# Evaluating catchment responses to drought and flood using gridded and rescued datasets

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Long term river flow data are instrumental in helping to identify the risks posed by fluvial flooding and drought events. They assist in providing greater understanding of the drivers of hydrological variability which is fundamental to the planning, operation and management of water resources. Whilst in many locations around the world long term river flow records are lacking, gridded paleoclimate reconstructions as well as precipitation data rescue efforts have made long term climatic data more readily available. When employed in tandem with rainfall runoff modelling techniques such data can be used to both generate and validate historic river flows. In this paper we outline a methodology that employs a gridded European temperature and precipitation dataset to reconstruct monthly river flow values for 30 river catchments around the island of Ireland, from 1766 to present. Modelled flow for the catchments is validated through the use of long term quality assured precipitation series with results assessed for historical drought and high flow periods. Uncertainties in reconstructions from hydrological model structure and parameters are integrated using the Generalised Likelihood Uncertainty Estimation (GLUE) method. We find that the methodology produces robust reconstructs of river flows that allow for detailed assessment of how varying historic climatic conditions influence catchment flow characteristics. Results also show that, despite uncertainties associated with the reconstruction process, low flow signatures associated with notable historic drought events are identifiable in our reconstructs. Finally, we highlight that the datasets and methods used can be readily employed to reconstruct river flows in other European contexts.