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Geomorphological and hydrological characterization of a meandering river by UAV and UWV applications

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The Sajó River in Hungary is a medium-sized sand-bed river along which intensive meander development and bank erosion occur. The process threatens agricultural lands and populated areas extensively. Therefore, preventive river management is needed.

Main geomorphological features, processes and in-channel flow conditions have to be studied in detail in order to reveal main driving factors. Datasets with high spatio-temporal resolution are necessary to identify relevant parameters. However, so far data density at this river is sparse and gauging stations are distributed poorly.

The aim of this study is the improvement of data availability to measure and model hydromorphodynamics of single reaches of the Sajó River. Therefore, multi-temporal field campaigns along selected sub-reaches are conducted with Unmanned Aerial Vehicles (UAV) and Unmanned Water Vehicles (UWV) to survey the topography, the river bed and flow conditions. The channel bathymetry is measured by a single-beam echo sounder mounted on a self-designed remotely controlled boat. The boat also integrates a Mobile Laser Scanner (MLS) to measure the river banks. Furthermore, a panorama camera system is installed to improve the pose estimation of the UWV functioning as a calibrated multi-sensor platform. UAV surveys were performed, using RGB and Thermal Infrared image sequences, to apply image velocimetry algorithms to characterize the river flow at selected cross-sections. ADCP measurements and Terrestrial Laser Scans (TLS) are used for accuracy assessment of the novel datasets.

Eventually, data captured over a 2-years period will be implemented into hydrodynamic modeling of the studied sub-reaches to better understand seasonal variations in channel morphodynamics.

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