Application of UAV photogrammetry and automated sensor network for tracking the fluvial dynamics of a montane stream

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The contribution demonstrates the potential of the fusion of experimental survey methods for analysis of fluvial dynamics of a montane stream. The UAV photogrammetry, optical granulometry, ground LiDAR scanning and sensor network monitoring were applied as a base for building hydrodynamic model for simulation of fluvial dynamics. The UAV photogrammetry is employed to acquire high precision DTM and especially for quantitative analysis of volumetric changes related to initial flood events. The multirotor platform has been used to acquire the data for photogrammetric analysis of complex stretch of stream with historically elevated fluvial dynamics and to track the volumetric changes of the channel in response to the flooding. The sensor network with automated high frequency water level monitoring was used to derive information on hydrological properties of initial flood event. The digital granulometry enabled to analyze the structure of sedimentary material in floodplain. The terrestrial LiDAR scanning allowed construction of very detailed 3D models of selected fluvial forms, enabling deeper insight into the effects of fluvial dynamics and to verify the spatial information acquired using UAS photogrammetry. The results of above mentioned techniques were used to build hydrodynamic model explaining threshold conditions for initiation of changes in fluvial morphology of the riverbed in relation to known and theoretical flood magnitude. The results achieved in the study enabled us to discuss the synergic potential of coupling the UAV photogrammetry, sensor networks and other high precision survey techniques to enhance significantly our knowledge on the dynamics of fluvial systems.