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Testing sensitivity of the LISFLOOD subgrid hydraulic model to SAR image derived information

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There has been much interest in the use of Synthetic Aperture Radar (SAR) images to indirectly estimate flood extent and flood elevation to aid the understanding of fluvial flood inundation processes. SAR remote sensing satellites are capable of all-weather day/night observations that can discriminate between land and smooth open water surfaces over large scales. By combining SAR derived information with 2D hydraulic models and terrain data, the mechanisms of flooding can be better simulated therefore enabling more accurate and reliable flood forecasting.

The objective of this study is to test the sensitivity of a LISFLOOD subgrid 2D model to its main parameters (i.e. roughness coefficient, river bathymetry) using SAR derived flood extent maps. Because of SAR imaging techniques and processing steps used to derive the flood information, any SAR-derived flood extent image will contain inherent uncertainty. We therefore use the uncertainty of the SAR information to obtain a range of plausible parameters to test sensitivity of the hydraulic model.

LISFLOOD is a distributed 2D model developed at the University of Bristol and designed for use with larger ungauged river catchments. The version used employs a subgrid procedure which allows any size of river channel below that of the grid resolution to be represented. This procedure has been shown to improve hydraulic connectivity within the modelled flooded area and thus improve flood prediction for data sparse areas. A hydrodynamic LISFLOOD subgrid model of the River Severn at Tewkesbury covering a domain area of 50x70km and including the confluence with a major tributary (the River Avon) will be utilised. A complete storm hydrograph will be used as inflow to the model to simulate the full flood event.

Surveyed cross section and gauged daily flows are also available for the River Severn. Therefore, the model results using variable parameters can be compared against results obtained from ground observations to further analyse the sensitivity of the model. The results will show which parameters the LISFLOOD subgrid model are most sensitive to, for the investigated test case.