,3;1	615,3;1			46,1;1				
O7 Y	Leaves wsh	72,8;1	3642,8;1			50;1				
O7 Y	Roots	9,3;1	259,2;1		1;2,5	27,7;1		1;23,3		1;648,1
T3	0 - 2 cm	6;1	441,1;1	1;1,1	1,5;1	73,3;1	1;6,6	1;3,7	1;485,6	1;276,1
T3	2 - 4 cm	6;1	441,9;1	1;1,1	1,6;1	73,1;1	1;6,6	1;3,7	1;486,1	1;274,3
T3	4 - 6 cm	6;1	448,6;1	1;1,1	1,6;1	74,4;1	1;6,6	1;3,7	1;497,7	1;275,5
T3	6 - 8 cm	6,1;1	449,9;1	1;1	1,6;1	73,7;1	1;6,6	1;3,6	1;492,4	1;270,7
T3	14 - 16 cm	5,8;1	428;1	1;1,1	1,5;1	72,9;1	1;6,6	1;3,8	1;485,8	1;280,5
T3	Soil MEAN	6;1	441,7;1	1;1,1	1,6;1	73,5;1	1;6,6	1;3,7	1;489,5	1;275,5
T3	Rock	6,6;1	568,3;1	1;1,3	2;1	85,9;1	1;9,2	1;3,2	1;795,5	1;276,9
T3 Y	Leaves nwsh	12,8;1	750;1			58,3;1				
T3 Y	Leaves wsh	8,3;1	714,2;1			85,7;1				
T3 O	Leaves nwsh	8,1;1	500;1			61,1;1				
T3 O	Leaves wsh	10,9;1	800;1			73,3;1				
T3 O	Roots	9,4;1	393,6;1		1,3;1	41,5;1		1;7		1;294,1
T4	0 - 2 cm	5,1;1	372,9;1	1;1,3	1,1;1	71,8;1	1;6,8	1;4,4	1;495	1;321,8
T4	2 - 4 cm	5,3;1	380,2;1	1;1,3	1,1;1	71,5;1	1;7	1;4,5	1;501,5	1;327,2
T4	4 - 6 cm	5,2;1	386;1	1;1,2	1,1;1	72,9;1	1;6,8	1;4,5	1;499,2	1;335,1
T4	6 - 8 cm	5,2;1	383,2;1	1;1,2	1,1;1	72,9;1	1;6,7	1;4,5	1;493,9	1;329,4
T4	14 - 16 cm	5,2;1	366,5;1	1;1,2	1,1;1	70,2;1	1;6,5	1;4,6	1;459,4	1;327,7
T4	Soil MEAN	5,2;1	377,6;1	1;1,2	1,1;1	71,8;1	1;6,8	1;4,5	1;489,2	1;328,3
T4a	Rock	4,3;1	402,5;1	1;1	1,3;1	92,7;1	1;4,6	1;3,2	1;434,2	1;296,9
T4b	Rock	4,3;1	370,8;1	1;1,1	1,3;1	85,5;1	1;4,9	1;3,2	1;420,9	1;280,8
T4 O	Leaves nwsh	7;1	480;1			68;1				
T4 O	Leaves wsh	6,9;1	500;1			72,2;1				
T4 O	Roots	8,7;1	325,5;1		1;1,4	37,2;1		1;12,5		1;465,1

Continuation: Table 6

Nr	Type	Fe/Ti	Fe/Zr	Fe/Si	Fe/Al	Ti/Zr	Ti/Si	Ti/Al	Zr/Si	Zr/Al
T11	0 - 2 cm	4,4;1	228,3;1	1;1,6	1;1,1	50,8;1	1;7,5	1;5,3	1;382,4	1;273
T11	2 - 4 cm	4,5;1	212,6;1	1;1,6	1;1,2	47,1;1	1;7,4	1;5,4	1;353,3	1;257,2
T11	4 - 6 cm	4,3;1	239,8;1	1;1,6	1;1	54,6;1	1;7	1;4,7	1;386,5	1;261,1
T11	6 - 8 cm	4,2;1	237,5;1	1;1,6	1;1,1	55,4;1	1;7,1	1;4,9	1;398,5	1;273,6
T11	8 - 10 cm	4,4;1	226,6;1	1;1,5	1;1,1	50,6;1	1;7,1	1;5	1;361,9	1;256,6
T11	Soil MEAN	4,4;1	229,2;1	1;1,6	1;1,1	51,8;1	1;7,2	1;5	1;376,6	1;264
T11	Rock	4,1;1	411,9;1	1;1,5	1,5;1	99,4;1	1;6,4	1;2,7	1;646,4	1;269,3
T11 O	Leaves nwsh	10;1	1600;1			160;1				
T11 O	Leaves wsh	8,5;1	1200;1			140;1				
T11 O	Roots	6,8;1	239,4;1		1;1,7	35,2;1		1;12		1;422,5
T12	0 - 2 cm	4,7;1	344,2;1	1;1,4	1,2;1	72,2;1	1;7,1	1;3,6	1;513,8	1;266,5
T12	2 - 4 cm	4,8;1	358,3;1	1;1,4	1,3;1	73,8;1	1;7	1;3,7	1;517,4	1;275,4
T12	4 - 6 cm	4,6;1	343,2;1	1;1,4	1,2;1	74,1;1	1;6,6	1;3,8	1;491,3	1;282,3
T12	6 - 8 cm	4,6;1	342,1;1	1;1,3	1,2;1	73,5;1	1;6,4	1;3,8	1;475,7	1;280,7
T12	8 - 10 cm	4,6;1	328,6;1	1;1,3	1,2;1	70,6;1	1;6,3	1;3,8	1;449,5	1;272,5
T12	Soil MEAN	4,7;1	342,2;1	1;1,4	1,2;1	72,7;1	1;6,6	1;3,7	1;486,6	1;275,3
T12	Rock	6,5;1	531,6;1	1;1,6	2,1;1	80,7;1	1;11	1;3	1;892,1	1;249,3
T12 Y	Leaves nwsh	10;1	1200;1			120;1				
T12 Y	Leaves wsh	13,3;1	1333,3;1			100;1				
T12 O	Leaves nwsh	7,1;1	1000;1			140;1				
T12 O	Leaves wsh	5;1	600;1			120;1				
T12 O	Roots	7,5;1	323,3;1		1;1	42,6;1		1;7,5		1;321,1

Table 7 Mg/Ni, Mg/Fe, Mg/Cu, Mg/Mn, Mg/Si and Mg/Al element-to-element ratios.

Nr	Type	Mg/Ni	Mg/Fe	Mg/Cu	Mg/Mn	Mg/Si	Mg/Al
A1	0 - 2 cm	538;1	1;3,9	613,5;1	11;1	1;12,5	1;6,5
A1	2 - 4 cm	477,6;1	1;4,8	735,6;1	19,3;1	1;14,7	1;7,8
A1	4 - 6 cm	493,3;1	1;7,1	904,5;1	15;1	1;17,6	1;11,3
A1	6 - 8 cm	267,5;1	1;11	776,9;1	10,6;1	1;21,2	1;16,7
A1	14 - 16 cm	266,2;1	1;18,3	672,1;1	4,9;1	1;32	1;28,6
A1	Soil MEAN	364,7;1	1;9,3	729,5;1	9,7;1	1;19,9	1;14,6
A1	Rock	3551;1	1;19,2	499,3;1	2,1;1	1;36,4	1;63
A1 O	Leaves nwsh	3850;1	25,6;1	398,9;1	3,6;1		
A1 O	Leaves wsh	5033,3;1	30,2;1	325,4;1	4;1		
A1 Y	Leaves nwsh	3175;1	31,7;1	345,1;1	3;1		
A1 Y	Leaves wsh	4166,6;1	41,6;1	345,3;1	3,1;1		
A1 O	Roots	2400;1	4,5;1	290,3;1	4,4;1		1,8;1
A1 Y	Roots	1300;1	2,5;1	304,9;1	3,5;1		1,3;1
A2	0 - 2 cm	746,3;1	1;7,6	586,4;1	7,3;1	1;12,7	1;10,2
A2	2 - 4 cm	633,7;1	1;8,7	578,4;1	6,2;1	1;15,4	1;12,8
A2	4 - 6 cm	685,6;1	1;10,2	570,6;1	5,1;1	1;18,5	1;16,4
A2	6 - 8 cm	802;1	1;10,2	578,3;1	4,9;1	1;18,8	1;16,8
A2	14 - 16 cm	568,7;1	1;10,8	545,5;1	5;1	1;19,8	1;17,4
A2	Soil MEAN	680,2;1	1;9,3	572,7;1	5,7;1	1;16,8	1;14,4
A2	Rock	686;1	1;4,4	522,9;1	20,8;1	1;6,1	1;3,9
A2 O	Leaves nwsh	3600;1	24;1	321,4;1	21,4;1		
A2 O	Leaves wsh	4566,6;1	22,8;1	325,4;1	23,2;1		
A2 O	Roots	700;1	1,1;1	60,8;1	6,7;1		1;1,4
A8	0 - 2 cm	412,5;1	1;4,9	246,8;1	19,8;1	1;7,4	1;3,8
A8	2 - 4 cm	327;1	1;6	257,2;1	15,2;1	1;10,4	1;5,4
A8	4 - 6 cm	335,7;1	1;6,8	306,7;1	14;1	1;9,1	1;5,4
A8	6 - 8 cm	428,9;1	1;7	361,7;1	14,1;1	1;8,2	1;5,2
A8	14 - 16 cm	364,4;1	1;6,7	353,6;1	15,9;1	1;7,8	1;4,8
A8	Soil MEAN	374;1	1;6,5	313,4;1	15,3;1	1;8,4	1;5
A8	Rock	1149,1;1	1;3,1	614,7;1	27,1;1	1;4,6	1;2,1
A8 Y	Leaves nwsh	2320;1	29;1	324,4;1	3,3;1		
A8 Y	Leaves wsh	2377,7;1	11,8;1	260,6;1	3,3;1		
A8 Y	Roots	529,4;1	1;1	93;1	3,6;1		1;1,5
A9	0 - 2 cm	167,9;1	1;11	112,4;1	6,7;1	1;11,2	1;8,5
A9	2 - 4 cm	159,6;1	1;12,2	139,3;1	6,9;1	1;11,4	1;9,7
A9	4 - 6 cm	163,1;1	1;12,3	149,7;1	7,4;1	1;11,3	1;9,9
A9	6 - 8 cm	171,9;1	1;12,4	105,2;1	7,5;1	1;11,2	1;9,7
A9	14 - 16 cm	125,5;1	1;13,2	136,4;1	7,4;1	1;11,8	1;10,2
A9	Soil MEAN	155,1;1	1;12,3	127,1;1	7,2;1	1;11,4	1;9,7
A9	Rock	84,1;1	1;16	88,2;1	8,5;1	1;13,6	1;10,8
A9 O	Leaves nwsh	1947;1	55,1;1	504,5;1	4,9;1		
A9 O	Leaves wsh	1388,8;1	41,6;1	349,6;1	5,1;1		
A9 O	Roots	271,4;1	1;3,8	57;1	4,1;1		1;3,4

Continuation: Table 7

Nr	Type	Mg/Ni	Mg/Fe	Mg/Cu	Mg/Mn	Mg/Si	Mg/Al
A10	0 - 2 cm	187,5;1	1;5,7	171,7;1	16,1;1	1;9,3	1;5,4
A10	2 - 4 cm	190,5;1	1;7,9	187,6;1	19,3;1	1;10,9	1;6,7
A10	4 - 6 cm	123,8;1	1;13,7	170,2;1	13,2;1	1;12,7	1;10,5
A10	6 - 8 cm	120,6;1	1;14,8	170,8;1	11,5;1	1;13,1	1;11
A10	8 - 10 cm	105,2;1	1;19,3	156,3;1	9;1	1;14,8	1;14,2
A10	Soil MEAN	129,9;1	1;13,5	169;1	12,2;1	1;12,6	1;10,3
A10	Rock	94,8;1	1;13,7	167,7;1	8,7;1	1;12	1;10,5
A10 O	Leaves nwsh	1106,2;1	29,5;1	315,5;1	6,1;1		
A10 O	Leaves wsh	712,5;1	22,8;1	180,9;1	4,5;1		
A10 O	Roots	216,6;1	1;2,4	115;1	3,6;1		1;1,3
A14	0 - 2 cm	854,2;1	1;4,7	420,5;1	11,8;1	1;9,9	1;6,3
A14	2 - 4 cm	816,5;1	1;5,9	463,8;1	10,3;1	1;12,4	1;8,2
A14	4 - 6 cm	691,4;1	1;7,5	542,2;1	9,9;1	1;14,3	1;9,8
A14	6 - 8 cm	635,2;1	1;8,7	474,3;1	9,3;1	1;16,2	1;11,4
A14	8 - 10 cm	675,5;1	1;8,5	540,4;1	9,6;1	1;15,4	1;11,1
A14	Soil MEAN	729,1;1	1;7	482;1	10,1;1	1;13,5	1;9,2
A14	Rock	1564,5;1	1;10,4	1052,5;1	3,3;1	1;34,8	1;24
A 14 Y	Leaves nwsh	4350;1	34,8;1	300;1	40,4;1		
A 14 Y	Leaves wsh	8150;1	40,7;1	263,3;1	39,7;1		
A 14 Y	Roots	4400;1	6,2;1	303,4;1	41,9;1		2,9;1
A15	0 - 2 cm	492;1	1;4,6	554,1;1	17,1;1	1;8,1	1;4,1
A15	2 - 4 cm	405,2;1	1;5,4	438,1;1	15,2;1	1;8,9	1;4,8
A15	4 - 6 cm	364,4;1	1;5,9	388,3;1	13,8;1	1;9,6	1;5,3
A15	6 - 8 cm	354,3;1	1;7,3	364,6;1	12;1	1;11,5	1;6,7
A15	8 - 10 cm	317,9;1	1;8	315,5;1	10,6;1	1;12,5	1;7,5
A15	14 - 16 cm	352,2;1	1;7,8	341,5;1	10,5;1	1;11,9	1;7,1
A15	Soil MEAN	380;1	1;6,3	396;1	13,1;1	1;10,2	1;5,8
A15	Rock	834,4;1	1;3,2	590,2;1	24,9;1	1;4,6	1;2,3
A15 Y	Leaves nwsh	1927,2;1	35,3;1	388,2;1	40,7;1		
A15 Y	Leaves wsh	2172,7;1	47,8;1	443,4;1	41,9;1		
A15 O	Leaves nwsh	4040;1	40,4;1	439,1;1	39,6;1		
A15 O	Leaves wsh	3780;1	37,8;1	436,4;1	37,8;1		
A16	0 - 2 cm	390,8;1	1;7,4	303,3;1	6,5;1	1;11,3	1;7,2
A16	2 - 4 cm	382,7;1	1;8,4	293,8;1	6,5;1	1;12,7	1;8,2
A16	4 - 6 cm	372,6;1	1;8,8	290,8;1	6,7;1	1;13	1;8,3
A16	6 - 8 cm	392;1	1;8,7	336,5;1	7,5;1	1;12,4	1;8
A16	8 - 10 cm	358,1;1	1;9,1	320,2;1	7,7;1	1;12,6	1;8,2
A16	14 - 16 cm	345,8;1	1;9,3	316,4;1	8,2;1	1;14	1;9,1
A16	Soil MEAN	372,3;1	1;8,7	310,2;1	7,2;1	1;12,7	1;8,2
A16a	Rock	2264,6;1	1;2,7	1333;1	28,6;1	1;4,4	1;1,6
A16b	Rock	1014,6;1	1;4	1161,2;1	23,5;1	1;5,1	1;3,1
A16 O	Leaves nwsh	3540;1	59;1	325,3;1	10,7;1		
A16 O	Leaves wsh	3320;1	55,3;1	324,8;1	9,8;1		
A16 O	Roots	3750;1	4,3;1	1500;1	90;1		3,7;1

Continuation: Table 7

Nr	Type	Mg/Ni	Mg/Fe	Mg/Cu	Mg/Mn	Mg/Si	Mg/Al
A17	0 - 2 cm	285,8;1	1;10,9	271,7;1	3,1;1	1;19,4	1;11,7
A17	2 - 4 cm	220,8;1	1;14,3	252;1	5;1	1;23,8	1;15,2
A17	4 - 6 cm	220,6;1	1;16,7	248,5;1	4,7;1	1;25,3	1;17,1
A17	6 - 8 cm	213,4;1	1;16,5	262,4;1	4,7;1	1;26,3	1;17,6
A17	8 - 10 cm	216,9;1	1;16,4	265,3;1	4,5;1	1;26,6	1;18
A17	14 - 16 cm	205,5;1	1;17,1	257,4;1	4,2;1	1;27,9	1;19,2
A17	Soil MEAN	224,3;1	1;15,4	259,3;1	4,3;1	1;24,9	1;16,5
A17	Rock	3008,9;1	1;3,3	1329,8;1	22,4;1	1;6,7	1;2,9
A17 O	Leaves nwsh	1457,1;1	34;1	165,8;1	6,2;1		
A17 O	Leaves wsh	1487,5;1	29,7;1	155,9;1	7;1		
A17 O	Roots	300;1	1;3,9	90,3;1	5,4;1		1;4
A19	0 - 2 cm	472,8;1	1;4,8	215,5;1	9,4;1	1;9	1;4,6
A19	2 - 4 cm	444,9;1	1;5,9	238,6;1	12;1	1;10,1	1;5,5
A19	4 - 6 cm	314,7;1	1;10,9	203,1;1	11,3;1	1;12,7	1;8,5
A19	6 - 8 cm	274,3;1	1;14,1	181;1	9,1;1	1;14,1	1;10,7
A19	8 - 10 cm	256;1	1;16	180,1;1	8,4;1	1;14,3	1;11,5
A19	14 - 16 cm	231,5;1	1;17,4	170;1	7,7;1	1;16,7	1;13,4
A19	Soil MEAN	295,8;1	1;12,4	191,7;1	9,3;1	1;13,2	1;9,6
A19	Rock	727,2;1	1;17,9	509,4;1	6,2;1	1;13,6	1;12,3
A19 O	Leaves nwsh	5133,3;1	25,6;1	336,9;1	11,9;1		
A19 O	Leaves wsh	3420;1	24,4;1	318,4;1	9,6;1		
A19 O	Roots	3481,8;1	11,6;1	666;1	52,4;1		4,7;1
O5	0 - 2 cm	628,5;1	1;3,5	377,1;1	17;1	1;6,2	1;3,5
O5	2 - 4 cm	574;1	1;3,5	434,2;1	20,3;1	1;5,7	1;3,2
O5	4 - 6 cm	607,4;1	1;3,8	379,6;1	18,5;1	1;6,3	1;3,6
O5	6 - 8 cm	593,6;1	1;3,7	423,2;1	18,9;1	1;6,2	1;3,4
O5	14 - 16 cm	541;1	1;4,3	359,6;1	18,8;1	1;6,9	1;4,3
O5	Soil MEAN	584,5;1	1;3,8	394;1	18,8;1	1;6,2	1;3,6
O5	Rock	808,4;1	1;2,8	571,8;1	26,2;1	1;5,9	1;2,5
O5 O	Leaves nwsh	8650;1	34,6;1	236,6;1	34,6;1		
O5 O	Leaves wsh	9600;1	48;1	230,4;1	35,5;1		
O5 O	Roots	8183,3;1	27,2;1	5455,5;1	158,3;1		9,8;1
O6	0 - 2 cm	471,3;1	1;3,8	716;1	12,4;1	1;9,7	1;5,4
O6	2 - 4 cm	440,2;1	1;3,7	753,7;1	13,3;1	1;9,6	1;5,3
O6	4 - 6 cm	405,9;1	1;3,4	855,3;1	14,5;1	1;8,6	1;4,8
O6	6 - 8 cm	528,1;1	1;3,7	806,1;1	12,7;1	1;10,3	1;5,5
O6	14 - 16 cm	644,1;1	1;3,6	896;1	12;1	1;10,8	1;5,6
O6	Soil MEAN	482,4;1	1;3,6	802,9;1	13;1	1;9,8	1;5,3
O6	Rock	4148,2;1	1;2,9	1293,5;1	19;1	1;9,2	1;3,7
O6 Y	Leaves nwsh	19100;1	23,8;1	402,1;1	63,6;1		
O6 Y	Leaves wsh	9700;1	19,4;1	394,3;1	62,5;1		
O6 Y	Roots	4800;1	3,6;1	127,3;1	20,8;1		1,6;1

Continuation: Table 7

Nr	Type	Mg/Ni	Mg/Fe	Mg/Cu	Mg/Mn	Mg/Si	Mg/Al
O7	0 - 2 cm	620,4;1	1;3,7	286;1	15,6;1	1;7,4	1;4,1
O7	2 - 4 cm	808,5;1	1;3,8	354,8;1	16;1	1;7,4	1;4,1
O7	4 - 6 cm	844,2;1	1;3,7	380,9;1	16,9;1	1;7,4	1;3,9
O7	6 - 8 cm	677,6;1	1;3,8	324,3;1	16,6;1	1;7,5	1;4,1
O7	14 - 16 cm	912,9;1	1;3,8	382,6;1	17,2;1	1;7,4	1;3,9
O7	Soil MEAN	766,7;1	1;3,7	345;1	16,5;1	1;7,4	1;4
O7a	Rock	3048,9;1	1;4,4	1045,7;1	17,1;1	1;11,6	1;3,3
O7b	Rock	2092,7;1	1;3,4	817,8;1	21,4;1	1;7	1;3
O7 Y	Leaves nwsh	7466,6;1	28;1	384,2;1	74,6;1		
O7 Y	Leaves wsh	4380;1	4,2;1	413,2;1	95,2;1		
O7 Y	Roots	1333,3;1	4,2;1	154,8;1	44,4;1		1,7;1
T3	0 - 2 cm	136,2;1	1;3,1	408,3;1	27,9;1	1;3,4	1;1,9
T3	2 - 4 cm	139,7;1	1;2,9	439,8;1	31;1	1;3,2	1;1,8
T3	4 - 6 cm	141,9;1	1;2,9	468,7;1	32,1;1	1;3,2	1;1,7
T3	6 - 8 cm	148,4;1	1;2,7	517,5;1	35,5;1	1;3	1;1,6
T3	14 - 16 cm	138;1	1;2,8	481,4;1	32,9;1	1;3,2	1;1,8
T3	Soil MEAN	141;1	1;2,9	463,8;1	31,9;1	1;3,2	1;1,8
T3	Rock	149,1;1	1;1,4	1102,8;1	67;1	1;1,9	1,4;1
T3 Y	Leaves nwsh	1729,4;1	32,6;1	812,1;1	32,6;1		
T3 Y	Leaves wsh	1731,5;1	65,8;1	861,2;1	32,5;1		
T3 O	Leaves nwsh	2662,5;1	23,6;1	432;1	24,2;1		
T3 O	Leaves wsh	2080;1	17,3;1	406,2;1	22,8;1		
T3 O	Roots	144,8;1	1;1,2	147;1	19,7;1		1;1
T4	0 - 2 cm	154,5;1	1;4,7	320,4;1	14,3;1	1;6,2	1;4
T4	2 - 4 cm	153,5;1	1;4,4	354;1	16,3;1	1;5,8	1;3,8
T4	4 - 6 cm	153,3;1	1;4,1	391,8;1	17;1	1;5,4	1;3,6
T4	6 - 8 cm	147,1;1	1;4,5	351,9;1	16;1	1;5,9	1;3,9
T4	14 - 16 cm	132,6;1	1;5	293,2;1	14,1;1	1;6,3	1;4,5
T4	Soil MEAN	147,9;1	1;4,5	340,9;1	15,5;1	1;5,9	1;3,9
T4a	Rock	146,1;1	1;7,8	127,7;1	14,1;1	1;8,4	1;5,7
T4b	Rock	152,7;1	1;8,2	109,3;1	12,9;1	1;9,3	1;6,2
T4 O	Leaves nwsh	1440;1	12;1	254,4;1	13,2;1		
T4 O	Leaves wsh	1611,1;1	16,1;1	253,9;1	14;1		
T4 O	Roots	800;1	2,2;1	36,6;1	6,2;1		1,6;1
T11	0 - 2 cm	405,9;1	1;4,5	369,3;1	12,1;1	1;7,5	1;5,4
T11	2 - 4 cm	377,3;1	1;4,7	360,3;1	11,1;1	1;7,9	1;5,8
T11	4 - 6 cm	391,1;1	1;4,2	421,9;1	14,5;1	1;6,8	1;4,6
T11	6 - 8 cm	396,1;1	1;4,2	435;1	14,4;1	1;7,1	1;4,9
T11	8 - 10 cm	386,5;1	1;4,6	390,5;1	12,5;1	1;7,4	1;5,2
T11	Soil MEAN	391,3;1	1;4,4	397,1;1	13;1	1;7,3	1;5,1
T11	Rock	876;1	1;4,3	194,9;1	24,4;1	1;6,7	1;2,8
T11 O	Leaves nwsh	8233,3;1	30,8;1	423,6;1	44,1;1		
T11 O	Leaves wsh	5766,6;1	28,8;1	333,9;1	39,3;1		
T11 O	Roots	1000;1	1,1;1	95,6;1	28,5;1		1;1,5

Continuation: Table 7

Nr	Type	Mg/Ni	Mg/Fe	Mg/Cu	Mg/Mn	Mg/Si	Mg/Al
T12	0 - 2 cm	223;1	1;2,9	461,5;1	25,5;1	1;4,3	1;2,2
T12	2 - 4 cm	204,8;1	1;3	406,3;1	24,7;1	1;4,3	1;2,3
T12	4 - 6 cm	214,3;1	1;3,6	355,3;1	21,1;1	1;5,2	1;3
T12	6 - 8 cm	208,5;1	1;3,6	361,9;1	21,5;1	1;5	1;2,9
T12	8 - 10 cm	214,3;1	1;3,8	361,1;1	22,7;1	1;5,2	1;3,1
T12	Soil MEAN	213;1	1;3,4	387,8;1	23,1;1	1;4,8	1;2,7
T12	Rock	189;1	1;1,1	1203;1	80,8;1	1;1,9	1,8;1
T12 Y	Leaves nwsh	8333,3;1	41,6;1	536,4;1	26,3;1		
T12 Y	Leaves wsh	6833,3;1	25,6;1	526,9;1	25,3;1		
T12 O	Leaves nwsh	2870;1	57,4;1	522,7;1	30,2;1		
T12 O	Leaves wsh	2170;1	72,3;1	480;1	30,5;1		
T12 O	Roots	180,7;1	1;1,5	195;1	15,4;1		1;1,4

Table 8 Ni/Fe, Ni/Cu, Ni/Mn, Ni/Si and Ni/Al element-to-element ratios.

Nr	Type	Ni/Fe	Ni/Cu	Ni/Mn	Ni/Si	Ni/Al
A1	0 - 2 cm	1;2150,7	1,1;1	1;48,6	1;6739,2	1;3540,1
A1	2 - 4 cm	1;2314,9	1,5;1	1;24,6	1;7023,2	1;3764,8
A1	4 - 6 cm	1;3522,2	1,8;1	1;32,8	1;8703,2	1;5619,7
A1	6 - 8 cm	1;2948,7	2,9;1	1;25	1;5678,2	1;4477,2
A1	14 - 16 cm	1;4888,4	2,5;1	1;53,3	1;8524,2	1;7622,4
A1	Soil MEAN	1;3410,9	2;1	1;37,4	1;7288,4	1;5348,5
A1	Rock	1;68502	1;7,1	1;1685,3	1;129307,1	1;223825,7
A1 O	Leaves nwsh	1;150	1;9,6	1;1057,5		
A1 O	Leaves wsh	1;166,6	1;15,4	1;1246,6		
A1 Y	Leaves nwsh	1;100	1;9,2	1;1030		
A1 Y	Leaves wsh	1;100	1;12	1;1320		
A1 O	Roots	1;533,3	1;8,2	1;540		1;1333,3
A1 Y	Roots	1;512,5	1;4,2	1;361,2		1;1000
A2	0 - 2 cm	1;5680	1;1,2	1;101,6	1;9496,7	1;7661,2
A2	2 - 4 cm	1;5538,5	1;1	1;100,6	1;9801	1;8157,3
A2	4 - 6 cm	1;6995,6	1;1,2	1;132,5	1;12699,3	1;11283,9
A2	6 - 8 cm	1;8249,5	1;1,3	1;160,9	1;15133,4	1;13499,5
A2	14 - 16 cm	1;6147,2	1;1	1;112	1;11313,9	1;9900,9
A2	Soil MEAN	1;6394,1	1;1,1	1;118,6	1;11432,1	1;9839,7
A2	Rock	1;3068,3	1;1,3	1;32,8	1;4195,7	1;2695,8
A2 O	Leaves nwsh	1;150	1;11,2	1;167,5		
A2 O	Leaves wsh	1;200	1;14	1;196,6		
A2 O	Roots	1;633,3	1;11,5	1;103,3		1;1000

Continuation: Table 8

Nr	Type	Ni/Fe	Ni/Cu	Ni/Mn	Ni/Si	Ni/Al
A8	0 - 2 cm	1;2046,4	1;1,6	1;20,7	1;3057	1;1600,9
A8	2 - 4 cm	1;1994,2	1;1,2	1;21,4	1;3422	1;1781,2
A8	4 - 6 cm	1;2285	1;1	1;23,9	1;3058,4	1;1821,4
A8	6 - 8 cm	1;3009,7	1;1,1	1;30,4	1;3551,4	1;2243,2
A8	14 - 16 cm	1;2474,7	1;1	1;22,8	1;2850,1	1;1782,9
A8	Soil MEAN	1;2438,9	1;1,1	1;24,4	1;3165,3	1;1876,3
A8	Rock	1;3652,2	1;1,8	1;42,2	1;5382,5	1;2490,6
A8 Y	Leaves nwsh	1;80	1;7,1	1;698		
A8 Y	Leaves wsh	1;200	1;9,1	1;707,7		
A8 Y	Roots	1;558,8	1;5,6	1;144,7		1;823,5
A9	0 - 2 cm	1;1848,6	1;1,4	1;24,9	1;1890,5	1;1433,8
A9	2 - 4 cm	1;1950,1	1;1,1	1;23	1;1835,2	1;1550,7
A9	4 - 6 cm	1;2009,4	1;1	1;21,8	1;1859,2	1;1625,8
A9	6 - 8 cm	1;2137	1;1,6	1;22,8	1;1925,7	1;1669,9
A9	14 - 16 cm	1;1658,9	1;1	1;16,9	1;1488,9	1;1286,2
A9	Soil MEAN	1;1910,6	1;1,2	1;21,4	1;1776,4	1;1505,8
A9	Rock	1;1348,9	1;1	1;9,7	1;1146,1	1;916,4
A9 O	Leaves nwsh	1;35,2	1;3,8	1;396,4		
A9 O	Leaves wsh	1;33,3	1;3,9	1;269,4		
A9 O	Roots	1;1042,8	1;4,7	1;65,7		1;928,5
A10	0 - 2 cm	1;1086,8	1;1	1;11,5	1;1745,5	1;1025,7
A10	2 - 4 cm	1;1510,2	1;1	1;9,8	1;2090,6	1;1293,7
A10	4 - 6 cm	1;1705,9	1,3;1	1;9,3	1;1583,6	1;1301,5
A10	6 - 8 cm	1;1791	1,4;1	1;10,4	1;1580,1	1;1334,3
A10	8 - 10 cm	1;2033,6	1,4;1	1;11,6	1;1564,7	1;1497,3
A10	Soil MEAN	1;1757,6	1,3;1	1;10,6	1;1646,2	1;1348,6
A10	Rock	1;1303,5	1,7;1	1;10,8	1;1139,3	1;999,5
A10 O	Leaves nwsh	1;37,5	1;3,5	1;178,7		
A10 O	Leaves wsh	1;31,2	1;3,9	1;156,8		
A10 O	Roots	1;530,9	1;1,8	1;59,2		1;285,7
A14	0 - 2 cm	1;4077,5	1;2	1;72,3	1;8459,4	1;5400,2
A14	2 - 4 cm	1;4893	1;1,7	1;78,9	1;10201	1;6700,6
A14	4 - 6 cm	1;5207,2	1;1,2	1;69,5	1;9888,4	1;6813,9
A14	6 - 8 cm	1;5548,3	1;1,3	1;67,6	1;10303,2	1;7264,2
A14	8 - 10 cm	1;5747,3	1;1,2	1;70,1	1;10416,6	1;7499
A14	Soil MEAN	1;5126,4	1;1,5	1;71,5	1;9881,4	1;6771,4
A14	Rock	1;16398,1	1;1,4	1;461,1	1;54449,6	1;37701,9
A 14 Y	Leaves nwsh	1;125	1;14,5	1;107,5		
A 14 Y	Leaves wsh	1;200	1;30,9	1;205		
A 14 Y	Roots	1;700	1;14,5	1;105		1;1500

Continuation: Table 8

Nr	Type	Ni/Fe	Ni/Cu	Ni/Mn	Ni/Si	Ni/Al
A15	0 - 2 cm	1;2300,1	1,1;1	1;28,6	1;4007,4	1;2056,7
A15	2 - 4 cm	1;2195,2	1;1	1;26,6	1;3622,2	1;1982,2
A15	4 - 6 cm	1;2153,8	1;1	1;26,3	1;3498,9	1;1945
A15	6 - 8 cm	1;2590,6	1;1	1;29,3	1;4085	1;2394,1
A15	8 - 10 cm	1;2546,8	1;1	1;29,7	1;4004,1	1;2414,5
A15	14 - 16 cm	1;2753,6	1;1	1;33,2	1;4223,8	1;2526,6
A15	Soil MEAN	1;2412,6	1;1	1;28,8	1;3890,1	1;2209,6
A15	Rock	1;2714	1;1,4	1;33,4	1;3906,6	1;1934,8
A15 Y	Leaves nwsh	1;54,5	1;4,9	1;47,2		
A15 Y	Leaves wsh	1;45,4	1;4,9	1;51,8		
A15 O	Leaves nwsh	1;100	1;9,2	1;102		
A15 O	Leaves wsh	1;100	1;8,6	1;100		
A16	0 - 2 cm	1;2925,8	1;1,2	1;59,9	1;4448,4	1;2852
A16	2 - 4 cm	1;3252,5	1;1,3	1;58,3	1;4866,4	1;3138,8
A16	4 - 6 cm	1;3288,6	1;1,2	1;54,8	1;4854,8	1;3129,9
A16	6 - 8 cm	1;3414,2	1;1,1	1;52,1	1;4898,1	1;3161,7
A16	8 - 10 cm	1;3285,3	1;1,1	1;45,9	1;4544	1;2967,2
A16	14 - 16 cm	1;3228,4	1;1	1;41,7	1;4848,1	1;3173,9
A16	Soil MEAN	1;3241	1;1,2	1;51,5	1;4747,2	1;3075,2
A16a	Rock	1;6283	1;1,6	1;79	1;10040,5	1;3687,9
A16b	Rock	1;4062,7	1,1;1	1;43,1	1;5267,6	1;3154,1
A16 O	Leaves nwsh	1;60	1;10,8	1;328		
A16 O	Leaves wsh	1;60	1;10,2	1;338		
A16 O	Roots	1;866,6	1;2,5	1;41,6		1;1000
A17	0 - 2 cm	1;3140,9	1;1	1;90,2	1;5561,5	1;3352,5
A17	2 - 4 cm	1;3173,1	1,1;1	1;43,8	1;5261,8	1;3365,1
A17	4 - 6 cm	1;3692,7	1,1;1	1;46,2	1;5601,7	1;3780,4
A17	6 - 8 cm	1;3535,1	1,2;1	1;45,3	1;5615,1	1;3776,4
A17	8 - 10 cm	1;3576,6	1,2;1	1;47,2	1;5774,2	1;3913,1
A17	14 - 16 cm	1;3523,2	1,2;1	1;48,1	1;5750,5	1;3963,9
A17	Soil MEAN	1;3456,1	1,1;1	1;51,8	1;5600,1	1;3713
A17	Rock	1;10040,1	1;2,2	1;134	1;20288,5	1;8822
A17 O	Leaves nwsh	1;42,8	1;8,7	1;234,2		
A17 O	Leaves wsh	1;50	1;9,5	1;212,5		
A17 O	Roots	1;1171,4	1;3,3	1;55		1;1214,2

Continuation: Table 8

Nr	Type	Ni/Fe	Ni/Cu	Ni/Mn	Ni/Si	Ni/Al
A19	0 - 2 cm	1;2303,5	1;2,1	1;50,2	1;4256	1;2200,1
A19	2 - 4 cm	1;2653,4	1;1,8	1;36,7	1;4520,3	1;2470,3
A19	4 - 6 cm	1;3445	1;1,5	1;27,8	1;4002,8	1;2679,8
A19	6 - 8 cm	1;3876	1;1,5	1;29,8	1;3868,2	1;2956
A19	8 - 10 cm	1;4100,6	1;1,4	1;30,3	1;3673,6	1;2960,2
A19	14 - 16 cm	1;4047,1	1;1,3	1;29,7	1;3871,3	1;3106,9
A19	Soil MEAN	1;3680,1	1;1,5	1;31,7	1;3927,7	1;2850,4
A19	Rock	1;13035,5	1;1,4	1;115,7	1;9942,4	1;9013,1
A19 O	Leaves nwsh	1;200	1;15,2	1;430		
A19 O	Leaves wsh	1;140	1;10,7	1;356		
A19 O	Roots	1;300	1;5,2	1;66,3		1;727,2
O5	0 - 2 cm	1;2230,1	1;1,6	1;36,7	1;3923,8	1;2213,9
O5	2 - 4 cm	1;2061	1;1,3	1;28,1	1;3299,3	1;1844,2
O5	4 - 6 cm	1;2319,6	1;1,6	1;32,7	1;3827,6	1;2198,2
O5	6 - 8 cm	1;2244,1	1;1,4	1;31,3	1;3689,7	1;2068,5
O5	14 - 16 cm	1;2379,9	1;1,5	1;28,6	1;3750,1	1;2344,5
O5	Soil MEAN	1;2250,7	1;1,4	1;31	1;3680,8	1;2131,4
O5	Rock	1;2326,5	1;1,4	1;30,7	1;4832,4	1;2095,4
O5 O	Leaves nwsh	1;250	1;36,5	1;250		
O5 O	Leaves wsh	1;200	1;41,6	1;270		
O5 O	Roots	1;300	1;1,5	1;51,6		1;833,3
O6	0 - 2 cm	1;1818,2	1,5;1	1;38	1;4585,7	1;2591,4
O6	2 - 4 cm	1;1642,5	1,7;1	1;33	1;4263,4	1;2368,1
O6	4 - 6 cm	1;1416,5	2,1;1	1;27,9	1;3506,1	1;1956
O6	6 - 8 cm	1;1962	1,5;1	1;41,4	1;5484,8	1;2924,1
O6	14 - 16 cm	1;2374,8	1,3;1	1;53,2	1;6958,1	1;3637,1
O6	Soil MEAN	1;1779	1,6;1	1;37	1;4732,6	1;2584,2
O6	Rock	1;12087,8	1;3,2	1;217,9	1;38229,5	1;15760,5
O6 Y	Leaves nwsh	1;800	1;47,5	1;300		
O6 Y	Leaves wsh	1;500	1;24,6	1;155		
O6 Y	Roots	1;1300	1;37,7	1;230		1;3000
O7	0 - 2 cm	1;2302,9	1;2,1	1;39,7	1;4647,4	1;2560,6
O7	2 - 4 cm	1;3101,8	1;2,2	1;50,2	1;6044,4	1;3363,3
O7	4 - 6 cm	1;3185,9	1;2,2	1;49,8	1;6297,1	1;3352,2
O7	6 - 8 cm	1;2577,9	1;2	1;40,6	1;5116,1	1;2807,3
O7	14 - 16 cm	1;3502,7	1;2,3	1;52,9	1;6824,9	1;3614,3
O7	Soil MEAN	1;2909,5	1;2,2	1;46,3	1;5741,5	1;3116,3
O7a	Rock	1;13497,5	1;2,9	1;178	1;35426,2	1;10080,8
O7b	Rock	1;7257,2	1;2,5	1;97,5	1;14837,5	1;6437,4
O7 Y	Leaves nwsh	1;266,6	1;19,4	1;100		
O7 Y	Leaves wsh	1;1020	1;10,6	1;46		
O7 Y	Roots	1;311,1	1;8,6	1;30		1;777,7

Continuation: Table 8

Nr	Type	Ni/Fe	Ni/Cu	Ni/Mn	Ni/Si	Ni/Al
T3	0 - 2 cm	1;432,1	2,9;1	1;4,8	1;475,7	1;270,5
T3	2 - 4 cm	1;410,4	3,1;1	1;4,5	1;451,5	1;254,7
T3	4 - 6 cm	1;412,1	3,3;1	1;4,4	1;457,2	1;253,1
T3	6 - 8 cm	1;406,8	3,4;1	1;4,1	1;445,2	1;244,8
T3	14 - 16 cm	1;398,7	3,4;1	1;4,1	1;452,5	1;261,3
T3	Soil MEAN	1;411,1	3,2;1	1;4,4	1;455,7	1;256,5
T3	Rock	1;213	7,3;1	1;2,2	1;298,1	1;103,7
T3 Y	Leaves nwsh	1;52,9	1;2,1	1;52,9		
T3 Y	Leaves wsh	1;26,3	1;2	1;53,1		
T3 O	Leaves nwsh	1;112,5	1;6,1	1;110		
T3 O	Leaves wsh	1;120	1;5,1	1;91		
T3 O	Roots	1;188,1	1;1	1;7,3		1;140,5
T4	0 - 2 cm	1;730	2;1	1;10,7	1;969,2	1;630
T4	2 - 4 cm	1;678,6	2,3;1	1;9,3	1;895	1;584
T4	4 - 6 cm	1;642	2,5;1	1;8,9	1;830,2	1;557,4
T4	6 - 8 cm	1;674,7	2,3;1	1;9,1	1;869,5	1;580
T4	14 - 16 cm	1;676,5	2,2;1	1;9,3	1;847,9	1;604,8
T4	Soil MEAN	1;678,7	2,3;1	1;9,4	1;879,3	1;590
T4a	Rock	1;1142,4	1;1,1	1;10,3	1;1232,4	1;842,7
T4b	Rock	1;1260,8	1;1,3	1;11,8	1;1430,9	1;954,6
T4 O	Leaves nwsh	1;120	1;5,6	1;109		
T4 O	Leaves wsh	1;100	1;6,3	1;114,4		
T4 O	Roots	1;350	1;21,8	1;127,5		1;500
T11	0 - 2 cm	1;1836,3	1;1	1;33,3	1;3076,3	1;2196,3
T11	2 - 4 cm	1;1811,2	1;1	1;33,7	1;3009	1;2190,8
T11	4 - 6 cm	1;1668,3	1;1	1;26,8	1;2688,5	1;1816,5
T11	6 - 8 cm	1;1698,5	1;1	1;27,4	1;2849,3	1;1956,2
T11	8 - 10 cm	1;1808,4	1;1	1;30,7	1;2888,2	1;2048,1
T11	Soil MEAN	1;1756,7	1;1	1;30	1;2885,3	1;2023,2
T11	Rock	1;3776,3	1;4,4	1;35,7	1;5925,6	1;2468,6
T11 O	Leaves nwsh	1;266,6	1;19,4	1;186,6		
T11 O	Leaves wsh	1;200	1;17,2	1;146,6		
T11 O	Roots	1;850	1;10,4	1;35		1;1500
T12	0 - 2 cm	1;651,3	2;1	1;8,7	1;972,2	1;504,2
T12	2 - 4 cm	1;619,6	1,9;1	1;8,2	1;894,6	1;476,3
T12	4 - 6 cm	1;783,5	1,6;1	1;10,1	1;1121,5	1;644,4
T12	6 - 8 cm	1;760,1	1,7;1	1;9,6	1;1057	1;623,8
T12	8 - 10 cm	1;824,8	1,6;1	1;9,4	1;1128,1	1;683,9
T12	Soil MEAN	1;724,7	1,8;1	1;9,2	1;1030,5	1;583,1
T12	Rock	1;221,9	6,3;1	1;2,3	1;372,3	1;104
T12 Y	Leaves nwsh	1;200	1;15,5	1;316,6		
T12 Y	Leaves wsh	1;266,6	1;12,9	1;270		
T12 O	Leaves nwsh	1;50	1;5,4	1;95		
T12 O	Leaves wsh	1;30	1;4,5	1;71		
T12 O	Roots	1;271,1	1;1	1;11,7		1;269,2

Table 9 Cu/Fe, Cu/Mn, Cu/Si, Cu/Al and Cu/Zr element-to-element ratios.

Nr	Type	Cu/Fe	Cu/Mn	Cu/Si	Cu/Al	Cu/Zr
A1	0 - 2 cm	1;2452,6	1;55,4	1;7685	1;4037	1;16,4
A1	2 - 4 cm	1;3565	1;38	1;10815,8	1;5797,8	1;24,4
A1	4 - 6 cm	1;6457,3	1;60,2	1;15955,9	1;10302,8	1;39,2
A1	6 - 8 cm	1;8562,6	1;72,8	1;16488,6	1;13001,1	1;53,1
A1	14 - 16 cm	1;12341,3	1;134,7	1;21520,3	1;19243,4	1;95,5
A1	Soil MEAN	1;6821,9	1;74,8	1;14576,8	1;10697	1;47,3
A1	Rock	1;9633	1;237	1;18183,8	1;31475,5	1;118,2
A1 O	Leaves nwsh	1;15,5	1;109,5			77,2;1
A1 O	Leaves wsh	1;10,7	1;80,6			116;1
A1 Y	Leaves nwsh	1;10,8	1;111,9			92;1
A1 Y	Leaves wsh	1;8,2	1;109,3			90,5;1
A1 O	Roots	1;64,5	1;65,3		1;161,2	3,8;1
A1 Y	Roots	1;120,2	1;84,7		1;234,6	2,1;1
A2	0 - 2 cm	1;4462,8	1;79,8	1;7461,7	1;6019,5	1;26,5
A2	2 - 4 cm	1;5055,5	1;91,8	1;8946,3	1;7445,9	1;33,8
A2	4 - 6 cm	1;5821,8	1;110,2	1;10568,5	1;9390,6	1;42,1
A2	6 - 8 cm	1;5948,6	1;116	1;10912,5	1;9734,3	1;43,9
A2	14 - 16 cm	1;5896,3	1;107,4	1;10852,1	1;9496,8	1;43,3
A2	Soil MEAN	1;5383,2	1;99,9	1;9624,7	1;8284,1	1;37,3
A2	Rock	1;2339,2	1;25	1;3198,7	1;2055,2	1;7,5
A2 O	Leaves nwsh	1;13,3	1;14,9			114,8;1
A2 O	Leaves wsh	1;14,2	1;14			120,2;1
A2 O	Roots	1;55	1;8,9		1;86,9	27,6;1
A8	0 - 2 cm	1;1224,6	1;12,4	1;1829,4	1;958	1;3,7
A8	2 - 4 cm	1;1568,8	1;16,8	1;2692	1;1401,2	1;4,7
A8	4 - 6 cm	1;2087,3	1;21,8	1;2793,9	1;1663,8	1;6,1
A8	6 - 8 cm	1;2538,6	1;25,6	1;2995,5	1;1892,1	1;7
A8	14 - 16 cm	1;2401,1	1;22,2	1;2765,4	1;1729,9	1;6,4
A8	Soil MEAN	1;2044,2	1;20,4	1;2653	1;1572,7	1;5,7
A8	Rock	1;1953,7	1;22,6	1;2879,4	1;1332,3	1;5,3
A8 Y	Leaves nwsh	1;11,1	1;97,6			89,3;1
A8 Y	Leaves wsh	1;21,9	1;77,5			91,2;1
A8 Y	Roots	1;98,2	1;25,4		1;144,7	7,3;1
A9	0 - 2 cm	1;1237,8	1;16,7	1;1265,9	1;960,1	1;3,4
A9	2 - 4 cm	1;1701,5	1;20,1	1;1601,3	1;1353	1;4,4
A9	4 - 6 cm	1;1844,9	1;20	1;1706,9	1;1492,6	1;4,7
A9	6 - 8 cm	1;1308,2	1;14	1;1178,9	1;1022,3	1;3,3
A9	14 - 16 cm	1;1803,6	1;18,3	1;1618,8	1;1398,4	1;4,7
A9	Soil MEAN	1;1565,6	1;17,5	1;1455,6	1;1233,9	1;4
A9	Rock	1;1415,9	1;10,2	1;1203	1;961,9	1;3,1
A9 O	Leaves nwsh	1;9,1	1;102,7			164;1
A9 O	Leaves wsh	1;8,3	1;67,8			238,3;1
A9 O	Roots	1;219,2	1;13,8		1;195,1	2;1

Continuation: Table 9

Nr	Type	Cu/Fe	Cu/Mn	Cu/Si	Cu/Al	Cu/Zr
A10	0 - 2 cm	1;995,8	1;10,6	1;1599,2	1;939,7	1;4,6
A10	2 - 4 cm	1;1487,1	1;9,6	1;2058,6	1;1273,9	1;4,9
A10	4 - 6 cm	1;2344,2	1;12,8	1;2176,1	1;1788,5	1;7
A10	6 - 8 cm	1;2537,3	1;14,7	1;2238,5	1;1890,3	1;7,9
A10	8 - 10 cm	1;3022,6	1;17,3	1;2325,6	1;2225,4	1;10
A10	Soil MEAN	1;2286,2	1;13,8	1;2141,3	1;1754,1	1;7,4
A10	Rock	1;2306,7	1;19,2	1;2016,2	1;1768,7	1;6,8
A10 O	Leaves nwsh	1;10,6	1;50,9			140,2;1
A10 O	Leaves wsh	1;7,9	1;39,8			105;1
A10 O	Roots	1;281,9	1;31,4		1;151,7	3,5;1
A14	0 - 2 cm	1;2007,3	1;35,6	1;4164,6	1;2658,5	1;10,7
A14	2 - 4 cm	1;2779,4	1;44,8	1;5794,6	1;3806,2	1;15,2
A14	4 - 6 cm	1;4083,3	1;54,5	1;7754,2	1;5343,3	1;22,8
A14	6 - 8 cm	1;4142,7	1;50,5	1;7693	1;5424	1;23,6
A14	8 - 10 cm	1;4597,8	1;56,1	1;8333,3	1;5999,2	1;25,7
A14	Soil MEAN	1;3389,4	1;47,2	1;6533,2	1;4477	1;18,8
A14	Rock	1;11031,4	1;310,2	1;36629,7	1;25363,1	1;143,3
A 14 Y	Leaves nwsh	1;8,6	1;7,4			193,3;1
A 14 Y	Leaves wsh	1;6,4	1;6,6			206,3;1
A 14 Y	Roots	1;48,2	1;7,2		1;103,4	3,2;1
A15	0 - 2 cm	1;2590,3	1;32,2	1;4512,9	1;2316,1	1;11,2
A15	2 - 4 cm	1;2373	1;28,8	1;3915,6	1;2142,7	1;9,9
A15	4 - 6 cm	1;2295	1;28,1	1;3728,3	1;2072,6	1;10,1
A15	6 - 8 cm	1;2666,2	1;30,1	1;4204,2	1;2463,9	1;12,5
A15	8 - 10 cm	1;2528	1;29,5	1;3974,6	1;2396,7	1;11,8
A15	14 - 16 cm	1;2669,3	1;32,2	1;4094,5	1;2449,3	1;12,4
A15	Soil MEAN	1;2514,1	1;30	1;4053,7	1;2302,5	1;11,3
A15	Rock	1;1919,6	1;23,6	1;2763,2	1;1368,5	1;6,5
A15 Y	Leaves nwsh	1;10,9	1;9,5			68,2;1
A15 Y	Leaves wsh	1;9,2	1;10,5			59,8;1
A15 O	Leaves nwsh	1;10,8	1;11			76,6;1
A15 O	Leaves wsh	1;11,5	1;11,5			61,8;1
A16	0 - 2 cm	1;2270,6	1;46,5	1;3452,3	1;2213,3	1;11,1
A16	2 - 4 cm	1;2496,9	1;44,7	1;3736	1;2409,7	1;11,8
A16	4 - 6 cm	1;2566,7	1;42,8	1;3789,1	1;2442,8	1;11,9
A16	6 - 8 cm	1;2930,6	1;44,7	1;4204,3	1;2713,9	1;13,3
A16	8 - 10 cm	1;2938	1;41,1	1;4063,7	1;2653,6	1;13,5
A16	14 - 16 cm	1;2953,4	1;38,1	1;4435,2	1;2903,6	1;14,2
A16	Soil MEAN	1;2700,3	1;42,9	1;3955,2	1;2562,2	1;12,6
A16a	Rock	1;3698,3	1;46,5	1;5910,1	1;2170,8	1;14,7
A16b	Rock	1;4649,9	1;49,3	1;6029	1;3610	1;19,2
A16 O	Leaves nwsh	1;5,5	1;30,1			108,8;1
A16 O	Leaves wsh	1;5,8	1;33			170,3;1
A16 O	Roots	1;346,6	1;16,6		1;400	10;1

Continuation: Table 9

Nr	Type	Cu/Fe	Cu/Mn	Cu/Si	Cu/Al	Cu/Zr
A17	0 - 2 cm	1;2985,8	1;85,8	1;5286,9	1;3187	1;14,8
A17	2 - 4 cm	1;3621,3	1;50	1;6005	1;3840,5	1;17,2
A17	4 - 6 cm	1;4159,4	1;52	1;6309,6	1;4258,1	1;23,1
A17	6 - 8 cm	1;4346,1	1;55,7	1;6903,3	1;4642,7	1;20,6
A17	8 - 10 cm	1;4373,7	1;57,7	1;7061	1;4785,2	1;22,4
A17	14 - 16 cm	1;4413,9	1;60,3	1;7204,3	1;4966	1;21,2
A17	Soil MEAN	1;3995,8	1;59,9	1;6474,4	1;4292,8	1;20
A17	Rock	1;4437,4	1;59,2	1;8966,8	1;3899	1;17,1
A17 O	Leaves nwsh	1;4,8	1;26,6			205;1
A17 O	Leaves wsh	1;5,2	1;22,2			254,3;1
A17 O	Roots	1;352,6	1;16,5		1;365,5	1,1;1
A19	0 - 2 cm	1;1050,3	1;22,9	1;1940,5	1;1003,1	1;3,3
A19	2 - 4 cm	1;1423,4	1;19,7	1;2425	1;1325,2	1;4,5
A19	4 - 6 cm	1;2223,4	1;17,9	1;2583,4	1;1729,5	1;6
A19	6 - 8 cm	1;2558,3	1;19,6	1;2553,2	1;1951,1	1;6,8
A19	8 - 10 cm	1;2885,2	1;21,3	1;2584,8	1;2082,8	1;7,7
A19	14 - 16 cm	1;2970,7	1;21,8	1;2841,7	1;2280,6	1;8,5
A19	Soil MEAN	1;2385,7	1;20,5	1;2546,1	1;1847,8	1;6,6
A19	Rock	1;9131,8	1;81,1	1;6965	1;6314	1;28,7
A19 O	Leaves nwsh	1;13,1	1;28,2			65,2;1
A19 O	Leaves wsh	1;13	1;33,1			59,6;1
A19 O	Roots	1;57,3	1;12,6		1;139,1	95,8;1
O5	0 - 2 cm	1;1338	1;22	1;2354,2	1;1328,3	1;4,8
O5	2 - 4 cm	1;1559,1	1;21,2	1;2495,9	1;1395,1	1;5,1
O5	4 - 6 cm	1;1449,7	1;20,4	1;2392,2	1;1373,9	1;4,7
O5	6 - 8 cm	1;1600,1	1;22,3	1;2630,8	1;1474,9	1;5,2
O5	14 - 16 cm	1;1581,8	1;19	1;2492,5	1;1558,3	1;5,6
O5	Soil MEAN	1;1517,4	1;20,9	1;2481,5	1;1436,9	1;5,1
O5	Rock	1;1645,8	1;21,7	1;3418,5	1;1482,2	1;5,9
O5 O	Leaves nwsh	1;6,8	1;6,8			73,1;1
O5 O	Leaves wsh	1;4,8	1;6,4			92,5;1
O5 O	Roots	1;200	1;34,4		1;555,5	1,2;1
O6	0 - 2 cm	1;2762,4	1;57,7	1;6966,8	1;3936,9	1;18,5
O6	2 - 4 cm	1;2812,5	1;56,6	1;7300,1	1;4054,8	1;19,3
O6	4 - 6 cm	1;2984,5	1;58,7	1;7387,3	1;4121,3	1;19,1
O6	6 - 8 cm	1;2994,6	1;63,2	1;8371,5	1;4463,1	1;21,3
O6	14 - 16 cm	1;3303,6	1;74,1	1;9679,1	1;5059,4	1;24,4
O6	Soil MEAN	1;2961	1;61,6	1;7876,6	1;4301	1;20,4
O6	Rock	1;3769,3	1;67,9	1;11921	1;4914,5	1;17
O6 Y	Leaves nwsh	1;16,8	1;6,3			10,1;1
O6 Y	Leaves wsh	1;20,3	1;6,3			10,4;1
O6 Y	Roots	1;34,4	1;6,1		1;79,5	3,6;1

Continuation: Table 9

Nr	Type	Cu/Fe	Cu/Mn	Cu/Si	Cu/Al	Cu/Zr
O7	0 - 2 cm	1;1061,7	1;18,3	1;2142,5	1;1180,5	1;5
O7	2 - 4 cm	1;1361,3	1;22	1;2652,9	1;1476,1	1;6,3
O7	4 - 6 cm	1;1437,8	1;22,5	1;2841,9	1;1512,8	1;6,7
O7	6 - 8 cm	1;1234	1;19,4	1;2448,9	1;1343,8	1;5,8
O7	14 - 16 cm	1;1468,3	1;22,2	1;2861	1;1515,1	1;6,4
O7	Soil MEAN	1;1309,3	1;20,8	1;2583,6	1;1402,3	1;6
O7a	Rock	1;4629,6	1;61	1;12151	1;3457,6	1;8,2
O7b	Rock	1;2836,1	1;38,1	1;5798,5	1;2515,7	1;10,4
O7 Y	Leaves nwsh	1;13,7	1;5,1			44,8;1
O7 Y	Leaves wsh	1;96,2	1;4,3			37,8;1
O7 Y	Roots	1;36,1	1;3,4		1;90,3	7,1;1
T3	0 - 2 cm	1;1294,9	1;14,6	1;1425,4	1;810,5	1;2,9
T3	2 - 4 cm	1;1292	1;14,1	1;1421,4	1;802,1	1;2,9
T3	4 - 6 cm	1;1360,9	1;14,5	1;1509,8	1;835,9	1;3
T3	6 - 8 cm	1;1418,9	1;14,5	1;1552,7	1;853,8	1;3,1
T3	14 - 16 cm	1;1390,2	1;14,6	1;1577,9	1;911,1	1;3,2
T3	Soil MEAN	1;1352	1;14,5	1;1498,5	1;843,4	1;3
T3	Rock	1;1575,5	1;16,4	1;2205,3	1;767,6	1;2,7
T3 Y	Leaves nwsh	1;24,8	1;24,8			30,1;1
T3 Y	Leaves wsh	1;13	1;26,4			54,5;1
T3 O	Leaves nwsh	1;18,2	1;17,8			27,3;1
T3 O	Leaves wsh	1;23,4	1;17,7			34,1;1
T3 O	Roots	1;190,9	1;7,4		1;142,7	2;1
T4	0 - 2 cm	1;1513,9	1;22,3	1;2010	1;1306,6	1;4
T4	2 - 4 cm	1;1564,6	1;21,6	1;2063,5	1;1346,5	1;4,1
T4	4 - 6 cm	1;1640,5	1;22,9	1;2121,3	1;1424,2	1;4,2
T4	6 - 8 cm	1;1614,1	1;21,9	1;2080	1;1387,5	1;4,2
T4	14 - 16 cm	1;1495,3	1;20,7	1;1874,3	1;1336,9	1;4
T4	Soil MEAN	1;1563,8	1;21,8	1;2026	1;1359,5	1;4,1
T4a	Rock	1;998,5	1;9	1;1077,1	1;736,5	1;2,4
T4b	Rock	1;902,5	1;8,4	1;1024,3	1;683,3	1;2,4
T4 O	Leaves nwsh	1;21,2	1;19,2			22,6;1
T4 O	Leaves wsh	1;15,7	1;18			31,7;1
T4 O	Roots	1;16	1;5,8		1;22,9	20,2;1
T11	0 - 2 cm	1;1670,8	1;30,3	1;2799,1	1;1998,4	1;7,3
T11	2 - 4 cm	1;1729,6	1;32,2	1;2873,5	1;2092,1	1;8,1
T11	4 - 6 cm	1;1799,9	1;28,9	1;2900,6	1;1959,8	1;7,5
T11	6 - 8 cm	1;1865,2	1;30,1	1;3129	1;2148,2	1;7,8
T11	8 - 10 cm	1;1827,1	1;31,1	1;2918,1	1;2069,4	1;8
T11	Soil MEAN	1;1782,7	1;30,5	1;2928,1	1;2053,2	1;7,7
T11	Rock	1;840,3	1;7,9	1;1318,6	1;549,3	1;2
T11 O	Leaves nwsh	1;13,7	1;9,6			116,6;1
T11 O	Leaves wsh	1;11,5	1;8,4			103,6;1
T11 O	Roots	1;81,3	1;3,3		1;143,5	2,9;1

Continuation: Table 9

Nr	Type	Cu/Fe	Cu/Mn	Cu/Si	Cu/Al	Cu/Zr
T12	0 - 2 cm	1;1348,1	1;18	1;2012,3	1;1043,7	1;3,9
T12	2 - 4 cm	1;1228,8	1;16,4	1;1774,3	1;944,5	1;3,4
T12	4 - 6 cm	1;1299,3	1;16,8	1;1859,9	1;1068,7	1;3,7
T12	6 - 8 cm	1;1319,6	1;16,7	1;1834,9	1;1082,9	1;3,8
T12	8 - 10 cm	1;1389,6	1;15,8	1;1900,6	1;1152,2	1;4,2
T12	Soil MEAN	1;1319,3	1;16,7	1;1876	1;1061,6	1;3,8
T12	Rock	1;1411,8	1;14,8	1;2369,1	1;662	1;2,6
T12 Y	Leaves nwsh	1;12,8	1;20,3			93,2;1
T12 Y	Leaves wsh	1;20,5	1;20,8			64,8;1
T12 O	Leaves nwsh	1;9,1	1;17,3			109,8;1
T12 O	Leaves wsh	1;6,6	1;15,7			90,4;1
T12 O	Roots	1;292,5	1;12,6		1;290,4	1,1;1

Table 10 Sr/Na, Sr/Ca, Sr/K, Sr/Fe, Sr/Mg, Na/K, Na/Ca, Na/P and Na/Mg element-to-element ratios.

Nr	Type	Sr/Na	Sr/Ca	Sr/K	Sr/Fe	Sr/Mg	Na/K	Na/Ca	Na/P	Na/Mg
A1	0 - 2 cm	1;15,3	1;78	1;39	1;160,5	1;40,1	1;2,5	1;5	1,5;1	1;2,6
A1	2 - 4 cm	1;14,5	1;58,9	1;36,7	1;175,2	1;36,1	1;2,5	1;4	1,6;1	1;2,4
A1	4 - 6 cm	1;13,2	1;42,4	1;32,3	1;230	1;32,2	1;2,4	1;3,2	1,4;1	1;2,4
A1	6 - 8 cm	1;12,5	1;29	1;31,4	1;359	1;32,5	1;2,5	1;2,3	1,2;1	1;2,5
A1	14 - 16 cm	1;8,2	1;13,1	1;15,8	1;494,9	1;26,9	1;1,9	1;1,5	1;1,1	1;3,2
A1	Soil MEAN	1;12,3	1;40,1	1;29,6	1;306,6	1;32,7	1;2,3	1;3,2	1,3;1	1;2,6
A1	Rock	1;27,7	1;31,7	1;18,6	1;1152,3	1;59,7	1,4;1	1;1,1	1;2	1;2,1
A1 O	Leaves nwsh	1;48,8	1;99	1;246	1;1,9	1;49,2	1;5	1;2	1,4;1	1;1
A1 O	Leaves wsh	1;44,8	1;95,8	1;253,4	1;1,7	1;51,7	1;5,6	1;2,1	1,3;1	1;1,1
A1 Y	Leaves nwsh	1;68,8	1;71,9	1;229,4	1;1,3	1;43,4	1;3,3	1;1	2,5;1	1,5;1
A1 Y	Leaves wsh	1;66,6	1;68,6	1;222,2	1;1	1;40,8	1;3,3	1;1	2,4;1	1,6;1
A1 O	Roots	1;41,9	1;73,1	1;107,3	1;7,8	1;35,1	1;2,5	1;1,7	3,4;1	1,1;1
A1 Y	Roots	1;35,5	1;87,4	1;72,8	1;11,9	1;30,3	1;2	1;2,4	3,5;1	1,1;1
A2	0 - 2 cm	1;10,8	1;47,7	1;25,1	1;328,7	1;43,1	1;2,3	1;4,4	1;1,1	1;3,9
A2	2 - 4 cm	1;10,4	1;36	1;24,3	1;323,2	1;36,9	1;2,3	1;3,4	1;1,1	1;3,5
A2	4 - 6 cm	1;5,7	1;19,1	1;15,3	1;307,8	1;30,1	1;2,6	1;3,3	1;2,1	1;5,2
A2	6 - 8 cm	1;4,4	1;16,4	1;11,3	1;292,7	1;28,4	1;2,5	1;3,6	1;2,7	1;6,3
A2	14 - 16 cm	1;4,7	1;12,4	1;11,9	1;277,5	1;25,6	1;2,5	1;2,6	1;2,3	1;5,4
A2	Soil MEAN	1;7	1;25,3	1;17,2	1;304,5	1;32,3	1;2,4	1;3,5	1;1,7	1;4,5
A2	Rock	1;19,2	1;172,9	1;51,1	1;463,2	1;103,5	1;2,6	1;9	1,4;1	1;5,3
A2 O	Leaves nwsh	1;53,3	1;85,6	1;237,3	1;2,3	1;56	1;4,4	1;1,6	1;1	1;1
A2 O	Leaves wsh	1;50,2	1;91,2	1;253,1	1;2,4	1;56,8	1;5	1;1,8	1;1,1	1;1,1
A2 O	Roots	1;61,5	1;38,4	1;400	1;14,6	1;16,1	1;6,5	1,6;1	1,9;1	3,8;1

Continuation: Table 10

Nr	Type	Sr/Na	Sr/Ca	Sr/K	Sr/Fe	Sr/Mg	Na/K	Na/Ca	Na/P	Na/Mg
A8	0 - 2 cm	1;14,6	1;120,8	1;31	1;341,8	1;68,9	1;2,1	1;8,2	1,1;1	1;4,6
A8	2 - 4 cm	1;16	1;94,3	1;35,8	1;346,7	1;56,8	1;2,2	1;5,8	1,1;1	1;3,5
A8	4 - 6 cm	1;15,4	1;104,1	1;32,5	1;483,3	1;71	1;2,1	1;6,7	1,1;1	1;4,5
A8	6 - 8 cm	1;16,2	1;118,2	1;27,7	1;562,8	1;80,2	1;1,7	1;7,2	1,1;1	1;4,9
A8	14 - 16 cm	1;15,9	1;114,4	1;27,5	1;546,7	1;80,5	1;1,7	1;7,1	1,2;1	1;5
A8	Soil MEAN	1;15,7	1;111	1;30,4	1;476,8	1;73,1	1;1,9	1;7	1,1;1	1;4,6
A8	Rock	1;15,8	1;83,3	1;6,9	1;149,6	1;47	2,2;1	1;5,2	3,7;1	1;2,9
A8 Y	Leaves nwsh	1;93,5	1;142,2	1;392,2	1;3,4	1;100	1;4,1	1;1,5	1,3;1	1;1
A8 Y	Leaves wsh	1;99,4	1;153	1;377,5	1;9,1	1;109,1	1;3,7	1;1,5	1,3;1	1;1
A8 Y	Roots	1;13,5	1;107,8	1;46,9	1;12	1;11,4	1;3,4	1;7,9	1,6;1	1,1;1
A9	0 - 2 cm	1;7,7	1;63,5	1;36,2	1;799,8	1;72,6	1;4,6	1;8,2	1;2,4	1;9,3
A9	2 - 4 cm	1;8,1	1;50,2	1;43,7	1;1570,1	1;128,5	1;5,3	1;6,1	1;3,7	1;15,7
A9	4 - 6 cm	1;6,7	1;41,6	1;46,4	1;1816,1	1;147,4	1;6,8	1;6,1	1;5,4	1;21,8
A9	6 - 8 cm	1;7,9	1;44,3	1;47,9	1;1904,3	1;153,1	1;6	1;5,5	1;4,9	1;19,1
A9	14 - 16 cm	1;9,1	1;32,5	1;56,5	1;2208,4	1;167	1;6,1	1;3,5	1;4,7	1;18,1
A9	Soil MEAN	1;7,9	1;48,1	1;45,1	1;1579,6	1;128,2	1;5,6	1;6	1;4,1	1;16,1
A9	Rock	1;14,2	1;16	1;27,9	1;2654,6	1;165,5	1;1,9	1;1,1	1;2,2	1;11,5
A9 O	Leaves nwsh	1;10,1	1;89,1	1;132,5	1,4;1	1;37,8	1;13	1;8,7	1;1,8	1;3,7
A9 O	Leaves wsh	1;8,6	1;76,1	1;119,8	1,3;1	1;31,2	1;13,9	1;8,8	1;2	1;3,6
A9 O	Roots	1;25,7	1;47,3	1;84,2	1;76,8	1;20	1;3,2	1;1,8	1,2;1	1,2;1
A10	0 - 2 cm	1;11,5	1;116,3	1;37,4	1;309,4	1;53,3	1;3,2	1;10	1;1,1	1;4,6
A10	2 - 4 cm	1;11,5	1;89,2	1;38,7	1;412,8	1;52	1;3,3	1;7,7	1;1	1;4,5
A10	4 - 6 cm	1;11,9	1;55,1	1;34,6	1;927,6	1;67,3	1;2,8	1;4,6	1;1,3	1;5,6
A10	6 - 8 cm	1;10,2	1;49,5	1;32	1;1048,4	1;70,6	1;3,1	1;4,8	1;1,5	1;6,9
A10	8 - 10 cm	1;9,2	1;32,5	1;32,1	1;1879,1	1;97,2	1;3,4	1;3,5	1;2,2	1;10,5
A10	Soil MEAN	1;10,9	1;67,1	1;34,9	1;922,3	1;68,1	1;3,1	1;6,1	1;1,4	1;6,2
A10	Rock	1;11,7	1;7,8	1;32,7	1;4188,4	1;304,6	1;2,7	1,4;1	1;4,4	1;26
A10 O	Leaves nwsh	1;23,3	1;144,7	1;219,4	1;1,3	1;40	1;9,4	1;6,2	1;1,2	1;1,7
A10 O	Leaves wsh	1;22,3	1;140,4	1;237,8	1;1,4	1;32,6	1;10,6	1;6,2	1;1,5	1;1,4
A10 O	Roots	1;26,6	1;128,4	1;55	1;102,2	1;41,7	1;2	1;4,8	2,7;1	1;1,5
A14	0 - 2 cm	1;9,4	1;91	1;30,7	1;207,1	1;43,3	1;3,2	1;9,6	1;1,2	1;4,6
A14	2 - 4 cm	1;11,9	1;81,8	1;38,2	1;280,7	1;46,8	1;3,1	1;6,8	1;1,2	1;3,9
A14	4 - 6 cm	1;13,1	1;57,9	1;38,9	1;346	1;45,9	1;2,9	1;4,4	1;1,2	1;3,5
A14	6 - 8 cm	1;14,8	1;50	1;43,8	1;443,8	1;50,8	1;2,9	1;3,3	1;1,2	1;3,4
A14	8 - 10 cm	1;14,8	1;56,3	1;44,2	1;460,1	1;54	1;2,9	1;3,7	1;1,2	1;3,6
A14	Soil MEAN	1;12,5	1;69,1	1;38,6	1;335,8	1;47,7	1;3	1;5,4	1;1,2	1;3,7
A14	Rock	1;51,8	1;35,5	1;148,3	1;347,4	1;33,1	1;2,8	1,4;1	4,4;1	1,5;1
A 14 Y	Leaves nwsh	1;84,9	1;154,5	1;381,9	1;2,1	1;74,6	1;4,4	1;1,8	1,4;1	1,1;1
A 14 Y	Leaves wsh	1;86,6	1;142,2	1;404,4	1;1,7	1;72,4	1;4,6	1;1,6	1,4;1	1,1;1
A 14 Y	Roots	1;7,3	1;88,7	1;33,6	1;1,3	1;8,2	1;4,5	1;12	2;1	1;1,1

Continuation: Table 10

Nr	Type	Sr/Na	Sr/Ca	Sr/K	Sr/Fe	Sr/Mg	Na/K	Na/Ca	Na/P	Na/Mg
A15	0 - 2 cm	1;16,8	1;75,3	1;25,9	1;275,3	1;58,8	1;1,5	1;4,4	1,6;1	1;3,5
A15	2 - 4 cm	1;15,9	1;72,9	1;28,5	1;319,5	1;59	1;1,7	1;4,5	1,4;1	1;3,7
A15	4 - 6 cm	1;16,3	1;72,4	1;32,8	1;379,6	1;64,2	1;2	1;4,4	1,2;1	1;3,9
A15	6 - 8 cm	1;15,1	1;64	1;40	1;466,2	1;63,7	1;2,6	1;4,2	1;1	1;4,2
A15	8 - 10 cm	1;16,2	1;65,1	1;48	1;578	1;72,1	1;2,9	1;4	1;1	1;4,4
A15	14 - 16 cm	1;15,8	1;65,6	1;47,2	1;572,7	1;73,2	1;2,9	1;4,1	1;1	1;4,6
A15	Soil MEAN	1;16,1	1;70,1	1;35,2	1;406,6	1;64	1;2,1	1;4,3	1,1;1	1;3,9
A15	Rock	1;10	1;130,4	1;11,9	1;221,3	1;68	1;1,1	1;13	1;1	1;6,7
A15 Y	Leaves nwsh	1;228,7	1;103,4	1;183,9	1;2,2	1;81,2	1,2;1	2,2;1	5,4;1	2,8;1
A15 Y	Leaves wsh	1;208,2	1;94,6	1;141,9	1;1,5	1;75,3	1,4;1	2,2;1	5,8;1	2,7;1
A15 O	Leaves nwsh	1;84,6	1;65,4	1;83,4	1,2;1	1;33	1;1	1,2;1	3,8;1	2,5;1
A15 O	Leaves wsh	1;80,5	1;61,4	1;85,9	1,1;1	1;33,1	1;1	1,3;1	3,4;1	2,4;1
A16	0 - 2 cm	1;10,3	1;63,2	1;28,7	1;272,3	1;36,3	1;2,7	1;6	1;1	1;3,5
A16	2 - 4 cm	1;11,9	1;52,3	1;34	1;354,9	1;41,7	1;2,8	1;4,3	1,1;1	1;3,4
A16	4 - 6 cm	1;13,5	1;49,5	1;37,6	1;401,1	1;45,4	1;2,7	1;3,6	1,2;1	1;3,3
A16	6 - 8 cm	1;14,3	1;51,7	1;36,5	1;399,2	1;45,8	1;2,5	1;3,6	1,2;1	1;3,2
A16	8 - 10 cm	1;13,3	1;45,2	1;32,8	1;383,4	1;41,8	1;2,4	1;3,3	1,1;1	1;3,1
A16	14 - 16 cm	1;17,4	1;38,6	1;38,9	1;371,3	1;39,7	1;2,2	1;2,2	1,9;1	1;2,2
A16	Soil MEAN	1;13,5	1;49,9	1;34,7	1;362,9	1;41,7	1;2,5	1;3,6	1,3;1	1;3
A16a	Rock	1;14,7	1;81,9	1;11,5	1;100,9	1;36,3	1,2;1	1;5,5	2,2;1	1;2,4
A16b	Rock	1;7,6	1;173,5	1;7,4	1;324,8	1;81,1	1;1	1;22,5	1;2,4	1;10,5
A16 O	Leaves nwsh	1;12,1	1;68,3	1;125,3	2,3;1	1;25,2	1;10,3	1;5,6	1;2	1;2
A16 O	Leaves wsh	1;13,2	1;70	1;129,6	2,2;1	1;24,7	1;9,7	1;5,2	1;1,8	1;1,8
A16 O	Roots	1;2,7	1;75	1;9,9	1;1,9	1;8,5	1;3,6	1;27,3	1;2,3	1;3,1
A17	0 - 2 cm	1;12,9	1;70,6	1;44,7	1;383,8	1;34,9	1;3,4	1;5,4	1;1	1;2,6
A17	2 - 4 cm	1;16,3	1;38,6	1;56,8	1;563,2	1;39,2	1;3,4	1;2,3	1,1;1	1;2,4
A17	4 - 6 cm	1;18,9	1;27,4	1;65,9	1;742,1	1;44,3	1;3,4	1;1,4	1,1;1	1;2,3
A17	6 - 8 cm	1;16,5	1;22,3	1;57,7	1;634,1	1;38,3	1;3,4	1;1,3	1;1	1;2,3
A17	8 - 10 cm	1;17,9	1;19,8	1;61,5	1;659,8	1;40	1;3,4	1;1,1	1,1;1	1;2,2
A17	14 - 16 cm	1;16,9	1;17,1	1;56,7	1;639,8	1;37,3	1;3,3	1;1	1;1	1;2,2
A17	Soil MEAN	1;16,4	1;33,1	1;56,9	1;598,4	1;38,8	1;3,4	1;2	1;1	1;2,3
A17	Rock	1;18,6	1;54,3	1;11,1	1;87,4	1;26,1	1,6;1	1;2,9	6;1	1;1,4
A17 O	Leaves nwsh	1;155,1	1;158,6	1;379,3	1;2	1;70,3	1;2,4	1;1	3,1;1	2,2;1
A17 O	Leaves wsh	1;143,3	1;150,6	1;439,7	1;2,4	1;71,6	1;3	1;1	2,7;1	2;1
A17 O	Roots	1;25,6	1;77,9	1;87,1	1;75,2	1;19,2	1;3,3	1;3	2,2;1	1,3;1
A19	0 - 2 cm	1;6,1	1;90,4	1;21,9	1;152,8	1;31,3	1;3,5	1;14,7	1;1,2	1;5
A19	2 - 4 cm	1;6,3	1;82,7	1;21,4	1;180,8	1;30,3	1;3,3	1;12,9	1;1,1	1;4,7
A19	4 - 6 cm	1;6,2	1;54,8	1;20,1	1;354,8	1;32,4	1;3,2	1;8,7	1;1,4	1;5,1
A19	6 - 8 cm	1;5,8	1;37,2	1;18,7	1;510,2	1;36,1	1;3,1	1;6,3	1;1,8	1;6,1
A19	8 - 10 cm	1;5,3	1;18,7	1;17,4	1;661,1	1;41,2	1;3,2	1;3,5	1;2	1;7,7
A19	14 - 16 cm	1;6,4	1;12,2	1;19,3	1;649,4	1;37,1	1;2,9	1;1,8	1;1,6	1;5,7
A19	Soil MEAN	1;6	1;46,7	1;19,6	1;436,1	1;35	1;3,2	1;7,7	1;1,5	1;5,7
A19	Rock	1;5,5	1;22,9	1;11,6	1;1266,8	1;70,6	1;2,1	1;4,1	1;5,1	1;12,8
A19 O	Leaves nwsh	1;18,5	1;91,6	1;116	1;1,2	1;31,3	1;6,2	1;4,9	1;1,1	1;1,6
A19 O	Leaves wsh	1;21,1	1;86,7	1;126,4	1;1,3	1;32,2	1;5,9	1;4,1	1;1	1;1,5
A19 O	Roots	1;3,4	1;62,5	1;24,7	1;3,5	1;41,2	1;7,1	1;18,1	1;3,9	1;11,9

Continuation: Table 10

Nr	Type	Sr/Na	Sr/Ca	Sr/K	Sr/Fe	Sr/Mg	Na/K	Na/Ca	Na/P	Na/Mg
O5	0 - 2 cm	1;9,2	1;80,8	1;9,9	1;102,6	1;28,9	1;1	1;8,7	3;1	1;3,1
O5	2 - 4 cm	1;11,7	1;95,7	1;11,2	1;153,2	1;42,6	1;1	1;8,1	3,5;1	1;3,6
O5	4 - 6 cm	1;13,4	1;99,8	1;12,4	1;164,6	1;43,1	1;1	1;7,4	3,9;1	1;3,2
O5	6 - 8 cm	1;14,8	1;99,6	1;12,2	1;172,8	1;45,7	1,2;1	1;6,7	4,2;1	1;3
O5	14 - 16 cm	1;17,2	1;101,7	1;15,2	1;226,3	1;51,4	1,1;1	1;5,8	4,4;1	1;2,9
O5	Soil MEAN	1;13,1	1;95,3	1;12,1	1;162	1;42	1;1	1;7,2	3,8;1	1;3,1
O5	Rock	1;18,4	1;80,8	1;12,6	1;110,9	1;38,5	1,4;1	1;4,3	4,8;1	1;2
O5 O	Leaves nwsh	1;3,3	1;39,9	1;63,6	2,7;1	1;12,8	1;19,1	1;12	1;3,5	1;3,8
O5 O	Leaves wsh	1;2,8	1;41,7	1;55,2	3,7;1	1;12,9	1;19	1;14,4	1;3,6	1;4,4
O5 O	Roots	1;13,6	1;47,5	1;11,4	1;2,9	1;80,4	1,1;1	1;3,4	1,9;1	1;5,9
O6	0 - 2 cm	1;18,9	1;43,6	1;14,4	1;78,3	1;20,3	1,3;1	1;2,3	5,3;1	1;1
O6	2 - 4 cm	1;20,6	1;43,7	1;15	1;81,4	1;21,8	1,3;1	1;2,1	5,7;1	1;1
O6	4 - 6 cm	1;21	1;47	1;14,8	1;88,8	1;25,4	1,4;1	1;2,2	5,6;1	1;1,2
O6	6 - 8 cm	1;19,9	1;41,2	1;14,4	1;70,9	1;19,1	1,3;1	1;2	6,1;1	1;1
O6	14 - 16 cm	1;19	1;38,8	1;12,7	1;62,2	1;16,8	1,4;1	1;2	6,9;1	1,1;1
O6	Soil MEAN	1;19,8	1;42,6	1;14,2	1;75,4	1;20,4	1,3;1	1;2,1	5,9;1	1;1
O6	Rock	1;22,5	1;37	1;10	1;41,3	1;14,2	2,2;1	1;1,6	8,7;1	1,5;1
O6 Y	Leaves nwsh	1;24,1	1;55,6	1;102,5	1,1;1	1;20,8	1;4,2	1;2,3	1,9;1	1,1;1
O6 Y	Leaves wsh	1;21,9	1;54,9	1;84,7	1;1	1;18,6	1;3,8	1;2,5	2,1;1	1,1;1
O6 Y	Roots	1;15,2	1;40,1	1;57	1;2,7	1;10,1	1;3,7	1;2,6	1;1	1,5;1
O7	0 - 2 cm	1;14,9	1;61,2	1;11,9	1;96,9	1;26,1	1,2;1	1;4	4,5;1	1;1,7
O7	2 - 4 cm	1;15,4	1;59,5	1;11,4	1;97,9	1;25,5	1,3;1	1;3,8	4,7;1	1;1,6
O7	4 - 6 cm	1;16,3	1;60,3	1;11,8	1;100,3	1;26,6	1,3;1	1;3,6	4,9;1	1;1,6
O7	6 - 8 cm	1;15	1;61,9	1;11,6	1;101,4	1;26,6	1,2;1	1;4,1	4,4;1	1;1,7
O7	14 - 16 cm	1;15	1;59,5	1;9,6	1;98,8	1;25,7	1,5;1	1;3,9	4,7;1	1;1,7
O7	Soil MEAN	1;15,3	1;60,4	1;11,2	1;99,1	1;26,1	1,3;1	1;3,9	4,6;1	1;1,6
O7a	Rock	1;67,9	1;147,1	1;43,6	1;280,2	1;63,3	1,5;1	1;2,1	14,7;1	1;1
O7b	Rock	1;16,9	1;57	1;8,5	1;84,3	1;24,3	1,9;1	1;3,3	5,7;1	1;1,4
O7 Y	Leaves nwsh	1;10,2	1;46,6	1;59,2	1,5;1	1;17,7	1;5,7	1;4,5	1,1;1	1;1,7
O7 Y	Leaves wsh	1;11,2	1;43	1;54,6	1;3,9	1;16,8	1;4,8	1;3,8	1,2;1	1;1,5
O7 Y	Roots	1;3,2	1;50,3	1;16,2	1;1,5	1;6,7	1;5	1;15,5	1,3;1	1;2
T3	0 - 2 cm	1;20,4	1;176	1;46,7	1;1273,2	1;401,5	1;2,2	1;8,6	1,2;1	1;19,6
T3	2 - 4 cm	1;21,6	1;172,3	1;48,3	1;1397,1	1;475,6	1;2,2	1;7,9	1,2;1	1;22
T3	4 - 6 cm	1;21,9	1;175	1;48,1	1;1454,8	1;501,1	1;2,1	1;7,9	1,2;1	1;22,8
T3	6 - 8 cm	1;22,2	1;175,2	1;42,8	1;1478,5	1;539,3	1;1,9	1;7,8	1,3;1	1;24,2
T3	14 - 16 cm	1;24,6	1;156,5	1;41,3	1;1497,4	1;518,5	1;1,6	1;6,3	1,4;1	1;21
T3	Soil MEAN	1;22,1	1;171	1;45,4	1;1420,2	1;487,2	1;2	1;7,7	1,2;1	1;21,9
T3	Rock	1;20,1	1;233,2	1;36,8	1;705,9	1;494,1	1;1,8	1;11,5	1,7;1	1;24,4
T3 Y	Leaves nwsh	1;24,4	1;150,7	1;103,1	1;1,7	1;58,3	1;4,2	1;6,1	1,1;1	1;2,3
T3 Y	Leaves wsh	1;30	1;155,5	1;114,8	1;1	1;60,9	1;3,8	1;5,1	1,3;1	1;2
T3 O	Leaves nwsh	1;43,3	1;129,6	1;194,5	1;2,2	1;53,1	1;4,4	1;2,9	1,1;1	1;1,2
T3 O	Leaves wsh	1;36,4	1;131,9	1;147,6	1;2,6	1;46,5	1;4	1;3,6	1,1;1	1;1,2
T3 O	Roots	1;8,2	1;157,8	1;52,6	1;73,2	1;56,4	1;6,4	1;19,2	1;1,6	1;6,8

Continuation: Table 10

Nr	Type	Sr/Na	Sr/Ca	Sr/K	Sr/Fe	Sr/Mg	Na/K	Na/Ca	Na/P	Na/Mg
T4	0 - 2 cm	1;26,2	1;162,8	1;47,6	1;775,4	1;164,1	1;1,8	1;6,1	1,8;1	1;6,2
T4	2 - 4 cm	1;28,1	1;176,5	1;52,7	1;926,6	1;209,6	1;1,8	1;6,2	1,8;1	1;7,4
T4	4 - 6 cm	1;30,2	1;197,4	1;53,8	1;963,9	1;230,2	1;1,7	1;6,5	1,4;1	1;7,6
T4	6 - 8 cm	1;28,2	1;166,3	1;53,9	1;903,8	1;197	1;1,9	1;5,8	1,9;1	1;6,9
T4	14 - 16 cm	1;32,6	1;154,2	1;56,5	1;981,7	1;192,5	1;1,7	1;4,7	1,9;1	1;5,9
T4	Soil MEAN	1;29	1;171	1;52,8	1;906,3	1;197,6	1;1,8	1;5,8	1,7;1	1;6,8
T4a	Rock	1;27,6	1;111,7	1;63,4	1;1437	1;183,8	1;2,2	1;4	1;1	1;6,6
T4b	Rock	1;11,8	1;93,8	1;16,4	1;1078,9	1;130,7	1;1,3	1;7,8	1;1,3	1;10,9
T4 O	Leaves nwsh	1;53	1;117,2	1;299,3	1;3,7	1;44,4	1;5,6	1;2,2	1,2;1	1,1;1
T4 O	Leaves wsh	1;55,2	1;114,2	1;314,2	1;2,8	1;46	1;5,6	1;2	1,3;1	1,2;1
T4 O	Roots	1;3,9	1;54,1	1;167,4	1;6,8	1;15,7	1;42,5	1;13,7	1;5,2	1;4
T11	0 - 2 cm	1;19,8	1;123,7	1;32	1;286,8	1;63,4	1;1,6	1;6,2	1,4;1	1;3,1
T11	2 - 4 cm	1;18,3	1;104	1;29,3	1;264	1;55	1;1,5	1;5,6	1,3;1	1;2,9
T11	4 - 6 cm	1;20	1;126,4	1;31,3	1;330	1;77,3	1;1,5	1;6,2	1,4;1	1;3,8
T11	6 - 8 cm	1;22,4	1;132	1;33,5	1;342,6	1;79,9	1;1,4	1;5,8	1,6;1	1;3,5
T11	8 - 10 cm	1;22,3	1;118,4	1;32,7	1;347,9	1;74,3	1;1,4	1;5,3	1,5;1	1;3,3
T11	Soil MEAN	1;20,5	1;120,7	1;31,7	1;314	1;69,9	1;1,5	1;5,8	1,5;1	1;3,3
T11	Rock	1;25,6	1;147,9	1;24,3	1;259	1;60	1;1	1;5,7	4,6;1	1;2,3
T11 O	Leaves nwsh	1;16,9	1;113,7	1;165,3	1;1	1;32,6	1;9,7	1;6,7	1;1,2	1;1,9
T11 O	Leaves wsh	1;15,9	1;106,6	1;190,5	1;1	1;30,2	1;11,9	1;6,7	1;1,4	1;1,9
T11 O	Roots	1;12,5	1;72,3	1;164,4	1;11,1	1;13,1	1;13,1	1;5,7	1;1,7	1;1
T12	0 - 2 cm	1;19	1;124,9	1;27,1	1;351,9	1;120,5	1;1,4	1;6,5	2,7;1	1;6,3
T12	2 - 4 cm	1;17,3	1;124	1;26,1	1;360,6	1;119,2	1;1,5	1;7,1	2,5;1	1;6,8
T12	4 - 6 cm	1;18,7	1;119,7	1;31	1;418,9	1;114,5	1;1,6	1;6,3	2,5;1	1;6,1
T12	6 - 8 cm	1;18,7	1;110,5	1;31	1;451,6	1;123,8	1;1,6	1;5,9	2,7;1	1;6,6
T12	8 - 10 cm	1;21,1	1;99,8	1;36,4	1;577,8	1;150,1	1;1,7	1;4,7	3;1	1;7
T12	Soil MEAN	1;18,9	1;116,6	1;30	1;424,9	1;124,9	1;1,5	1;6,1	2,7;1	1;6,5
T12	Rock	1;20,2	1;168,6	1;19,9	1;342,4	1;291,8	1;1	1;8,3	3,4;1	1;14,3
T12 Y	Leaves nwsh	1;14,7	1;67,4	1;89,8	1,1;1	1;35,1	1;6	1;4,5	1;1,3	1;2,3
T12 Y	Leaves wsh	1;14,5	1;69,3	1;80,8	1;1,3	1;33,8	1;5,5	1;4,7	1;1,3	1;2,3
T12 O	Leaves nwsh	1;11,8	1;89,1	1;170,1	1,2;1	1;46,5	1;14,3	1;7,5	1;2,2	1;3,9
T12 O	Leaves wsh	1;10,1	1;86,2	1;156,8	1,7;1	1;42,5	1;15,3	1;8,4	1;2,6	1;4,1
T12 O	Roots	1;45,2	1;165,2	1;56,5	1;61,3	1;40,8	1;1,2	1;3,6	3,5;1	1,1;1

Table 11 Na/Si, Na/Al, Ca/K, Ca/P, Ca/Mg, Ca/Si and Ca/Al element-to-element ratios.

Nr	Type	Na/Si	Na/Al	Ca/K	Ca/P	Ca/Mg	Ca/Si	Ca/Al
A1	0 - 2 cm	1;32,7	1;17,2	1,9;1	7,8;1	1,9;1	1;6,4	1;3,3
A1	2 - 4 cm	1;36,4	1;19,5	1,6;1	6,5;1	1,6;1	1;9	1;4,8
A1	4 - 6 cm	1;43	1;27,7	1,3;1	4,7;1	1,3;1	1;13,4	1;8,6
A1	6 - 8 cm	1;55	1;43,3	1;1	2,9;1	1;1,1	1;23,8	1;18,7
A1	14 - 16 cm	1;104,1	1;93	1;1,2	1,3;1	1;2	1;65,6	1;58,6
A1	Soil MEAN	1;53	1;38,9	1,3;1	4,2;1	1,2;1	1;16,3	1;11,9
A1	Rock	1;78,4	1;135,7	1,7;1	1;1,7	1;1,8	1;68,4	1;118,4
A1 O	Leaves nwsh			1;2,4	3;1	2;1		
A1 O	Leaves wsh			1;2,6	2,8;1	1,8;1		
A1 Y	Leaves nwsh			1;3,1	2,6;1	1,6;1		
A1 Y	Leaves wsh			1;3,2	2,5;1	1,6;1		
A1 O	Roots		2,1;1	1;1,4	6;1	2;1		3,7;1
A1 Y	Roots		1,5;1	1,2;1	8,8;1	2,8;1		3,7;1
A2	0 - 2 cm	1;50,8	1;41	1,8;1	3,7;1	1,1;1	1;11,5	1;9,2
A2	2 - 4 cm	1;54,5	1;45,4	1,4;1	2,8;1	1;1	1;15,8	1;13,2
A2	4 - 6 cm	1;96,4	1;85,7	1,2;1	1,5;1	1;1,5	1;29,1	1;25,9
A2	6 - 8 cm	1;120	1;107,1	1,4;1	1,3;1	1;1,7	1;32,7	1;29,2
A2	14 - 16 cm	1;107,4	1;94	1;1	1,1;1	1;2	1;40,9	1;35,7
A2	Soil MEAN	1;77,1	1;66,4	1,4;1	2;1	1;1,2	1;21,4	1;18,4
A2	Rock	1;32,9	1;21,1	3,3;1	12,9;1	1,6;1	1;3,6	1;2,3
A2 O	Leaves nwsh			1;2,7	1,5;1	1,5;1		
A2 O	Leaves wsh			1;2,7	1,5;1	1,6;1		
A2 O	Roots		2,6;1	1;10,4	1,2;1	2,3;1		1,6;1
A8	0 - 2 cm	1;34,7	1;18,2	3,8;1	9,3;1	1,7;1	1;4,2	1;2,2
A8	2 - 4 cm	1;37,1	1;19,3	2,6;1	6,4;1	1,6;1	1;6,3	1;3,2
A8	4 - 6 cm	1;41,8	1;24,9	3,1;1	7,4;1	1,4;1	1;6,2	1;3,6
A8	6 - 8 cm	1;40,9	1;25,8	4,2;1	8,2;1	1,4;1	1;5,6	1;3,5
A8	14 - 16 cm	1;39,3	1;24,6	4,1;1	9;1	1,4;1	1;5,5	1;3,4
A8	Soil MEAN	1;39,2	1;23,2	3,6;1	8,1;1	1,5;1	1;5,5	1;3,3
A8	Rock	1;13,9	1;6,4	12;1	19,6;1	1,7;1	1;2,6	1;1,2
A8 Y	Leaves nwsh			1;2,7	2;1	1,4;1		
A8 Y	Leaves wsh			1;2,4	2;1	1,4;1		
A8 Y	Roots		1;1,3	2,2;1	13,4;1	9,4;1		6;1
A9	0 - 2 cm	1;105,6	1;80,1	1,7;1	3,3;1	1;1,1	1;12,8	1;9,7
A9	2 - 4 cm	1;180,5	1;152,5	1,1;1	1,6;1	1;2,5	1;29,4	1;24,8
A9	4 - 6 cm	1;248,9	1;217,7	1;1,1	1,1;1	1;3,5	1;40,3	1;35,3
A9	6 - 8 cm	1;214,9	1;186,3	1;1	1,1;1	1;3,4	1;38,6	1;33,5
A9	14 - 16 cm	1;215,5	1;186,2	1;1,7	1;1,3	1;5,1	1;60,9	1;52,6
A9	Soil MEAN	1;185,4	1;157,1	1;1	1,4;1	1;2,6	1;30,5	1;25,8
A9	Rock	1;157,8	1;126,1	1;1,7	1;1,9	1;10,3	1;140,5	1;112,3
A9 O	Leaves nwsh			1;1,4	4,7;1	2,3;1		
A9 O	Leaves wsh			1;1,5	4,2;1	2,4;1		
A9 O	Roots		1;2,6	1;1,7	2,3;1	2,3;1		1;1,4

Continuation: Table 11

Nr	Type	Na/Si	Na/Al	Ca/K	Ca/P	Ca/Mg	Ca/Si	Ca/Al
A10	0 - 2 cm	1;42,8	1;25,1	3,1;1	8,4;1	2,1;1	1;4,2	1;2,5
A10	2 - 4 cm	1;49,4	1;30,5	2,3;1	7,2;1	1,7;1	1;6,4	1;3,9
A10	4 - 6 cm	1;71,8	1;59	1,5;1	3,4;1	1;1,2	1;15,6	1;12,8
A10	6 - 8 cm	1;90,5	1;76,4	1,5;1	3,1;1	1;1,4	1;18,6	1;15,7
A10	8 - 10 cm	1;157	1;150,2	1;1	1,5;1	1;2,9	1;44,4	1;42,4
A10	Soil MEAN	1;79	1;64,7	1,9;1	4,2;1	1;1	1;12,8	1;10,5
A10	Rock	1;312,4	1;274,1	1;4,1	1;6,5	1;38,5	1;463,7	1;406,8
A10 O	Leaves nwsh			1;1,5	4,9;1	3,6;1		
A10 O	Leaves wsh			1;1,6	4;1	4,2;1		
A10 O	Roots		1;2	2,3;1	13,3;1	3;1		2,3;1
A14	0 - 2 cm	1;45,5	1;29,1	2,9;1	7,7;1	2;1	1;4,7	1;3
A14	2 - 4 cm	1;48,8	1;32,1	2,1;1	5,5;1	1,7;1	1;7,1	1;4,6
A14	4 - 6 cm	1;50	1;34,5	1,4;1	3,5;1	1,2;1	1;11,3	1;7,8
A14	6 - 8 cm	1;55,5	1;39,1	1,1;1	2,6;1	1;1	1;16,4	1;11,6
A14	8 - 10 cm	1;56,1	1;40,4	1,2;1	2,9;1	1;1	1;14,8	1;10,6
A14	Soil MEAN	1;51,3	1;35,2	1,7;1	4,3;1	1,4;1	1;9,3	1;6,4
A14	Rock	1;22,2	1;15,4	1;4,1	3;1	1;1	1;32,4	1;22,4
A 14 Y	Leaves nwsh			1;2,4	2,6;1	2;1		
A 14 Y	Leaves wsh			1;2,8	2,4;1	1,9;1		
A 14 Y	Roots		2,6;1	2,6;1	24,3;1	10,7;1		31,6;1
A15	0 - 2 cm	1;28,5	1;14,6	2,9;1	7,3;1	1,2;1	1;6,3	1;3,2
A15	2 - 4 cm	1;33	1;18,1	2,5;1	6,5;1	1,2;1	1;7,2	1;3,9
A15	4 - 6 cm	1;37,6	1;20,9	2,2;1	5,7;1	1,1;1	1;8,5	1;4,7
A15	6 - 8 cm	1;48,5	1;28,4	1,5;1	4,1;1	1;1	1;11,4	1;6,7
A15	8 - 10 cm	1;55,8	1;33,7	1,3;1	3,6;1	1;1,1	1;13,9	1;8,4
A15	14 - 16 cm	1;55,4	1;33,1	1,3;1	3,7;1	1;1,1	1;13,3	1;8
A15	Soil MEAN	1;40,6	1;23,1	1,9;1	5,2;1	1;1	1;9,3	1;5,3
A15	Rock	1;31,8	1;15,7	10,8;1	12,5;1	1,9;1	1;2,4	1;1,2
A15 Y	Leaves nwsh			1;1,7	2,4;1	1,2;1		
A15 Y	Leaves wsh			1;1,5	2,6;1	1,2;1		
A15 O	Leaves nwsh			1;1,2	2,9;1	1,9;1		
A15 O	Leaves wsh			1;1,4	2,5;1	1,8;1		
A16	0 - 2 cm	1;39,9	1;25,5	2,2;1	6,6;1	1,7;1	1;6,5	1;4,1
A16	2 - 4 cm	1;44,4	1;28,6	1,5;1	5;1	1,2;1	1;10,1	1;6,5
A16	4 - 6 cm	1;43,8	1;28,2	1,3;1	4,4;1	1;1	1;11,9	1;7,7
A16	6 - 8 cm	1;40	1;25,8	1,4;1	4,5;1	1,1;1	1;11	1;7,1
A16	8 - 10 cm	1;39,6	1;25,8	1,3;1	4;1	1;1	1;11,7	1;7,6
A16	14 - 16 cm	1;31,9	1;20,9	1;1	4,2;1	1;1	1;14,4	1;9,4
A16	Soil MEAN	1;39,2	1;25,4	1,4;1	4,7;1	1,1;1	1;10,6	1;6,8
A16a	Rock	1;10,9	1;4	7;1	12,6;1	2,2;1	1;1,9	1,3;1
A16b	Rock	1;54,7	1;32,7	23,2;1	9,2;1	2,1;1	1;2,4	1;1,4
A16 O	Leaves nwsh			1;1,8	2,6;1	2,7;1		
A16 O	Leaves wsh			1;1,8	2,8;1	2,8;1		
A16 O	Roots		1,2;1	7,5;1	11,7;1	8,7;1		32,8;1

Continuation: Table 11

Nr	Type	Na/Si	Na/Al	Ca/K	Ca/P	Ca/Mg	Ca/Si	Ca/Al
A17	0 - 2 cm	1;52,4	1;31,6	1,5;1	5,8;1	2;1	1;9,6	1;5,8
A17	2 - 4 cm	1;57,2	1;36,6	1;1,4	2,6;1	1;1	1;24,1	1;15,4
A17	4 - 6 cm	1;59,5	1;40,1	1;2,4	1,6;1	1;1,6	1;41	1;27,6
A17	6 - 8 cm	1;60,8	1;40,9	1;2,5	1,4;1	1;1,7	1;45,1	1;30,3
A17	8 - 10 cm	1;59,4	1;40,2	1;3,1	1,2;1	1;2	1;53,7	1;36,4
A17	14 - 16 cm	1;61,7	1;42,5	1;3,3	1;1	1;2,1	1;61	1;42
A17	Soil MEAN	1;58,7	1;38,9	1;1,7	2,2;1	1;1,1	1;29,2	1;19,4
A17	Rock	1;9,4	1;4,1	4,8;1	17,5;1	2;1	1;3,2	1;1,4
A17 O	Leaves nwsh			1;2,3	3,1;1	2,2;1		
A17 O	Leaves wsh			1;2,9	2,8;1	2,1;1		
A17 O	Roots		1;3	1;1,1	6,8;1	4;1		1;1
A19	0 - 2 cm	1;45,8	1;23,7	4,1;1	11,4;1	2,8;1	1;3,1	1;1,6
A19	2 - 4 cm	1;48,2	1;26,3	3,8;1	11;1	2,7;1	1;3,7	1;2
A19	4 - 6 cm	1;65,4	1;43,8	2,7;1	6,1;1	1,6;1	1;7,5	1;5
A19	6 - 8 cm	1;86,7	1;66,2	1,9;1	3,5;1	1;1	1;13,6	1;10,4
A19	8 - 10 cm	1;111,1	1;89,5	1;1	1,7;1	1;2,1	1;31,5	1;25,4
A19	14 - 16 cm	1;96	1;77	1;1,5	1,1;1	1;3	1;50,8	1;40,8
A19	Soil MEAN	1;76,7	1;55,6	2,3;1	4,8;1	1,3;1	1;9,9	1;7,2
A19	Rock	1;175,5	1;159,1	1,9;1	1;1,2	1;3	1;42	1;38
A19 O	Leaves nwsh			1;1,2	4,2;1	2,9;1		
A19 O	Leaves wsh			1;1,4	4;1	2,6;1		
A19 O	Roots		1;2,5	2,5;1	4,6;1	1,5;1		7,2;1
O5	0 - 2 cm	1;19,5	1;11	8,1;1	26,3;1	2,7;1	1;2,2	1;1,2
O5	2 - 4 cm	1;20,9	1;11,7	8,5;1	28,7;1	2,2;1	1;2,5	1;1,4
O5	4 - 6 cm	1;20,1	1;11,5	8;1	29;1	2,3;1	1;2,7	1;1,5
O5	6 - 8 cm	1;19,1	1;10,7	8,1;1	28,2;1	2,1;1	1;2,8	1;1,5
O5	14 - 16 cm	1;20,6	1;12,9	6,6;1	26,2;1	1,9;1	1;3,5	1;2,1
O5	Soil MEAN	1;20	1;11,6	7,8;1	27,7;1	2,2;1	1;2,7	1;1,6
O5	Rock	1;12,5	1;5,4	6,4;1	21,3;1	2;1	1;2,8	1;1,2
O5 O	Leaves nwsh			1;1,5	3,3;1	3,1;1		
O5 O	Leaves wsh			1;1,3	3,9;1	3,2;1		
O5 O	Roots		1,6;1	4,1;1	6,9;1	1;1,6		5,8;1
O6	0 - 2 cm	1;10,4	1;5,9	3;1	12,4;1	2,1;1	1;4,5	1;2,5
O6	2 - 4 cm	1;10,2	1;5,6	2,8;1	12,2;1	2;1	1;4,8	1;2,6
O6	4 - 6 cm	1;10,4	1;5,8	3,1;1	12,5;1	1,8;1	1;4,6	1;2,6
O6	6 - 8 cm	1;9,9	1;5,2	2,8;1	12,6;1	2,1;1	1;4,8	1;2,5
O6	14 - 16 cm	1;9,5	1;5	3;1	14;1	2,3;1	1;4,6	1;2,4
O6	Soil MEAN	1;10	1;5,5	2,9;1	12,7;1	2;1	1;4,7	1;2,5
O6	Rock	1;5,7	1;2,3	3,6;1	14,2;1	2,6;1	1;3,5	1;1,4
O6 Y	Leaves nwsh			1;1,8	4,3;1	2,6;1		
O6 Y	Leaves wsh			1;1,5	5,3;1	2,9;1		
O6 Y	Roots		2,4;1	1;1,4	2,6;1	3,9;1		6,3;1

Continuation: Table 11

Nr	Type	Na/Si	Na/Al	Ca/K	Ca/P	Ca/Mg	Ca/Si	Ca/Al
O7	0 - 2 cm	1;13	1;7,2	5,1;1	18,6;1	2,3;1	1;3,1	1;1,7
O7	2 - 4 cm	1;12,3	1;6,8	5,1;1	18,1;1	2,3;1	1;3,2	1;1,7
O7	4 - 6 cm	1;12,1	1;6,4	5;1	18,1;1	2,2;1	1;3,2	1;1,7
O7	6 - 8 cm	1;13,3	1;7,3	5,3;1	18,2;1	2,3;1	1;3,2	1;1,7
O7	14 - 16 cm	1;12,7	1;6,7	6,1;1	18,8;1	2,3;1	1;3,2	1;1,7
O7	Soil MEAN	1;12,7	1;6,8	5,3;1	18,4;1	2,3;1	1;3,2	1;1,7
O7a	Rock	1;10,8	1;3	3,3;1	32;1	2,3;1	1;5	1;1,4
O7b	Rock	1;10,1	1;4,4	6,6;1	19,3;1	2,3;1	1;3	1;1,3
O7 Y	Leaves nwsh			1;1,2	5,2;1	2,6;1		
O7 Y	Leaves wsh			1;1,2	4,8;1	2,5;1		
O7 Y	Roots		1;1,2	3,1;1	20,9;1	7,5;1		12,8;1
T3	0 - 2 cm	1;68,5	1;38,9	3,7;1	10,5;1	1;2,2	1;7,9	1;4,5
T3	2 - 4 cm	1;71,1	1;40,1	3,5;1	10,1;1	1;2,7	1;8,9	1;5
T3	4 - 6 cm	1;73,4	1;40,6	3,6;1	10,1;1	1;2,8	1;9,2	1;5,1
T3	6 - 8 cm	1;72,6	1;39,9	4;1	10,4;1	1;3	1;9,2	1;5
T3	14 - 16 cm	1;68,9	1;39,8	3,7;1	8,9;1	1;3,3	1;10,8	1;6,2
T3	Soil MEAN	1;70,9	1;39,9	3,7;1	10;1	1;2,8	1;9,2	1;5,1
T3	Rock	1;48,9	1;17	6,3;1	20;1	1;2,1	1;4,2	1;1,4
T3 Y	Leaves nwsh			1,4;1	6,9;1	2,5;1		
T3 Y	Leaves wsh			1,3;1	7,1;1	2,5;1		
T3 O	Leaves nwsh			1;1,5	3,4;1	2,4;1		
T3 O	Leaves wsh			1;1,1	4,2;1	2,8;1		
T3 O	Roots		1;6,6	3;1	11,5;1	2,7;1		2,8;1
T4	0 - 2 cm	1;39,1	1;25,4	3,4;1	11,3;1	1;1	1;6,3	1;4,1
T4	2 - 4 cm	1;43,3	1;28,3	3,3;1	11,7;1	1;1,1	1;6,9	1;4,5
T4	4 - 6 cm	1;41,1	1;27,6	3,6;1	9,5;1	1;1,1	1;6,3	1;4,2
T4	6 - 8 cm	1;41,3	1;27,5	3;1	11,3;1	1;1,1	1;7	1;4,6
T4	14 - 16 cm	1;37,7	1;26,9	2,7;1	9,3;1	1;1,2	1;7,9	1;5,6
T4	Soil MEAN	1;40,4	1;27,1	3,2;1	10,6;1	1;1,1	1;6,8	1;4,6
T4a	Rock	1;56	1;38,3	1,7;1	4,2;1	1;1,6	1;13,8	1;9,4
T4b	Rock	1;102,9	1;68,6	5,6;1	5,7;1	1;1,3	1;13	1;8,7
T4 O	Leaves nwsh			1;2,5	2,8;1	2,6;1		
T4 O	Leaves wsh			1;2,7	2,7;1	2,4;1		
T4 O	Roots		1;2,5	1;3	2,6;1	3,4;1		5,5;1
T11	0 - 2 cm	1;24,1	1;17,2	3,8;1	9;1	1,9;1	1;3,8	1;2,7
T11	2 - 4 cm	1;23,8	1;17,3	3,5;1	7,7;1	1,8;1	1;4,2	1;3
T11	4 - 6 cm	1;26,4	1;17,8	4;1	9,4;1	1,6;1	1;4,2	1;2,8
T11	6 - 8 cm	1;25,6	1;17,6	3,9;1	9,7;1	1,6;1	1;4,3	1;2,9
T11	8 - 10 cm	1;24,8	1;17,6	3,6;1	8,4;1	1,5;1	1;4,6	1;3,3
T11	Soil MEAN	1;25	1;17,5	3,8;1	8,8;1	1,7;1	1;4,2	1;2,9
T11	Rock	1;15,8	1;6,6	6;1	26,6;1	2,4;1	1;2,7	1;1,1
T11 O	Leaves nwsh			1;1,4	5,3;1	3,4;1		
T11 O	Leaves wsh			1;1,7	4,4;1	3,5;1		
T11 O	Roots		1;1,5	1;2,2	3,2;1	5,5;1		3,6;1

Continuation: Table 11

Nr	Type	Na/Si	Na/Al	Ca/K	Ca/P	Ca/Mg	Ca/Si	Ca/Al
T12	0 - 2 cm	1;27,6	1;14,3	4,6;1	17,7;1	1;1	1;4,2	1;2,1
T12	2 - 4 cm	1;30	1;15,9	4,7;1	18;1	1;1	1;4,1	1;2,2
T12	4 - 6 cm	1;31,9	1;18,3	3,8;1	16,4;1	1;1	1;5	1;2,8
T12	6 - 8 cm	1;33,5	1;19,7	3,5;1	16,2;1	1;1,1	1;5,6	1;3,3
T12	8 - 10 cm	1;37,3	1;22,6	2,7;1	14,4;1	1;1,5	1;7,9	1;4,7
T12	Soil MEAN	1;31,9	1;18	3,8;1	16,7;1	1;1	1;5,1	1;2,9
T12	Rock	1;28,3	1;7,9	8,4;1	28,6;1	1;1,7	1;3,4	1;1
T12 Y	Leaves nwsh			1;1,3	3,4;1	1,9;1		
T12 Y	Leaves wsh			1;1,1	3,5;1	2;1		
T12 O	Leaves nwsh			1;1,9	3,4;1	1,9;1		
T12 O	Leaves wsh			1;1,8	3,1;1	2;1		
T12 O	Roots		1;1,3	2,9;1	13,1;1	4;1		2,7;1

Table 12 K/Si, K/Al, P/Fe, P/Mg, P/Si, P/Al and Si/Al element-to-element ratios.

Nr	Type	K/Si	K/Al	P/Fe	P/Mg	P/Si	P/Al	Si/Al
A1	0 - 2 cm	1;12,8	1;6,7	1;16	1;4	1;50,3	1;26,4	1,9;1
A1	2 - 4 cm	1;14,4	1;7,7	1;19,3	1;3,9	1;58,7	1;31,5	1,8;1
A1	4 - 6 cm	1;17,5	1;11,3	1;25,8	1;3,6	1;63,8	1;41,2	1,5;1
A1	6 - 8 cm	1;21,9	1;17,3	1;36,4	1;3,3	1;70,2	1;55,4	1,2;1
A1	14 - 16 cm	1;54,5	1;48,7	1;52,2	1;2,8	1;91,1	1;81,5	1,1;1
A1	Soil MEAN	1;22,1	1;16,2	1;32,4	1;3,4	1;69,4	1;50,9	1,3;1
A1	Rock	1;116,8	1;202,2	1;20,2	1;1	1;38,1	1;66	1;1,7
A1 O	Leaves nwsh			17,1;1	1;1,4			
A1 O	Leaves wsh			19,4;1	1;1,5			
A1 Y	Leaves nwsh			20;1	1;1,5			
A1 Y	Leaves wsh			27,3;1	1;1,5			
A1 O	Roots		5,5;1	1,5;1	1;2,8		1;1,6	
A1 Y	Roots		3,1;1	1;1,2	1;3		1;2,3	
A2	0 - 2 cm	1;21,8	1;17,5	1;25,8	1;3,3	1;43,2	1;34,8	1,2;1
A2	2 - 4 cm	1;23,4	1;19,5	1;25,8	1;2,9	1;45,7	1;38,1	1,2;1
A2	4 - 6 cm	1;36,4	1;32,4	1;25,2	1;2,4	1;45,7	1;40,6	1,1;1
A2	6 - 8 cm	1;47,1	1;42	1;23,8	1;2,3	1;43,8	1;39	1,1;1
A2	14 - 16 cm	1;42,7	1;37,3	1;25,1	1;2,3	1;46,3	1;40,5	1,1;1
A2	Soil MEAN	1;31,6	1;27,2	1;25,1	1;2,6	1;45	1;38,7	1,1;1
A2	Rock	1;12,3	1;7,9	1;34,7	1;7,7	1;47,5	1;30,5	1,5;1
A2 O	Leaves nwsh			23,8;1	1;1			
A2 O	Leaves wsh			24;1	1;1			
A2 O	Roots		17,3;1	2,1;1	1,9;1		1,3;1	

Continuation: Table 12

Nr	Type	K/Si	K/Al	P/Fe	P/Mg	P/Si	P/Al	Si/Al
A8	0 - 2 cm	1;16,4	1;8,6	1;26,3	1;5,3	1;39,3	1;20,6	1,9;1
A8	2 - 4 cm	1;16,5	1;8,6	1;23,8	1;3,9	1;40,9	1;21,3	1,9;1
A8	4 - 6 cm	1;19,8	1;11,8	1;34,6	1;5	1;46,4	1;27,6	1,6;1
A8	6 - 8 cm	1;23,9	1;15,1	1;39,4	1;5,6	1;46,5	1;29,4	1,5;1
A8	14 - 16 cm	1;22,8	1;14,2	1;43,3	1;6,3	1;49,9	1;31,2	1,5;1
A8	Soil MEAN	1;20,3	1;12	1;34,9	1;5,3	1;45,3	1;26,9	1,6;1
A8	Rock	1;31,8	1;14,7	1;35,3	1;11,1	1;52	1;24,1	2,1;1
A8 Y	Leaves nwsh			20;1	1;1,4			
A8 Y	Leaves wsh			7,9;1	1;1,4			
A8 Y	Roots		2,6;1	1;1,5	1;1,4		1;2,2	
A9	0 - 2 cm	1;22,5	1;17,1	1;41,9	1;3,8	1;42,8	1;32,5	1,3;1
A9	2 - 4 cm	1;33,7	1;28,5	1;50,6	1;4,1	1;47,6	1;40,2	1,1;1
A9	4 - 6 cm	1;36,2	1;31,6	1;49,3	1;4	1;45,6	1;39,9	1,1;1
A9	6 - 8 cm	1;35,7	1;31	1;48,5	1;3,9	1;43,7	1;37,9	1,1;1
A9	14 - 16 cm	1;35	1;30,2	1;50,4	1;3,8	1;45,2	1;39	1,1;1
A9	Soil MEAN	1;32,5	1;27,5	1;48,5	1;3,9	1;45,1	1;38,2	1,1;1
A9	Rock	1;80,6	1;64,4	1;84,3	1;5,2	1;71,6	1;57,3	1,2;1
A9 O	Leaves nwsh			27,5;1	1;2			
A9 O	Leaves wsh			24;1	1;1,7			
A9 O	Roots		1,2;1	1;3,7	1;1		1;3,3	
A10	0 - 2 cm	1;13,2	1;7,7	1;22,5	1;3,8	1;36,2	1;21,2	1,7;1
A10	2 - 4 cm	1;14,7	1;9,1	1;33,5	1;4,2	1;46,3	1;28,7	1,6;1
A10	4 - 6 cm	1;24,8	1;20,4	1;58,4	1;4,2	1;54,2	1;44,5	1,2;1
A10	6 - 8 cm	1;28,8	1;24,4	1;67,3	1;4,5	1;59,4	1;50,1	1,1;1
A10	8 - 10 cm	1;44,9	1;43	1;89,7	1;4,6	1;69	1;66,1	1;1
A10	Soil MEAN	1;24,7	1;20,2	1;58,8	1;4,3	1;55,1	1;45,1	1,2;1
A10	Rock	1;111,7	1;98	1;81,2	1;5,9	1;70,9	1;62,2	1,1;1
A10 O	Leaves nwsh			21,6;1	1;1,3			
A10 O	Leaves wsh			24,2;1	1;1			
A10 O	Roots		1;1	1;10,6	1;4,3		1;5,7	
A14	0 - 2 cm	1;13,9	1;8,9	1;17,6	1;3,6	1;36,5	1;23,3	1,5;1
A14	2 - 4 cm	1;15,3	1;10	1;18,8	1;3,1	1;39,3	1;25,8	1,5;1
A14	4 - 6 cm	1;16,8	1;11,6	1;21,3	1;2,8	1;40,5	1;27,9	1,4;1
A14	6 - 8 cm	1;18,7	1;13,2	1;23,7	1;2,7	1;44	1;31	1,4;1
A14	8 - 10 cm	1;18,8	1;13,5	1;24,1	1;2,8	1;43,7	1;31,5	1,3;1
A14	Soil MEAN	1;16,7	1;11,4	1;21,2	1;3	1;40,9	1;28	1,4;1
A14	Rock	1;7,7	1;5,3	1;29,5	1;2,8	1;98,2	1;68	1,4;1
A 14 Y	Leaves nwsh			27,4;1	1;1,2			
A 14 Y	Leaves wsh			32,7;1	1;1,2			
A 14 Y	Roots		12;1	2,7;1	1;2,2		1,3;1	

Continuation: Table 12

Nr	Type	K/Si	K/Al	P/Fe	P/Mg	P/Si	P/Al	Si/Al
A15	0 - 2 cm	1;18,4	1;9,4	1;26,7	1;5,7	1;46,5	1;23,8	1,9;1
A15	2 - 4 cm	1;18,4	1;10	1;28,6	1;5,2	1;47,2	1;25,8	1,8;1
A15	4 - 6 cm	1;18,8	1;10,4	1;29,9	1;5	1;48,6	1;27	1,7;1
A15	6 - 8 cm	1;18,3	1;10,7	1;30,3	1;4,1	1;47,8	1;28	1,7;1
A15	8 - 10 cm	1;18,9	1;11,4	1;32,3	1;4	1;50,8	1;30,6	1,6;1
A15	14 - 16 cm	1;18,5	1;11,1	1;32,9	1;4,2	1;50,4	1;30,1	1,6;1
A15	Soil MEAN	1;18,6	1;10,5	1;30,1	1;4,7	1;48,6	1;27,6	1,7;1
A15	Rock	1;26,5	1;13,1	1;21,3	1;6,5	1;30,6	1;15,1	2;1
A15 Y	Leaves nwsh			18,1;1	1;1,9			
A15 Y	Leaves wsh			22,6;1	1;2,1			
A15 O	Leaves nwsh			27;1	1;1,4			
A15 O	Leaves wsh			27;1	1;1,4			
A16	0 - 2 cm	1;14,4	1;9,2	1;28,8	1;3,8	1;43,7	1;28	1,5;1
A16	2 - 4 cm	1;15,5	1;10	1;34,2	1;4	1;51,3	1;33	1,5;1
A16	4 - 6 cm	1;15,7	1;10,1	1;36,1	1;4	1;53,3	1;34,4	1,5;1
A16	6 - 8 cm	1;15,6	1;10,1	1;34,8	1;3,9	1;49,9	1;32,2	1,5;1
A16	8 - 10 cm	1;16,1	1;10,5	1;34	1;3,7	1;47,1	1;30,7	1,5;1
A16	14 - 16 cm	1;14,3	1;9,3	1;41	1;4,3	1;61,6	1;40,3	1,5;1
A16	Soil MEAN	1;15,2	1;9,9	1;34,8	1;4	1;51	1;33	1,5;1
A16a	Rock	1;13,9	1;5,1	1;15,5	1;5,6	1;24,8	1;9,1	2,7;1
A16b	Rock	1;56,3	1;33,7	1;17,2	1;4,3	1;22,4	1;13,4	1,6;1
A16 O	Leaves nwsh			59,3;1	1;1			
A16 O	Leaves wsh			55,6;1	1;1			
A16 O	Roots		4,3;1	3,2;1	1;1,3		2,7;1	
A17	0 - 2 cm	1;15,1	1;9,1	1;31,6	1;2,8	1;55,9	1;33,7	1,6;1
A17	2 - 4 cm	1;16,4	1;10,5	1;38,6	1;2,6	1;64	1;40,9	1,5;1
A17	4 - 6 cm	1;17	1;11,5	1;43,5	1;2,5	1;65,9	1;44,5	1,4;1
A17	6 - 8 cm	1;17,4	1;11,7	1;41,2	1;2,4	1;65,5	1;44	1,4;1
A17	8 - 10 cm	1;17,3	1;11,7	1;41,8	1;2,5	1;67,5	1;45,7	1,4;1
A17	14 - 16 cm	1;18,3	1;12,6	1;40,9	1;2,3	1;66,7	1;46	1,4;1
A17	Soil MEAN	1;17	1;11,2	1;39,8	1;2,5	1;64,5	1;42,8	1,5;1
A17	Rock	1;15,8	1;6,8	1;28,1	1;8,4	1;56,8	1;24,7	2,2;1
A17 O	Leaves nwsh			24;1	1;1,4			
A17 O	Leaves wsh			22;1	1;1,3			
A17 O	Roots		1,1;1	1;6,5	1;1,6		1;6,8	
A19	0 - 2 cm	1;12,8	1;6,6	1;19,3	1;3,9	1;35,6	1;18,4	1,9;1
A19	2 - 4 cm	1;14,3	1;7,8	1;24,1	1;4	1;41,2	1;22,5	1,8;1
A19	4 - 6 cm	1;20,4	1;13,6	1;39,9	1;3,6	1;46,4	1;31	1,4;1
A19	6 - 8 cm	1;27,1	1;20,7	1;48	1;3,4	1;47,9	1;36,6	1,3;1
A19	8 - 10 cm	1;34	1;27,4	1;61	1;3,8	1;54,7	1;44,1	1,2;1
A19	14 - 16 cm	1;32,1	1;25,8	1;59,4	1;3,4	1;56,8	1;45,6	1,2;1
A19	Soil MEAN	1;23,6	1;17,1	1;45,6	1;3,6	1;48,6	1;35,3	1,3;1
A19	Rock	1;82,5	1;74,8	1;45	1;2,5	1;34,3	1;31,1	1,1;1
A19 O	Leaves nwsh			17,5;1	1;1,4			
A19 O	Leaves wsh			16,4;1	1;1,4			
A19 O	Roots		2,8;1	3,8;1	1;3		1,5;1	

Continuation: Table 12

Nr	Type	K/Si	K/Al	P/Fe	P/Mg	P/Si	P/Al	Si/Al
O5	0 - 2 cm	1;18,2	1;10,2	1;33,4	1;9,4	1;58,8	1;33,2	1,7;1
O5	2 - 4 cm	1;21,9	1;12,2	1;45,9	1;12,7	1;73,5	1;41,1	1,7;1
O5	4 - 6 cm	1;21,8	1;12,5	1;47,8	1;12,5	1;78,8	1;45,3	1,7;1
O5	6 - 8 cm	1;23,1	1;12,9	1;48,9	1;12,9	1;80,5	1;45,1	1,7;1
O5	14 - 16 cm	1;23,3	1;14,6	1;58,3	1;13,2	1;91,9	1;57,4	1,5;1
O5	Soil MEAN	1;21,8	1;12,6	1;47,1	1;12,2	1;77	1;44,6	1,7;1
O5	Rock	1;18,2	1;7,9	1;29,2	1;10,1	1;60,7	1;26,3	2,3;1
O5 O	Leaves nwsh			32,2;1	1;1			
O5 O	Leaves wsh			39;1	1;1,2			
O5 O	Roots		1,4;1	2,3;1	1;11,6		1;1,1	
O6	0 - 2 cm	1;13,6	1;7,7	1;22,3	1;5,7	1;56,3	1;31,8	1,7;1
O6	2 - 4 cm	1;14	1;7,7	1;22,7	1;6	1;59	1;32,8	1,8;1
O6	4 - 6 cm	1;14,8	1;8,2	1;23,7	1;6,8	1;58,8	1;32,8	1,7;1
O6	6 - 8 cm	1;13,6	1;7,2	1;21,7	1;5,8	1;60,7	1;32,3	1,8;1
O6	14 - 16 cm	1;14,2	1;7,4	1;22,5	1;6,1	1;66,1	1;34,5	1,9;1
O6	Soil MEAN	1;14	1;7,6	1;22,6	1;6,1	1;60,2	1;32,8	1,8;1
O6	Rock	1;12,9	1;5,3	1;15,9	1;5,4	1;50,3	1;20,7	2,4;1
O6 Y	Leaves nwsh			14,5;1	1;1,6			
O6 Y	Leaves wsh			10,6;1	1;1,8			
O6 Y	Roots		9;1	5,4;1	1,4;1		2,3;1	
O7	0 - 2 cm	1;16,3	1;8,9	1;29,6	1;7,9	1;59,7	1;32,9	1,8;1
O7	2 - 4 cm	1;16,6	1;9,2	1;29,8	1;7,7	1;58,1	1;32,3	1,7;1
O7	4 - 6 cm	1;16,7	1;8,9	1;30,1	1;7,9	1;59,5	1;31,6	1,8;1
O7	6 - 8 cm	1;17,2	1;9,4	1;29,9	1;7,8	1;59,3	1;32,5	1,8;1
O7	14 - 16 cm	1;19,8	1;10,5	1;31,1	1;8,1	1;60,7	1;32,1	1,8;1
O7	Soil MEAN	1;17,3	1;9,4	1;30,1	1;7,9	1;59,5	1;32,3	1,8;1
O7a	Rock	1;16,8	1;4,7	1;61	1;13,7	1;160,2	1;45,5	3,5;1
O7b	Rock	1;20,2	1;8,7	1;28,6	1;8,2	1;58,6	1;25,4	2,3;1
O7 Y	Leaves nwsh			14;1	1;2			
O7 Y	Leaves wsh			2,2;1	1;1,9			
O7 Y	Roots		4,1;1	1,5;1	1;2,7		1;1,6	
T3	0 - 2 cm	1;30	1;17	1;75,9	1;23,9	1;83,5	1;47,5	1,7;1
T3	2 - 4 cm	1;31,7	1;17,9	1;82,2	1;27,9	1;90,4	1;51	1,7;1
T3	4 - 6 cm	1;33,5	1;18,5	1;84,2	1;29	1;93,5	1;51,7	1,8;1
T3	6 - 8 cm	1;37,7	1;20,7	1;87,9	1;32	1;96,2	1;52,9	1,8;1
T3	14 - 16 cm	1;41,1	1;23,7	1;85,2	1;29,5	1;96,8	1;55,9	1,7;1
T3	Soil MEAN	1;34,6	1;19,4	1;83,1	1;28,5	1;92,1	1;51,8	1,7;1
T3	Rock	1;26,8	1;9,3	1;60,8	1;42,5	1;85,1	1;29,6	2,8;1
T3 Y	Leaves nwsh			12,2;1	1;2,6			
T3 Y	Leaves wsh			23,4;1	1;2,8			
T3 O	Leaves nwsh			16,7;1	1;1,4			
T3 O	Leaves wsh			11,6;1	1;1,4			
T3 O	Roots		1;1	1;5,3	1;4,1		1;4	

Continuation: Table 12

Nr	Type	K/Si	K/Al	P/Fe	P/Mg	P/Si	P/Al	Si/Al
T4	0 - 2 cm	1;21,5	1;14	1;53,8	1;11,4	1;71,5	1;46,4	1,5;1
T4	2 - 4 cm	1;23,1	1;15,1	1;61,7	1;13,9	1;81,4	1;53,1	1,5;1
T4	4 - 6 cm	1;23,1	1;15,5	1;46,8	1;11,1	1;60,5	1;40,6	1,4;1
T4	6 - 8 cm	1;21,5	1;14,3	1;61,5	1;13,4	1;79,2	1;52,8	1,4;1
T4	14 - 16 cm	1;21,7	1;15,5	1;59,8	1;11,7	1;74,9	1;53,4	1,4;1
T4	Soil MEAN	1;22,2	1;14,9	1;56,2	1;12,2	1;72,8	1;48,8	1,4;1
T4a	Rock	1;24,4	1;16,7	1;55,1	1;7	1;59,4	1;40,6	1,4;1
T4b	Rock	1;74,3	1;49,5	1;66	1;8	1;74,9	1;50	1,4;1
T4 O	Leaves nwsh			11,1;1	1;1			
T4 O	Leaves wsh			14,6;1	1;1			
T4 O	Roots		17;1	3;1	1,3;1		2,1;1	
T11	0 - 2 cm	1;14,9	1;10,6	1;20,9	1;4,6	1;35	1;25	1,4;1
T11	2 - 4 cm	1;14,9	1;10,9	1;19,7	1;4,1	1;32,7	1;23,8	1,3;1
T11	4 - 6 cm	1;16,9	1;11,4	1;24,5	1;5,7	1;39,5	1;26,7	1,4;1
T11	6 - 8 cm	1;17,1	1;11,7	1;25,2	1;5,8	1;42,2	1;29	1,4;1
T11	8 - 10 cm	1;16,9	1;12	1;24,9	1;5,3	1;39,8	1;28,2	1,4;1
T11	Soil MEAN	1;16,2	1;11,3	1;23	1;5,1	1;37,8	1;26,5	1,4;1
T11	Rock	1;16,6	1;6,9	1;46,7	1;10,8	1;73,3	1;30,5	2,4;1
T11 O	Leaves nwsh			20;1	1;1,5			
T11 O	Leaves wsh			22,6;1	1;1,2			
T11 O	Roots		8,3;1	2;1	1,7;1		1,1;1	
T12	0 - 2 cm	1;19,3	1;10	1;50	1;17,1	1;74,6	1;38,7	1,9;1
T12	2 - 4 cm	1;19,9	1;10,6	1;52,4	1;17,3	1;75,7	1;40,3	1,8;1
T12	4 - 6 cm	1;19,3	1;11,1	1;57,5	1;15,7	1;82,4	1;47,3	1,7;1
T12	6 - 8 cm	1;20,2	1;11,9	1;66,2	1;18,1	1;92,1	1;54,3	1,6;1
T12	8 - 10 cm	1;21,6	1;13,1	1;83,6	1;21,7	1;114,3	1;69,3	1,6;1
T12	Soil MEAN	1;20,1	1;11,3	1;60,8	1;17,8	1;86,5	1;48,9	1,7;1
T12	Rock	1;28,7	1;8	1;58,1	1;49,5	1;97,5	1;27,2	3,5;1
T12 Y	Leaves nwsh			23;1	1;1,8			
T12 Y	Leaves wsh			14,8;1	1;1,7			
T12 O	Leaves nwsh			32,2;1	1;1,7			
T12 O	Leaves wsh			46,3;1	1;1,5			
T12 O	Roots		1;1	1;4,8	1;3,2		1;4,8	

14.2 The geochemical composition of the analysed rocks

Table 13 The Si, Al, Fe, Ca and Na contents of the analysed rocks (LF = laurel forest / AGR = fallow agricultural).

		Si	**(+/-)**	**Al**	**(+/-)**	**Fe**	**(+/-)**	**Ca**	**(+/-)**	**Na**	**(+/-)**
Nr.	Type	{wt %}	1.28 (%)	{wt %}	1.40 (%)	{wt %}	3.21 (%)	{wt %}	2.67 (%)	{wt %}	3.39 (%)
		Mdl	0.01	Mdl	0.01	Mdl	0.04	Mdl	0.01	Mdl	0.01
A1	LF	11.64	0.15	20.14	0.28	6.17	0.20	0.17	0.00	0.15	0.01
A2	LF	16.15	0.21	10.38	0.14	11.81	0.38	4.41	0.12	0.49	0.02
A8	LF	17.71	0.23	8.19	0.11	12.02	0.39	6.69	0.18	1.27	0.04
A9	LF	14.05	0.18	11.24	0.16	16.54	0.53	0.10	0.00	0.09	0.00
A10	LF	13.91	0.18	12.20	0.17	15.92	0.51	0.03	0.00	0.04	0.00
A14	LF	20.15	0.26	13.95	0.19	6.07	0.19	0.62	0.02	0.91	0.03
A15	LF	16.99	0.22	8.42	0.12	11.81	0.38	6.96	0.19	0.53	0.02
A16a	LF	17.67	0.23	6.49	0.09	11.06	0.35	8.97	0.24	1.62	0.05
A16b	LF	15.43	0.20	9.24	0.13	11.90	0.38	6.36	0.17	0.28	0.01
A17	LF	20.09	0.26	8.73	0.12	9.94	0.32	6.18	0.16	2.12	0.07
A19	LF	13.02	0.17	11.81	0.16	17.08	0.55	0.31	0.01	0.07	0.00
O5	LF	19.86	0.26	8.61	0.12	9.56	0.31	6.97	0.19	1.59	0.05
O6	LF	22.17	0.29	9.14	0.13	7.01	0.22	6.28	0.17	3.83	0.13
O7a	LF	25.15	0.32	7.16	0.10	9.58	0.31	5.03	0.13	2.32	0.08
O7b	LF	20.18	0.26	8.75	0.12	9.87	0.32	6.67	0.18	1.98	0.07
T3	LF	17.80	0.23	6.19	0.09	12.71	0.41	4.20	0.11	0.36	0.01
T4a	LF	15.81	0.20	10.81	0.15	14.66	0.47	1.14	0.03	0.28	0.01
T4b	LF	16.04	0.21	10.70	0.15	14.13	0.45	1.23	0.03	0.16	0.01
T11	LF	18.84	0.24	7.85	0.11	12.01	0.39	6.86	0.18	1.19	0.04
T12	LF	19.12	0.25	5.34	0.07	11.39	0.37	5.61	0.15	0.68	0.02
A29	AGR	16.86	0.22	9.07	0.13	12.59	0.40	5.51	0.15	0.43	0.01
A30	AGR	17.63	0.23	7.48	0.10	11.47	0.37	7.29	0.19	0.62	0.02
O31	AGR	17.98	0.23	8.01	0.11	10.76	0.34	7.09	0.19	1.14	0.04
O28	AGR	18.52	0.24	7.20	0.10	10.83	0.35	7.36	0.20	1.22	0.04
T22	AGR	18.94	0.24	5.95	0.08	11.93	0.38	8.05	0.21	1.12	0.04
T23	AGR	20.24	0.26	7.80	0.11	10.10	0.32	7.59	0.20	1.71	0.06
T25	AGR	18.81	0.24	8.60	0.12	10.81	0.35	8.21	0.22	1.54	0.05
T 26	AGR	19.31	0.25	8.33	0.12	10.88	0.35	7.79	0.21	1.82	0.06
T 27	AGR	19.17	0.25	8.65	0.12	10.32	0.33	8.02	0.21	1.91	0.06

Table 14 The Mg, K, Ti, P and Mn contents of the analysed rocks (LF = laurel forest / AGR = fallow agricultural).

		Mg	(+/-)	K	(+/-)	Ti	+/-)	P	(+/-)	Mn	(+/-)
Nr.	Type	{wt %}	3.44 (%)	{wt %}	2.68 (%)	{wt %}	0.74 (%)	{wt %}	7.69 (%)	{wt %}	6.25 (%)
		Mdl	0.01	Mdl	0.01	Mdl	0.01	Mdl	0.01	Mdl	0.01
A1	LF	0.32	0.01	0.10	0.00	1.47	0.01	0.31	0.02	0.15	0.01
A2	LF	2.64	0.09	1.30	0.03	3.48	0.03	0.34	0.03	0.13	0.01
A8	LF	3.78	0.13	0.56	0.01	3.25	0.02	0.34	0.03	0.14	0.01
A9	LF	1.03	0.04	0.17	0.00	3.97	0.03	0.20	0.02	0.12	0.01
A10	LF	1.16	0.04	0.12	0.00	3.88	0.03	0.20	0.02	0.13	0.01
A14	LF	0.58	0.02	2.59	0.07	1.50	0.01	0.20	0.02	0.17	0.01
A15	LF	3.63	0.12	0.64	0.02	2.95	0.02	0.55	0.04	0.15	0.01
A16a	LF	3.99	0.14	1.27	0.03	3.46	0.03	0.71	0.05	0.14	0.01
A16b	LF	2.97	0.10	0.27	0.01	3.79	0.03	0.69	0.05	0.13	0.01
A17	LF	2.98	0.10	1.27	0.03	2.63	0.02	0.35	0.03	0.13	0.01
A19	LF	0.95	0.03	0.16	0.00	4.40	0.03	0.38	0.03	0.15	0.01
O5	LF	3.32	0.11	1.09	0.03	2.28	0.02	0.33	0.03	0.13	0.01
O6	LF	2.41	0.08	1.71	0.05	1.86	0.01	0.44	0.03	0.13	0.01
O7a	LF	2.16	0.07	1.49	0.04	1.37	0.01	0.16	0.01	0.13	0.01
O7b	LF	2.85	0.10	1.00	0.03	2.61	0.02	0.34	0.03	0.13	0.01
T3	LF	8.90	0.31	0.66	0.02	1.92	0.01	0.21	0.02	0.13	0.01
T4a	LF	1.88	0.06	0.65	0.02	3.38	0.03	0.27	0.02	0.13	0.01
T4b	LF	1.71	0.06	0.22	0.01	3.26	0.02	0.21	0.02	0.13	0.01
T11	LF	2.79	0.10	1.13	0.03	2.90	0.02	0.26	0.02	0.11	0.01
T12	LF	9.71	0.33	0.66	0.02	1.73	0.01	0.20	0.02	0.12	0.01
A29	AGR	2.59	0.09	1.54	0.04	3.25	0.02	0.58	0.04	0.17	0.01
A30	AGR	5.29	0.18	0.52	0.01	2.79	0.02	0.34	0.03	0.16	0.01
O31	AGR	5.91	0.20	0.29	0.01	2.42	0.02	0.35	0.03	0.16	0.01
O28	AGR	6.13	0.21	0.66	0.02	2.51	0.02	0.23	0.02	0.17	0.01
T22	AGR	6.16	0.21	0.98	0.03	2.41	0.02	0.31	0.02	0.14	0.01
T23	AGR	3.91	0.13	1.06	0.03	2.35	0.02	0.27	0.02	0.14	0.01
T25	AGR	4.08	0.14	0.52	0.01	2.40	0.02	0.30	0.02	0.15	0.01
T 26	AGR	4.00	0.14	0.72	0.02	2.33	0.02	0.29	0.02	0.15	0.01
T 27	AGR	3.63	0.12	0.74	0.02	2.37	0.02	0.30	0.02	0.15	0.01

Table 15 The Sr, C_{tot}, S_{tot}, Zr and Ni contents of the analysed rocks (LF = laurel forest / AGR = fallow agricultural).

Nr.	Type	**Sr** {µg/g} Mdl	**(+/-)** 5.83 (%) 0.5	**C_{tot}** {wt %} Mdl	**(+/-)** 4.42 (%) 0.02	**S_{tot}** {wt %} Mdl	**(+/-)** 8.22 (%) 0.02	**Zr** {µg/g} Mdl	**(+/-)** 5.45 (%) 0.1	**Ni** {µg/g} Mdl	**(+/-)** 9.94 (%) 0.1
A1	LF	53.5	3.1	0.76	0.03	0.11	0.01	756.5	41.3	0.9	0.1
A2	LF	255.0	14.9	0.31	0.01	0.05	0.00	382.1	20.8	38.5	4.5
A8	LF	803.0	46.8	0.14	0.01	<0.02		328.8	17.9	32.9	3.9
A9	LF	62.3	3.6	0.65	0.03	<0.02		366.6	20.0	122.6	14.4
A10	LF	38.0	2.2	0.79	0.03	<0.02		472.4	25.8	122.1	14.4
A14	LF	174.6	10.2	0.46	0.02	<0.02		788.3	43.0	3.7	0.4
A15	LF	533.4	31.1	0.18	0.01	<0.02		402.5	22.0	43.5	5.1
A16a	LF	1095.2	63.9	0.22	0.01	<0.02		442.3	24.1	17.6	2.1
A16b	LF	366.5	21.4	0.54	0.02	<0.02		493.8	26.9	29.3	3.4
A17	LF	1137.0	66.3	0.11	0.00	<0.02		384.9	21.0	9.9	1.2
A19	LF	134.8	7.9	0.67	0.03	<0.02		537.2	29.3	13.1	1.5
O5	LF	861.7	50.3	0.12	0.01	<0.02		344.6	18.8	41.1	4.8
O6	LF	1694.2	98.8			<0.02		317.2	17.3	5.8	0.7
O7a	LF	341.9	19.9			<0.02		170.1	9.3	7.1	0.8
O7b	LF	1170.1	68.3	0.05	0.00	<0.02		365.0	19.9	13.6	1.6
T3	LF	180.1	10.5	0.11	0.00	<0.02		223.7	12.2	596.9	70.2
T4a	LF	102.0	5.9	0.16	0.01	<0.02		364.1	19.9	128.3	15.1
T4b	LF	131.0	7.6	0.14	0.01	<0.02		381.1	20.8	112.1	13.2
T11	LF	463.6	27.0	0.20	0.01	<0.02		291.5	15.9	31.8	3.7
T12	LF	332.7	19.4	0.12	0.01	<0.02		214.3	11.7	513.4	60.4
A29	AGR	334.0	19.6	0.20	0.01	0.09	0.01	443.1	24.1	7.6	0.8
A30	AGR	419.2	24.6	0.18	0.01	<0.02		253.2	13.8	139.8	13.9
O31	AGR	782.4	46.0	0.18	0.01	<0.02		270.3	14.7	143.3	14.2
O28	AGR	623.4	36.7	0.06	0.00	<0.02		226.4	12.3	183.0	18.2
T22	AGR	649.4	38.2	0.12	0.01	0.11	0.01	206.2	11.2	223.2	22.2
T23	AGR	744.8	43.8	0.03	0.00	0.05	0.00	228.5	12.5	88.9	8.8
T25	AGR	821.2	48.3	0.30	0.01	<0.02		215.8	11.8	59.2	5.9
T 26	AGR	775.4	45.6	0.28	0.01	<0.02		215.9	11.8	59.7	5.9
T 27	AGR	899.9	52.9	0.23	0.01	<0.02		218.8	11.9	33.7	3.3

Table 16 The Zn, Cu, Pb, Mo and Sb contents of the analysed rocks (LF = laurel forest / AGR = fallow agricultural).

Nr.	Type	Zn {µg/g} Mdl	(+/-) 8.33 (%) 1	Cu {µg/g} Mdl	(+/-) 9.3 (%) 0.1	Pb {µg/g} Mdl	(+/-) 7.14 (%) 0.1	Mo {µg/g} Mdl	(+/-) 6.85 (%) 0.1	Sb {µg/g} Mdl	(+/-) 4.61 (%) 0.1
A1	LF	139	12	6.4	0.6	12.0	0.9	1.0	0.1	<0.1	
A2	LF	146	12	50.5	4.7	5.2	0.4	2.4	0.2	<0.1	
A8	LF	96	8	61.5	5.7	2.9	0.2	1.8	0.1	<0.1	
A9	LF	71	6	116.8	10.9	5.4	0.4	1.8	0.1	<0.1	
A10	LF	124	10	69.0	6.4	3.8	0.3	1.7	0.1	<0.1	
A14	LF	89	7	5.5	0.5	6.0	0.4	0.2	0.0	<0.1	
A15	LF	146	12	61.5	5.7	4.1	0.3	1.7	0.1	<0.1	
A16a	LF	135	11	29.9	2.8	4.9	0.3	2.1	0.1	<0.1	
A16b	LF	148	12	25.6	2.4	6.0	0.4	1.0	0.1	<0.1	
A17	LF	69	6	22.4	2.1	2.4	0.2	0.6	0.0	<0.1	
A19	LF	63	5	18.7	1.7	6.2	0.4	0.2	0.0	<0.1	
O5	LF	105	9	58.1	5.4	2.1	0.1	1.2	0.1	<0.1	
O6	LF	98	8	18.6	1.7	2.0	0.1	2.3	0.2	<0.1	
O7a	LF	74	6	20.7	1.9	2.7	0.2	2.4	0.2	<0.1	
O7b	LF	98	8	34.8	3.2	1.4	0.1	0.9	0.1	<0.1	
T3	LF	78	6	80.7	7.5	1.8	0.1	0.7	0.0	<0.1	
T4a	LF	94	8	146.8	13.7	2.9	0.2	0.4	0.0	<0.1	
T4b	LF	107	9	156.6	14.6	3.7	0.3	0.3	0.0	<0.1	
T11	LF	64	5	142.9	13.3	2.9	0.2	1.0	0.1	<0.1	
T12	LF	65	5	80.7	7.5	1.4	0.1	0.9	0.1	<0.1	
A29	AGR	46	4	27.7	2.6	2.8	0.2	0.8	0.1	<0.1	
A30	AGR	77	6	74.8	7.0	2.4	0.2	1.1	0.1	<0.1	
O31	AGR	83	7	26.9	2.5	2.7	0.2	1.1	0.1	<0.1	
O28	AGR	71	6	66.3	6.2	1.5	0.1	0.5	0.0	<0.1	
T22	AGR	74	6	110.4	10.3	2.0	0.2	1.0	0.1	<0.1	
T23	AGR	82	7	63.2	5.9	2.2	0.2	1.3	0.1	<0.1	
T25	AGR	86	7	24.5	2.3	1.7	0.1	0.5	0.0	<0.1	
T 26	AGR	86	7	43.7	4.1	1.4	0.1	0.8	0.1	<0.1	
T 27	AGR	98	8	35.3	3.3	2.2	0.2	1.2	0.1	<0.1	

Table 17 The Zn, Cu, Pb, Mo and Sb contents of the analysed rocks (LF = laurel forest / AGR = fallow agricultural).

Nr.	Type	**Cd** {µg/g} Mdl	**(+/-)** 7.85 (%) 0.1	**Hg** {µg/g} Mdl	**(+/-)** 14.88 (%) 0.01	**LOI** {wt %}	**(+/-)** 0.57 (%)
A1	LF			0.03	0.00	23.4	0.1
A2	LF	0.2	0.0	<0.01		8.9	0.1
A8	LF	<0.1		<0.01		4.5	0.0
A9	LF	0.2	0.0	0.02	0.00	15.1	0.1
A10	LF	<0.1		0.06	0.01	14.7	0.1
A14	LF	<0.1		0.03	0.00	12.1	0.1
A15	LF	<0.1		<0.01		6.6	0.0
A16a	LF	<0.1		<0.01		3.0	0.0
A16b	LF	<0.1		0.08	0.01	9.3	0.1
A17	LF	<0.1		<0.01		2.4	0.0
A19	LF	<0.1		0.09	0.01	14.2	0.1
O5	LF	<0.1		<0.01		3.6	0.0
O6	LF	<0.1		<0.01		0.4	0.0
O7a	LF	<0.1		<0.01		0.2	0.0
O7b	LF	<0.1		<0.01		2.4	0.0
T3	LF	<0.1		<0.01		5.5	0.0
T4a	LF	<0.1		<0.01		12.0	0.1
T4b	LF	<0.1		0.03	0.00	13.7	0.1
T11	LF	<0.1		<0.01		4.5	0.0
T12	LF	<0.1		<0.01		2.8	0.0
A29	AGR	0.3	0.0	0.03		7.0	0.0
A30	AGR	0.2	0.0	<0.01		5.2	0.0
O31	AGR	<0.1		<0.01		3.8	0.0
O28	AGR	<0.1		0.02		2.9	0.0
T22	AGR	<0.1		<0.01		1.5	0.0
T23	AGR	0.2	0.0	<0.01		1.7	0.0
T25	AGR	<0.1		<0.01		1.8	0.0
T 26	AGR	<0.1		<0.01		1.4	0.0
T 27	AGR	<0.1		<0.01		1.9	0.0

14.3 The geochemical composition of the analysed soils

Table 18 The Si, Al, Fe, Ca and Na contents of the analysed soils, including min, max and mean values.

		Si	**(+/-)**	**Al**	**(+/-)**	**Fe**	**(+/-)**	**Ca**	**(+/-)**	**Na**	**(+/-)**
Nr.	cm	{wt %}	1.28 (%)	{wt %}	1.40 (%)	{wt %}	3.21 (%)	{wt %}	2.67 (%)	{wt %}	3.39 (%)
		Mdl	0.01	Mdl	0.01	Mdl	0.04	Mdl	0.01	Mdl	0.01
A1	0-2	4.38	0.06	2.30	0.03	1.40	0.04	0.68	0.02	0.13	0.00
A1	2-4	5.41	0.07	2.90	0.04	1.78	0.06	0.60	0.02	0.15	0.01
A1	4-6	6.70	0.09	4.33	0.06	2.71	0.09	0.50	0.01	0.16	0.01
A1	6-8	8.57	0.11	6.76	0.09	4.45	0.14	0.36	0.01	0.16	0.01
A1	14-16	13.13	0.17	11.74	0.16	7.53	0.24	0.20	0.01	0.13	0.00
A1	**Min**	**4.38**	**0.06**	**2.30**	**0.03**	**1.40**	**0.04**	**0.20**	**0.01**	**0.13**	**0.00**
A1	**Max**	**13.13**	**0.17**	**11.74**	**0.16**	**7.53**	**0.24**	**0.68**	**0.02**	**0.16**	**0.01**
A1	**Mean**	**7.64**	**0.10**	**5.61**	**0.08**	**3.57**	**0.11**	**0.47**	**0.01**	**0.14**	**0.00**
A2	0-2	13.58	0.17	10.96	0.15	8.12	0.26	1.18	0.03	0.27	0.01
A2	2-4	15.39	0.20	12.81	0.18	8.70	0.28	0.97	0.03	0.28	0.01
A2	4-6	15.75	0.20	13.99	0.20	8.67	0.28	0.54	0.01	0.16	0.01
A2	6-8	16.04	0.21	14.31	0.20	8.74	0.28	0.49	0.01	0.13	0.00
A2	14-16	15.95	0.20	13.96	0.19	8.67	0.28	0.39	0.01	0.15	0.01
A2	**Min**	**13.58**	**0.17**	**10.96**	**0.15**	**8.12**	**0.26**	**0.39**	**0.01**	**0.13**	**0.00**
A2	**Max**	**16.04**	**0.21**	**14.31**	**0.20**	**8.74**	**0.28**	**1.18**	**0.03**	**0.28**	**0.01**
A2	**Mean**	**15.34**	**0.20**	**13.20**	**0.18**	**8.58**	**0.28**	**0.71**	**0.02**	**0.20**	**0.01**
A8	0-2	4.65	0.06	2.43	0.03	3.11	0.10	1.10	0.03	0.13	0.00
A8	2-4	6.06	0.08	3.15	0.04	3.53	0.11	0.96	0.03	0.16	0.01
A8	4-6	8.07	0.10	4.81	0.07	6.03	0.19	1.30	0.03	0.19	0.01
A8	6-8	10.33	0.13	6.53	0.09	8.76	0.28	1.84	0.05	0.25	0.01
A8	14-16	10.23	0.13	6.40	0.09	8.88	0.28	1.86	0.05	0.26	0.01
A8	**Min**	**4.65**	**0.06**	**2.43**	**0.03**	**3.11**	**0.10**	**0.96**	**0.03**	**0.13**	**0.00**
A8	**Max**	**10.33**	**0.13**	**6.53**	**0.09**	**8.88**	**0.28**	**1.86**	**0.05**	**0.26**	**0.01**
A8	**Mean**	**7.87**	**0.10**	**4.66**	**0.07**	**6.06**	**0.19**	**1.41**	**0.04**	**0.20**	**0.01**
A9	0-2	8.62	0.11	6.54	0.09	8.43	0.27	0.67	0.02	0.08	0.00
A9	2-4	12.06	0.15	10.19	0.14	12.81	0.41	0.41	0.01	0.07	0.00
A9	4-6	12.92	0.17	11.30	0.16	13.97	0.45	0.32	0.01	0.05	0.00
A9	6-8	12.77	0.16	11.07	0.15	14.17	0.45	0.33	0.01	0.06	0.00
A9	14-16	12.81	0.16	11.06	0.15	14.27	0.46	0.21	0.01	0.06	0.00
A9	**Min**	**8.62**	**0.11**	**6.54**	**0.09**	**8.43**	**0.27**	**0.21**	**0.01**	**0.05**	**0.00**
A9	**Max**	**12.92**	**0.17**	**11.30**	**0.16**	**14.27**	**0.46**	**0.67**	**0.02**	**0.08**	**0.00**
A9	**Mean**	**11.83**	**0.15**	**10.03**	**0.14**	**12.73**	**0.41**	**0.39**	**0.01**	**0.06**	**0.00**
A10	0-2	2.86	0.04	1.68	0.02	1.78	0.06	0.67	0.02	0.07	0.00
A10	2-4	4.03	0.05	2.50	0.03	2.91	0.09	0.63	0.02	0.08	0.00
A10	4-6	6.40	0.08	5.26	0.07	6.89	0.22	0.41	0.01	0.09	0.00
A10	6-8	6.72	0.09	5.67	0.08	7.61	0.24	0.36	0.01	0.07	0.00
A10	8-10	9.33	0.12	8.92	0.12	12.12	0.39	0.21	0.01	0.06	0.00
A10	**Min**	**2.86**	**0.04**	**1.68**	**0.02**	**1.78**	**0.06**	**0.21**	**0.01**	**0.06**	**0.00**
A10	**Max**	**9.33**	**0.12**	**8.92**	**0.12**	**12.12**	**0.39**	**0.67**	**0.02**	**0.09**	**0.00**
A10	**Mean**	**5.87**	**0.08**	**4.81**	**0.07**	**6.26**	**0.20**	**0.46**	**0.01**	**0.07**	**0.00**

Continuation: Table 18

Nr.	cm	Si {wt %} Mdl	(+/-) 1.28 (%) 0.01	Al {wt %} Mdl	(+/-) 1.40 (%) 0.01	Fe {wt %} Mdl	(+/-) 3.21 (%) 0.04	Ca {wt %} Mdl	(+/-) 2.67 (%) 0.01	Na {wt %} Mdl	(+/-) 3.39 (%) 0.01
A14	0-2	8.12	0.10	5.18	0.07	3.91	0.13	1.72	0.05	0.18	0.01
A14	2-4	9.79	0.13	6.43	0.09	4.70	0.15	1.37	0.04	0.20	0.01
A14	4-6	10.78	0.14	7.43	0.10	5.68	0.18	0.95	0.03	0.22	0.01
A14	6-8	11.54	0.15	8.14	0.11	6.21	0.20	0.70	0.02	0.21	0.01
A14	8-10	11.25	0.14	8.10	0.11	6.21	0.20	0.76	0.02	0.20	0.01
A14	**Min**	**8.12**	**0.10**	**5.18**	**0.07**	**3.91**	**0.13**	**0.70**	**0.02**	**0.18**	**0.01**
A14	**Max**	**11.54**	**0.15**	**8.14**	**0.11**	**6.21**	**0.20**	**1.72**	**0.05**	**0.22**	**0.01**
A14	**Mean**	**10.30**	**0.13**	**7.06**	**0.10**	**5.34**	**0.17**	**1.10**	**0.03**	**0.20**	**0.01**
A15	0-2	15.03	0.19	7.71	0.11	8.63	0.28	2.36	0.06	0.53	0.02
A15	2-4	15.47	0.20	8.46	0.12	9.37	0.30	2.14	0.06	0.47	0.02
A15	4-6	15.92	0.20	8.85	0.12	9.80	0.31	1.87	0.05	0.42	0.01
A15	6-8	15.85	0.20	9.29	0.13	10.05	0.32	1.38	0.04	0.33	0.01
A15	8-10	16.18	0.21	9.75	0.14	10.29	0.33	1.16	0.03	0.29	0.01
A15	14-16	16.05	0.21	9.60	0.13	10.46	0.34	1.20	0.03	0.29	0.01
A15	**Min**	**15.03**	**0.19**	**7.71**	**0.11**	**8.63**	**0.28**	**1.16**	**0.03**	**0.29**	**0.01**
A15	**Max**	**16.18**	**0.21**	**9.75**	**0.14**	**10.46**	**0.34**	**2.36**	**0.06**	**0.53**	**0.02**
A15	**Mean**	**15.75**	**0.20**	**8.95**	**0.12**	**9.77**	**0.31**	**1.68**	**0.04**	**0.39**	**0.01**
A16	0-2	11.25	0.14	7.22	0.10	7.40	0.24	1.72	0.05	0.28	0.01
A16	2-4	13.19	0.17	8.51	0.12	8.81	0.28	1.30	0.03	0.30	0.01
A16	4-6	13.98	0.18	9.01	0.13	9.47	0.30	1.17	0.03	0.32	0.01
A16	6-8	14.84	0.19	9.58	0.13	10.35	0.33	1.34	0.04	0.37	0.01
A16	8-10	15.00	0.19	9.79	0.14	10.84	0.35	1.28	0.03	0.38	0.01
A16	14-16	16.14	0.21	10.57	0.15	10.75	0.34	1.12	0.03	0.50	0.02
A16	**Min**	**11.25**	**0.14**	**7.22**	**0.10**	**7.40**	**0.24**	**1.12**	**0.03**	**0.28**	**0.01**
A16	**Max**	**16.14**	**0.21**	**10.57**	**0.15**	**10.84**	**0.35**	**1.72**	**0.05**	**0.50**	**0.02**
A16	**Mean**	**14.07**	**0.18**	**9.11**	**0.13**	**9.60**	**0.31**	**1.32**	**0.04**	**0.36**	**0.01**
A17	0-2	8.56	0.11	5.16	0.07	4.84	0.16	0.89	0.02	0.16	0.01
A17	2-4	10.63	0.14	6.80	0.09	6.41	0.21	0.44	0.01	0.19	0.01
A17	4-6	11.48	0.15	7.75	0.11	7.57	0.24	0.28	0.01	0.19	0.01
A17	6-8	11.74	0.15	7.89	0.11	7.39	0.24	0.26	0.01	0.19	0.01
A17	8-10	12.36	0.16	8.37	0.12	7.65	0.25	0.23	0.01	0.21	0.01
A17	14-16	12.82	0.16	8.84	0.12	7.86	0.25	0.21	0.01	0.21	0.01
A17	**Min**	**8.56**	**0.11**	**5.16**	**0.07**	**4.84**	**0.16**	**0.21**	**0.01**	**0.16**	**0.01**
A17	**Max**	**12.82**	**0.16**	**8.84**	**0.12**	**7.86**	**0.25**	**0.89**	**0.02**	**0.21**	**0.01**
A17	**Mean**	**11.27**	**0.14**	**7.47**	**0.10**	**6.95**	**0.22**	**0.39**	**0.01**	**0.19**	**0.01**
A19	0-2	3.75	0.05	1.94	0.03	2.03	0.07	1.20	0.03	0.08	0.00
A19	2-4	4.66	0.06	2.54	0.04	2.73	0.09	1.25	0.03	0.10	0.00
A19	4-6	7.29	0.09	4.88	0.07	6.27	0.20	0.97	0.03	0.11	0.00
A19	6-8	9.01	0.12	6.89	0.10	9.03	0.29	0.66	0.02	0.10	0.00
A19	8-10	10.73	0.14	8.64	0.12	11.97	0.38	0.34	0.01	0.10	0.00
A19	14-16	10.69	0.14	8.58	0.12	11.17	0.36	0.21	0.01	0.11	0.00
A19	**Min**	**3.75**	**0.05**	**1.94**	**0.03**	**2.03**	**0.07**	**0.21**	**0.01**	**0.08**	**0.00**
A19	**Max**	**10.73**	**0.14**	**8.64**	**0.12**	**11.97**	**0.38**	**1.25**	**0.03**	**0.11**	**0.00**
A19	**Mean**	**7.69**	**0.10**	**5.58**	**0.08**	**7.20**	**0.23**	**0.77**	**0.02**	**0.10**	**0.00**

Continuation: Table 18

Nr.	cm	Si {wt %} Mdl	(+/-) 1.28 (%) 0.01	Al {wt %} Mdl	(+/-) 1.40 (%) 0.01	Fe {wt %} Mdl	(+/-) 3.21 (%) 0.04	Ca {wt %} Mdl	(+/-) 2.67 (%) 0.01	Na {wt %} Mdl	(+/-) 3.39 (%) 0.01
O5	0-2	7.42	0.09	4.18	0.06	4.22	0.14	3.32	0.09	0.38	0.01
O5	2-4	9.63	0.12	5.39	0.08	6.02	0.19	3.76	0.10	0.46	0.02
O5	4-6	10.33	0.13	5.94	0.08	6.26	0.20	3.80	0.10	0.51	0.02
O5	6-8	11.92	0.15	6.68	0.09	7.25	0.23	4.18	0.11	0.62	0.02
O5	14-16	12.41	0.16	7.76	0.11	7.88	0.25	3.54	0.09	0.60	0.02
O5	**Min**	**7.42**	**0.09**	**4.18**	**0.06**	**4.22**	**0.14**	**3.32**	**0.09**	**0.38**	**0.01**
O5	**Max**	**12.41**	**0.16**	**7.76**	**0.11**	**7.88**	**0.25**	**4.18**	**0.11**	**0.62**	**0.02**
O5	**Mean**	**10.34**	**0.13**	**5.99**	**0.08**	**6.32**	**0.20**	**3.72**	**0.10**	**0.51**	**0.02**
O6	0-2	14.49	0.19	8.19	0.11	5.75	0.18	3.20	0.09	1.39	0.05
O6	2-4	15.48	0.20	8.60	0.12	5.96	0.19	3.20	0.09	1.51	0.05
O6	4-6	15.88	0.20	8.86	0.12	6.42	0.21	3.40	0.09	1.52	0.05
O6	6-8	15.91	0.20	8.48	0.12	5.69	0.18	3.31	0.09	1.60	0.05
O6	14-16	17.33	0.22	9.06	0.13	5.91	0.19	3.69	0.10	1.81	0.06
O6	**Min**	**14.49**	**0.19**	**8.19**	**0.11**	**5.69**	**0.18**	**3.20**	**0.09**	**1.39**	**0.05**
O6	**Max**	**17.33**	**0.22**	**9.06**	**0.13**	**6.42**	**0.21**	**3.69**	**0.10**	**1.81**	**0.06**
O6	**Mean**	**15.82**	**0.20**	**8.64**	**0.12**	**5.95**	**0.19**	**3.36**	**0.09**	**1.57**	**0.05**
O7	0-2	9.62	0.12	5.30	0.07	4.77	0.15	3.01	0.08	0.73	0.02
O7	2-4	10.64	0.14	5.92	0.08	5.46	0.18	3.32	0.09	0.86	0.03
O7	4-6	11.96	0.15	6.37	0.09	6.05	0.19	3.64	0.10	0.99	0.03
O7	6-8	10.33	0.13	5.67	0.08	5.21	0.17	3.18	0.08	0.77	0.03
O7	14-16	12.22	0.16	6.47	0.09	6.27	0.20	3.78	0.10	0.96	0.03
O7	**Min**	**9.62**	**0.12**	**5.30**	**0.07**	**4.77**	**0.15**	**3.01**	**0.08**	**0.73**	**0.02**
O7	**Max**	**12.22**	**0.16**	**6.47**	**0.09**	**6.27**	**0.20**	**3.78**	**0.10**	**0.99**	**0.03**
O7	**Mean**	**10.95**	**0.14**	**5.95**	**0.08**	**5.55**	**0.18**	**3.39**	**0.09**	**0.86**	**0.03**
T3	0-2	11.70	0.15	6.65	0.09	10.63	0.34	1.47	0.04	0.17	0.01
T3	2-4	12.67	0.16	7.15	0.10	11.51	0.37	1.42	0.04	0.18	0.01
T3	4-6	13.09	0.17	7.25	0.10	11.80	0.38	1.42	0.04	0.18	0.01
T3	6-8	13.48	0.17	7.41	0.10	12.32	0.40	1.46	0.04	0.19	0.01
T3	14-16	14.33	0.18	8.27	0.12	12.62	0.40	1.32	0.04	0.21	0.01
T3	**Min**	**11.70**	**0.15**	**6.65**	**0.09**	**10.63**	**0.34**	**1.32**	**0.04**	**0.17**	**0.01**
T3	**Max**	**14.33**	**0.18**	**8.27**	**0.12**	**12.62**	**0.40**	**1.47**	**0.04**	**0.21**	**0.01**
T3	**Mean**	**13.05**	**0.17**	**7.35**	**0.10**	**11.78**	**0.38**	**1.42**	**0.04**	**0.18**	**0.01**
T4	0-2	13.09	0.17	8.51	0.12	9.86	0.32	2.07	0.06	0.33	0.01
T4	2-4	13.85	0.18	9.04	0.13	10.50	0.34	2.00	0.05	0.32	0.01
T4	4-6	13.45	0.17	9.03	0.13	10.40	0.33	2.13	0.06	0.33	0.01
T4	6-8	13.79	0.18	9.20	0.13	10.70	0.34	1.97	0.05	0.33	0.01
T4	14-16	13.72	0.18	9.79	0.14	10.95	0.35	1.72	0.05	0.36	0.01
T4	**Min**	**13.09**	**0.17**	**8.51**	**0.12**	**9.86**	**0.32**	**1.72**	**0.05**	**0.32**	**0.01**
T4	**Max**	**13.85**	**0.18**	**9.79**	**0.14**	**10.95**	**0.35**	**2.13**	**0.06**	**0.36**	**0.01**
T4	**Mean**	**13.58**	**0.17**	**9.11**	**0.13**	**10.48**	**0.34**	**1.98**	**0.05**	**0.34**	**0.01**
T11	0-2	9.32	0.12	6.65	0.09	5.56	0.18	2.40	0.06	0.39	0.01
T11	2-4	9.57	0.12	6.97	0.10	5.76	0.18	2.27	0.06	0.40	0.01
T11	4-6	11.40	0.15	7.70	0.11	7.07	0.23	2.71	0.07	0.43	0.01
T11	6-8	11.80	0.15	8.10	0.11	7.03	0.23	2.71	0.07	0.46	0.02
T11	8-10	11.26	0.14	7.99	0.11	7.05	0.23	2.40	0.06	0.45	0.02
T11	**Min**	**9.32**	**0.12**	**6.65**	**0.09**	**5.56**	**0.18**	**2.27**	**0.06**	**0.39**	**0.01**
T11	**Max**	**11.80**	**0.15**	**8.10**	**0.11**	**7.07**	**0.23**	**2.71**	**0.07**	**0.46**	**0.02**
T11	**Mean**	**10.67**	**0.14**	**7.48**	**0.10**	**6.50**	**0.21**	**2.50**	**0.07**	**0.43**	**0.01**

Continuation: Table 18

Nr.	cm	Si {wt %} Mdl	(+/-) 1.28 (%) 0.01	Al {wt %} Mdl	(+/-) 1.40 (%) 0.01	Fe {wt %} Mdl	(+/-) 3.21 (%) 0.04	Ca {wt %} Mdl	(+/-) 2.67 (%) 0.01	Na {wt %} Mdl	(+/-) 3.39 (%) 0.01
T12	0-2	12.70	0.16	6.59	0.09	8.51	0.27	3.02	0.08	0.46	0.02
T12	2-4	11.59	0.15	6.17	0.09	8.02	0.26	2.76	0.07	0.39	0.01
T12	4-6	11.87	0.15	6.82	0.10	8.29	0.27	2.37	0.06	0.37	0.01
T12	6-8	12.44	0.16	7.34	0.10	8.95	0.29	2.19	0.06	0.37	0.01
T12	8-10	14.41	0.18	8.73	0.12	10.53	0.34	1.82	0.05	0.39	0.01
T12	**Min**	**11.59**	**0.15**	**6.17**	**0.09**	**8.02**	**0.26**	**1.82**	**0.05**	**0.37**	**0.01**
T12	**Max**	**14.41**	**0.18**	**8.73**	**0.12**	**10.53**	**0.34**	**3.02**	**0.08**	**0.46**	**0.02**
T12	**Mean**	**12.60**	**0.16**	**7.13**	**0.10**	**8.86**	**0.28**	**2.43**	**0.06**	**0.39**	**0.01**
A29	0-2	15.82	0.20	9.49	0.13	12.04	0.39	3.06	0.08	0.42	0.01
A29	4-6	15.90	0.20	9.68	0.14	12.04	0.39	2.97	0.08	0.40	0.01
A29	8-10	15.86	0.20	9.77	0.14	12.09	0.39	2.82	0.08	0.39	0.01
A29	14-16	15.66	0.20	9.77	0.14	11.70	0.38	2.67	0.07	0.36	0.01
A29	**Min**	**15.66**	**0.20**	**9.49**	**0.13**	**11.70**	**0.38**	**2.67**	**0.07**	**0.36**	**0.01**
A29	**Max**	**15.90**	**0.20**	**9.77**	**0.14**	**12.09**	**0.39**	**3.06**	**0.08**	**0.42**	**0.01**
A29	**Mean**	**15.81**	**0.20**	**9.67**	**0.14**	**11.97**	**0.38**	**2.88**	**0.08**	**0.39**	**0.01**
A30	0-2	14.91	0.19	9.10	0.13	12.83	0.41	2.60	0.07	0.34	0.01
A30	4-6	15.17	0.19	9.42	0.13	12.83	0.41	2.45	0.07	0.31	0.01
A30	8-10	14.89	0.19	9.25	0.13	12.97	0.42	2.36	0.06	0.31	0.01
A30	14-16	15.81	0.20	9.98	0.14	13.18	0.42	2.37	0.06	0.31	0.01
A30	**Min**	**14.89**	**0.19**	**9.10**	**0.13**	**12.83**	**0.41**	**2.36**	**0.06**	**0.31**	**0.01**
A30	**Max**	**15.81**	**0.20**	**9.98**	**0.14**	**13.18**	**0.42**	**2.60**	**0.07**	**0.34**	**0.01**
A30	**Mean**	**15.20**	**0.19**	**9.44**	**0.13**	**12.95**	**0.42**	**2.44**	**0.07**	**0.32**	**0.01**
O31	0-2	16.20	0.21	7.09	0.10	9.75	0.31	4.81	0.13	1.22	0.04
O31	4-6	15.76	0.20	7.46	0.10	9.20	0.30	4.68	0.13	1.14	0.04
O31	8-10	15.95	0.20	7.91	0.11	9.47	0.30	4.58	0.12	1.09	0.04
O31	14-16	15.49	0.20	8.23	0.11	9.34	0.30	4.15	0.11	1.02	0.03
O31	**Min**	**15.49**	**0.20**	**7.09**	**0.10**	**9.20**	**0.30**	**4.15**	**0.11**	**1.02**	**0.03**
O31	**Max**	**16.20**	**0.21**	**8.23**	**0.11**	**9.75**	**0.31**	**4.81**	**0.13**	**1.22**	**0.04**
O31	**Mean**	**15.85**	**0.20**	**7.67**	**0.11**	**9.44**	**0.30**	**4.56**	**0.12**	**1.12**	**0.04**
O28	0-2	20.30	0.26	10.52	0.15	8.04	0.26	0.57	0.02	0.97	0.03
O28	4-6	20.72	0.27	10.50	0.15	8.01	0.26	0.56	0.02	0.97	0.03
O28	8-10	20.87	0.27	10.63	0.15	8.19	0.26	0.54	0.01	0.93	0.03
O28	14-16	21.08	0.27	10.83	0.15	8.51	0.27	0.55	0.01	0.93	0.03
O28	**Min**	**20.30**	**0.26**	**10.50**	**0.15**	**8.01**	**0.26**	**0.54**	**0.01**	**0.93**	**0.03**
O28	**Max**	**21.08**	**0.27**	**10.83**	**0.15**	**8.51**	**0.27**	**0.57**	**0.02**	**0.97**	**0.03**
O28	**Mean**	**20.74**	**0.27**	**10.62**	**0.15**	**8.19**	**0.26**	**0.56**	**0.01**	**0.95**	**0.03**
T22	0-2	14.21	0.18	8.98	0.13	10.02	0.32	1.86	0.05	0.57	0.02
T22	4-6	14.76	0.19	9.14	0.13	10.51	0.34	1.83	0.05	0.60	0.02
T22	8-10	15.13	0.19	9.55	0.13	10.79	0.35	1.84	0.05	0.63	0.02
T22	14-16	14.58	0.19	9.23	0.13	10.36	0.33	1.77	0.05	0.59	0.02
T22	**Min**	**14.21**	**0.18**	**8.98**	**0.13**	**10.02**	**0.32**	**1.77**	**0.05**	**0.57**	**0.02**
T22	**Max**	**15.13**	**0.19**	**9.55**	**0.13**	**10.79**	**0.35**	**1.86**	**0.05**	**0.63**	**0.02**
T22	**Mean**	**14.67**	**0.19**	**9.22**	**0.13**	**10.42**	**0.33**	**1.83**	**0.05**	**0.60**	**0.02**
T23	0-2	18.27	0.23	8.02	0.11	10.40	0.33	4.34	0.12	0.82	0.03
T23	4-6	18.61	0.24	7.86	0.11	10.40	0.33	5.04	0.13	0.85	0.03
T23	8-10	18.36	0.24	8.20	0.11	10.67	0.34	4.68	0.12	0.90	0.03
T23	14-16	18.31	0.23	8.31	0.12	10.81	0.35	4.32	0.12	0.92	0.03
T23	**Min**	**18.27**	**0.23**	**7.86**	**0.11**	**10.40**	**0.33**	**4.32**	**0.12**	**0.82**	**0.03**
T23	**Max**	**18.61**	**0.24**	**8.31**	**0.12**	**10.81**	**0.35**	**5.04**	**0.13**	**0.92**	**0.03**
T23	**Mean**	**18.39**	**0.24**	**8.10**	**0.11**	**10.57**	**0.34**	**4.59**	**0.12**	**0.87**	**0.03**

Continuation: Table 18

		Si	**(+/-)**	**Al**	**(+/-)**	**Fe**	**(+/-)**	**Ca**	**(+/-)**	**Na**	**(+/-)**
Nr.	cm	{wt %}	1.28 (%)	{wt %}	1.40 (%)	{wt %}	3.21 (%)	{wt %}	2.67 (%)	{wt %}	3.39 (%)
		Mdl	0.01	Mdl	0.01	Mdl	0.04	Mdl	0.01	Mdl	0.01
T25	0-2	14.12	0.18	7.95	0.11	6.19	0.20	2.48	0.07	0.96	0.03
T25	2-4	15.55	0.20	9.15	0.13	7.61	0.24	2.95	0.08	1.10	0.04
T25	14-16	16.06	0.21	9.61	0.13	7.91	0.25	3.00	0.08	1.15	0.04
T25	**Min**	**14.12**	**0.18**	**7.95**	**0.11**	**6.19**	**0.20**	**2.48**	**0.07**	**0.96**	**0.03**
T25	**Max**	**16.06**	**0.21**	**9.61**	**0.13**	**7.91**	**0.25**	**3.00**	**0.08**	**1.15**	**0.04**
T25	**Mean**	**15.24**	**0.20**	**8.90**	**0.12**	**7.23**	**0.23**	**2.81**	**0.08**	**1.07**	**0.04**
T26	0-2	14.53	0.19	7.99	0.11	8.05	0.26	4.08	0.11	1.08	0.04
T26	4-6	15.30	0.20	8.28	0.12	8.43	0.27	4.28	0.11	1.05	0.04
T26	8-10	15.57	0.20	8.76	0.12	9.00	0.29	4.63	0.12	1.12	0.04
T26	14-16	15.16	0.19	8.97	0.13	8.38	0.27	3.80	0.10	1.11	0.04
T26	**Min**	**14.53**	**0.19**	**7.99**	**0.11**	**8.05**	**0.26**	**3.80**	**0.10**	**1.05**	**0.04**
T26	**Max**	**15.57**	**0.20**	**8.97**	**0.13**	**9.00**	**0.29**	**4.63**	**0.12**	**1.12**	**0.04**
T26	**Mean**	**15.14**	**0.19**	**8.50**	**0.12**	**8.46**	**0.27**	**4.20**	**0.11**	**1.09**	**0.04**
T27	0-2	10.23	0.13	5.61	0.08	5.44	0.17	4.00	0.11	0.56	0.02
T27	4-6	12.22	0.16	6.99	0.10	6.80	0.22	4.43	0.12	0.97	0.03
T27	8-10	13.65	0.17	8.43	0.12	7.40	0.24	4.10	0.11	1.02	0.03
T27	14-16	11.43	0.15	6.86	0.10	6.42	0.21	3.96	0.11	0.82	0.03
T27	**Min**	**10.23**	**0.13**	**5.61**	**0.08**	**5.44**	**0.17**	**3.96**	**0.11**	**0.56**	**0.02**
T27	**Max**	**13.65**	**0.17**	**8.43**	**0.12**	**7.40**	**0.24**	**4.43**	**0.12**	**1.02**	**0.03**
T27	**Mean**	**11.88**	**0.15**	**6.97**	**0.10**	**6.51**	**0.21**	**4.13**	**0.11**	**0.84**	**0.03**

Table 19 The Mg, K, Ti, P and Mn contents of the analysed soils, including min, max and mean values.

		Mg	(+/-)	K	(+/-)	Ti	(+/-)	P	(+/-)	Mn	(+/-)
Nr.	cm	{wt %}	3.44 (%)	{wt %}	2.68 (%)	{wt %}	0.74 (%)	{wt %}	7.69 (%)	{wt %}	6.25 (%)
		Mdl	0.01	Mdl	0.01	Mdl	0.01	Mdl	0.01	Mdl	0.01
A1	0-2	0.35	0.01	0.34	0.01	0.28	0.00	0.09	0.01	0.03	0.00
A1	2-4	0.37	0.01	0.37	0.01	0.38	0.00	0.09	0.01	0.02	0.00
A1	4-6	0.38	0.01	0.38	0.01	0.62	0.00	0.10	0.01	0.03	0.00
A1	6-8	0.40	0.01	0.39	0.01	1.05	0.01	0.12	0.01	0.04	0.00
A1	14-16	0.41	0.01	0.24	0.01	1.74	0.01	0.14	0.01	0.08	0.01
A1	**Min**	**0.35**	**0.01**	**0.24**	**0.01**	**0.28**	**0.00**	**0.09**	**0.01**	**0.02**	**0.00**
A1	**Max**	**0.41**	**0.01**	**0.39**	**0.01**	**1.74**	**0.01**	**0.14**	**0.01**	**0.08**	**0.01**
A1	**Mean**	**0.38**	**0.01**	**0.35**	**0.01**	**0.81**	**0.01**	**0.11**	**0.01**	**0.04**	**0.00**
A2	0-2	1.07	0.04	0.62	0.02	2.07	0.02	0.31	0.02	0.15	0.01
A2	2-4	1.00	0.03	0.66	0.02	2.20	0.02	0.34	0.03	0.16	0.01
A2	4-6	0.85	0.03	0.43	0.01	2.19	0.02	0.34	0.03	0.16	0.01
A2	6-8	0.85	0.03	0.34	0.01	2.23	0.02	0.37	0.03	0.17	0.01
A2	14-16	0.80	0.03	0.37	0.01	2.19	0.02	0.34	0.03	0.16	0.01
A2	**Min**	**0.80**	**0.03**	**0.34**	**0.01**	**2.07**	**0.02**	**0.31**	**0.02**	**0.15**	**0.01**
A2	**Max**	**1.07**	**0.04**	**0.66**	**0.02**	**2.23**	**0.02**	**0.37**	**0.03**	**0.17**	**0.01**
A2	**Mean**	**0.91**	**0.03**	**0.48**	**0.01**	**2.18**	**0.02**	**0.34**	**0.03**	**0.16**	**0.01**
A8	0-2	0.63	0.02	0.28	0.01	0.78	0.01	0.12	0.01	0.03	0.00
A8	2-4	0.58	0.02	0.37	0.01	0.90	0.01	0.15	0.01	0.04	0.00
A8	4-6	0.89	0.03	0.41	0.01	1.58	0.01	0.17	0.01	0.06	0.00
A8	6-8	1.25	0.04	0.43	0.01	2.26	0.02	0.22	0.02	0.09	0.01
A8	14-16	1.31	0.05	0.45	0.01	2.32	0.02	0.20	0.02	0.08	0.01
A8	**Min**	**0.58**	**0.02**	**0.28**	**0.01**	**0.78**	**0.01**	**0.12**	**0.01**	**0.03**	**0.00**
A8	**Max**	**1.31**	**0.05**	**0.45**	**0.01**	**2.32**	**0.02**	**0.22**	**0.02**	**0.09**	**0.01**
A8	**Mean**	**0.93**	**0.03**	**0.39**	**0.01**	**1.57**	**0.01**	**0.17**	**0.01**	**0.06**	**0.00**
A9	0-2	0.77	0.03	0.38	0.01	2.31	0.02	0.20	0.02	0.11	0.01
A9	2-4	1.05	0.04	0.36	0.01	3.54	0.03	0.25	0.02	0.15	0.01
A9	4-6	1.13	0.04	0.36	0.01	3.93	0.03	0.28	0.02	0.15	0.01
A9	6-8	1.14	0.04	0.36	0.01	3.94	0.03	0.29	0.02	0.15	0.01
A9	14-16	1.08	0.04	0.37	0.01	3.96	0.03	0.28	0.02	0.15	0.01
A9	**Min**	**0.77**	**0.03**	**0.36**	**0.01**	**2.31**	**0.02**	**0.20**	**0.02**	**0.11**	**0.01**
A9	**Max**	**1.14**	**0.04**	**0.38**	**0.01**	**3.96**	**0.03**	**0.29**	**0.02**	**0.15**	**0.01**
A9	**Mean**	**1.03**	**0.04**	**0.36**	**0.01**	**3.54**	**0.03**	**0.26**	**0.02**	**0.14**	**0.01**
A10	0-2	0.31	0.01	0.22	0.01	0.43	0.00	0.08	0.01	0.02	0.00
A10	2-4	0.37	0.01	0.27	0.01	0.74	0.01	0.09	0.01	0.02	0.00
A10	4-6	0.50	0.02	0.26	0.01	1.84	0.01	0.12	0.01	0.04	0.00
A10	6-8	0.51	0.02	0.23	0.01	2.00	0.01	0.11	0.01	0.04	0.00
A10	8-10	0.63	0.02	0.21	0.01	3.10	0.02	0.14	0.01	0.07	0.00
A10	**Min**	**0.31**	**0.01**	**0.21**	**0.01**	**0.43**	**0.00**	**0.08**	**0.01**	**0.02**	**0.00**
A10	**Max**	**0.63**	**0.02**	**0.27**	**0.01**	**3.10**	**0.02**	**0.14**	**0.01**	**0.07**	**0.00**
A10	**Mean**	**0.46**	**0.02**	**0.24**	**0.01**	**1.62**	**0.01**	**0.11**	**0.01**	**0.04**	**0.00**
A14	0-2	0.82	0.03	0.58	0.02	0.89	0.01	0.22	0.02	0.07	0.00
A14	2-4	0.78	0.03	0.64	0.02	1.05	0.01	0.25	0.02	0.08	0.00
A14	4-6	0.75	0.03	0.64	0.02	1.28	0.01	0.27	0.02	0.08	0.00
A14	6-8	0.71	0.02	0.61	0.02	1.43	0.01	0.26	0.02	0.08	0.00
A14	8-10	0.73	0.03	0.60	0.02	1.41	0.01	0.26	0.02	0.08	0.00
A14	**Min**	**0.71**	**0.02**	**0.58**	**0.02**	**0.89**	**0.01**	**0.22**	**0.02**	**0.07**	**0.00**
A14	**Max**	**0.82**	**0.03**	**0.64**	**0.02**	**1.43**	**0.01**	**0.27**	**0.02**	**0.08**	**0.00**
A14	**Mean**	**0.76**	**0.03**	**0.61**	**0.02**	**1.21**	**0.01**	**0.25**	**0.02**	**0.07**	**0.00**

Continuation: Table 19

Nr.	cm	Mg {wt %} Mdl	(+/-) 3.44 (%) 0.01	K {wt %} Mdl	(+/-) 2.68 (%) 0.01	Ti {wt %} Mdl	(+/-) 0.74 (%) 0.01	P {wt %} Mdl	(+/-) 7.69 (%) 0.01	Mn {wt %} Mdl	(+/-) 6.25 (%) 0.01
A15	0-2	1.85	0.06	0.81	0.02	2.07	0.02	0.32	0.02	0.11	0.01
A15	2-4	1.73	0.06	0.84	0.02	2.23	0.02	0.33	0.03	0.11	0.01
A15	4-6	1.66	0.06	0.85	0.02	2.31	0.02	0.33	0.03	0.12	0.01
A15	6-8	1.37	0.05	0.86	0.02	2.35	0.02	0.33	0.03	0.11	0.01
A15	8-10	1.28	0.04	0.85	0.02	2.44	0.02	0.32	0.02	0.12	0.01
A15	14-16	1.34	0.05	0.86	0.02	2.46	0.02	0.32	0.02	0.13	0.01
A15	**Min**	**1.28**	**0.04**	**0.81**	**0.02**	**2.07**	**0.02**	**0.32**	**0.02**	**0.11**	**0.01**
A15	**Max**	**1.85**	**0.06**	**0.86**	**0.02**	**2.46**	**0.02**	**0.33**	**0.03**	**0.13**	**0.01**
A15	**Mean**	**1.54**	**0.05**	**0.85**	**0.02**	**2.31**	**0.02**	**0.32**	**0.02**	**0.12**	**0.01**
A16	0-2	0.99	0.03	0.78	0.02	1.77	0.01	0.26	0.02	0.15	0.01
A16	2-4	1.04	0.04	0.85	0.02	2.11	0.02	0.26	0.02	0.16	0.01
A16	4-6	1.07	0.04	0.89	0.02	2.26	0.02	0.26	0.02	0.16	0.01
A16	6-8	1.19	0.04	0.95	0.03	2.47	0.02	0.30	0.02	0.16	0.01
A16	8-10	1.18	0.04	0.93	0.02	2.63	0.02	0.32	0.02	0.15	0.01
A16	14-16	1.15	0.04	1.13	0.03	2.58	0.02	0.26	0.02	0.14	0.01
A16	**Min**	**0.99**	**0.03**	**0.78**	**0.02**	**1.77**	**0.01**	**0.26**	**0.02**	**0.14**	**0.01**
A16	**Max**	**1.19**	**0.04**	**1.13**	**0.03**	**2.63**	**0.02**	**0.32**	**0.02**	**0.16**	**0.01**
A16	**Mean**	**1.10**	**0.04**	**0.92**	**0.02**	**2.30**	**0.02**	**0.28**	**0.02**	**0.15**	**0.01**
A17	0-2	0.44	0.02	0.56	0.02	0.90	0.01	0.15	0.01	0.14	0.01
A17	2-4	0.45	0.02	0.65	0.02	1.20	0.01	0.17	0.01	0.09	0.01
A17	4-6	0.45	0.02	0.67	0.02	1.42	0.01	0.17	0.01	0.09	0.01
A17	6-8	0.45	0.02	0.67	0.02	1.37	0.01	0.18	0.01	0.09	0.01
A17	8-10	0.46	0.02	0.71	0.02	1.44	0.01	0.18	0.01	0.10	0.01
A17	14-16	0.46	0.02	0.70	0.02	1.50	0.01	0.19	0.01	0.11	0.01
A17	**Min**	**0.44**	**0.02**	**0.56**	**0.02**	**0.90**	**0.01**	**0.15**	**0.01**	**0.09**	**0.01**
A17	**Max**	**0.46**	**0.02**	**0.71**	**0.02**	**1.50**	**0.01**	**0.19**	**0.01**	**0.14**	**0.01**
A17	**Mean**	**0.45**	**0.02**	**0.66**	**0.02**	**1.30**	**0.01**	**0.17**	**0.01**	**0.10**	**0.01**
A19	0-2	0.42	0.01	0.29	0.01	0.46	0.00	0.10	0.01	0.04	0.00
A19	2-4	0.46	0.02	0.32	0.01	0.64	0.00	0.11	0.01	0.04	0.00
A19	4-6	0.57	0.02	0.36	0.01	1.58	0.01	0.16	0.01	0.05	0.00
A19	6-8	0.64	0.02	0.33	0.01	2.32	0.02	0.19	0.01	0.07	0.00
A19	8-10	0.75	0.03	0.32	0.01	3.10	0.02	0.20	0.02	0.09	0.01
A19	14-16	0.64	0.02	0.33	0.01	2.88	0.02	0.19	0.01	0.08	0.01
A19	**Min**	**0.42**	**0.01**	**0.29**	**0.01**	**0.46**	**0.00**	**0.10**	**0.01**	**0.04**	**0.00**
A19	**Max**	**0.75**	**0.03**	**0.36**	**0.01**	**3.10**	**0.02**	**0.20**	**0.02**	**0.09**	**0.01**
A19	**Mean**	**0.58**	**0.02**	**0.33**	**0.01**	**1.83**	**0.01**	**0.16**	**0.01**	**0.06**	**0.00**
O5	0-2	1.19	0.04	0.41	0.01	0.95	0.01	0.13	0.01	0.07	0.00
O5	2-4	1.68	0.06	0.44	0.01	1.38	0.01	0.13	0.01	0.08	0.01
O5	4-6	1.64	0.06	0.47	0.01	1.43	0.01	0.13	0.01	0.09	0.01
O5	6-8	1.92	0.07	0.51	0.01	1.66	0.01	0.15	0.01	0.10	0.01
O5	14-16	1.79	0.06	0.53	0.01	1.77	0.01	0.14	0.01	0.09	0.01
O5	**Min**	**1.19**	**0.04**	**0.41**	**0.01**	**0.95**	**0.01**	**0.13**	**0.01**	**0.07**	**0.00**
O5	**Max**	**1.92**	**0.07**	**0.53**	**0.01**	**1.77**	**0.01**	**0.15**	**0.01**	**0.10**	**0.01**
O5	**Mean**	**1.64**	**0.06**	**0.47**	**0.01**	**1.44**	**0.01**	**0.13**	**0.01**	**0.09**	**0.01**

Continuation: Table 19

		Mg	(+/-)	K	(+/-)	Ti	(+/-)	P	(+/-)	Mn	(+/-)
Nr.	cm	{wt %}	3.44 (%)	{wt %}	2.68 (%)	{wt %}	0.74 (%)	{wt %}	7.69 (%)	{wt %}	6.25 (%)
		Mdl	0.01	Mdl	0.01	Mdl	0.01	Mdl	0.01	Mdl	0.01
O6	0-2	1.49	0.05	1.06	0.03	1.33	0.01	0.26	0.02	0.12	0.01
O6	2-4	1.60	0.06	1.10	0.03	1.41	0.01	0.26	0.02	0.12	0.01
O6	4-6	1.84	0.06	1.07	0.03	1.51	0.01	0.27	0.02	0.13	0.01
O6	6-8	1.53	0.05	1.16	0.03	1.35	0.01	0.26	0.02	0.12	0.01
O6	14-16	1.60	0.06	1.21	0.03	1.44	0.01	0.26	0.02	0.13	0.01
O6	**Min**	**1.49**	**0.05**	**1.06**	**0.03**	**1.33**	**0.01**	**0.26**	**0.02**	**0.12**	**0.01**
O6	**Max**	**1.84**	**0.06**	**1.21**	**0.03**	**1.51**	**0.01**	**0.27**	**0.02**	**0.13**	**0.01**
O6	**Mean**	**1.61**	**0.06**	**1.12**	**0.03**	**1.41**	**0.01**	**0.26**	**0.02**	**0.12**	**0.01**
O7	0-2	1.28	0.04	0.59	0.02	1.13	0.01	0.16	0.01	0.08	0.01
O7	2-4	1.42	0.05	0.64	0.02	1.30	0.01	0.18	0.01	0.09	0.01
O7	4-6	1.60	0.06	0.71	0.02	1.48	0.01	0.20	0.02	0.09	0.01
O7	6-8	1.37	0.05	0.60	0.02	1.23	0.01	0.17	0.01	0.08	0.01
O7	14-16	1.63	0.06	0.61	0.02	1.54	0.01	0.20	0.02	0.09	0.01
O7	**Min**	**1.28**	**0.04**	**0.59**	**0.02**	**1.13**	**0.01**	**0.16**	**0.01**	**0.08**	**0.01**
O7	**Max**	**1.63**	**0.06**	**0.71**	**0.02**	**1.54**	**0.01**	**0.20**	**0.02**	**0.09**	**0.01**
O7	**Mean**	**1.46**	**0.05**	**0.63**	**0.02**	**1.34**	**0.01**	**0.18**	**0.01**	**0.09**	**0.01**
T3	0-2	3.35	0.12	0.39	0.01	1.77	0.01	0.14	0.01	0.12	0.01
T3	2-4	3.92	0.13	0.40	0.01	1.90	0.01	0.14	0.01	0.13	0.01
T3	4-6	4.06	0.14	0.39	0.01	1.96	0.01	0.14	0.01	0.13	0.01
T3	6-8	4.49	0.15	0.36	0.01	2.02	0.02	0.14	0.01	0.13	0.01
T3	14-16	4.37	0.15	0.35	0.01	2.15	0.02	0.15	0.01	0.13	0.01
T3	**Min**	**3.35**	**0.12**	**0.35**	**0.01**	**1.77**	**0.01**	**0.14**	**0.01**	**0.12**	**0.01**
T3	**Max**	**4.49**	**0.15**	**0.40**	**0.01**	**2.15**	**0.02**	**0.15**	**0.01**	**0.13**	**0.01**
T3	**Mean**	**4.04**	**0.14**	**0.38**	**0.01**	**1.96**	**0.01**	**0.14**	**0.01**	**0.13**	**0.01**
T4	0-2	2.09	0.07	0.61	0.02	1.90	0.01	0.18	0.01	0.15	0.01
T4	2-4	2.38	0.08	0.60	0.02	1.98	0.01	0.17	0.01	0.15	0.01
T4	4-6	2.48	0.09	0.58	0.02	1.96	0.01	0.22	0.02	0.15	0.01
T4	6-8	2.33	0.08	0.64	0.02	2.04	0.02	0.17	0.01	0.15	0.01
T4	14-16	2.15	0.07	0.63	0.02	2.10	0.02	0.18	0.01	0.15	0.01
T4	**Min**	**2.09**	**0.07**	**0.58**	**0.02**	**1.90**	**0.01**	**0.17**	**0.01**	**0.15**	**0.01**
T4	**Max**	**2.48**	**0.09**	**0.64**	**0.02**	**2.10**	**0.02**	**0.22**	**0.02**	**0.15**	**0.01**
T4	**Mean**	**2.29**	**0.08**	**0.61**	**0.02**	**1.99**	**0.01**	**0.19**	**0.01**	**0.15**	**0.01**
T11	0-2	1.23	0.04	0.62	0.02	1.24	0.01	0.27	0.02	0.10	0.01
T11	2-4	1.20	0.04	0.64	0.02	1.28	0.01	0.29	0.02	0.11	0.01
T11	4-6	1.66	0.06	0.67	0.02	1.61	0.01	0.29	0.02	0.11	0.01
T11	6-8	1.64	0.06	0.69	0.02	1.64	0.01	0.28	0.02	0.11	0.01
T11	8-10	1.51	0.05	0.66	0.02	1.58	0.01	0.28	0.02	0.12	0.01
T11	**Min**	**1.20**	**0.04**	**0.62**	**0.02**	**1.24**	**0.01**	**0.27**	**0.02**	**0.10**	**0.01**
T11	**Max**	**1.66**	**0.06**	**0.69**	**0.02**	**1.64**	**0.01**	**0.29**	**0.02**	**0.12**	**0.01**
T11	**Mean**	**1.45**	**0.05**	**0.66**	**0.02**	**1.47**	**0.01**	**0.28**	**0.02**	**0.11**	**0.01**
T12	0-2	2.91	0.10	0.66	0.02	1.79	0.01	0.17	0.01	0.11	0.01
T12	2-4	2.65	0.09	0.58	0.02	1.65	0.01	0.15	0.01	0.11	0.01
T12	4-6	2.27	0.08	0.61	0.02	1.79	0.01	0.14	0.01	0.11	0.01
T12	6-8	2.45	0.08	0.61	0.02	1.92	0.01	0.14	0.01	0.11	0.01
T12	8-10	2.74	0.09	0.66	0.02	2.26	0.02	0.13	0.01	0.12	0.01
T12	**Min**	**2.27**	**0.08**	**0.58**	**0.02**	**1.65**	**0.01**	**0.13**	**0.01**	**0.11**	**0.01**
T12	**Max**	**2.91**	**0.10**	**0.66**	**0.02**	**2.26**	**0.02**	**0.17**	**0.01**	**0.12**	**0.01**
T12	**Mean**	**2.60**	**0.09**	**0.63**	**0.02**	**1.88**	**0.01**	**0.15**	**0.01**	**0.11**	**0.01**

Continuation: Table 19

		Mg	(+/-)	K	(+/-)	Ti	(+/-)	P	(+/-)	Mn	(+/-)
Nr.	cm	{wt %}	3.44 (%)	{wt %}	2.68 (%)	{wt %}	0.74 (%)	{wt %}	7.69 (%)	{wt %}	6.25 (%)
		Mdl	0.01	Mdl	0.01	Mdl	0.01	Mdl	0.01	Mdl	0.01
A29	0-2	1.92	0.07	0.55	0.01	3.16	0.02	0.27	0.02	0.16	0.01
A29	4-6	1.86	0.06	0.54	0.01	3.13	0.02	0.27	0.02	0.16	0.01
A29	8-10	1.83	0.06	0.51	0.01	3.14	0.02	0.25	0.02	0.16	0.01
A29	14-16	1.71	0.06	0.51	0.01	3.06	0.02	0.26	0.02	0.16	0.01
A29	**Min**	**1.71**	**0.06**	**0.51**	**0.01**	**3.06**	**0.02**	**0.25**	**0.02**	**0.16**	**0.01**
A29	**Max**	**1.92**	**0.07**	**0.55**	**0.01**	**3.16**	**0.02**	**0.27**	**0.02**	**0.16**	**0.01**
A29	**Mean**	**1.83**	**0.06**	**0.53**	**0.01**	**3.12**	**0.02**	**0.26**	**0.02**	**0.16**	**0.01**
A30	0-2	2.00	0.07	0.46	0.01	3.22	0.02	0.22	0.02	0.16	0.01
A30	4-6	1.89	0.06	0.45	0.01	3.13	0.02	0.21	0.02	0.16	0.01
A30	8-10	1.86	0.06	0.45	0.01	3.26	0.02	0.22	0.02	0.16	0.01
A30	14-16	1.86	0.06	0.41	0.01	3.23	0.02	0.20	0.02	0.14	0.01
A30	**Min**	**1.86**	**0.06**	**0.41**	**0.01**	**3.13**	**0.02**	**0.20**	**0.02**	**0.14**	**0.01**
A30	**Max**	**2.00**	**0.07**	**0.46**	**0.01**	**3.26**	**0.02**	**0.22**	**0.02**	**0.16**	**0.01**
A30	**Mean**	**1.90**	**0.07**	**0.44**	**0.01**	**3.21**	**0.02**	**0.21**	**0.02**	**0.15**	**0.01**
O31	0-2	5.35	0.18	0.71	0.02	1.98	0.01	0.24	0.02	0.13	0.01
O31	4-6	4.40	0.15	0.66	0.02	2.02	0.01	0.25	0.02	0.13	0.01
O31	8-10	4.35	0.15	0.65	0.02	2.05	0.02	0.25	0.02	0.13	0.01
O31	14-16	3.87	0.13	0.66	0.02	2.03	0.02	0.25	0.02	0.13	0.01
O31	**Min**	**3.87**	**0.13**	**0.65**	**0.02**	**1.98**	**0.01**	**0.24**	**0.02**	**0.13**	**0.01**
O31	**Max**	**5.35**	**0.18**	**0.71**	**0.02**	**2.05**	**0.02**	**0.25**	**0.02**	**0.13**	**0.01**
O31	**Mean**	**4.49**	**0.15**	**0.67**	**0.02**	**2.02**	**0.01**	**0.25**	**0.02**	**0.13**	**0.01**
O28	0-2	0.68	0.02	1.90	0.05	1.61	0.01	0.09	0.01	0.22	0.01
O28	4-6	0.66	0.02	1.90	0.05	1.59	0.01	0.09	0.01	0.23	0.01
O28	8-10	0.68	0.02	1.83	0.05	1.62	0.01	0.07	0.01	0.22	0.01
O28	14-16	0.78	0.03	1.84	0.05	1.70	0.01	0.07	0.01	0.22	0.01
O28	**Min**	**0.66**	**0.02**	**1.83**	**0.05**	**1.59**	**0.01**	**0.07**	**0.01**	**0.22**	**0.01**
O28	**Max**	**0.78**	**0.03**	**1.90**	**0.05**	**1.70**	**0.01**	**0.09**	**0.01**	**0.23**	**0.01**
O28	**Mean**	**0.70**	**0.02**	**1.87**	**0.05**	**1.63**	**0.01**	**0.08**	**0.01**	**0.23**	**0.01**
T22	0-2	1.38	0.05	0.71	0.02	2.26	0.02	0.26	0.02	0.16	0.01
T22	4-6	1.41	0.05	0.74	0.02	2.36	0.02	0.27	0.02	0.16	0.01
T22	8-10	1.42	0.05	0.74	0.02	2.43	0.02	0.26	0.02	0.17	0.01
T22	14-16	1.36	0.05	0.72	0.02	2.37	0.02	0.27	0.02	0.16	0.01
T22	**Min**	**1.36**	**0.05**	**0.71**	**0.02**	**2.26**	**0.02**	**0.26**	**0.02**	**0.16**	**0.01**
T22	**Max**	**1.42**	**0.05**	**0.74**	**0.02**	**2.43**	**0.02**	**0.27**	**0.02**	**0.17**	**0.01**
T22	**Mean**	**1.39**	**0.05**	**0.73**	**0.02**	**2.35**	**0.02**	**0.26**	**0.02**	**0.16**	**0.01**
T23	0-2	3.02	0.10	0.75	0.02	2.16	0.02	0.13	0.01	0.16	0.01
T23	4-6	3.43	0.12	0.72	0.02	2.06	0.02	0.13	0.01	0.16	0.01
T23	8-10	3.08	0.11	0.76	0.02	2.22	0.02	0.13	0.01	0.16	0.01
T23	14-16	2.85	0.10	0.77	0.02	2.16	0.02	0.13	0.01	0.16	0.01
T23	**Min**	**2.85**	**0.10**	**0.72**	**0.02**	**2.06**	**0.02**	**0.13**	**0.01**	**0.16**	**0.01**
T23	**Max**	**3.43**	**0.12**	**0.77**	**0.02**	**2.22**	**0.02**	**0.13**	**0.01**	**0.16**	**0.01**
T23	**Mean**	**3.09**	**0.11**	**0.75**	**0.02**	**2.15**	**0.02**	**0.13**	**0.01**	**0.16**	**0.01**
T25	0-2	1.37	0.05	0.85	0.02	1.28	0.01	0.24	0.02	0.14	0.01
T25	2-4	1.74	0.06	0.94	0.03	1.58	0.01	0.22	0.02	0.16	0.01
T25	14-16	1.85	0.06	0.96	0.03	1.65	0.01	0.20	0.02	0.16	0.01
T25	**Min**	**1.37**	**0.05**	**0.85**	**0.02**	**1.28**	**0.01**	**0.20**	**0.02**	**0.14**	**0.01**
T25	**Max**	**1.85**	**0.06**	**0.96**	**0.03**	**1.65**	**0.01**	**0.24**	**0.02**	**0.16**	**0.01**
T25	**Mean**	**1.65**	**0.06**	**0.92**	**0.02**	**1.50**	**0.01**	**0.22**	**0.02**	**0.15**	**0.01**

Continuation: Table 19

		Mg	**(+/-)**	**K**	**(+/-)**	**Ti**	**(+/-)**	**P**	**(+/-)**	**Mn**	**(+/-)**
Nr.	cm	{wt %}	3.44 (%)	{wt %}	2.68 (%)	{wt %}	0.74 (%)	{wt %}	7.69 (%)	{wt %}	6.25 (%)
		Mdl	0.01	Mdl	0.01	Mdl	0.01	Mdl	0.01	Mdl	0.01
T26	0-2	2.38	0.08	0.67	0.02	1.73	0.01	0.31	0.02	0.15	0.01
T26	4-6	2.48	0.09	0.63	0.02	1.79	0.01	0.31	0.02	0.16	0.01
T26	8-10	2.65	0.09	0.63	0.02	1.95	0.01	0.31	0.02	0.16	0.01
T26	14-16	2.27	0.08	0.76	0.02	1.76	0.01	0.31	0.02	0.16	0.01
T26	**Min**	**2.27**	**0.08**	**0.63**	**0.02**	**1.73**	**0.01**	**0.31**	**0.02**	**0.15**	**0.01**
T26	**Max**	**2.65**	**0.09**	**0.76**	**0.02**	**1.95**	**0.01**	**0.31**	**0.02**	**0.16**	**0.01**
T26	**Mean**	**2.44**	**0.08**	**0.67**	**0.02**	**1.80**	**0.01**	**0.31**	**0.02**	**0.16**	**0.01**
T27	0-2	1.50	0.05	0.38	0.01	1.19	0.01	0.26	0.02	0.12	0.01
T27	4-6	1.90	0.07	0.55	0.01	1.55	0.01	0.29	0.02	0.12	0.01
T27	8-10	1.98	0.07	0.65	0.02	1.61	0.01	0.30	0.02	0.12	0.01
T27	14-16	1.78	0.06	0.51	0.01	1.40	0.01	0.28	0.02	0.12	0.01
T27	**Min**	**1.50**	**0.05**	**0.38**	**0.01**	**1.19**	**0.01**	**0.26**	**0.02**	**0.12**	**0.01**
T27	**Max**	**1.98**	**0.07**	**0.65**	**0.02**	**1.61**	**0.01**	**0.30**	**0.02**	**0.12**	**0.01**
T27	**Mean**	**1.79**	**0.06**	**0.52**	**0.01**	**1.43**	**0.01**	**0.28**	**0.02**	**0.12**	**0.01**

Table 20 The Sr, C_{tot}, S_{tot}, Zr and Ni contents of the analysed soils, including min, max and mean values.

		Sr	**(+/-)**	**C_{tot}**	**(+/-)**	**S_{tot}**	**(+/-)**	**Zr**	**(+/-)**	**Ni**	**(+/-)**
Nr.	cm	{µg/g}	5.83 (%)	{wt %}	4.42 (%)	{wt %}	8.22 (%)	{µg/g}	5.45 (%)	{µg/g}	9.94 (%)
		Mdl	0.5	Mdl	0.02	Mdl	0.02	Mdl	0.1	Mdl	0.1
A1	0-2	87.1	5.1	43.11	1.91	<0.02		93.7	5.1	6.5	0.8
A1	2-4	101.7	5.9	39.55	1.75	<0.02		122.3	6.7	7.7	0.9
A1	4-6	117.9	6.9	35.61	1.57	<0.02		164.9	9.0	7.7	0.9
A1	6-8	124.0	7.2	28.41	1.26	0.07	0.01	276.3	15.1	15.1	1.8
A1	14-16	152.1	8.9	12.09	0.53	0.03	0.00	582.8	31.8	15.4	1.8
A1	**Min**	**87.1**	**5.1**	**12.09**	**0.53**	**0.03**	**0.00**	**93.7**	**5.1**	**6.5**	**0.8**
A1	**Max**	**152.1**	**8.9**	**43.11**	**1.91**	**0.07**	**0.01**	**582.8**	**31.8**	**15.4**	**1.8**
A1	**Mean**	**116.6**	**6.8**	**31.75**	**1.40**	**0.05**	**0.00**	**248.0**	**13.5**	**10.5**	**1.2**
A2	0-2	247.1	14.4	10.19	0.45	0.03	0.00	482.6	26.3	14.3	1.7
A2	2-4	269.0	15.7	4.94	0.22	<0.02		582.0	31.7	15.7	1.8
A2	4-6	281.8	16.4	3.41	0.15	<0.02		627.3	34.2	12.4	1.5
A2	6-8	298.7	17.4	2.59	0.11	0.04	0.00	646.4	35.3	10.6	1.2
A2	14-16	312.3	18.2	3.37	0.15	<0.02		637.2	34.8	14.1	1.7
A2	**Min**	**247.1**	**14.4**	**2.59**	**0.11**	**0.03**	**0.00**	**482.6**	**26.3**	**10.6**	**1.2**
A2	**Max**	**312.3**	**18.2**	**10.19**	**0.45**	**0.04**	**0.00**	**646.4**	**35.3**	**15.7**	**1.8**
A2	**Mean**	**281.8**	**16.4**	**4.90**	**0.22**	**0.04**	**0.00**	**595.1**	**32.5**	**13.4**	**1.6**
A8	0-2	91.0	5.3	36.01	1.59	0.13	0.01	94.5	5.2	15.2	1.8
A8	2-4	101.8	5.9	33.09	1.46	0.16	0.01	107.3	5.9	17.7	2.1
A8	4-6	124.8	7.3	25.93	1.15	0.13	0.01	176.3	9.6	26.4	3.1
A8	6-8	155.6	9.1	17.81	0.79	0.09	0.01	243.0	13.3	29.1	3.4
A8	14-16	162.5	9.5	17.90	0.79	0.09	0.01	237.8	13.0	35.9	4.2
A8	**Min**	**91.0**	**5.3**	**17.81**	**0.79**	**0.09**	**0.01**	**94.5**	**5.2**	**15.2**	**1.8**
A8	**Max**	**162.5**	**9.5**	**36.01**	**1.59**	**0.16**	**0.01**	**243.0**	**13.3**	**35.9**	**4.2**
A8	**Mean**	**127.1**	**7.4**	**26.15**	**1.16**	**0.12**	**0.01**	**171.8**	**9.4**	**24.9**	**2.9**
A9	0-2	105.4	6.1	20.64	0.91	0.09	0.01	231.6	12.6	45.6	5.4
A9	2-4	81.6	4.8	7.50	0.33	0.04	0.00	334.4	18.2	65.7	7.7
A9	4-6	76.9	4.5	4.10	0.18	<0.02		362.1	19.8	69.5	8.2
A9	6-8	74.4	4.3	4.25	0.19	0.03	0.00	365.8	20.0	66.3	7.8
A9	14-16	64.6	3.8	4.17	0.18	<0.02		372.3	20.3	86.0	10.1
A9	**Min**	**64.6**	**3.8**	**4.10**	**0.18**	**0.03**	**0.00**	**231.6**	**12.6**	**45.6**	**5.4**
A9	**Max**	**105.4**	**6.1**	**20.64**	**0.91**	**0.09**	**0.01**	**372.3**	**20.3**	**86.0**	**10.1**
A9	**Mean**	**80.6**	**4.7**	**8.13**	**0.36**	**0.05**	**0.00**	**333.2**	**18.2**	**66.6**	**7.8**
A10	0-2	57.6	3.4	41.40	1.83	<0.02		83.8	4.6	16.4	1.9
A10	2-4	70.6	4.1	37.92	1.68	0.03	0.00	96.9	5.3	19.3	2.3
A10	4-6	74.3	4.3	27.56	1.22	0.04	0.00	206.7	11.3	40.4	4.8
A10	6-8	72.6	4.2	25.33	1.12	0.03	0.00	238.2	13.0	42.5	5.0
A10	8-10	64.5	3.8	13.52	0.60	<0.02		401.7	21.9	59.6	7.0
A10	**Min**	**57.6**	**3.4**	**13.52**	**0.60**	**0.03**	**0.00**	**83.8**	**4.6**	**16.4**	**1.9**
A10	**Max**	**74.3**	**4.3**	**41.40**	**1.83**	**0.04**	**0.00**	**401.7**	**21.9**	**59.6**	**7.0**
A10	**Mean**	**67.9**	**4.0**	**29.15**	**1.29**	**0.03**	**0.00**	**205.5**	**11.2**	**35.6**	**4.2**
A14	0-2	189.0	11.0	27.76	1.23	0.17	0.01	210.0	11.5	9.6	1.1
A14	2-4	167.3	9.8	23.95	1.06	0.09	0.01	258.4	14.1	9.6	1.1
A14	4-6	164.0	9.6	20.28	0.90	0.05	0.00	317.7	17.3	10.9	1.3
A14	6-8	140.0	8.2	18.27	0.81	0.03	0.00	354.7	19.3	11.2	1.3
A14	8-10	134.9	7.9	18.57	0.82	<0.02		347.7	19.0	10.8	1.3
A14	**Min**	**134.9**	**7.9**	**18.27**	**0.81**	**0.03**	**0.00**	**210.0**	**11.5**	**9.6**	**1.1**
A14	**Max**	**189.0**	**11.0**	**27.76**	**1.23**	**0.17**	**0.01**	**354.7**	**19.3**	**11.2**	**1.3**
A14	**Mean**	**159.0**	**9.3**	**21.77**	**0.96**	**0.09**	**0.01**	**297.7**	**16.2**	**10.4**	**1.2**

Continuation: Table 20

Nr.	cm	Sr {µg/g}	(+/-) 5.83 (%)	C_{tot} {wt %}	(+/-) 4.42 (%)	S_{tot} {wt %}	(+/-) 8.22 (%)	Zr {µg/g}	(+/-) 5.45 (%)	Ni {µg/g}	(+/-) 9.94 (%)
		Mdl	0.5	Mdl	0.02	Mdl	0.02	Mdl	0.1	Mdl	0.1
A15	0-2	313.3	18.3	10.20	0.45	<0.02		376.0	20.5	37.5	4.4
A15	2-4	293.3	17.1	8.08	0.36	<0.02		394.1	21.5	42.7	5.0
A15	4-6	258.1	15.1	6.66	0.29	<0.02		433.8	23.7	45.5	5.4
A15	6-8	215.6	12.6	6.37	0.28	<0.02		471.9	25.7	38.8	4.6
A15	8-10	178.0	10.4	5.32	0.24	<0.02		484.3	26.4	40.4	4.8
A15	14-16	182.7	10.7	5.49	0.24	<0.02		487.2	26.6	38.0	4.5
A15	**Min**	**178.0**	**10.4**	**5.32**	**0.24**			**376.0**	**20.5**	**37.5**	**4.4**
A15	**Max**	**313.3**	**18.3**	**10.20**	**0.45**			**487.2**	**26.6**	**45.5**	**5.4**
A15	**Mean**	**240.2**	**14.0**	**7.02**	**0.31**			**441.2**	**24.1**	**40.5**	**4.8**
A16	0-2	271.8	15.9	18.48	0.82	0.04	0.00	362.5	19.8	25.3	3.0
A16	2-4	248.3	14.5	12.43	0.55	0.02	0.00	417.6	22.8	27.1	3.2
A16	4-6	236.1	13.8	10.31	0.46	<0.02		439.6	24.0	28.8	3.4
A16	6-8	259.1	15.1	7.60	0.34	<0.02		471.6	25.7	30.3	3.6
A16	8-10	282.7	16.5	6.55	0.29	<0.02		500.1	27.3	33.0	3.9
A16	14-16	289.5	16.9	4.33	0.19	<0.02		517.8	28.2	33.3	3.9
A16	**Min**	**236.1**	**13.8**	**4.33**	**0.19**	**0.02**	**0.00**	**362.5**	**19.8**	**25.3**	**3.0**
A16	**Max**	**289.5**	**16.9**	**18.48**	**0.82**	**0.04**	**0.00**	**517.8**	**28.2**	**33.3**	**3.9**
A16	**Mean**	**264.6**	**15.4**	**9.95**	**0.44**	**0.03**	**0.00**	**451.5**	**24.6**	**29.6**	**3.5**
A17	0-2	126.0	7.4	28.35	1.25	0.03	0.00	239.9	13.1	15.4	1.8
A17	2-4	113.8	6.6	20.71	0.92	0.07	0.01	305.3	16.7	20.2	2.4
A17	4-6	102.0	6.0	18.17	0.80	0.04	0.00	422.0	23.0	20.5	2.4
A17	6-8	116.5	6.8	17.53	0.77	0.04	0.00	351.8	19.2	20.9	2.5
A17	8-10	116.0	6.8	16.52	0.73	0.03	0.00	393.1	21.4	21.4	2.5
A17	14-16	122.8	7.2	15.44	0.68	0.02	0.00	378.6	20.7	22.3	2.6
A17	**Min**	**102.0**	**6.0**	**15.44**	**0.68**	**0.02**	**0.00**	**239.9**	**13.1**	**15.4**	**1.8**
A17	**Max**	**126.0**	**7.4**	**28.35**	**1.25**	**0.07**	**0.01**	**422.0**	**23.0**	**22.3**	**2.6**
A17	**Mean**	**116.2**	**6.8**	**19.45**	**0.86**	**0.04**	**0.00**	**348.5**	**19.0**	**20.1**	**2.4**
A19	0-2	132.6	7.7	41.33	1.83	0.08	0.01	65.1	3.6	8.8	1.0
A19	2-4	151.1	8.8	39.87	1.76	0.08	0.01	87.3	4.8	10.3	1.2
A19	4-6	176.7	10.3	28.54	1.26	0.05	0.00	171.8	9.4	18.2	2.1
A19	6-8	177.0	10.3	20.89	0.92	0.03	0.00	242.1	13.2	23.3	2.7
A19	8-10	181.1	10.6	13.56	0.60	<0.02		320.9	17.5	29.2	3.4
A19	14-16	172.0	10.0	14.35	0.63	<0.02		322.6	17.6	27.6	3.2
A19	**Min**	**132.6**	**7.7**	**13.56**	**0.60**	**0.03**	**0.00**	**65.1**	**3.6**	**8.8**	**1.0**
A19	**Max**	**181.1**	**10.6**	**41.33**	**1.83**	**0.08**	**0.01**	**322.6**	**17.6**	**29.2**	**3.4**
A19	**Mean**	**165.1**	**9.6**	**26.42**	**1.17**	**0.06**	**0.00**	**201.6**	**11.0**	**19.6**	**2.3**
O5	0-2	410.6	24.0	26.98	1.19	0.13	0.01	154.3	8.4	18.9	2.2
O5	2-4	392.6	22.9	20.69	0.91	0.08	0.01	197.2	10.8	29.2	3.4
O5	4-6	380.4	22.2	18.84	0.83	0.09	0.01	207.2	11.3	27.0	3.2
O5	6-8	419.4	24.5	14.80	0.65	0.06	0.00	238.0	13.0	32.3	3.8
O5	14-16	348.0	20.3	12.20	0.54	0.05	0.00	282.4	15.4	33.1	3.9
O5	**Min**	**348.0**	**20.3**	**12.20**	**0.54**	**0.05**	**0.00**	**154.3**	**8.4**	**18.9**	**2.2**
O5	**Max**	**419.4**	**24.5**	**26.98**	**1.19**	**0.13**	**0.01**	**282.4**	**15.4**	**33.1**	**3.9**
O5	**Mean**	**390.2**	**22.8**	**18.70**	**0.83**	**0.08**	**0.01**	**215.8**	**11.8**	**28.1**	**3.3**

Continuation: Table 20

Nr.	cm	Sr {µg/g} Mdl	(+/-) 5.83 (%) 0.5	C_{tot} {wt %} Mdl	(+/-) 4.42 (%) 0.02	S_{tot} {wt %} Mdl	(+/-) 8.22 (%) 0.02	Zr {µg/g} Mdl	(+/-) 5.45 (%) 0.1	Ni {µg/g} Mdl	(+/-) 9.94 (%) 0.1
O6	0-2	733.2	42.8	11.76	0.52	0.05	0.00	386.2	21.1	31.6	3.7
O6	2-4	732.1	42.7	9.78	0.43	0.04	0.00	410.0	22.4	36.3	4.3
O6	4-6	722.5	42.1	8.53	0.38	0.05	0.00	411.6	22.5	45.3	5.3
O6	6-8	801.7	46.8	9.74	0.43	0.04	0.00	406.0	22.1	29.0	3.4
O6	14-16	950.6	55.5	7.18	0.32	0.03	0.00	438.4	23.9	24.9	2.9
O6	**Min**	**722.5**	**42.1**	**7.18**	**0.32**	**0.03**	**0.00**	**386.2**	**21.1**	**24.9**	**2.9**
O6	**Max**	**950.6**	**55.5**	**11.76**	**0.52**	**0.05**	**0.00**	**438.4**	**23.9**	**45.3**	**5.3**
O6	**Mean**	**788.0**	**46.0**	**9.40**	**0.42**	**0.04**	**0.00**	**410.4**	**22.4**	**33.4**	**3.9**
O7	0-2	491.6	28.7	22.50	0.99	0.14	0.01	227.4	12.4	20.7	2.4
O7	2-4	557.5	32.5	19.86	0.88	0.12	0.01	254.6	13.9	17.6	2.1
O7	4-6	603.0	35.2	17.06	0.75	0.08	0.01	284.1	15.5	19.0	2.2
O7	6-8	513.2	29.9	21.24	0.94	0.09	0.01	245.0	13.4	20.2	2.4
O7	14-16	634.5	37.0	16.60	0.73	0.07	0.01	276.6	15.1	17.9	2.1
O7	**Min**	**491.6**	**28.7**	**16.60**	**0.73**	**0.07**	**0.01**	**227.4**	**12.4**	**17.6**	**2.1**
O7	**Max**	**634.5**	**37.0**	**22.50**	**0.99**	**0.14**	**0.01**	**284.1**	**15.5**	**20.7**	**2.4**
O7	**Mean**	**560.0**	**32.7**	**19.45**	**0.86**	**0.10**	**0.01**	**257.5**	**14.0**	**19.1**	**2.2**
T3	0-2	83.5	4.9	11.96	0.53	0.08	0.01	241.0	13.1	246.0	28.9
T3	2-4	82.4	4.8	9.43	0.42	0.04	0.00	260.5	14.2	280.5	33.0
T3	4-6	81.1	4.7	8.37	0.37	0.03	0.00	263.0	14.3	286.3	33.7
T3	6-8	83.3	4.9	7.15	0.32	0.03	0.00	273.7	14.9	302.7	35.6
T3	14-16	84.3	4.9	4.94	0.22	<0.02		294.9	16.1	316.6	37.2
T3	**Min**	**81.1**	**4.7**	**4.94**	**0.22**	**0.03**	**0.00**	**241.0**	**13.1**	**246.0**	**28.9**
T3	**Max**	**84.3**	**4.9**	**11.96**	**0.53**	**0.08**	**0.01**	**294.9**	**16.1**	**316.6**	**37.2**
T3	**Mean**	**82.9**	**4.8**	**8.37**	**0.37**	**0.05**	**0.00**	**266.6**	**14.5**	**286.4**	**33.7**
T4	0-2	127.1	7.4	11.76	0.52	0.07	0.01	264.3	14.4	135.0	15.9
T4	2-4	113.3	6.6	9.22	0.41	0.08	0.01	276.1	15.1	154.7	18.2
T4	4-6	107.9	6.3	9.55	0.42	0.05	0.00	269.4	14.7	162.0	19.1
T4	6-8	118.4	6.9	8.92	0.39	0.05	0.00	279.2	15.2	158.6	18.7
T4	14-16	111.5	6.5	8.10	0.36	0.04	0.00	298.6	16.3	161.8	19.0
T4	**Min**	**107.9**	**6.3**	**8.10**	**0.36**	**0.04**	**0.00**	**264.3**	**14.4**	**135.0**	**15.9**
T4	**Max**	**127.1**	**7.4**	**11.76**	**0.52**	**0.08**	**0.01**	**298.6**	**16.3**	**162.0**	**19.1**
T4	**Mean**	**115.6**	**6.7**	**9.51**	**0.42**	**0.06**	**0.00**	**277.5**	**15.1**	**154.4**	**18.2**
T11	0-2	194.0	11.3	20.39	0.90	<0.02		243.7	13.3	30.3	3.6
T11	2-4	218.1	12.7	19.32	0.85	<0.02		270.8	14.8	31.8	3.7
T11	4-6	214.3	12.5	15.03	0.66	<0.02		294.9	16.1	42.4	5.0
T11	6-8	205.2	12.0	14.45	0.64	<0.02		296.0	16.1	41.4	4.9
T11	8-10	202.7	11.8	14.87	0.66	0.03	0.00	311.2	17.0	39.0	4.6
T11	**Min**	**194.0**	**11.3**	**14.45**	**0.64**	**0.03**	**0.00**	**243.7**	**13.3**	**30.3**	**3.6**
T11	**Max**	**218.1**	**12.7**	**20.39**	**0.90**	**0.03**	**0.00**	**311.2**	**17.0**	**42.4**	**5.0**
T11	**Mean**	**206.9**	**12.1**	**16.81**	**0.74**	**0.03**	**0.00**	**283.3**	**15.5**	**37.0**	**4.4**
T12	0-2	241.7	14.1	13.42	0.59	<0.02		247.1	13.5	130.6	15.4
T12	2-4	222.5	13.0	15.64	0.69	<0.02		223.9	12.2	129.5	15.2
T12	4-6	197.9	11.5	15.19	0.67	<0.02		241.5	13.2	105.8	12.4
T12	6-8	198.1	11.6	12.99	0.57	<0.02		261.5	14.3	117.7	13.8
T12	8-10	182.3	10.6	7.47	0.33	<0.02		320.5	17.5	127.7	15.0
T12	**Min**	**182.3**	**10.6**	**7.47**	**0.33**			**223.9**	**12.2**	**105.8**	**12.4**
T12	**Max**	**241.7**	**14.1**	**15.64**	**0.69**			**320.5**	**17.5**	**130.6**	**15.4**
T12	**Mean**	**208.5**	**12.2**	**12.94**	**0.57**			**258.9**	**14.1**	**122.3**	**14.4**

Continuation: Table 20

		Sr	(+/-)	C_{tot}	(+/-)	S_{tot}	(+/-)	Zr	(+/-)	Ni	(+/-)
Nr.	cm	{µg/g}	5.83 (%)	{wt %}	4.42 (%)	{wt %}	8.22 (%)	{µg/g}	5.45 (%)	{µg/g}	9.94 (%)
		Mdl	0.5	Mdl	0.02	Mdl	0.02	Mdl	0.1	Mdl	0.1
A29	0-2	311.7	18.2	3.58	0.16	<0.02		384.1	20.9	29.7	3.5
A29	4-6	310.1	18.1	3.31	0.15	0.11	0.01	386.6	21.1	31.1	3.7
A29	8-10	303.6	17.7	3.18	0.14	<0.02		394.0	21.5	32.5	3.8
A29	14-16	289.5	16.9	3.90	0.17	0.13	0.01	403.6	22.0	30.2	3.6
A29	**Min**	**289.5**	**16.9**	**3.18**	**0.14**	**0.11**	**0.01**	**384.1**	**20.9**	**29.7**	**3.5**
A29	**Max**	**311.7**	**18.2**	**3.90**	**0.17**	**0.13**	**0.01**	**403.6**	**22.0**	**32.5**	**3.8**
A29	**Mean**	**303.7**	**17.7**	**3.49**	**0.15**	**0.12**	**0.01**	**392.1**	**21.4**	**30.9**	**3.6**
A30	0-2	269.3	15.7	4.39	0.19			342.5	18.7	60.6	7.1
A30	4-6	236.7	13.8	4.02	0.18			353.4	19.3	63.5	7.5
A30	8-10	253.5	14.8	4.26	0.19	0.03	0.00	353.6	19.3	60.9	7.2
A30	14-16	216.4	12.6	2.14	0.09			460.2	25.1	67.0	7.9
A30	**Min**	**216.4**	**12.6**	**2.14**	**0.09**	**0.03**	**0.00**	**342.5**	**18.7**	**60.6**	**7.1**
A30	**Max**	**269.3**	**15.7**	**4.39**	**0.19**	**0.03**	**0.00**	**460.2**	**25.1**	**67.0**	**7.9**
A30	**Mean**	**244.0**	**14.2**	**3.70**	**0.16**	**0.03**	**0.00**	**377.4**	**20.6**	**63.0**	**7.4**
O31	0-2	550.0	32.1	5.14	0.23	0.03	0.00	260.4	14.2	138.2	16.3
O31	4-6	507.6	29.6	6.72	0.30	0.03	0.00	358.7	19.5	107.0	12.6
O31	8-10	494.8	28.8	5.19	0.23	0.03	0.00	281.5	15.3	123.2	14.5
O31	14-16	456.9	26.6	5.65	0.25	<0.02		290.8	15.8	114.1	13.4
O31	**Min**	**456.9**	**26.6**	**5.14**	**0.23**	**0.03**	**0.00**	**260.4**	**14.2**	**107.0**	**12.6**
O31	**Max**	**550.0**	**32.1**	**6.72**	**0.30**	**0.03**	**0.00**	**358.7**	**19.5**	**138.2**	**16.3**
O31	**Mean**	**502.3**	**29.3**	**5.68**	**0.25**	**0.03**	**0.00**	**297.9**	**16.2**	**120.6**	**14.2**
O28	0-2	183.1	10.7	4.46	0.20	0.04	0.00	690.2	37.6	45.9	5.4
O28	4-6	187.5	10.9	3.84	0.17	<0.02		655.4	35.7	44.6	5.2
O28	8-10	190.5	11.1	3.21	0.14	<0.02		676.8	36.9	44.8	5.3
O28	14-16	190.5	11.1	2.52	0.11	<0.02		680.2	37.1	52.5	6.2
O28	**Min**	**183.1**	**10.7**	**2.52**	**0.11**	**0.04**	**0.00**	**655.4**	**35.7**	**44.6**	**5.2**
O28	**Max**	**190.5**	**11.1**	**4.46**	**0.20**	**0.04**	**0.00**	**690.2**	**37.6**	**52.5**	**6.2**
O28	**Mean**	**187.9**	**11.0**	**3.51**	**0.16**	**0.04**	**0.00**	**675.7**	**36.8**	**47.0**	**5.5**
T22	0-2	520.8	30.4	10.01	0.44	<0.02		452.9	24.7	40.3	4.7
T22	4-6	552.5	32.2	8.49	0.38	<0.02		479.1	26.1	41.5	4.9
T22	8-10	535.6	31.2	7.18	0.32	<0.02		470.8	25.7	46.5	5.5
T22	14-16	562.1	32.8	8.89	0.39	0.03	0.00	479.1	26.1	41.6	4.9
T22	**Min**	**520.8**	**30.4**	**7.18**	**0.32**	**0.03**	**0.00**	**452.9**	**24.7**	**40.3**	**4.7**
T22	**Max**	**562.1**	**32.8**	**10.01**	**0.44**	**0.03**	**0.00**	**479.1**	**26.1**	**46.5**	**5.5**
T22	**Mean**	**542.8**	**31.6**	**8.64**	**0.38**	**0.03**	**0.00**	**470.5**	**25.6**	**42.5**	**5.0**
T23	0-2	356.8	20.8	3.83	0.17	0.03	0.00	253.0	13.8	92.1	10.8
T23	4-6	372.1	21.7	2.99	0.13	<0.02		248.6	13.5	87.7	10.3
T23	8-10	367.6	21.4	2.98	0.13	<0.02		264.7	14.4	90.7	10.7
T23	14-16	394.2	23.0	3.19	0.14	0.05	0.00	267.5	14.6	83.5	9.8
T23	**Min**	**356.8**	**20.8**	**2.98**	**0.13**	**0.03**	**0.00**	**248.6**	**13.5**	**83.5**	**9.8**
T23	**Max**	**394.2**	**23.0**	**3.83**	**0.17**	**0.05**	**0.00**	**267.5**	**14.6**	**92.1**	**10.8**
T23	**Mean**	**372.7**	**21.7**	**3.25**	**0.14**	**0.04**	**0.00**	**258.5**	**14.1**	**88.5**	**10.4**
T25	0-2	291.7	17.0	14.83	0.66	<0.02		319.0	17.4	31.3	3.7
T25	2-4	338.2	19.7	9.16	0.40	0.03	0.00	366.4	20.0	31.7	3.7
T25	14-16	358.7	20.9	7.37	0.33	0.04	0.00	389.9	21.2	38.5	4.5
T25	**Min**	**291.7**	**17.0**	**7.37**	**0.33**	**0.03**	**0.00**	**319.0**	**17.4**	**31.3**	**3.7**
T25	**Max**	**358.7**	**20.9**	**14.83**	**0.66**	**0.04**	**0.00**	**389.9**	**21.2**	**38.5**	**4.5**
T25	**Mean**	**329.5**	**19.2**	**10.45**	**0.46**	**0.04**	**0.00**	**358.4**	**19.5**	**33.8**	**4.0**

Continuation: Table 20

		Sr	**(+/-)**	**C_{tot}**	**(+/-)**	**S_{tot}**	**(+/-)**	**Zr**	**(+/-)**	**Ni**	**(+/-)**
Nr.	cm	{µg/g}	5.83 (%)	{wt %}	4.42 (%)	{wt %}	8.22 (%)	{µg/g}	5.45 (%)	{µg/g}	9.94 (%)
		Mdl	0.5	Mdl	0.02	Mdl	0.02	Mdl	0.1	Mdl	0.1
T26	0-2	424.3	24.7	10.93	0.48	0.03	0.00	279.3	15.2	36.5	4.3
T26	4-6	419.8	24.5	9.02	0.40	<0.02		294.0	16.0	33.4	3.9
T26	8-10	465.7	27.2	6.78	0.30	<0.02		315.7	17.2	40.1	4.7
T26	14-16	417.5	24.3	8.06	0.36	<0.02		324.9	17.7	39.1	4.6
T26	**Min**	**417.5**	**24.3**	**6.78**	**0.30**	**0.03**	**0.00**	**279.3**	**15.2**	**33.4**	**3.9**
T26	**Max**	**465.7**	**27.2**	**10.93**	**0.48**	**0.03**	**0.00**	**324.9**	**17.7**	**40.1**	**4.7**
T26	**Mean**	**431.8**	**25.2**	**8.70**	**0.38**	**0.03**	**0.00**	**303.5**	**16.5**	**37.3**	**4.4**
T27	0-2	444.2	25.9	22.66	1.00	0.07	0.01	195.4	10.6	16.4	1.9
T27	4-6	537.7	31.3	15.75	0.70	0.03	0.00	224.1	12.2	16.5	1.9
T27	8-10	567.5	33.1	11.14	0.49	0.12	0.01	287.7	15.7	16.4	1.9
T27	14-16	455.8	26.6	15.01	0.66	0.09	0.01	239.1	13.0	14.8	1.7
T27	**Min**	**444.2**	**25.9**	**11.14**	**0.49**	**0.03**	**0.00**	**195.4**	**10.6**	**14.8**	**1.7**
T27	**Max**	**567.5**	**33.1**	**22.66**	**1.00**	**0.12**	**0.01**	**287.7**	**15.7**	**16.5**	**1.9**
T27	**Mean**	**501.3**	**29.2**	**16.14**	**0.71**	**0.08**	**0.01**	**236.6**	**12.9**	**16.0**	**1.9**

Table 21 The Zn, Pb, Mo and Sb contents of the analysed soils, including min, max and mean values.

		Zn	(+/-)	Cu	(+/-)	Pb	(+/-)	Mo	(+/-)	Sb	(+/-)
Nr.	cm	{µg/g}	8.33 (%)	{µg/g}	9.3 (%)	{µg/g}	7.14 (%)	{µg/g}	6.85 (%)	{µg/g}	4.61 (%)
		Mdl	1	Mdl	0.1	Mdl	0.1	Mdl	0.1	Mdl	0.1
A1	0-2	29	2	5.7	0.5	19.9	1.4	0.6	0.0	0.3	0.0
A1	2-4	38	3	5.0	0.5	33.9	2.4	0.8	0.1	0.4	0.0
A1	4-6	43	4	4.2	0.4	35.9	2.6	0.9	0.1	0.3	0.0
A1	6-8	91	8	5.2	0.5	14.4	1.0	0.5	0.0	<0.1	
A1	14-16	98	8	6.1	0.6	15.3	1.1	0.5	0.0	<0.1	
A1	**Min**	**29**	**2**	**4.2**	**0.4**	**14.4**	**1.0**	**0.5**	**0.0**	**0.3**	**0.0**
A1	**Max**	**98**	**8**	**6.1**	**0.6**	**35.9**	**2.6**	**0.9**	**0.1**	**0.4**	**0.0**
A1	**Mean**	**60**	**5**	**5.2**	**0.5**	**23.9**	**1.7**	**0.7**	**0.0**	**0.3**	**0.0**
A2	0-2	116	10	18.2	1.7	13.8	1.0	0.7	0.0	<0.1	
A2	2-4	127	11	17.2	1.6	13.8	1.0	0.8	0.1	<0.1	
A2	4-6	130	11	14.9	1.4	13.6	1.0	0.6	0.0	<0.1	
A2	6-8	135	11	14.7	1.4	13.7	1.0	0.5	0.0	<0.1	
A2	14-16	131	11	14.7	1.4	13.9	1.0	0.6	0.0	<0.1	
A2	**Min**	**116**	**10**	**14.7**	**1.4**	**13.6**	**1.0**	**0.5**	**0.0**		
A2	**Max**	**135**	**11**	**18.2**	**1.7**	**13.9**	**1.0**	**0.8**	**0.1**		
A2	**Mean**	**128**	**11**	**15.9**	**1.5**	**13.8**	**1.0**	**0.6**	**0.0**		
A8	0-2	40	3	25.4	2.4	20.1	1.4	0.8	0.1	0.5	0.0
A8	2-4	51	4	22.5	2.1	45.9	3.3	1.1	0.1	0.6	0.0
A8	4-6	63	5	28.9	2.7	47.2	3.4	1.0	0.1	0.4	0.0
A8	6-8	71	6	34.5	3.2	41.1	2.9	0.7	0.0	0.3	0.0
A8	14-16	69	6	37.0	3.4	40.0	2.9	1.0	0.1	0.2	0.0
A8	**Min**	**40**	**3**	**22.5**	**2.1**	**20.1**	**1.4**	**0.7**	**0.0**	**0.2**	**0.0**
A8	**Max**	**71**	**6**	**37.0**	**3.4**	**47.2**	**3.4**	**1.1**	**0.1**	**0.6**	**0.0**
A8	**Mean**	**59**	**5**	**29.7**	**2.8**	**38.9**	**2.8**	**0.9**	**0.1**	**0.4**	**0.0**
A9	0-2	73	6	68.1	6.3	9.0	0.6	1.0	0.1	<0.1	
A9	2-4	94	8	75.3	7.0	6.5	0.5	1.0	0.1	<0.1	
A9	4-6	101	8	75.7	7.0	7.3	0.5	0.9	0.1	<0.1	
A9	6-8	97	8	108.3	10.1	7.8	0.6	1.0	0.1	<0.1	
A9	14-16	115	10	79.1	7.4	7.5	0.5	0.9	0.1	<0.1	
A9	**Min**	**73**	**6**	**68.1**	**6.3**	**6.5**	**0.5**	**0.9**	**0.1**		
A9	**Max**	**115**	**10**	**108.3**	**10.1**	**9.0**	**0.6**	**1.0**	**0.1**		
A9	**Mean**	**96**	**8**	**81.3**	**7.6**	**7.6**	**0.5**	**1.0**	**0.1**		
A10	0-2	85	7	17.9	1.7	16.0	1.1	0.5	0.0	0.2	0.0
A10	2-4	86	7	19.6	1.8	29.9	2.1	0.7	0.0	0.3	0.0
A10	4-6	81	7	29.4	2.7	28.4	2.0	1.0	0.1	0.2	0.0
A10	6-8	74	6	30.0	2.8	23.8	1.7	1.1	0.1	0.2	0.0
A10	8-10	74	6	40.1	3.7	12.3	0.9	0.8	0.1	<0.1	
A10	**Min**	**74**	**6**	**17.9**	**1.7**	**12.3**	**0.9**	**0.5**	**0.0**	**0.2**	**0.0**
A10	**Max**	**86**	**7**	**40.1**	**3.7**	**29.9**	**2.1**	**1.1**	**0.1**	**0.3**	**0.0**
A10	**Mean**	**80**	**7**	**27.4**	**2.5**	**22.1**	**1.6**	**0.8**	**0.1**	**0.2**	**0.0**
A14	0-2	71	6	19.5	1.8	15.7	1.1	0.9	0.1	0.2	0.0
A14	2-4	57	5	16.9	1.6	15.5	1.1	0.9	0.1	0.2	0.0
A14	4-6	53	4	13.9	1.3	15.7	1.1	0.9	0.1	<0.1	
A14	6-8	59	5	15.0	1.4	13.5	1.0	1.0	0.1	0.2	0.0
A14	8-10	60	5	13.5	1.3	13.3	0.9	1.0	0.1	<0.1	
A14	**Min**	**53**	**4**	**13.5**	**1.3**	**13.3**	**0.9**	**0.9**	**0.1**	**0.2**	**0.0**
A14	**Max**	**71**	**6**	**19.5**	**1.8**	**15.7**	**1.1**	**1.0**	**0.1**	**0.2**	**0.0**
A14	**Mean**	**60**	**5**	**15.8**	**1.5**	**14.7**	**1.1**	**0.9**	**0.1**	**0.2**	**0.0**

Continuation: Table 21

		Zn	(+/-)	Cu	(+/-)	Pb	(+/-)	Mo	(+/-)	Sb	(+/-)
Nr.	cm	{µg/g}	8.33 (%)	{µg/g}	9.3 (%)	{µg/g}	7.14 (%)	{µg/g}	6.85 (%)	{µg/g}	4.61 (%)
		Mdl	1	Mdl	0.1	Mdl	0.1	Mdl	0.1	Mdl	0.1
A15	0-2	94	8	33.3	3.1	16.1	1.1	1.2	0.1	<0.1	
A15	2-4	107	9	39.5	3.7	19.4	1.4	1.3	0.1	<0.1	
A15	4-6	116	10	42.7	4.0	20.5	1.5	1.4	0.1	<0.1	
A15	6-8	104	9	37.7	3.5	18.1	1.3	1.5	0.1	<0.1	
A15	8-10	108	9	40.7	3.8	16.1	1.1	1.7	0.1	<0.1	
A15	14-16	99	8	39.2	3.6	14.5	1.0	1.5	0.1	<0.1	
A15	**Min**	**94**	**8**	**33.3**	**3.1**	**14.5**	**1.0**	**1.2**	**0.1**		
A15	**Max**	**116**	**10**	**42.7**	**4.0**	**20.5**	**1.5**	**1.7**	**0.1**		
A15	**Mean**	**105**	**9**	**38.9**	**3.6**	**17.5**	**1.2**	**1.4**	**0.1**		
A16	0-2	102	8	32.6	3.0	13.7	1.0	0.8	0.1	<0.1	
A16	2-4	109	9	35.3	3.3	16.5	1.2	0.8	0.1	<0.1	
A16	4-6	106	9	36.9	3.4	19.6	1.4	0.7	0.0	<0.1	
A16	6-8	112	9	35.3	3.3	24.1	1.7	0.9	0.1	<0.1	
A16	8-10	126	10	36.9	3.4	23.3	1.7	0.8	0.1	<0.1	
A16	14-16	130	11	36.4	3.4	13.3	0.9	0.6	0.0	<0.1	
A16	**Min**	**102**	**8**	**32.6**	**3.0**	**13.3**	**0.9**	**0.6**	**0.0**		
A16	**Max**	**130**	**11**	**36.9**	**3.4**	**24.1**	**1.7**	**0.9**	**0.1**		
A16	**Mean**	**114**	**10**	**35.6**	**3.3**	**18.4**	**1.3**	**0.8**	**0.1**		
A17	0-2	73	6	16.2	1.5	18.0	1.3	1.1	0.1	0.2	0.0
A17	2-4	87	7	17.7	1.6	18.2	1.3	1.3	0.1	0.2	0.0
A17	4-6	97	8	18.2	1.7	20.3	1.4	1.2	0.1	<0.1	
A17	6-8	98	8	17.0	1.6	35.8	2.6	1.1	0.1	<0.1	
A17	8-10	103	9	17.5	1.6	58.3	4.2	1.2	0.1	0.4	0.0
A17	14-16	110	9	17.8	1.7	15.9	1.1	1.1	0.1	<0.1	
A17	**Min**	**73**	**6**	**16.2**	**1.5**	**15.9**	**1.1**	**1.1**	**0.1**	**0.2**	**0.0**
A17	**Max**	**110**	**9**	**18.2**	**1.7**	**58.3**	**4.2**	**1.3**	**0.1**	**0.4**	**0.0**
A17	**Mean**	**95**	**8**	**17.4**	**1.6**	**27.8**	**2.0**	**1.2**	**0.1**	**0.3**	**0.0**
A19	0-2	36	3	19.3	1.8	10.6	0.8	0.5	0.0	0.2	0.0
A19	2-4	33	3	19.2	1.8	12.6	0.9	0.5	0.0	<0.1	
A19	4-6	46	4	28.2	2.6	12.8	0.9	0.7	0.0	<0.1	
A19	6-8	55	5	35.3	3.3	10.7	0.8	0.7	0.0	<0.1	
A19	8-10	62	5	41.5	3.9	7.7	0.5	0.7	0.0	<0.1	
A19	14-16	62	5	37.6	3.5	7.6	0.5	0.7	0.0	0.2	0.0
A19	**Min**	**33**	**3**	**19.2**	**1.8**	**7.6**	**0.5**	**0.5**	**0.0**	**0.2**	**0.0**
A19	**Max**	**62**	**5**	**41.5**	**3.9**	**12.8**	**0.9**	**0.7**	**0.0**	**0.2**	**0.0**
A19	**Mean**	**49**	**4**	**30.2**	**2.8**	**10.3**	**0.7**	**0.6**	**0.0**	**0.2**	**0.0**
O5	0-2	44	4	31.5	2.9	8.4	0.6	0.5	0.0	0.2	0.0
O5	2-4	48	4	38.6	3.6	8.1	0.6	0.5	0.0	<0.1	
O5	4-6	46	4	43.2	4.0	12.5	0.9	0.5	0.0	<0.1	
O5	6-8	49	4	45.3	4.2	13.0	0.9	0.5	0.0	<0.1	
O5	14-16	50	4	49.8	4.6	9.2	0.7	0.5	0.0	<0.1	
O5	**Min**	**44**	**4**	**31.5**	**2.9**	**8.1**	**0.6**	**0.5**	**0.0**	**0.2**	**0.0**
O5	**Max**	**50**	**4**	**49.8**	**4.6**	**13.0**	**0.9**	**0.5**	**0.0**	**0.2**	**0.0**
O5	**Mean**	**47**	**4**	**41.7**	**3.9**	**10.2**	**0.7**	**0.5**	**0.0**	**0.2**	**0.0**

Continuation: Table 21

Nr.	cm	Zn {µg/g} Mdl	(+/-) 8.33 (%) 1	Cu {µg/g} Mdl	(+/-) 9.3 (%) 0.1	Pb {µg/g} Mdl	(+/-) 7.14 (%) 0.1	Mo {µg/g} Mdl	(+/-) 6.85 (%) 0.1	Sb {µg/g} Mdl	(+/-) 4.61 (%) 0.1
O6	0-2	71	6	20.8	1.9	11.4	0.8	0.9	0.1	<0.1	
O6	2-4	73	6	21.2	2.0	10.6	0.8	0.8	0.1	<0.1	
O6	4-6	76	6	21.5	2.0	10.4	0.7	0.7	0.0	<0.1	
O6	6-8	74	6	19.0	1.8	9.8	0.7	0.8	0.1	<0.1	
O6	14-16	75	6	17.9	1.7	8.0	0.6	0.7	0.0	<0.1	
O6	**Min**	**71**	**6**	**17.9**	**1.7**	**8.0**	**0.6**	**0.7**	**0.0**		
O6	**Max**	**76**	**6**	**21.5**	**2.0**	**11.4**	**0.8**	**0.9**	**0.1**		
O6	**Mean**	**74**	**6**	**20.1**	**1.9**	**10.0**	**0.7**	**0.8**	**0.1**		
O7	0-2	60	5	44.9	4.2	16.9	1.2	0.5	0.0	0.2	0.0
O7	2-4	56	5	40.1	3.7	17.4	1.2	0.5	0.0	0.2	0.0
O7	4-6	61	5	42.1	3.9	15.7	1.1	0.5	0.0	0.2	0.0
O7	6-8	60	5	42.2	3.9	15.2	1.1	0.6	0.0	0.2	0.0
O7	14-16	58	5	42.7	4.0	14.6	1.0	0.4	0.0	0.2	0.0
O7	**Min**	**56**	**5**	**40.1**	**3.7**	**14.6**	**1.0**	**0.4**	**0.0**	**0.2**	**0.0**
O7	**Max**	**61**	**5**	**44.9**	**4.2**	**17.4**	**1.2**	**0.6**	**0.0**	**0.2**	**0.0**
O7	**Mean**	**59**	**5**	**42.4**	**3.9**	**16.0**	**1.1**	**0.5**	**0.0**	**0.2**	**0.0**
T3	0-2	77	6	82.1	7.6	7.1	0.5	0.6	0.0	<0.1	
T3	2-4	83	7	89.1	8.3	6.7	0.5	0.5	0.0	<0.1	
T3	4-6	83	7	86.7	8.1	6.3	0.4	0.3	0.0	<0.1	
T3	6-8	84	7	86.8	8.1	5.9	0.4	0.4	0.0	<0.1	
T3	14-16	89	7	90.8	8.4	4.9	0.3	0.3	0.0	<0.1	
T3	**Min**	**77**	**6**	**82.1**	**7.6**	**4.9**	**0.3**	**0.3**	**0.0**		
T3	**Max**	**89**	**7**	**90.8**	**8.4**	**7.1**	**0.5**	**0.6**	**0.0**		
T3	**Mean**	**83**	**7**	**87.1**	**8.1**	**6.2**	**0.4**	**0.4**	**0.0**		
T4	0-2	94	8	65.1	6.1	12.2	0.9	0.6	0.0	<0.1	
T4	2-4	86	7	67.1	6.2	9.8	0.7	0.5	0.0	<0.1	
T4	4-6	88	7	63.4	5.9	10.6	0.8	0.6	0.0	<0.1	
T4	6-8	88	7	66.3	6.2	9.9	0.7	0.7	0.0	<0.1	
T4	14-16	91	8	73.2	6.8	9.4	0.7	0.7	0.0	<0.1	
T4	**Min**	**86**	**7**	**63.4**	**5.9**	**9.4**	**0.7**	**0.5**	**0.0**		
T4	**Max**	**94**	**8**	**73.2**	**6.8**	**12.2**	**0.9**	**0.7**	**0.0**		
T4	**Mean**	**89**	**7**	**67.0**	**6.2**	**10.4**	**0.7**	**0.6**	**0.0**		
T11	0-2	64	5	33.3	3.1	9.4	0.7	0.6	0.0	<0.1	
T11	2-4	59	5	33.3	3.1	10.9	0.8	0.6	0.0	<0.1	
T11	4-6	69	6	39.3	3.7	9.2	0.7	0.7	0.0	<0.1	
T11	6-8	69	6	37.7	3.5	8.5	0.6	0.5	0.0	<0.1	
T11	8-10	67	6	38.6	3.6	9.4	0.7	0.6	0.0	<0.1	
T11	**Min**	**59**	**5**	**33.3**	**3.1**	**8.5**	**0.6**	**0.5**	**0.0**		
T11	**Max**	**69**	**6**	**39.3**	**3.7**	**10.9**	**0.8**	**0.7**	**0.0**		
T11	**Mean**	**66**	**5**	**36.4**	**3.4**	**9.5**	**0.7**	**0.6**	**0.0**		
T12	0-2	56	5	63.1	5.9	7.9	0.6	0.5	0.0	<0.1	
T12	2-4	55	5	65.3	6.1	12.0	0.9	0.5	0.0	<0.1	
T12	4-6	50	4	63.8	5.9	11.0	0.8	0.6	0.0	<0.1	
T12	6-8	55	5	67.8	6.3	12.1	0.9	0.5	0.0	<0.1	
T12	8-10	58	5	75.8	7.0	8.0	0.6	0.3	0.0	<0.1	
T12	**Min**	**50**	**4**	**63.1**	**5.9**	**7.9**	**0.6**	**0.3**	**0.0**		
T12	**Max**	**58**	**5**	**75.8**	**7.0**	**12.1**	**0.9**	**0.6**	**0.0**		
T12	**Mean**	**55**	**5**	**67.2**	**6.2**	**10.2**	**0.7**	**0.5**	**0.0**		

Continuation: Table 21

Nr.	cm	Zn {µg/g} Mdl	(+/-) 8.33 (%) 1	Cu {µg/g} Mdl	(+/-) 9.3 (%) 0.1	Pb {µg/g} Mdl	(+/-) 7.14 (%) 0.1	Mo {µg/g} Mdl	(+/-) 6.85 (%) 0.1	Sb {µg/g} Mdl	(+/-) 4.61 (%) 0.1
A29	0-2	55	5	66.8	6.2	11.6	0.8	0.4	0.0	<0.1	
A29	4-6	54	4	48.0	4.5	10.1	0.7	0.4	0.0	<0.1	
A29	8-10	54	4	51.3	4.8	10.0	0.7	0.4	0.0	<0.1	
A29	14-16	56	5	49.4	4.6	10.9	0.8	0.4	0.0	<0.1	
A29	**Min**	**54**	**4**	**48.0**	**4.5**	**10.0**	**0.7**	**0.4**	**0.0**		
A29	**Max**	**56**	**5**	**66.8**	**6.2**	**11.6**	**0.8**	**0.4**	**0.0**		
A29	**Mean**	**55**	**5**	**53.9**	**5.0**	**10.7**	**0.8**	**0.4**	**0.0**		
A30	0-2	78	6	54.5	5.1	10.6	0.8	0.8	0.1	<0.1	
A30	4-6	74	6	54.1	5.0	10.5	0.7	0.7	0.0	<0.1	
A30	8-10	81	7	51.6	4.8	10.9	0.8	0.7	0.0	<0.1	
A30	14-16	62	5	49.5	4.6	10.1	0.7	0.8	0.1	<0.1	
A30	**Min**	**62**	**5**	**49.5**	**4.6**	**10.1**	**0.7**	**0.7**	**0.0**		
A30	**Max**	**81**	**7**	**54.5**	**5.1**	**10.9**	**0.8**	**0.8**	**0.1**		
A30	**Mean**	**74**	**6**	**52.4**	**4.9**	**10.5**	**0.8**	**0.8**	**0.1**		
O31	0-2	72	6	36.0	3.3	7.7	0.5	0.5	0.0	<0.1	
O31	4-6	74	6	38.9	3.6	9.1	0.6	0.6	0.0	<0.1	
O31	8-10	80	7	40.9	3.8	8.8	0.6	0.8	0.1	<0.1	
O31	14-16	79	7	43.3	4.0	9.4	0.7	0.7	0.0	<0.1	
O31	**Min**	**72**	**6**	**36.0**	**3.3**	**7.7**	**0.5**	**0.5**	**0.0**		
O31	**Max**	**80**	**7**	**43.3**	**4.0**	**9.4**	**0.7**	**0.8**	**0.1**		
O31	**Mean**	**76**	**6**	**39.8**	**3.7**	**8.8**	**0.6**	**0.7**	**0.0**		
O28	0-2	78	6	25.5	2.4	19.0	1.4	0.9	0.1	<0.1	
O28	4-6	74	6	24.8	2.3	18.5	1.3	0.9	0.1	<0.1	
O28	8-10	73	6	24.2	2.3	18.7	1.3	0.9	0.1	<0.1	
O28	14-16	73	6	24.1	2.2	19.1	1.4	1.0	0.1	<0.1	
O28	**Min**	**73**	**6**	**24.1**	**2.2**	**18.5**	**1.3**	**0.9**	**0.1**		
O28	**Max**	**78**	**6**	**25.5**	**2.4**	**19.1**	**1.4**	**1.0**	**0.1**		
O28	**Mean**	**75**	**6**	**24.7**	**2.3**	**18.8**	**1.3**	**0.9**	**0.1**		
T22	0-2	69	6	26.3	2.4	8.9	0.6	0.6	0.0	<0.1	
T22	4-6	66	5	26.6	2.5	8.9	0.6	0.6	0.0	<0.1	
T22	8-10	69	6	28.4	2.6	9.7	0.7	0.6	0.0	<0.1	
T22	14-16	69	6	27.1	2.5	10.0	0.7	0.6	0.0	<0.1	
T22	**Min**	**66**	**5**	**26.3**	**2.4**	**8.9**	**0.6**	**0.6**	**0.0**		
T22	**Max**	**69**	**6**	**28.4**	**2.6**	**10.0**	**0.7**	**0.6**	**0.0**		
T22	**Mean**	**68**	**6**	**27.1**	**2.5**	**9.4**	**0.7**	**0.6**	**0.0**		
T23	0-2	79	7	70.0	6.5	27.5	2.0	0.4	0.0	<0.1	
T23	4-6	75	6	66.7	6.2	5.3	0.4	0.4	0.0	<0.1	
T23	8-10	74	6	66.5	6.2	5.1	0.4	0.4	0.0	<0.1	
T23	14-16	76	6	67.7	6.3	5.7	0.4	0.4	0.0	<0.1	
T23	**Min**	**74**	**6**	**66.5**	**6.2**	**5.1**	**0.4**	**0.4**	**0.0**		
T23	**Max**	**79**	**7**	**70.0**	**6.5**	**27.5**	**2.0**	**0.4**	**0.0**		
T23	**Mean**	**76**	**6**	**67.7**	**6.3**	**10.9**	**0.8**	**0.4**	**0.0**		
T25	0-2	120	10	42.4	3.9	14.9	1.1	0.9	0.1	<0.1	
T25	2-4	106	9	35.9	3.3	12.3	0.9	0.8	0.1	<0.1	
T25	14-16	113	9	32.1	3.0	12.0	0.9	0.9	0.1	<0.1	
T25	**Min**	**106**	**9**	**32.1**	**3.0**	**12.0**	**0.9**	**0.8**	**0.1**		
T25	**Max**	**120**	**10**	**42.4**	**3.9**	**14.9**	**1.1**	**0.9**	**0.1**		
T25	**Mean**	**113**	**9**	**36.8**	**3.4**	**13.1**	**0.9**	**0.9**	**0.1**		

Continuation: Table 21

		Zn	(+/-)	Cu	(+/-)	Pb	(+/-)	Mo	(+/-)	Sb	(+/-)
Nr.	cm	{µg/g}	8.33 (%)	{µg/g}	9.3 (%)	{µg/g}	7.14 (%)	{µg/g}	6.85 (%)	{µg/g}	4.61 (%)
		Mdl	1	Mdl	0.1	Mdl	0.1	Mdl	0.1	Mdl	0.1
T26	0-2	87	7	38.9	3.6	14.0	1.0	0.8	0.1	0.2	0.0
T26	4-6	82	7	37.9	3.5	11.0	0.8	0.7	0.0	0.2	0.0
T26	8-10	86	7	43.1	4.0	10.8	0.8	0.6	0.0	<0.1	
T26	14-16	101	8	49.7	4.6	13.2	0.9	0.9	0.1	<0.1	
T26	**Min**	**82**	**7**	**37.9**	**3.5**	**10.8**	**0.8**	**0.6**	**0.0**	**0.2**	**0.0**
T26	**Max**	**101**	**8**	**49.7**	**4.6**	**14.0**	**1.0**	**0.9**	**0.1**	**0.2**	**0.0**
T26	**Mean**	**89**	**7**	**42.4**	**3.9**	**12.3**	**0.9**	**0.8**	**0.1**	**0.2**	**0.0**
T27	0-2	85	7	29.6	2.8	6.7	0.5	0.5	0.0	<0.1	
T27	4-6	89	7	30.3	2.8	8.2	0.6	0.5	0.0	<0.1	
T27	8-10	80	7	30.1	2.8	8.6	0.6	0.6	0.0	<0.1	
T27	14-16	82	7	28.3	2.6	8.6	0.6	0.6	0.0	<0.1	
T27	**Min**	**80**	**7**	**28.3**	**2.6**	**6.7**	**0.5**	**0.5**	**0.0**		
T27	**Max**	**89**	**7**	**30.3**	**2.8**	**8.6**	**0.6**	**0.6**	**0.0**		
T27	**Mean**	**84**	**7**	**29.6**	**2.8**	**8.0**	**0.6**	**0.6**	**0.0**		

Table 22 The Cd, Hg and LOI contents of the analysed soils, including min, max and mean values.

		Cd	**(+/-)**	**Hg**	**(+/-)**	**LOI**	**(+/-)**
Nr.	cm	{µg/g}	7.85 (%)	{µg/g}	14.88 (%)	{wt %}	0.57 (%)
		Mdl	0.1	Mdl	0.01		
A1	0-2	<0.1		0.32	0.05	81.4	0.5
A1	2-4	<0.1		0.36	0.05	77.3	0.4
A1	4-6	<0.1		0.28	0.04	70.1	0.4
A1	6-8	0.2	0.0	0.11	0.02	58.4	0.3
A1	14-16	0.3	0.0	0.12	0.02	33.8	0.2
A1	**Min**	**0.2**	**0.0**	**0.11**	**0.02**	**33.8**	**0.2**
A1	**Max**	**0.3**	**0.0**	**0.36**	**0.05**	**81.4**	**0.5**
A1	**Mean**	**0.3**	**0.0**	**0.24**	**0.04**	**64.2**	**0.4**
A2	0-2	0.2	0.0	0.12	0.02	29.3	0.2
A2	2-4	0.2	0.0	0.09	0.01	21.1	0.1
A2	4-6	0.2	0.0	0.08	0.01	19.4	0.1
A2	6-8	0.2	0.0	0.07	0.01	18.1	0.1
A2	14-16	0.3	0.0	0.10	0.01	19.3	0.1
A2	**Min**	**0.2**	**0.0**	**0.07**	**0.01**	**18.1**	**0.1**
A2	**Max**	**0.3**	**0.0**	**0.12**	**0.02**	**29.3**	**0.2**
A2	**Mean**	**0.2**	**0.0**	**0.09**	**0.01**	**21.4**	**0.1**
A8	0-2	0.2	0.0	0.31	0.05	76.2	0.4
A8	2-4	<0.1		0.46	0.07	71.0	0.4
A8	4-6	0.2	0.0	0.43	0.06	57.6	0.3
A8	6-8	0.2	0.0	0.29	0.04	42.8	0.2
A8	14-16	0.3	0.0	0.28	0.04	42.9	0.2
A8	**Min**	**0.2**	**0.0**	**0.28**	**0.04**	**42.8**	**0.2**
A8	**Max**	**0.3**	**0.0**	**0.46**	**0.07**	**76.2**	**0.4**
A8	**Mean**	**0.2**	**0.0**	**0.35**	**0.05**	**58.1**	**0.3**
A9	0-2	0.2	0.0	0.23	0.03	49.6	0.3
A9	2-4	0.2	0.0	0.14	0.02	26.7	0.2
A9	4-6	0.2	0.0	0.08	0.01	20.4	0.1
A9	6-8	0.2	0.0	0.08	0.01	20.7	0.1
A9	14-16	0.2	0.0	0.07	0.01	20.8	0.1
A9	**Min**	**0.2**	**0.0**	**0.07**	**0.01**	**20.4**	**0.1**
A9	**Max**	**0.2**	**0.0**	**0.23**	**0.03**	**49.6**	**0.3**
A9	**Mean**	**0.2**	**0.0**	**0.12**	**0.02**	**27.6**	**0.2**
A10	0-2	<0.1		0.20	0.03	85.3	0.5
A10	2-4	<0.1		0.25	0.04	79.0	0.5
A10	4-6	0.2	0.0	0.26	0.04	61.1	0.3
A10	6-8	0.2	0.0	0.23	0.03	58.4	0.3
A10	8-10	0.3	0.0	0.18	0.03	38.3	0.2
A10	**Min**	**0.2**	**0.0**	**0.18**	**0.03**	**38.3**	**0.2**
A10	**Max**	**0.3**	**0.0**	**0.26**	**0.04**	**85.3**	**0.5**
A10	**Mean**	**0.2**	**0.0**	**0.22**	**0.03**	**64.4**	**0.4**
A14	0-2	0.4	0.0	0.28	0.04	60.2	0.3
A14	2-4	0.3	0.0	0.24	0.04	53.3	0.3
A14	4-6	0.2	0.0	0.23	0.03	48.0	0.3
A14	6-8	0.2	0.0	0.21	0.03	44.5	0.3
A14	8-10	0.2	0.0	0.21	0.03	45.2	0.3
A14	**Min**	**0.2**	**0.0**	**0.21**	**0.03**	**44.5**	**0.3**
A14	**Max**	**0.4**	**0.0**	**0.28**	**0.04**	**60.2**	**0.3**
A14	**Mean**	**0.3**	**0.0**	**0.23**	**0.03**	**50.2**	**0.3**

Continuation: Table 22

		Cd	**(+/-)**	**Hg**	**(+/-)**	**LOI**	**(+/-)**
Nr.	cm	{µg/g}	7.85 (%)	{µg/g}	14.88 (%)	{wt %}	0.57 (%)
		Mdl	0.1	Mdl	0.01		
A15	0-2			0.17	0.03	28.1	0.2
A15	2-4	0.2	0.0	0.20	0.03	25.0	0.1
A15	4-6	0.2	0.0	0.21	0.03	23.1	0.1
A15	6-8	<0.1		0.20	0.03	23.2	0.1
A15	8-10	<0.1		0.20	0.03	21.7	0.1
A15	14-16	<0.1		0.18	0.03	21.8	0.1
A15	**Min**	**0.2**	**0.0**	**0.17**	**0.03**	**21.7**	**0.1**
A15	**Max**	**0.2**	**0.0**	**0.21**	**0.03**	**28.1**	**0.2**
A15	**Mean**	**0.2**	**0.0**	**0.19**	**0.03**	**23.8**	**0.1**
A16	0-2	0.3	0.0	0.19	0.03	42.2	0.2
A16	2-4	0.3	0.0	0.16	0.02	33.4	0.2
A16	4-6	0.2	0.0	0.17	0.03	29.6	0.2
A16	6-8	0.2	0.0	0.15	0.02	24.4	0.1
A16	8-10	0.2	0.0	0.15	0.02	22.8	0.1
A16	14-16	<0.1		0.12	0.02	19.1	0.1
A16	**Min**	**0.2**	**0.0**	**0.12**	**0.02**	**19.1**	**0.1**
A16	**Max**	**0.3**	**0.0**	**0.19**	**0.03**	**42.2**	**0.2**
A16	**Mean**	**0.2**	**0.0**	**0.16**	**0.02**	**28.6**	**0.2**
A17	0-2	0.3	0.0	0.29	0.04	59.9	0.3
A17	2-4	0.3	0.0	0.19	0.03	50.1	0.3
A17	4-6	0.5	0.0	0.17	0.03	44.6	0.3
A17	6-8	0.4	0.0	0.16	0.02	44.1	0.3
A17	8-10	0.4	0.0	0.13	0.02	41.3	0.2
A17	14-16	0.4	0.0	0.14	0.02	39.1	0.2
A17	**Min**	**0.3**	**0.0**	**0.13**	**0.02**	**39.1**	**0.2**
A17	**Max**	**0.5**	**0.0**	**0.29**	**0.04**	**59.9**	**0.3**
A17	**Mean**	**0.4**	**0.0**	**0.18**	**0.03**	**46.5**	**0.3**
A19	0-2	<0.1		0.33	0.05	81.4	0.5
A19	2-4	<0.1		0.32	0.05	76.8	0.4
A19	4-6	<0.1		0.27	0.04	60.0	0.3
A19	6-8	<0.1		0.19	0.03	47.6	0.3
A19	8-10	0.2	0.0	0.12	0.02	35.3	0.2
A19	14-16	0.3	0.0	0.13	0.02	37.4	0.2
A19	**Min**	**0.2**	**0.0**	**0.12**	**0.02**	**35.3**	**0.2**
A19	**Max**	**0.3**	**0.0**	**0.33**	**0.05**	**81.4**	**0.5**
A19	**Mean**	**0.3**	**0.0**	**0.23**	**0.03**	**56.4**	**0.3**
O5	0-2	<0.1		0.15	0.02	60.4	0.3
O5	2-4	<0.1	0.0	0.14	0.02	48.4	0.3
O5	4-6	<0.1		0.17	0.03	45.3	0.3
O5	6-8	0.2	0.0	0.13	0.02	37.5	0.2
O5	14-16	<0.1		0.12	0.02	34.4	0.2
O5	**Min**	**0.2**	**0.0**	**0.12**	**0.02**	**34.4**	**0.2**
O5	**Max**	**0.2**	**0.0**	**0.17**	**0.03**	**60.4**	**0.3**
O5	**Mean**	**0.2**	**0.0**	**0.14**	**0.02**	**45.2**	**0.3**

Continuation: Table 22

		Cd	(+/-)	Hg	(+/-)	LOI	(+/-)
Nr.	cm	{µg/g}	7.85 (%)	{µg/g}	14.88 (%)	{wt %}	0.57 (%)
		Mdl	0.1	Mdl	0.01		
O6	0-2	<0.1		0.09	0.01	31.8	0.2
O6	2-4	0.2	0.0	0.08	0.01	28.1	0.2
O6	4-6	0.2	0.0	0.08	0.01	25.2	0.1
O6	6-8	0.2	0.0	0.09	0.01	27.6	0.2
O6	14-16	<0.1		0.06	0.01	22.0	0.1
O6	**Min**	**0.2**	**0.0**	**0.06**	**0.01**	**22.0**	**0.1**
O6	**Max**	**0.2**	**0.0**	**0.09**	**0.01**	**31.8**	**0.2**
O6	**Mean**	**0.2**	**0.0**	**0.08**	**0.01**	**26.9**	**0.2**
O7	0-2	<0.1		0.21	0.03	51.9	0.3
O7	2-4	0.2	0.0	0.20	0.03	46.3	0.3
O7	4-6	0.3	0.0	0.18	0.03	40.4	0.2
O7	6-8	0.2	0.0	0.24	0.04	48.4	0.3
O7	14-16	<0.1		0.18	0.03	39.1	0.2
O7	**Min**	**0.2**	**0.0**	**0.18**	**0.03**	**39.1**	**0.2**
O7	**Max**	**0.3**	**0.0**	**0.24**	**0.04**	**51.9**	**0.3**
O7	**Mean**	**0.2**	**0.0**	**0.20**	**0.03**	**45.2**	**0.3**
T3	0-2	<0.1		0.12	0.02	34.9	0.2
T3	2-4	<0.1		0.11	0.02	29.5	0.2
T3	4-6	<0.1		0.11	0.02	27.7	0.2
T3	6-8	<0.1		0.08	0.01	24.9	0.1
T3	14-16	<0.1		0.07	0.01	21.2	0.1
T3	**Min**			**0.07**	**0.01**	**21.2**	**0.1**
T3	**Max**			**0.12**	**0.02**	**34.9**	**0.2**
T3	**Mean**			**0.10**	**0.01**	**27.6**	**0.2**
T4	0-2	0.2	0.0	0.13	0.02	30.1	0.2
T4	2-4	0.2	0.0	0.11	0.02	26.1	0.1
T4	4-6	0.2	0.0	0.11	0.02	26.6	0.2
T4	6-8	0.2	0.0	0.12	0.02	25.6	0.1
T4	14-16	0.2	0.0	0.09	0.01	24.8	0.1
T4	**Min**	**0.2**	**0.0**	**0.09**	**0.01**	**24.8**	**0.1**
T4	**Max**	**0.2**	**0.0**	**0.13**	**0.02**	**30.1**	**0.2**
T4	**Mean**	**0.2**	**0.0**	**0.11**	**0.02**	**26.6**	**0.2**
T11	0-2	<0.1		0.14	0.02	49.8	0.3
T11	2-4	0.2	0.0	0.16	0.02	48.4	0.3
T11	4-6	0.3	0.0	0.13	0.02	39.2	0.2
T11	6-8	0.2	0.0	0.12	0.02	37.6	0.2
T11	8-10	0.2	0.0	0.12	0.02	39.7	0.2
T11	**Min**	**0.2**	**0.0**	**0.12**	**0.02**	**37.6**	**0.2**
T11	**Max**	**0.3**	**0.0**	**0.16**	**0.02**	**49.8**	**0.3**
T11	**Mean**	**0.2**	**0.0**	**0.13**	**0.02**	**42.9**	**0.2**
T12	0-2	0.2	0.0	0.09	0.01	33.8	0.2
T12	2-4	<0.1		0.12	0.02	39.0	0.2
T12	4-6	<0.1		0.12	0.02	37.7	0.2
T12	6-8	<0.1		0.11	0.02	34.3	0.2
T12	8-10	<0.1		0.07	0.01	24.5	0.1
T12	**Min**	**0.2**	**0.0**	**0.07**	**0.01**	**24.5**	**0.1**
T12	**Max**	**0.2**	**0.0**	**0.12**	**0.02**	**39.0**	**0.2**
T12	**Mean**	**0.2**	**0.0**	**0.10**	**0.02**	**33.9**	**0.2**

Continuation: Table 22

Nr.	cm	Cd {µg/g} Mdl	(+/-) 7.85 (%) 0.1	Hg {µg/g} Mdl	(+/-) 14.88 (%) 0.01	LOI {wt %}	(+/-) 0.57 (%)
A29	0-2	0.2	0.0	0.09	0.01	15.8	0.1
A29	4-6	<0.1		0.09	0.01	15.6	0.1
A29	8-10	0.2	0.0	0.09	0.01	15.8	0.1
A29	14-16	<0.1		0.11	0.02	17.3	0.1
A29	**Min**	**0.2**	**0.0**	**0.09**	**0.01**	**15.6**	**0.1**
A29	**Max**	**0.2**	**0.0**	**0.11**	**0.02**	**17.3**	**0.1**
A29	**Mean**	**0.2**	**0.0**	**0.10**	**0.01**	**16.1**	**0.1**
A30	0-2	0.2	0.0	0.08	0.01	18.1	0.1
A30	4-6	0.2	0.0	0.09	0.01	17.5	0.1
A30	8-10	0.2	0.0	0.09	0.01	18.2	0.1
A30	14-16	<0.1		0.08	0.01	14.7	0.1
A30	**Min**	**0.2**	**0.0**	**0.08**	**0.01**	**14.7**	**0.1**
A30	**Max**	**0.2**	**0.0**	**0.09**	**0.01**	**18.2**	**0.1**
A30	**Mean**	**0.2**	**0.0**	**0.09**	**0.01**	**17.1**	**0.1**
O31	0-2	<0.1		0.05	0.01	15.3	0.1
O31	4-6	0.2	0.0	0.08	0.01	18.3	0.1
O31	8-10	0.2	0.0	0.08	0.01	16.9	0.1
O31	14-16	0.2	0.0	0.08	0.01	19.0	0.1
O31	**Min**	**0.2**	**0.0**	**0.05**	**0.01**	**15.3**	**0.1**
O31	**Max**	**0.2**	**0.0**	**0.08**	**0.01**	**19.0**	**0.1**
O31	**Mean**	**0.2**	**0.0**	**0.07**	**0.01**	**17.4**	**0.1**
O28	0-2	0.3	0.0	0.09	0.01	16.1	0.1
O28	4-6	0.3	0.0	0.11	0.02	15.3	0.1
O28	8-10	0.3	0.0	0.09	0.01	14.6	0.1
O28	14-16	0.2	0.0	0.11	0.02	13.1	0.1
O28	**Min**	**0.2**	**0.0**	**0.09**	**0.01**	**13.1**	**0.1**
O28	**Max**	**0.3**	**0.0**	**0.11**	**0.02**	**16.1**	**0.1**
O28	**Mean**	**0.3**	**0.0**	**0.10**	**0.01**	**14.8**	**0.1**
T22	0-2	0.2	0.0	0.11	0.02	26.8	0.2
T22	4-6	0.2	0.0	0.12	0.02	24.4	0.1
T22	8-10	0.3	0.0	0.11	0.02	22.2	0.1
T22	14-16	0.2	0.0	0.16	0.02	25.0	0.1
T22	**Min**	**0.2**	**0.0**	**0.11**	**0.02**	**22.2**	**0.1**
T22	**Max**	**0.3**	**0.0**	**0.16**	**0.02**	**26.8**	**0.2**
T22	**Mean**	**0.2**	**0.0**	**0.13**	**0.02**	**24.6**	**0.1**
T23	0-2	0.2	0.0	0.05	0.01	13.3	0.1
T23	4-6	0.2	0.0	0.04	0.01	11.3	0.1
T23	8-10	0.2	0.0	0.05	0.01	11.5	0.1
T23	14-16	0.3	0.0	0.05	0.01	12.2	0.1
T23	**Min**	**0.2**	**0.0**	**0.04**	**0.01**	**11.3**	**0.1**
T23	**Max**	**0.3**	**0.0**	**0.05**	**0.01**	**13.3**	**0.1**
T23	**Mean**	**0.2**	**0.0**	**0.05**	**0.01**	**12.1**	**0.1**
T25	0-2	0.3	0.0	0.09	0.01	34.7	0.2
T25	2-4	0.3	0.0	0.06	0.01	25.2	0.1
T25	14-16	0.3	0.0	0.05	0.01	22.4	0.1
T25	**Min**	**0.3**	**0.0**	**0.05**	**0.01**	**22.4**	**0.1**
T25	**Max**	**0.3**	**0.0**	**0.09**	**0.01**	**34.7**	**0.2**
T25	**Mean**	**0.3**	**0.0**	**0.07**	**0.01**	**27.4**	**0.2**

Continuation: Table 22

		Cd	**(+/-)**	**Hg**	**(+/-)**	**LOI**	**(+/-)**
Nr.	cm	{µg/g}	7.85 (%)	{µg/g}	14.88 (%)	{wt %}	0.57 (%)
		Mdl	0.1	Mdl	0.01		
T26	0-2	0.3	0.0	0.10	0.01	26.3	0.1
T26	4-6	0.2	0.0	0.10	0.01	23.0	0.1
T26	8-10	0.3	0.0	0.09	0.01	19.5	0.1
T26	14-16	0.3	0.0	0.14	0.02	23.0	0.1
T26	**Min**	**0.2**	**0.0**	**0.09**	**0.01**	**19.5**	**0.1**
T26	**Max**	**0.3**	**0.0**	**0.14**	**0.02**	**26.3**	**0.1**
T26	**Mean**	**0.3**	**0.0**	**0.11**	**0.02**	**23.0**	**0.1**
T27	0-2	0.3	0.0	0.11	0.02	47.4	0.3
T27	4-6	0.2	0.0	0.09	0.01	35.9	0.2
T27	8-10	0.3	0.0	0.09	0.01	29.2	0.2
T27	14-16	0.3	0.0	0.11	0.02	34.6	0.2
T27	**Min**	**0.2**	**0.0**	**0.09**	**0.01**	**29.2**	**0.2**
T27	**Max**	**0.3**	**0.0**	**0.11**	**0.02**	**47.4**	**0.3**
T27	**Mean**	**0.3**	**0.0**	**0.10**	**0.01**	**36.8**	**0.2**

14.4 Geochemical composition of the vegetation samples.

Table 23 The Al, Fe, Ca, Na and Mg contents of the analysed leaves (L) and roots (R) (wsh = washed, nwsh = unwashed).

Nr.	Type		Al {wt %} Mdl	(+/-) 1.40 (%) 0.01	Fe {wt %} Mdl	(+/-) 3.21 (%) 0.001	Ca {wt %} Mdl	(+/-) 2.67 (%) 0.01	Na {wt %} Mdl	(+/-) 3.39 (%) 0.001	Mg {wt %} Mdl	(+/-) 3.44 (%) 0.001
A1 O	L	wsh	<0.01	-	0.006	0.000	0.31	0.01	0.153	0.005	0.154	0.005
A1 O	L	nwsh	<0.01	-	0.005	0.000	0.28	0.01	0.131	0.004	0.151	0.005
A1 Y	L	wsh	<0.01	-	0.004	0.000	0.21	0.01	0.201	0.007	0.127	0.004
A1 Y	L	nwsh	<0.01	-	0.003	0.000	0.21	0.01	0.204	0.007	0.125	0.004
A2 O	L	wsh	<0.01	-	0.006	0.000	0.22	0.01	0.137	0.005	0.144	0.005
A2 O	L	nwsh	<0.01	-	0.006	0.000	0.22	0.01	0.121	0.004	0.137	0.005
A8 Y	L	wsh	<0.01	-	0.008	0.000	0.33	0.01	0.217	0.007	0.232	0.008
A8 Y	L	nwsh	<0.01	-	0.018	0.001	0.30	0.01	0.195	0.007	0.214	0.007
A9 O	L	wsh	<0.01	-	0.006	0.000	0.78	0.02	0.089	0.003	0.331	0.011
A9 O	L	nwsh	<0.01	-	0.006	0.000	0.61	0.02	0.069	0.002	0.250	0.009
A10 O	L	wsh	<0.01	-	0.006	0.000	0.64	0.02	0.103	0.003	0.177	0.006
A10 O	L	nwsh	<0.01	-	0.005	0.000	0.49	0.01	0.078	0.003	0.114	0.004
A 14 Y	L	wsh	<0.01	-	0.005	0.000	0.36	0.01	0.198	0.007	0.174	0.006
A 14 Y	L	nwsh	<0.01	-	0.004	0.000	0.32	0.01	0.195	0.007	0.163	0.006
A15 Y	L	wsh	<0.01	-	0.006	0.000	0.27	0.01	0.597	0.020	0.212	0.007
A15 Y	L	nwsh	<0.01	-	0.005	0.000	0.30	0.01	0.660	0.022	0.239	0.008
A15 O	L	wsh	<0.01	-	0.005	0.000	0.40	0.01	0.517	0.018	0.202	0.007
A15 O	L	nwsh	<0.01	-	0.005	0.000	0.35	0.01	0.459	0.016	0.189	0.007
A16 O	L	wsh	<0.01	-	0.003	0.000	0.48	0.01	0.085	0.003	0.177	0.006
A16 O	L	nwsh	<0.01	-	0.003	0.000	0.47	0.01	0.089	0.003	0.166	0.006
A17 O	L	wsh	<0.01	-	0.003	0.000	0.23	0.01	0.225	0.008	0.102	0.004
A17 O	L	nwsh	<0.01	-	0.004	0.000	0.25	0.01	0.238	0.008	0.119	0.004
A19 O	L	wsh	<0.01	-	0.006	0.000	0.45	0.01	0.091	0.003	0.154	0.005
A19 O	L	nwsh	<0.01	-	0.007	0.000	0.46	0.01	0.112	0.004	0.171	0.006
O5 O	L	wsh	<0.01	-	0.005	0.000	0.54	0.01	0.045	0.002	0.173	0.006
O5 O	L	nwsh	<0.01	-	0.004	0.000	0.62	0.02	0.043	0.001	0.192	0.007
O6 Y	L	wsh	<0.01	-	0.008	0.000	0.51	0.01	0.221	0.007	0.191	0.007
O6 Y	L	nwsh	<0.01	-	0.010	0.000	0.57	0.02	0.228	0.008	0.194	0.007
O7 Y	L	wsh	<0.01	-	0.008	0.000	0.59	0.02	0.130	0.004	0.224	0.008
O7 Y	L	nwsh	<0.01	-	0.051	0.002	0.56	0.02	0.146	0.005	0.219	0.008
T11 O	L	wsh	<0.01	-	0.008	0.000	0.86	0.02	0.128	0.004	0.247	0.008
T11 O	L	nwsh	<0.01	-	0.006	0.000	0.61	0.02	0.091	0.003	0.173	0.006
T12 Y	L	wsh	<0.01	-	0.006	0.000	0.48	0.01	0.105	0.004	0.250	0.009
T12 Y	L	nwsh	<0.01	-	0.008	0.000	0.42	0.01	0.088	0.003	0.205	0.007
T12 O	L	wsh	<0.01	-	0.005	0.000	0.55	0.01	0.073	0.002	0.287	0.010
T12 O	L	nwsh	<0.01	-	0.003	0.000	0.44	0.01	0.052	0.002	0.217	0.007
T3 Y	L	wsh	<0.01	-	0.009	0.000	0.76	0.02	0.123	0.004	0.294	0.010
T3 Y	L	nwsh	<0.01	-	0.005	0.000	0.84	0.02	0.162	0.005	0.329	0.011
T3 O	L	wsh	<0.01	-	0.009	0.000	0.52	0.01	0.174	0.006	0.213	0.007
T3 O	L	nwsh	<0.01	-	0.012	0.000	0.59	0.02	0.163	0.006	0.208	0.007
T4 O	L	wsh	<0.01	-	0.012	0.000	0.38	0.01	0.172	0.006	0.144	0.005
T4 O	L	nwsh	<0.01	-	0.009	0.000	0.36	0.01	0.174	0.006	0.145	0.005
A29 O	L	wsh	<0.01	-	0.008	0.000	0.64	0.02	0.085	0.003	0.117	0.004
A29 O	L	nwsh	<0.01	-	0.008	0.000	0.58	0.02	0.073	0.002	0.117	0.004

Continuation: Table 23

Nr.	Type		Al {wt %} Mdl	(+/-) 1.40 (%) 0.01	Fe {wt %} Mdl	(+/-) 3.21 (%) 0.001	Ca {wt %} Mdl	(+/-) 2.67 (%) 0.01	Na {wt %} Mdl	(+/-) 3.39 (%) 0.001	Mg {wt %} Mdl	(+/-) 3.44 (%) 0.001
A30 O	L	wsh	<0.01	-	0.009	0.000	0.89	0.02	0.119	0.004	0.106	0.004
A30 O	L	nwsh	<0.01	-	0.009	0.000	0.91	0.02	0.125	0.004	0.109	0.004
O31 O	L	wsh	<0.01	-	0.006	0.000	0.41	0.01	0.078	0.003	0.177	0.006
O31 O	L	nwsh	<0.01	-	0.006	0.000	0.48	0.01	0.076	0.003	0.181	0.006
O28 O	L	wsh	<0.01	-	0.008	0.000	0.65	0.02	0.038	0.001	0.128	0.004
O28 O	L	nwsh	<0.01	-	0.006	0.000	0.64	0.02	0.033	0.001	0.122	0.004
T22 Y	L	wsh	<0.01	-	0.009	0.000	0.71	0.02	0.165	0.006	0.179	0.006
T22 Y	L	nwsh	<0.01	-	0.009	0.000	0.59	0.02	0.165	0.006	0.151	0.005
T23 Y	L	wsh	<0.01	-	0.012	0.000	0.95	0.03	0.134	0.005	0.257	0.009
T23 Y	L	nwsh	<0.01	-	0.011	0.000	1.03	0.03	0.153	0.005	0.279	0.010
T25 O	L	wsh	<0.01	-	0.008	0.000	0.43	0.01	0.079	0.003	0.078	0.003
T25 O	L	nwsh	<0.01	-	0.009	0.000	0.42	0.01	0.073	0.002	0.073	0.003
T26 O	L	wsh	<0.01	-	0.009	0.000	0.64	0.02	0.123	0.004	0.129	0.004
T26 O	L	nwsh	<0.01	-	0.009	0.000	0.63	0.02	0.123	0.004	0.140	0.005
T27 Y	L	wsh	<0.01	-	0.009	0.000	0.81	0.02	0.167	0.006	0.163	0.006
T27 Y	L	nwsh	<0.01	-	0.010	0.000	0.79	0.02	0.168	0.006	0.153	0.005
A1 O	R	wsh	0.04	0.00	0.016	0.001	0.15	0.00	0.086	0.003	0.072	0.002
A1 Y	R	wsh	0.08	0.00	0.041	0.001	0.30	0.01	0.122	0.004	0.104	0.004
A2 O	R	wsh	0.03	0.00	0.019	0.001	0.05	0.00	0.080	0.003	0.021	0.001
A8 Y	R	wsh	0.14	0.00	0.095	0.003	0.85	0.02	0.107	0.004	0.090	0.003
A9 O	R	wsh	0.13	0.00	0.146	0.005	0.09	0.00	0.049	0.002	0.038	0.001
A10 O	R	wsh	0.12	0.00	0.223	0.007	0.28	0.01	0.058	0.002	0.091	0.003
A 14 Y	R	wsh	0.03	0.00	0.014	0.000	0.95	0.03	0.079	0.003	0.088	0.003
A16 O	R	wsh	0.06	0.00	0.052	0.002	1.97	0.05	0.072	0.002	0.225	0.008
A17 O	R	wsh	0.17	0.00	0.164	0.005	0.17	0.00	0.056	0.002	0.042	0.001
A19 O	R	wsh	0.08	0.00	0.033	0.001	0.58	0.02	0.032	0.001	0.383	0.013
O5 O	R	wsh	0.05	0.00	0.018	0.001	0.29	0.01	0.083	0.003	0.491	0.017
O6 Y	R	wsh	0.03	0.00	0.013	0.000	0.19	0.01	0.072	0.002	0.048	0.002
O7 Y	R	wsh	0.07	0.00	0.028	0.001	0.90	0.02	0.058	0.002	0.120	0.004
T11 O	R	wsh	0.03	0.00	0.017	0.001	0.11	0.00	0.019	0.001	0.020	0.001
T12 O	R	wsh	0.14	0.00	0.141	0.005	0.38	0.01	0.104	0.004	0.094	0.003
T3 O	R	wsh	0.26	0.00	0.348	0.011	0.75	0.02	0.039	0.001	0.268	0.009
T4 O	R	wsh	0.02	0.00	0.014	0.000	0.11	0.00	0.008	0.000	0.032	0.001

Table 24 The K, Ti, P, Mn and Sr contents of the analysed leaves (L) and roots (R) (wsh = washed, nwsh = unwashed).

			K	(+/-)	Ti	(+/-)	P	(+/-)	Mn	(+/-)	Sr	(+/-)
Nr.	Type		{wt %}	2,68 (%)	{µg/g}	0,74 (%)	{wt %}	7,69 (%)	{µg/g}	6,25 (%)	{µg/g}	5,83 (%)
			Mdl	0.01	Mdl	1	Mdl	0.001	Mdl	1	Mdl	0.5
A1 O	L	wsh	0.77	0.02	5	0	0.103	0.008	423	0	31.3	1.8
A1 O	L	nwsh	0.74	0.02	4	0	0.097	0.007	374	0	29.2	1.7
A1 Y	L	wsh	0.67	0.02	4	0	0.080	0.006	412	0	29.2	1.7
A1 Y	L	nwsh	0.68	0.02	4	0	0.082	0.006	396	0	30.6	1.8
A2 O	L	wsh	0.61	0.02	7	0	0.143	0.011	67	0	25.7	1.5
A2 O	L	nwsh	0.61	0.02	7	0	0.144	0.011	59	0	24.1	1.4
A8 Y	L	wsh	0.91	0.02	9	0	0.160	0.012	698	0	23.2	1.4
A8 Y	L	nwsh	0.74	0.02	8	0	0.143	0.011	637	0	19.6	1.1
A9 O	L	wsh	1.16	0.03	8	0	0.165	0.013	674	0	87.5	5.1
A9 O	L	nwsh	0.96	0.03	6	0	0.144	0.011	485	0	80.1	4.7
A10 O	L	wsh	0.97	0.03	6	0	0.130	0.010	286	0	44.2	2.6
A10 O	L	nwsh	0.83	0.02	5	0	0.121	0.009	251	0	34.9	2.0
A 14 Y	L	wsh	0.89	0.02	7	0	0.137	0.011	43	0	23.3	1.4
A 14 Y	L	nwsh	0.91	0.02	6	0	0.131	0.010	41	0	22.5	1.3
A15 Y	L	wsh	0.48	0.01	7	0	0.109	0.008	52	0	26.1	1.5
A15 Y	L	nwsh	0.45	0.01	7	0	0.113	0.009	57	0	31.7	1.8
A15 O	L	wsh	0.51	0.01	8	0	0.135	0.010	51	0	61.1	3.6
A15 O	L	nwsh	0.49	0.01	8	0	0.135	0.010	50	0	57.0	3.3
A16 O	L	wsh	0.88	0.02	9	0	0.178	0.014	164	0	70.2	4.1
A16 O	L	nwsh	0.87	0.02	8	0	0.167	0.013	169	0	67.1	3.9
A17 O	L	wsh	0.55	0.01	4	0	0.072	0.006	164	0	14.5	0.8
A17 O	L	nwsh	0.73	0.02	5	0	0.088	0.007	170	0	16.6	1.0
A19 O	L	wsh	0.57	0.02	7	0	0.105	0.008	129	0	49.1	2.9
A19 O	L	nwsh	0.67	0.02	7	0	0.115	0.009	178	0	53.0	3.1
O5 O	L	wsh	0.86	0.02	8	0	0.161	0.012	50	0	135.1	7.9
O5 O	L	nwsh	0.82	0.02	7	0	0.156	0.012	54	0	148.4	8.7
O6 Y	L	wsh	0.94	0.03	12	0	0.116	0.009	30	0	91.7	5.3
O6 Y	L	nwsh	0.88	0.02	11	0	0.106	0.008	31	0	103.8	6.1
O7 Y	L	wsh	0.75	0.02	6	0	0.112	0.009	30	0	126.5	7.4
O7 Y	L	nwsh	0.71	0.02	7	0	0.115	0.009	23	0	130.0	7.6
T11 O	L	wsh	1.25	0.03	8	0	0.160	0.012	56	0	75.6	4.4
T11 O	L	nwsh	1.09	0.03	7	0	0.136	0.011	44	0	57.2	3.3
T12 Y	L	wsh	0.64	0.02	6	0	0.138	0.011	95	0	71.2	4.2
T12 Y	L	nwsh	0.49	0.01	6	0	0.119	0.009	81	0	60.6	3.5
T12 O	L	wsh	1.05	0.03	7	0	0.161	0.012	95	0	61.7	3.6
T12 O	L	nwsh	0.80	0.02	6	0	0.139	0.011	71	0	51.0	3.0
T3 Y	L	wsh	0.52	0.01	7	0	0.110	0.008	90	0	50.4	2.9
T3 Y	L	nwsh	0.62	0.02	6	0	0.117	0.009	101	0	54.0	3.2
T3 O	L	wsh	0.78	0.02	11	0	0.151	0.012	88	0	40.1	2.3
T3 O	L	nwsh	0.66	0.02	11	0	0.140	0.011	91	0	44.7	2.6
T4 O	L	wsh	0.97	0.03	17	0	0.134	0.010	109	0	32.4	1.9
T4 O	L	nwsh	0.99	0.03	13	0	0.132	0.010	103	0	31.5	1.8
A29 O	L	wsh	0.75	0.02	8	0	0.113	0.009	48	0	74.7	4.4
A29 O	L	nwsh	0.76	0.02	7	0	0.106	0.008	48	0	69.5	4.1
A30 O	L	wsh	1.06	0.03	10	0	0.150	0.012	89	0	88.1	5.1
A30 O	L	nwsh	1.03	0.03	10	0	0.134	0.010	116	0	87.8	5.1
O31 O	L	wsh	0.83	0.02	8	0	0.122	0.009	25	0	39.6	2.3
O31 O	L	nwsh	0.79	0.02	7	0	0.116	0.009	24	0	43.7	2.5

Continuation: Table 24

Nr.	Type		K {wt %} Mdl	(+/-) 2,68 (%) 0.01	Ti {µg/g} Mdl	(+/-) 0,74 (%) 1	P {wt %} Mdl	(+/-) 7,69 (%) 0.001	Mn {µg/g} Mdl	(+/-) 6,25 (%) 1	Sr {µg/g} Mdl	(+/-) 5,83 (%) 0.5
O28 O	L	wsh	0.61	0.02	9	0	0.101	0.008	298	0	45.7	2.7
O28 O	L	nwsh	0.62	0.02	7	0	0.096	0.007	277	0	45.5	2.7
T22 Y	L	wsh	0.77	0.02	12	0	0.205	0.016	44	0	77.0	4.5
T22 Y	L	nwsh	0.75	0.02	11	0	0.190	0.015	38	0	67.7	3.9
T23 Y	L	wsh	1.33	0.04	9	0	0.141	0.011	55	0	78.4	4.6
T23 Y	L	nwsh	1.23	0.03	9	0	0.141	0.011	58	0	88.9	5.2
T25 O	L	wsh	0.58	0.02	6	0	0.075	0.006	41	0	44.1	2.6
T25 O	L	nwsh	0.59	0.02	7	0	0.074	0.006	56	0	48.2	2.8
T26 O	L	wsh	0.49	0.01	8	0	0.093	0.007	70	0	61.3	3.6
T26 O	L	nwsh	0.51	0.01	8	0	0.092	0.007	70	0	66.0	3.9
T27 Y	L	wsh	0.58	0.02	9	0	0.128	0.010	79	0	90.7	5.3
T27 Y	L	nwsh	0.55	0.01	10	0	0.129	0.010	73	0	88.1	5.1
A1 O	R	wsh	0.22	0.01	15	0	0.025	0.002	162	0	20.5	1.2
A1 Y	R	wsh	0.25	0.01	42	0	0.034	0.003	289	0	34.3	2.0
A2 O	R	wsh	0.52	0.01	29	0	0.041	0.003	31	0	13.0	0.8
A8 Y	R	wsh	0.37	0.01	104	0	0.063	0.005	246	0	78.8	4.6
A9 O	R	wsh	0.16	0.00	279	0	0.039	0.003	92	0	19.0	1.1
A10 O	R	wsh	0.12	0.00	133	0	0.021	0.002	249	0	21.8	1.3
A 14 Y	R	wsh	0.36	0.01	19	0	0.039	0.003	21	0	107.1	6.2
A16 O	R	wsh	0.26	0.01	21	0	0.167	0.013	25	0	262.6	15.3
A17 O	R	wsh	0.19	0.01	151	0	0.025	0.002	77	0	21.8	1.3
A19 O	R	wsh	0.23	0.01	19	0	0.126	0.010	73	0	92.8	5.4
O5 O	R	wsh	0.07	0.00	26	0	0.042	0.003	31	0	61.0	3.6
O6 Y	R	wsh	0.27	0.01	19	0	0.071	0.005	23	0	47.3	2.8
O7 Y	R	wsh	0.29	0.01	30	0	0.043	0.003	27	0	178.7	10.4
T11 O	R	wsh	0.25	0.01	25	0	0.034	0.003	7	0	15.2	0.9
T12 O	R	wsh	0.13	0.00	186	0	0.029	0.002	61	0	23.0	1.3
T3 O	R	wsh	0.25	0.01	367	0	0.065	0.005	136	0	47.5	2.8
T4 O	R	wsh	0.34	0.01	16	0	0.042	0.003	51	0	20.3	1.2

Table 25 The S_{tot}, Zr, Ni, Zn and Cu contents of the analysed leaves (L) and roots (R) (wsh = washed, nwsh = unwashed).

			S_{tot}	**(+/-)**	**Zr**	**(+/-)**	**Ni**	**(+/-)**	**Zn**	**(+/-)**	**Cu**	**(+/-)**
Nr.	Type		{wt %}	8,22 (%)	{µg/g}	5,45 (%)	{µg/g}	9,94 (%)	{µg/g}	8,33 (%)	{µg/g}	9,3 (%)
			Mdl	0.01	Mdl	0.01	Mdl	0.10	Mdl	0.1	Mdl	0.01
A1 O	L	wsh	0.19	0.02	0.1	0.0	0.4	0.0	54.4	4.5	3.9	0.4
A1 O	L	nwsh	0.19	0.02	0.0	0.0	0.3	0.0	60.3	5.0	4.6	0.4
A1 Y	L	wsh	0.14	0.01	0.0	0.0	0.4	0.0	36.7	3.1	3.7	0.3
A1 Y	L	nwsh	0.14	0.01	0.0	0.0	0.3	0.0	37.7	3.1	3.6	0.3
A2 O	L	wsh	0.13	0.01	0.0	0.0	0.4	0.0	33.5	2.8	4.5	0.4
A2 O	L	nwsh	0.14	0.01	0.0	0.0	0.3	0.0	34.3	2.9	4.2	0.4
A8 Y	L	wsh	0.18	0.01	0.1	0.0	1.0	0.1	43.6	3.6	7.2	0.7
A8 Y	L	nwsh	0.17	0.01	0.1	0.0	0.9	0.1	60.5	5.0	8.2	0.8
A9 O	L	wsh	0.22	0.02	0.0	0.0	1.7	0.2	31.5	2.6	6.6	0.6
A9 O	L	nwsh	0.19	0.02	0.0	0.0	1.8	0.2	40.7	3.4	7.2	0.7
A10 O	L	wsh	0.22	0.02	0.0	0.0	1.6	0.2	86.0	7.2	5.6	0.5
A10 O	L	nwsh	0.20	0.02	0.1	0.0	1.6	0.2	112.8	9.4	6.3	0.6
A 14 Y	L	wsh	0.14	0.01	0.0	0.0	0.4	0.0	27.3	2.3	5.8	0.5
A 14 Y	L	nwsh	0.14	0.01	0.0	0.0	0.2	0.0	28.3	2.4	6.2	0.6
A15 Y	L	wsh	0.23	0.02	0.1	0.0	1.1	0.1	21.5	1.8	5.5	0.5
A15 Y	L	nwsh	0.23	0.02	0.1	0.0	1.1	0.1	20.6	1.7	5.4	0.5
A15 O	L	wsh	0.15	0.01	0.1	0.0	0.5	0.0	17.5	1.5	4.6	0.4
A15 O	L	nwsh	0.16	0.01	0.1	0.0	0.5	0.0	16.7	1.4	4.3	0.4
A16 O	L	wsh	0.21	0.02	0.1	0.0	0.5	0.0	42.5	3.5	5.4	0.5
A16 O	L	nwsh	0.20	0.02	0.0	0.0	0.5	0.0	41.6	3.5	5.1	0.5
A17 O	L	wsh	0.14	0.01	0.0	0.0	0.7	0.1	20.1	1.7	6.2	0.6
A17 O	L	nwsh	0.18	0.01	0.0	0.0	0.8	0.1	24.7	2.1	7.6	0.7
A19 O	L	wsh	0.16	0.01	0.1	0.0	0.3	0.0	18.4	1.5	4.6	0.4
A19 O	L	nwsh	0.19	0.02	0.1	0.0	0.5	0.0	22.1	1.8	5.4	0.5
O5 O	L	wsh	0.15	0.01	0.1	0.0	0.2	0.0	17.5	1.5	7.3	0.7
O5 O	L	nwsh	0.13	0.01	0.1	0.0	0.2	0.0	21.8	1.8	8.3	0.8
O6 Y	L	wsh	0.13	0.01	0.5	0.0	0.1	0.0	15.7	1.3	4.8	0.4
O6 Y	L	nwsh	0.12	0.01	0.5	0.0	0.2	0.0	18.2	1.5	4.9	0.5
O7 Y	L	wsh	0.20	0.02	0.1	0.0	0.3	0.0	32.3	2.7	5.8	0.5
O7 Y	L	nwsh	0.14	0.01	0.1	0.0	0.5	0.0	36.3	3.0	5.3	0.5
T11 O	L	wsh	0.12	0.01	0.1	0.0	0.3	0.0	24.9	2.1	5.8	0.5
T11 O	L	nwsh	0.12	0.01	0.1	0.0	0.3	0.0	29.6	2.5	5.2	0.5
T12 Y	L	wsh	0.10	0.01	0.1	0.0	0.3	0.0	8.2	0.7	4.7	0.4
T12 Y	L	nwsh	0.11	0.01	0.1	0.0	0.3	0.0	11.6	1.0	3.9	0.4
T12 O	L	wsh	0.13	0.01	0.1	0.0	1.0	0.1	9.2	0.8	5.5	0.5
T12 O	L	nwsh	0.14	0.01	0.1	0.0	1.0	0.1	12.7	1.1	4.5	0.4
T3 Y	L	wsh	0.12	0.01	0.1	0.0	1.7	0.2	30.4	2.5	3.6	0.3
T3 Y	L	nwsh	0.14	0.01	0.1	0.0	1.9	0.2	31.7	2.6	3.8	0.4
T3 O	L	wsh	0.15	0.01	0.2	0.0	0.8	0.1	26.0	2.2	4.9	0.5
T3 O	L	nwsh	0.15	0.01	0.2	0.0	1.0	0.1	26.6	2.2	5.1	0.5
T4 O	L	wsh	0.12	0.01	0.3	0.0	1.0	0.1	23.6	2.0	5.7	0.5
T4 O	L	nwsh	0.11	0.01	0.2	0.0	0.9	0.1	22.9	1.9	5.7	0.5
A29 O	L	wsh	0.08	0.01	0.1	0.0	0.2	0.0	17.5	1.5	3.8	0.4
A29 O	L	nwsh	0.07	0.01	0.1	0.0	0.3	0.0	16.1	1.3	4.1	0.4
A30 O	L	wsh	0.15	0.01	0.1	0.0	0.6	0.1	32.2	2.7	5.5	0.5
A30 O	L	nwsh	0.13	0.01	0.1	0.0	0.6	0.1	37.4	3.1	5.4	0.5
O31 O	L	wsh	0.11	0.01	0.1	0.0	0.3	0.0	21.5	1.8	7.2	0.7

Continuation: Table 25

Nr.	Type		S_{tot}	(+/-)	Zr	(+/-)	Ni	(+/-)	Zn	(+/-)	Cu	(+/-)
			{wt %}	8,22 (%)	{µg/g}	5,45 (%)	{µg/g}	9,94 (%)	{µg/g}	8,33 (%)	{µg/g}	9,3 (%)
			Mdl	0.01	Mdl	0.01	Mdl	0.10	Mdl	0.1	Mdl	0.01
O31 O	L	nwsh	0.10	0.01	0.1	0.0	0.3	0.0	17.8	1.5	7.2	0.7
O28 O	L	wsh	0.12	0.01	0.2	0.0	0.3	0.0	19.3	1.6	6.2	0.6
O28 O	L	nwsh	0.11	0.01	0.1	0.0	0.3	0.0	18.9	1.6	6.3	0.6
T22 Y	L	wsh	0.14	0.01	0.1	0.0	0.9	0.1	27.6	2.3	3.7	0.3
T22 Y	L	nwsh	0.14	0.01	0.1	0.0	0.7	0.1	28.2	2.3	4.2	0.4
T23 Y	L	wsh	0.10	0.01	0.1	0.0	2.8	0.3	23.6	2.0	6.4	0.6
T23 Y	L	nwsh	0.13	0.01	0.1	0.0	2.9	0.3	26.0	2.2	6.7	0.6
T25 O	L	wsh	0.07	0.01	0.1	0.0	0.4	0.0	15.7	1.3	3.2	0.3
T25 O	L	nwsh	0.07	0.01	0.1	0.0	0.4	0.0	16.7	1.4	3.6	0.3
T26 O	L	wsh	0.14	0.01	0.2	0.0	0.2	0.0	18.2	1.5	5.3	0.5
T26 O	L	nwsh	0.15	0.01	0.2	0.0	0.3	0.0	18.9	1.6	5.9	0.5
T27 Y	L	wsh	0.13	0.01	0.1	0.0	0.2	0.0	23.1	1.9	5.6	0.5
T27 Y	L	nwsh	0.13	0.01	0.2	0.0	0.2	0.0	24.5	2.0	6.2	0.6
A1 O	R	wsh	0.08	0.01	0.7	0.0	0.3	0.0	39.0	3.2	2.5	0.2
A1 Y	R	wsh	0.10	0.01	1.6	0.1	0.8	0.1	25.7	2.1	3.4	0.3
A2 O	R	wsh	0.02	0.00	0.1	0.0	0.3	0.0	11.6	1.0	3.5	0.3
A8 Y	R	wsh	0.12	0.01	1.3	0.1	1.7	0.2	38.1	3.2	9.7	0.9
A9 O	R	wsh	0.07	0.01	3.2	0.2	1.4	0.1	10.3	0.9	6.7	0.6
A10 O	R	wsh	0.12	0.01	2.3	0.1	4.2	0.4	32.6	2.7	7.9	0.7
A 14 Y	R	wsh	0.11	0.01	0.9	0.0	0.2	0.0	6.4	0.5	2.9	0.3
A16 O	R	wsh	0.04	0.00	0.2	0.0	0.6	0.1	75.4	6.3	1.5	0.1
A17 O	R	wsh	0.08	0.01	4.1	0.2	1.4	0.1	20.4	1.7	4.7	0.4
A19 O	R	wsh	0.32	0.03	0.1	0.0	1.1	0.1	27.2	2.3	5.8	0.5
O5 O	R	wsh	0.12	0.01	0.8	0.0	0.6	0.1	12.9	1.1	0.9	0.1
O6 Y	R	wsh	0.07	0.01	1.0	0.1	0.1	0.0	27.6	2.3	3.8	0.4
O7 Y	R	wsh	0.08	0.01	1.1	0.1	0.9	0.1	12.8	1.1	7.8	0.7
T11 O	R	wsh	0.03	0.00	0.7	0.0	0.2	0.0	5.3	0.4	2.1	0.2
T12 O	R	wsh	0.09	0.01	4.4	0.2	5.2	0.5	9.8	0.8	4.8	0.4
T3 O	R	wsh	0.13	0.01	8.8	0.5	18.5	1.8	38.3	3.2	18.2	1.7
T4 O	R	wsh	0.04	0.00	0.4	0.0	0.4	0.0	12.0	1.0	8.7	0.8

Table 26 The Pb, Mo, Sb, Cd and Hg contents of the analysed leaves (L) and roots (R) (wsh = washed, nwsh = unwashed).

			Pb	(+/-)	Mo	(+/-)	Sb	(+/-)	Cd	(+/-)	Hg	(+/-)
Nr.	Type		{µg/g}	7,14 (%)	{µg/g}	6,85 (%)	{µg/g}	4,61 (%)	{µg/g}	7,85 (%)	{µg/g}	14,88 (%)
			Mdl	0.01	Mdl	0.01	Mdl	0.02	Mdl	0.01	Mdl	0.001
A1 O	L	wsh	0.1	0.0	0.0	0.0	0.05	0.00	<0.01		0.023	0.003
A1 O	L	nwsh	0.1	0.0	0.0	0.0	0.10	0.00	0.02	0.00	0.027	0.004
A1 Y	L	wsh	0.1	0.0	0.0	0.0	0.07	0.00	<0.01		0.024	0.004
A1 Y	L	nwsh	0.1	0.0	0.0	0.0	0.07	0.00	<0.01		0.027	0.004
A2 O	L	wsh	<0.1	<0.1	0.2	0.0	<0.02		0.09	0.01	0.007	0.001
A2 O	L	nwsh	<0.1	<0.1	0.2	0.0	<0.02		<0.01		0.007	0.001
A8 Y	L	wsh	0.5	0.0	0.1	0.0	0.35	0.02	0.05	0.00	0.039	0.006
A8 Y	L	nwsh	1.2	0.1	0.2	0.0	0.70	0.03	<0.01		0.049	0.007
A9 O	L	wsh	0.2	0.0	0.1	0.0	0.26	0.01	0.08	0.01	0.059	0.009
A9 O	L	nwsh	0.8	0.1	0.1	0.0	0.57	0.03	<0.01		0.053	0.008
A10 O	L	wsh	0.2	0.0	0.0	0.0	0.24	0.01	0.04	0.00	0.039	0.006
A10 O	L	nwsh	0.4	0.0	0.0	0.0	0.34	0.02	0.06	0.00	0.036	0.005
A 14 Y	L	wsh	0.1	0.0	0.1	0.0	0.14	0.01	<0.01		0.037	0.006
A 14 Y	L	nwsh	0.1	0.0	0.1	0.0	0.32	0.01	<0.01		0.043	0.006
A15 Y	L	wsh	0.1	0.0	0.1	0.0	0.20	0.01	0.03	0.00	0.036	0.005
A15 Y	L	nwsh	0.2	0.0	0.1	0.0	0.31	0.01	0.03	0.00	0.038	0.006
A15 O	L	wsh	0.2	0.0	0.1	0.0	0.12	0.01	0.03	0.00	0.041	0.006
A15 O	L	nwsh	0.2	0.0	0.2	0.0	0.36	0.02	0.02	0.00	0.042	0.006
A16 O	L	wsh	0.0	0.0	0.1	0.0	0.10	0.00	0.02	0.00	0.020	0.003
A16 O	L	nwsh	0.1	0.0	0.1	0.0	0.14	0.01	0.02	0.00	0.022	0.003
A17 O	L	wsh	0.1	0.0	0.1	0.0	0.11	0.01	<0.01		0.036	0.005
A17 O	L	nwsh	0.1	0.0	0.1	0.0	0.15	0.01	<0.01		0.038	0.006
A19 O	L	wsh	0.1	0.0	0.0	0.0	0.06	0.00	0.02	0.00	0.050	0.007
A19 O	L	nwsh	0.1	0.0	0.0	0.0	0.10	0.00	<0.01		0.054	0.008
O5 O	L	wsh	<0.01		0.1	0.0	0.16	0.01	<0.01		0.021	0.003
O5 O	L	nwsh	0.7	0.0	0.1	0.0	0.24	0.01	<0.01		0.023	0.003
O6 Y	L	wsh	<0.01		0.1	0.0	0.19	0.01	<0.01		0.056	0.008
O6 Y	L	nwsh	0.7	0.0	0.2	0.0	0.19	0.01	<0.01		0.060	0.009
O7 Y	L	wsh	<0.01		0.1	0.0	0.10	0.00	<0.01		0.034	0.005
O7 Y	L	nwsh	0.7	0.1	0.2	0.0	0.14	0.01	<0.01		0.044	0.007
T11 O	L	wsh	0.1	0.0	0.6	0.0	0.11	0.01	<0.01		0.039	0.006
T11 O	L	nwsh	0.1	0.0	0.5	0.0	0.20	0.01	<0.01		0.033	0.005
T12 Y	L	wsh	0.7	0.1	0.1	0.0	0.12	0.01	<0.01		0.028	0.004
T12 Y	L	nwsh	0.1	0.0	0.1	0.0	0.16	0.01	<0.01		0.029	0.004
T12 O	L	wsh	0.2	0.0	0.1	0.0	0.13	0.01	<0.01		0.034	0.005
T12 O	L	nwsh	0.4	0.0	0.1	0.0	0.19	0.01	<0.01		0.030	0.004
T3 Y	L	wsh	0.2	0.0	0.1	0.0	<0.02		<0.01		0.030	0.004
T3 Y	L	nwsh	0.8	0.1	0.1	0.0	<0.02		0.02	0.00	0.032	0.005
T3 O	L	wsh	0.1	0.0	0.1	0.0	0.15	0.01	<0.01		0.027	0.004
T3 O	L	nwsh	0.1	0.0	0.1	0.0	<0.02		<0.01		0.032	0.005
T4 O	L	wsh	0.1	0.0	0.2	0.0	0.08	0.00	<0.01		0.022	0.003
T4 O	L	nwsh	0.1	0.0	0.2	0.0	0.06	0.00	<0.01		0.027	0.004
A29 O	L	wsh	0.4	0.0	0.4	0.0	0.07	0.00	0.02	0.00	0.015	0.002
A29 O	L	nwsh	2.1	0.1	0.4	0.0	0.04	0.00	0.02	0.00	0.011	0.002
A30 O	L	wsh	0.2	0.0	0.6	0.0	0.03	0.00	0.12	0.01	0.020	0.003
A30 O	L	nwsh	1.8	0.1	0.5	0.0	0.07	0.00	0.19	0.01	0.018	0.003
O31 O	L	wsh	0.2	0.0	0.5	0.0	0.03	0.00	0.02	0.00	0.019	0.003

Continuation: Table 26

Nr.	Type		Pb {µg/g} Mdl	(+/-) 7,14 (%) 0.01	Mo {µg/g} Mdl	(+/-) 6,85 (%) 0.01	Sb {µg/g} Mdl	(+/-) 4,61 (%) 0.02	Cd {µg/g} Mdl	(+/-) 7,85 (%) 0.01	Hg {µg/g} Mdl	(+/-) 14,88 (%) 0.001
O31 O	L	nwsh	1.8	0.1	0.6	0.0	0.05	0.00	0.02	0.00	0.023	0.003
O28 O	L	wsh	0.2	0.0	0.1	0.0	0.09	0.00	0.13	0.01	0.008	0.001
O28 O	L	nwsh	1.3	0.1	0.1	0.0	0.04	0.00	0.11	0.01	0.009	0.001
T22 Y	L	wsh	0.3	0.0	0.1	0.0	<0.02		0.03	0.00	0.026	0.004
T22 Y	L	nwsh	2.8	0.2	0.1	0.0	0.08	0.00	0.03	0.00	0.016	0.002
T23 Y	L	wsh	0.2	0.0	0.2	0.0	0.05	0.00	0.03	0.00	0.018	0.003
T23 Y	L	nwsh	1.8	0.1	0.2	0.0	0.04	0.00	0.05	0.00	0.022	0.003
T25 O	L	wsh	1.0	0.1	0.2	0.0	0.03	0.00	<0.01		0.016	0.002
T25 O	L	nwsh	1.5	0.1	0.2	0.0	0.06	0.00	0.02	0.00	0.014	0.002
T26 O	L	wsh	0.7	0.1	0.6	0.0	0.02	0.00	0.03	0.00	0.023	0.003
T26 O	L	nwsh	1.6	0.1	0.6	0.0	0.04	0.00	0.04	0.00	0.022	0.003
T27 Y	L	wsh	0.4	0.0	0.2	0.0	0.04	0.00	0.11	0.01	0.017	0.003
T27 Y	L	nwsh	1.1	0.1	0.2	0.0	0.06	0.00	<0.01		0.017	0.003
A1 O	R	wsh	2.0	0.1	0.1	0.0	0.17	0.01	0.15	0.01	0.037	0.006
A1 Y	R	wsh	2.8	0.2	0.1	0.0	0.26	0.01	0.07	0.01	0.052	0.008
A2 O	R	wsh	<0.1	<0.1	0.1	0.0	<0.02		0.13	0.01	0.006	0.001
A8 Y	R	wsh	2.4	0.2	0.1	0.0	0.10	0.00	0.13	0.01	0.050	0.007
A9 O	R	wsh	0.2	0.0	0.1	0.0	<0.02		0.06	0.00	0.006	0.001
A10 O	R	wsh	2.1	0.1	0.2	0.0	0.15	0.01	0.13	0.01	0.057	0.008
A 14 Y	R	wsh	0.2	0.0	0.2	0.0	0.37	0.02	0.03	0.00	0.012	0.002
A16 O	R	wsh	0.4	0.0	0.1	0.0	0.51	0.02	0.08	0.01	0.023	0.003
A17 O	R	wsh	0.8	0.1	0.6	0.0	0.69	0.03	0.05	0.00	0.007	0.001
A19 O	R	wsh	0.5	0.0	0.1	0.0	0.48	0.02	0.04	0.00	0.006	0.001
O5 O	R	wsh	0.6	0.0	0.4	0.0	<0.02		0.07	0.01	0.003	0.000
O6 Y	R	wsh	0.2	0.0	<0.01	-	<0.02		0.03	0.00	0.016	0.002
O7 Y	R	wsh	0.9	0.1	0.2	0.0	0.07	0.00	0.04	0.00	0.020	0.003
T11 O	R	wsh	0.1	0.0	0.0	0.0	0.99	0.05	<0.01		0.003	0.000
T12 O	R	wsh	0.4	0.0	0.6	0.0	0.32	0.01	0.05	0.00	0.024	0.004
T3 O	R	wsh	1.3	0.1	0.7	0.0	0.05	0.00	0.05	0.00	0.052	0.008
T4 O	R	wsh	0.1	0.0	0.1	0.0	4.84	0.22	0.02	0.00	0.007	0.001

14.5 The calculated index of geoaccumulation values

Table 27 The calculated Cd Igeo classes for the analysed laurel forest topsoils.

Nr.	Cd	Error	I_{geo} classes (Cd 0.14 µg/g)°	I_{geo} classes (Cd 0.20 µg/g)°°
A17	0.4	0.030	1.99	1.52
A14	0.3	0.020	1.43	0.96
A1	0.3	0.020	1.37	0.91
A19	0.3	0.020	1.37	0.91
A16	0.2	0.019	1.31	0.85
A10	0.2	0.018	1.27	0.81
A8	0.2	0.018	1.22	0.75
A2	0.2	0.017	1.19	0.72
A9	0.2	0.016	1.05	0.58
A15	0.2	0.016	1.05	0.58
O5	0.2	0.012	0.63	0.17
O6	0.2	0.016	1.05	0.58
O7	0.2	0.018	1.27	0.81
T4	0.2	0.016	1.05	0.58
T11	0.2	0.018	1.22	0.75
T12	0.2	0.016	1.05	0.58
T3	-		-	-
			mean European topsoils (Salminen et al., 2005)°	Lowest mean value°°

I_{geo} classes	Background	Cd µg/g 0.15	Cd µg/g 0.20
0.00	unpolluted	0.22	0.30
1.00	unpolluted to slightly polluted	0.33	0.45
2.00	slightly polluted	0.49	0.68
3.00	slightly to heavily polluted	0.73	1.01
4.00	heavy polluted	1.10	1.52
5.00	heavy to excessively polluted	1.65	2.28
6.00	excessively polluted	2.48	3.42

Table 28 The calculated Hg I_{geo} classes for the analysed laurel forest topsoils.

Nr.	Hg	Error	I_{geo} classes (Hg 0.32 µg/g)°	I_{geo} classes (Hg 0.16 µg/g)°°	I_{geo} classes (Hg 0.08 µg/g)°°°
A8	0.35	0.05	0.73	1.73	2.73
A1	0.24	0.04	0.16	1.16	2.16
A14	0.23	0.03	0.13	1.13	2.13
A19	0.23	0.03	0.09	1.09	2.09
A10	0.22	0.03	0.07	1.07	2.07
A15	0.19	0.03	-0.14	0.86	1.86
A17	0.18	0.03	-0.25	0.75	1.75
A16	0.16	0.02	-0.45	0.55	1.55
A9	0.12	0.02	-0.83	0.17	1.17
A2	0.09	0.01	-1.21	-0.21	0.79
O7	0.20	0.03	-0.08	0.92	1.92
O5	0.14	0.02	-0.59	0.41	1.41
O6	0.08	0.01	-1.42	-0.42	0.58
T11	0.13	0.02	-0.67	0.33	1.33
T4	0.11	0.02	-0.93	0.07	1.07
T12	0.10	0.02	-1.06	-0.06	0.94
T3	0.10	0.01	-1.12	-0.12	0.88
			highest content of European volcanic soils (Martínez-Cortizas et al. 2007)°	highest value of Tenerife soils (Martínez-Cortizas et al. 2007)°°	lowest mean°°°

I_{geo} classes	Background	Hg µg/g 0.32	Hg µg/g 0.16	Hg µg/g 0.08
0.00	unpolluted	0.48	0.24	0.12
1.00	unpolluted to slightly polluted	0.72	0.36	0.18
2.00	slightly polluted	1.08	0.54	0.27
3.00	slightly to heavily polluted	1.62	0.81	0.41
4.00	heavy polluted	2.43	1.22	0.61
5.00	heavy to excessively polluted	3.65	1.82	0.91
6.00	excessively polluted	5.47	2.73	1.37

Table 29 The calculated Pb I_{geo} classes for the analysed laurel forest topsoils.

Nr.	Pb	Error	I_{geo} classes (Pb 30 µg/g)°	I_{geo} classes (Pb 16 µg/g)°°	I_{geo} classes (Pb 6,2 µg/g)°°°
A8	38.9	2.8	0.96	1.87	3.23
A17	27.8	2.0	0.47	1.38	2.75
A1	23.9	1.7	0.26	1.16	2.53
A10	22.1	1.6	0.14	1.05	2.42
A16	18.4	1.3	-0.12	0.79	2.16
A15	17.5	1.2	-0.20	0.71	2.08
A14	14.7	1.1	-0.44	0.47	1.83
A2	13.8	1.0	-0.54	0.37	1.74
A19	10.3	0.7	-0.95	-0.05	1.32
A9	7.6	0.5	-1.39	-0.49	0.88
O7	16.0	1.1	-0.33	0.58	1.95
O5	10.2	0.7	-0.97	-0.06	1.31
O6	10.0	0.7	-0.99	-0.09	1.28
T4	10.4	0.7	-0.95	-0.04	1.33
T12	10.2	0.7	-0.97	-0.06	1.30
T11	9.5	0.7	-1.08	-0.17	1.20
T3	6.2	0.4	-1.69	-0.79	0.58
			highest level of volcanic soils Tenerife (Martínez-Cortizas et al., 2007)°	average mean°°	lowest mean°°°

I_{geo} classes	Background	Pb µg/g 30.00	Pb µg/g 16.00	Pb µg/g 6.20
0.00	unpolluted	45.00	24.00	9.30
1.00	unpolluted to slightly polluted	67.50	36.00	13.95
2.00	slightly polluted	101.25	54.00	20.93
3.00	slightly to heavily polluted	151.88	81.00	31.39
4.00	heavy polluted	227.81	121.50	47.08
5.00	heavy to excessively polluted	341.72	182.25	70.62
6.00	excessively polluted	512.58	273.38	105.93

Table 30 The calculated Sb I_{geo} classes for the analysed laurel forest topsoils.

Nr.	Sb	Error	I_{geo} classes (Sb 0.6 µg/g)°	I_{geo} classes (Sb 0.3 µg/g)°°	I_{geo} classes (Sb 0.2 µg/g)°°°
A8	0.4	0.0	0.00	1.00	1.58
A1	0.3	0.0	-0.26	0.74	1.32
A17	0.3	0.0	-0.58	0.42	1.00
A10	0.2	0.0	-0.83	0.17	0.75
A14	0.2	0.0	-1.00	0.00	0.58
A19	0.2	0.0	-1.00	0.00	0.58
A2					
A9					
A15					
A16					
O5	0.2	0.0	-1.00	0.00	0.58
O7	0.2	0.0	-1.00	0.00	0.58
O6					
T3					
T4					
T11					
T12					

I_{geo} classes	Background	mean European topsoils (Salminen et al. 2005)° Sb µg/g 0.60	average mean°° Sb µg/g 0.30	lowest mean°°° Sb µg/g 0.12
0.00	unpolluted	0.90	0.45	0.17
1.00	unpolluted to slightly polluted	1.35	0.68	0.26
2.00	slightly polluted	2.03	1.01	0.39
3.00	slightly to heavily polluted	3.04	1.52	0.58
4.00	heavy polluted	4.56	2.28	0.87
5.00	heavy to excessively polluted	6.83	3.42	1.31
6.00	excessively polluted	10.25	5.13	1.96

15. Appendix: DVD

The attached DVD contains all sampling site images, including rock, soil and vegetation images as well all geochemical results from the Acme Analytical Laboratories.

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1. Bei der eingereichten Dissertation zu dem Thema

The geochemical fingerprints, the anthropogenic impacts and the plant essential nutrient contents of the laurel forest in Tenerife (Canary Islands, Spain).

handelt es sich um meine eigenständig erbrachte Leistung.

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