Geophysical Research Abstracts
Vol. 14, EGU2012-2047, 2012
EGU General Assembly 2012

Using LiDAR data to define stream flow rating curves

M. Nathanson (1), J. W. Kean (2), H. Laudon (3), J. Seibert (1,4,5), T. Grabs (5), S. W. Lyon (1,6)

(1) Stockholm University, Physical Geography and Quaternary Geology, Sweden (marcus.nathanson@natgeo.su.se), (2) U.S. Geological Survey, Denver, CO, United States, (3) Dept. Forest Ecology and Management, SLU, Umea˚, Sweden, (4) Department of Geography, University of Zurich, Zu¨rich, Switzerland, (5) Earth Sciences Air, Water and Landscape Sciences, Uppsala University, Sweden, (6) Bert Bolin Centre for Climate Research, Stockholm University, Stockholm, Sweden

In remote locations, it is difficult to obtain stream flow information because of the difficulty making sufficient discharge measurements. In this study we investigate the feasibility to constrain a fluid mechanics-based flow model for defining stream flow rating curves with remotely sensed topographic data from airborne LiDAR scanning. A near infrared (NIR) LiDAR scan was carried out for an 8-m wide channel in northern Sweden. The topographic information from this NIR LiDAR scan along the 90-m surveyed reach was used to define channel geometry above the water surface. To fill in the channel bed topography below the water surface we used a detailed ground survey to create a hybrid model for comparison to a simple assumption of a flat bottom channel. Based on the boundaries of confidence intervals calculated from the direct measurements, we show that for the channel considered the simple flat bottom assumption performs just as well as the hybrid model with regards to estimating direct discharge measurements. The mismatch between the two models was greatest at low flows and may be associated with unresolved submerged bed topography. This deficiency, while rather small, could potentially be remedied by scanning during periods of low flow, or use other techniques such as multi-frequency bathymetric LiDAR or passive optical remote sensing that offer alternative ways for generating the necessary topographic information.