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Bayesian calibration of flood inundation models using an observation of flood extent

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We construct a Bayesian framework for the calibration of a simple storage cell flood inundation model (LISFLOOD-FP) using an observation of flood extent. The framework is presented in the form of a directed acyclic graph (DAG), which clearly encodes the dependencies between variables.

Conditional distributions must be defined for each node in the DAG. In particular we define the likelihood of the observed flood extent given a prediction of flood extent. The observed and predicted flood extents take the form of binary valued (wet or dry) grids; we develop a Hidden Gaussian Markov Random Field model that can handle the spatial dependence in the binary valued observed data, and the blurred regression on the prediction.