

Global scale water stages from SAR imagery (GlosSARi) to support global flood forecasting

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Despite the success of studies attempting to integrate remotely sensed data and flood modelling and the need to provide near-real time data routinely on a global scale as well as setting up online data archives, there is to date a lack of spatially and temporally distributed hydraulic parameters to support ongoing efforts in modelling. Therefore, the objective of this project is to provide a global evaluation and benchmark data set of floodplain water stages with uncertainties and assimilation in a large scale flood model using space-borne radar imagery. An algorithm is developed for automated retrieval of water stages with uncertainties from a sequence of radar imagery and data are assimilated in a flood model using the Tewkesbury 2007 flood event as a feasibility study.

The retrieval method that we employ is based on possibility theory which is an extension of fuzzy sets and that encompasses probability theory. In our case we first attempt to identify main sources of uncertainty in the retrieval of water stages from radar imagery for which we define physically meaningful ranges of parameter values. Possibilities of values are then computed for each parameter using a triangular ‘membership’ function. This procedure allows the computation of possible values of water stages at maximum flood extents along a river at many different locations. At a later stage in the project these data are then used in assimilation, calibration or validation of a flood model.

The application is subsequently extended to a global scale using wide swath radar imagery and a simple global flood forecasting model thereby providing improved river discharge estimates to update the latter.