AvH6-38-3, 2010
6th Alexander von Humboldt International Conference

Using boat-based mobile terrestrial laser scanning (TLS) in quantifying the flood-related changes in river channel morphology

E. Kasvi (1), P. Alho (1), A. Kukko (2), J. Hyyppä (2), H. Hyyppä (3), H. Kaartinen (2), and M. Vaaja (2)

(1) University of Turku, Department of Geography, Finland (emkasv@utu.fi), (2) Finnish Geodetic Institute, Department of Remote Sensing and Photogrammetry, Finland, (3) University of Technology, Department of Surveying, Finland

Flooding has a major effect on their surrounding environment over time. Understanding the river system dynamics is important both in scientific manner and for societal purposes. Being able to map and quantify the flood-related erosion processes in a channel is essential for general understanding of the river dynamics as well as for improving flood protection and management. The variations in river bed material and the varying three dimensional flow conditions lead to asymmetries in the formation of the meanders and other channel formations and make the studying of the natural river channel dynamics challenging.

To date, the detailed morphology of the fluvial landforms has been a challenge to measure. Field measurements for digital terrain model (DTM) creation based on traditional approaches are limited in riverine environment as steep river banks, curved point bars and dense vegetation create shadows on the sight of survey. Furthermore, these survey campaigns are usually rather time-consuming and might even be dangerous. Spatial or temporal coverage is rather diminished in these field measurements and consequently resolution of DTM is rather coarse. Therefore, new approaches for more detailed mapping of the flood-related geomorphologic changes in rivers are necessary in order to develop flood protection.

In this study the boat-based, mobile mapping system (BoMMS) combined with a laser scanner was used to gather detailed, multi-temporal, pre- and post-flood topographical data in order to map the flood related geomorphic changes. The BoMMS- measurements were completed with static terrestrial LiDAR (Light Detection And Range) and mobile terrestrial LiDAR. The change detection was realized by subtracting the LiDAR-based DTMs. BoMMS-approach proved to be an effective and accurate way of mapping the river channel with only a small time-lag directly after flood. In addition, multi-temporal data set allowed a precise location and quantification of the flood-related erosion and deposition processes.