



## **Calibration of hydraulic models using uncertain satellite observations**

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A technique to calibrate flood inundation models using uncertain flood extent maps derived from satellite imagery is proposed. The study is performed on a river reach of the Lower Dee, UK, where a coarse resolution image (ENVISAT ASAR) and high resolution satellite image (ERS-2 SAR) were acquired at the same time during the December 2006 flood event. A sensitivity analysis is carried out in order to investigate the ability of the two different resolution images to calibrate a simple raster-based flood inundation model (LISFLOOD-FP). This analysis showed that the optimal parameters of the model depend on the type of satellite image used to evaluate the model as well as on the particular procedure used to derive the flood extent map. These results pointed out the need to move from deterministic binary wet/dry maps to uncertain flood extent maps. Consequently, a possibility of inundation map is obtained by combining the different estimations of flood extent from satellite imagery according to an appropriate measure of consistency. Then, the study investigated the possibility of calibrating hydraulic models by using this possibility of inundation map, instead of a traditional flood extent map. Specifically, a new technique to produce flood inundation maps conditioned on a possibility of inundation map is developed. This methodology is believed to be more reliable than the standard calibration techniques that do not take into account the uncertainty in the observation of flood extent and lead to subjectivity in identifying an optimal set of parameters.