



Unmanned aerial and water vehicle data for hydro-morphological river monitoring

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Unmanned aerial vehicles (UAV) are by now a frequently used measurement tool in geosciences due to their low-cost, flexibility, and ease of use. This is advantageous for river research to monitor flow velocities using image-based tracking algorithms and to reconstruct river bank geometries and even bathymetric information using SfM photogrammetry. However, dense vegetation covers along the river as well as opaque water conditions can hinder a holistic 3D description of river reaches. Using unmanned water vehicles (UWV), equipped with topographic measurement tools, can complement the UAV data to retrieve a full 3D representation because boats are floating below the plant cover and integrated echo sounders can capture underwater geometries.

In this study UAV and UWV data from a river reach in Saxony is presented. The aim is the automatic retrieval of hydro-morphological parameters. Flow velocities are calculated applying particle tracking velocimetry algorithms (PTV) to video sequences captured from an UAV. Furthermore, UAV-based images are acquired to perform 3D reconstruction above and partly below the water surface. UWV data is utilised to measure the river bathymetry with a single beam echo sounder and to capture river banks below dense tree cover with a 360° camera and mobile laserscanning. Reference data for flow velocities are established at isolated positions using a current meter. To assess the quality of the 3D data a terrestrial laser scanner is applied. Georeferencing of the measurements are either performed indirectly using ground control points or directly with post-processed RTK information.

The established workflow enables a fast and frequent measurement of hydrological and morphological data of river reaches allowing for their multi-temporal assessment. Therefore, monitoring of changes of the river due to e.g. seasonal variabilities become possible.