On the monitoring and prediction of flash floods in small and medium-sized catchments – the EXTRUSO project

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Flash floods regularly cause severe socio-economic damage worldwide. In parallel, climate change is very likely to increase the number of such events, due to an increasing frequency of extreme precipitation events (EASAC 2013). Whereas recent work primarily addresses the resilience of large catchment areas, the major impact of hydro-meteorological extremes caused by heavy precipitation is on small areas. Those are very difficult to observe and predict, due to sparse monitoring networks and only few means for hydro-meteorological modelling, especially in small catchment areas.

The objective of the EXTRUSO project is to identify and implement appropriate means to close this gap by an interdisciplinary approach, combining comprehensive research expertise from meteorology, hydrology, photogrammetry and geoinformatics. The project targets innovative techniques for achieving spatio-temporal densified monitoring and simulations for the analysis, prediction and warning of local hydro-meteorological extreme events. The following four aspects are of particular interest:

1. The monitoring, analysis and combination of relevant hydro-meteorological parameters from various sources, including existing monitoring networks, ground radar, specific low-cost sensors and crowdsourcing.
2. The determination of relevant hydro-morphological parameters from different photogrammetric sensors (e.g. camera, laser scanner) and sensor platforms (e.g. UAV (unmanned aerial vehicle) and UWV (unmanned water vehicle)).
3. The continuous hydro-meteorological modelling of precipitation, soil moisture and water flows by means of conceptual and data-driven modelling.
4. The development of a collaborative, web-based service infrastructure as an information and communication point, especially in the case of an extreme event.

There are three major applications for the planned information system: First, the warning of local extreme events for the population in potentially affected areas, second, the support for decision makers and emergency responders in the case of an event and, third, the development of open, interoperable tools for other researchers to be applied and further developed. The test area of the project is the Free State of Saxony (Germany) with a number of small and medium catchment areas. However, the whole system, comprising models, tools and sensor setups, is planned to be transferred and tested in other areas, within and outside Europe, as well.

The team working on the project consists of eight researchers, including five PhD students and three post-docs. The EXTRUSO project is funded by the European Social Fund (ESF grant nr. 100270097) with a project duration of three years until June 2019.

EASAC (2013): Trends in extreme weather events in Europe: implications for national and European Union adaption strategies. European Academies Science Advisory Council. Policy report 22, November 2013