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Calibration of a flood inundation model using a SAR image: influence of acquisition time

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Flood risk management has always been in a search for effective prediction approaches. As such, the calibration of flood inundation models is continuously improved. In practice, this calibration process consists of finding the optimal roughness parameters, both channel and floodplain Manning coefficients, since these values considerably influence the flood extent in a catchment. In addition, Synthetic Aperture Radar (SAR) images have been proven to be a very useful tool in calibrating the flood extent. These images can distinguish between wet (flooded) and dry (non-flooded) pixels through the intensity of backscattered radio waves. To this date, however, satellite overpass often occurs only once during a flood event. Therefore, this study is specifically concerned with the effect of the timing of the SAR data acquisition on calibration results.

In order to model the flood extent, the raster-based inundation model, LISFLOOD-FP, is used together with a high resolution synthetic aperture radar image (ERS-2 SAR) of a flood event of the river Dee, Wales, in December 2006. As only one satellite image of the considered case study is available, a synthetic framework is implemented in order to generate a time series of SAR observations. These synthetic observations are then used to calibrate the model at different time instants. In doing so, the sensitivity of the model output to the channel and floodplain Manning coefficients is studied through time. As results are examined, these suggest that there is a clear difference in the spatial variability to which water is held within the floodplain. Furthermore, these differences seem to be variable through time. Calibration by means of satellite flood observations obtained from the rising or receding limb, would generally lead to more reliable results rather than near peak flow observations.