Geophysical Research Abstracts
Vol. 16, EGU2014-11204, 2014
EGU General Assembly 2014

Mapping of local-scale flooding on vegetated floodplains from radiometrically calibrated airborne laser scanning data

Radosław Malinowski (1), Bernhard Höfle (2), Kristina König (2), Geoffrey Groom (3), Wolfgang Schwanghart (4), and Goswin Heckrath (1)

(1) Institute of Science and Technology, Department of Agroecology, Aarhus University, Tjele, Denmark (radoslaw.malinowski@agrsci.dk, goswin.heckrath@agrsci.dk), (2) Institute of Geography, University of Heidelberg, Heidelberg, Germany (bernhard.hoefle@geog.uni-heidelberg.de, kristina.koenig@geog.uni-heidelberg.de), (3) Department of Bioscience, Aarhus University, Roende, Denmark (gbg@dmu.dk), (4) Institute of Earth and Environmental Science, University of Potsdam, Potsdam-Golm, Germany (w.schwanghart@geo.uni-potsdam.de)

The agricultural use of riverine lowlands is often dependent on complex hydrological regimes including localized flooding. Knowledge about spatio-temporal inundation patterns enables a better understanding of the state of agricultural areas in lowlands and provides valuable and objective information on land suitability for land use administration and environmental planning.

Data from Airborne Laser Scanning (ALS), also referred to as LiDAR, have become one of the most important sources of elevation data during the last two decades. Recently, geometric and radiometric attributes of ALS have also been explored for analysing the extent of water surfaces. Thus, the main objective of this work is to develop a method for mapping the spatial extent of floodplain inundation by means of remote sensing data.

Our study focusses on analysing floodwaters partly covered by some vegetation, which is a major challenge in flood mapping. We hypothesize that ALS data due to its high sampling density and high rate of canopy penetration can effectively be used for floodwater detection in such areas.

This research utilizes full-waveform ALS data with an average point density of 20 points/m2 obtained for an area of ca. 8 km2 of the Nørreå River valley in Jutland, Denmark. The study area is characterised by the presence of improved or semi-improved grasslands (meadows and pasture), few arable fields, irregularly scattered group of trees and bushes, and an extensive ditch network.

Our approach is based on an inspection of properties of single laser points with regard to water vs. vegetation coverage within the laser footprint, which is compared with very detailed field reference data. Exploratory analysis and classification of ALS data were preceded by radiometric calibration of point cloud data, utilizing in situ measurements of reference targets reflectance. The resulting calibration derivatives provide very stable estimates of surface characteristics and are used as the main input in the subsequent classification process of point cloud data. A decision tree classifier is being used, which utilizes radiometric calibration derivatives, mainly the backscattering coefficient, and 3D geometric attributes of ALS data.

Here we present initial results on developing a floodwater classification procedure, which assigns class information to each point from the 3D point cloud.

https://doi.org/10.11588/heidok.00037138