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## Hydromorphological monitoring of individual river reaches with UAV-data – image-based measurement of bathymetry and flow velocity

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Unmanned Aerial Vehicles (UAV) have become a commonly used measurement tool in geomorphology due to their affordable cost, flexibility, and ease of use. They are regularly used in fluvial geomorphology, among other fields, because the high spatiotemporal resolution of UAV data makes it possible to assess the continuum rather than relying on single samples.

In this study, UAV data are used to hydro-morphologically describe three different river reaches of lengths between 150 and 1000 m. Specifically, the surface flow velocity and bathymetry of the rivers were reconstructed. The flow velocities were calculated using the Particle Tracking Velocimetry (PTV) method applied to UAV video sequences. In addition, UAV-based imagery was acquired to perform 3D reconstruction above and below the water surface using SfM (Structure from Motion) photogrammetry, taking into account refraction effects as well as frame processing to increase the visibility of underwater features. Reference data for flow velocities were generated at selected positions using current meters as well as ADCP (Acoustic Doppler Current Profiler) readings. The image-based calculated bathymetry was compared with RTK-GNSS sampling depth measurements and also ADCP data.

The developed workflow enables rapid and regular measurement of hydrological and morphological data of river channels. This ultimately enables multi-temporal assessment and significantly improves hydro-morphodynamic modelling, in particular their calibration.