EGU2020-17845
EGU General Assembly 2020

Estimation of Flow Velocity During Flash Floods with the synergy of Unmanned Aerial Systems (UAS) data and Ground Observations: The Case of 2017 Mandra Flash Flood, Greece

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Unmanned Aircraft Systems (UAS) can be used to enhance monitoring of a wide range of environmental parameters, including acquiring data on various types of hydro-geomorphic phenomena.

Their capabilities to provide on demand images and videos of high resolution, are particularly useful in the case of flash flood phenomena, which occur in spatial and temporal scales that do not favor traditional monitoring processes.

In this work, flow velocity is estimated using aerial imaging acquired by means of an Unmanned Aircraft Vehicle (UAV) as well as ground observations during the catastrophic flash flood event of November 2017 in Mandra, Greece.

In these imaging detailed tracing of various floating objects and particles such as light trash, debris etc. was carried out using multiple high-resolution video frames with specific time marks. Water velocity estimations were also cross-examined using flood mark-derived velocity hydraulic heads extracted by ground observations after the flood.

The analysis was applied at a variety of locations across the study area, leading to a map of velocities for parts of the floodplain. Velocity values varied significantly depending on location, reaching up to 10m/s.

The UAS proved to be very useful for the collection of important information for an extended area during the flood since a large portion of it was inaccessible due to road closures and safety issues. Nevertheless, the approach comes with certain limitations, including flight regulations, safety precautions and that rainfall is at a level that allows the deployment of a UAV during a flash flood.

The findings show that the integration of aerial with ground observations in post-flood analysis contributes the completeness and accuracy of datasets regarding specific flash flood parameters and in the future could become a useful source of information, especially in data-poor regions.