



A new automatic SAR-based flood mapping application hosted on the European Space Agency's grid processing on demand fast access to imagery environment

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There is a clear need for developing innovative processing chains based on earth observation (EO) data to generate products supporting emergency response and flood management at a global scale. Here an automatic flood mapping application is introduced. The latter is currently hosted on the Grid Processing on Demand (G-POD) Fast Access to Imagery (Faïre) environment of the European Space Agency. The main objective of the online application is to deliver flooded areas using both recent and historical acquisitions of SAR data in an operational framework. It is worth mentioning that the method can be applied to both medium and high resolution SAR images. The flood mapping application consists of two main blocks:

- 1) A set of query tools for selecting the “crisis image” and the optimal corresponding pre-flood “reference image” from the G-POD archive.
- 2) An algorithm for extracting flooded areas using the previously selected “crisis image” and “reference image”.

The proposed method is a hybrid methodology, which combines histogram thresholding, region growing and change detection as an approach enabling the automatic, objective and reliable flood extent extraction from SAR images. The method is based on the calibration of a statistical distribution of “open water” backscatter values inferred from SAR images of floods. Change detection with respect to a pre-flood reference image helps reducing over-detection of inundated areas. The algorithms are computationally efficient and operate with minimum data requirements, considering as input data a flood image and a reference image. Stakeholders in flood management and service providers are able to log onto the flood mapping application to get support for the retrieval, from the rolling archive, of the most appropriate pre-flood reference image. Potential users will also be able to apply the implemented flood delineation algorithm.

Case studies of several recent high magnitude flooding events (e.g. July 2007 Severn River flood, UK and March 2010 Red River flood, US) observed by high-resolution SAR sensors as well as airborne photography highlight advantages and limitations of the online application.

A mid-term target is the exploitation of ESA SENTINEL 1 SAR data streams. In the long term it is foreseen to develop a potential extension of the application for systematically extracting flooded areas from all SAR images acquired on a daily, weekly or monthly basis. On-going research activities investigate the usefulness of the method for mapping flood hazard at global scale using databases of historic SAR remote sensing-derived flood inundation maps.