Flood Inundation Modelling Under Uncertainty Using Globally and Freely Available Remote Sensing Data

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The extreme consequences of recent catastrophic events have highlighted that flood risk prevention still needs to be improved to reduce human losses and economic damages, which have considerably increased worldwide in recent years. Flood risk management and long term floodplain planning are vital for living with floods, which is the currently proposed approach to cope with floods. To support the decision making processes, a significant issue is the availability of data to build appropriate and reliable models, from which the needed information could be obtained. The desirable data for model building, calibration and validation are often not sufficient or available. A unique opportunity is offered nowadays by globally available data which can be freely downloaded from internet. This might open new opportunities for filling the gap between available and needed data, in order to build reliable models and potentially lead to the development of global inundation models to produce floodplain maps for the entire globe. However, there remains the question of what is the real potential of those global remote sensing data, characterized by different accuracy, for global inundation monitoring and how to integrate them with inundation models.

This research aims at contributing to understand whether the current globally and freely available remote sensing data (e.g. SRTM, SAR) can be actually used to appropriately support inundation modelling. In this study, the SRTM DEM is used for hydraulic model building, while ENVISAT-ASAR satellite imagery is used for model validation. To test the usefulness of these globally and freely available data, a model based on the high resolution LiDAR DEM and ground data (high water marks) is used as benchmark. The work is carried out on a data-rich test site: the River Alzette in the north of Luxembourg City. Uncertainties are estimated for both SRTM and LiDAR based models. Probabilistic flood inundation maps are produced under the framework of GLUE. Various target groups which can benefit from SRTM based model results are also identified.