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Using high resolution bathymetric lidar data for a Telemac2D simulation

Wolfgang Dobler (1), Ramona Baran (1), Frank Steinbacher (1), Marcel Ritter (1), and Markus Aufleger (2)

(1) AirborneHydroMapping GmbH, Innsbruck, Austria (w.dobler@ahm.co.at), (2) Unit of Hydraulic Engineering, University Innsbruck, Innsbruck, Austria

Knowledge about the hydraulic situation in a mountain torrent is relevant to quantify flood risks, to study sediment transport and to assess the waterbodies' ecology. To conduct reliable calculations, high-quality terrain data of riverbeds, riverbanks and floodplains are required. Typically, digital terrain models (DTMs) of floodplains are derived from classical airborne laserscanning (red wavelength) together with terrestrial surveys along riverbeds and riverbanks. Usually, these are restricted to a limited number of cross sections. Terrestrial surveys are required since laser measurement systems cannot penetrate the water column of the observed waterbodies. Consequently, data describing the geometry of riverbeds and bank structures are hardly available at high spatial resolutions and extents, comparable to the airborne-laser scanning derived data for river floodplains. In this study, a newly available, water-penetrating airborne laser system (green wavelength, FFG research project between the University of Innsbruck and Riegl LMS) was used to survey a mountain torrent. Detailed and extensive data ($\sim$30 points/m^2 on topo-bathy side) of the riverbed and the riverbanks were acquired with this single sensor. In order to construct a 2D-Telemac simulation, the point cloud was down-sampled to an appropriate resolution required for the simulation. The creation of the mesh was carried out with the Software HydroVish and imported into Blue Kenue for further boundary treatment. On one hand the calibration of the numerical model was based on a known water discharge-rate and on the other on abundant data points of the water surface. The green laser system demonstrates its great potential for such an analysis. The final results of the numerical simulation show clearly the supremacy of using such a high resolution data basis in contrast to the traditional way of terrestrial surveying of cross sections along riverbeds.