Geophysical Research Abstracts
Vol. 13, EGU2011-405, 2011
EGU General Assembly 2011

Very high resolution bathymetric modelling from low altitude UAV-based imagery

Claude Flener (1), Anttoni Jaakkola (2), Juha Hyyppä (2), and Petteri Alho (1)

(1) Department of Geography, University of Turku, Finland, (2) Department of Remote Sensing and Photogrammetry, Finnish Geodetic Institute, Masala, Finland

Knowledge of underwater terrain is an essential component of many hydrological and environmental applications such as flood modelling and habitat mapping. The accuracy of the geometry of the river bed has great influence on the result of hydraulic models. Remote sensing allows to model bathymetry at spatial scales that are impossible to achieve with traditional methods. Given clear enough water, it is possible to map large stretches of river based on aerial photography at relatively low cost compared to lidar or sonar.

Spectrally based bathymetric models operate on the principle of isolating the depth signal from the reflectance values of the water surface. This is achieved by either removing the influence of other factors such as the river substrate and using a deep water correction method or by calculating the rate of attenuation of light in the water column.

A methodology for mapping river bed geometry at very high resolution based on low-altitude UAV-based aerial images in a shallow subarctic river in Lapland is presented here. Lyzenga's deep water correction algorithm is applied to images captured using an off-the-shelf Nikon D5000 camera mounted to a remote-controlled helicopter. The images were georeferenced using ground control points. Ground control depth data required for the calibration of the bathymetry model were gathered using the sonar of an RTK-GPS-enabled ADCP mounted on a remote-controlled boat.

One problem of applying deep water correction models in rivers has so far been that the deep water values required for these models are often impossible to measure in clear water rivers. A new method for calibrating deep water reflectance allowing the application of the Lyzenga's algorithm in shallow rivers is presented here.