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Testing conventional and unconventional data sources for the validation of a real-time flash flood impact model

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The socio-economic impacts of flash floods are expected to increase with climate change, which calls for the development of forecasting methods to anticipate them better. Conventional flash flood forecasting methods typically predict pure hazard information (e.g. discharge at a given river section). The World Meteorological Organization (WMO) found that for emergency management it can be useful to complement these hazard forecasts with methods that translate the hazard into the resulting socio-economic impacts (e.g. number of affected people). These impact forecasts can reduce the potential for suboptimal decisions and save time in the decision making. The latter is particularly crucial in the case of flash floods, since they evolve very quickly in time and space and leave very little time to coordinate flood response measures, such as warning or evacuation.

We developed a method that automatically combines flash flood hazard with exposure and vulnerability information in the flood zones to assess socio-economic impacts in real time and high resolution. The prototype for the region of Catalonia (NE Spain) quantitatively estimates the impacts in the flooded area in three categories: Economic damages, and affected population and critical infrastructures.

The underlying hazard model relies on radar rainfall estimates and climatological rainfall thresholds to assess the exceeded return period along the drainage network. These return periods are translated into flood extent by employing a static catalogue of flood maps.

The skill of such hazard estimates is typically analysed by validation against observations of water levels or flood extents, e.g. from stream gauges or satellite imagery.

The translation from hazard into impacts introduces additional uncertainties that are often even higher than those originating from the hazard estimation. Analysis of these additional uncertainties is a challenging task, since information of observed impacts is often scattered, qualitative or incomplete. Impact data can for instance be extracted from newspaper articles, insurance claims, 112 emergency calls, and crowdsourcing from social media. In this work, several of these validation sources have been employed to validate the outputs of the regional real-time impact model during autumn of 2018 (September – November). In this period, Catalonia was hit by several significant flash floods.

First tests cases indicate that impact data derived from insurance claims, 112 emergency calls and crowd-sourcing can add valuable information to conventional validation sources, such as water level observations or newspaper articles.