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Impact of Climate Change on high and low flows across Great Britain: a temporal analysis and uncertainty assessment.

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Over the past decade there have been significant challenges to water management posed by both floods and droughts. In the UK, since 2000 flooding has caused over £Bn worth of damage, and direct costs from the recent drought (2011-12) are estimated to be between £0-165M, arising from impacts on public and industrial water supply. Projections of future climate change suggest an increase in temperature and precipitation trends which may exacerbate the frequency and severity of such hazards, but there is significant uncertainty associated with these projections. It thus becomes urgent to assess the possible impact of these changes on extreme flows and evaluate the uncertainties related to these projections, particularly changes in the seasonality of such hazards.
This paper aims to assess the changes in seasonality of peak and low flows across Great Britain as a result of climate change. It is based on the Future Flow database; an 11-member ensemble of transient river flow projections from January 1951 to December 2098. We analyse the daily river flow over the baseline (1961–1990) and the 2080s (2069–2098) for 281 gauging stations. For each ensemble member, annual maxima (AMAX) and minima (AMIN) are extracted for both time periods for each gauging station. The month of the year the AMAX and AMIN occur respectively are recorded for each of the 30 years in the past and the future time periods. The uncertainty of the AMAX and AMIN occurrence temporally (monthly) is assessed across the 11 ensemble members, as well as the changes to this temporal signal between the baseline and the 2080s.
Ultimately, this work gives a national picture (spatially) of high and low flows occurrence temporally and allows the assessment of possible changes in hydrological dynamics as a result of climate change in a statistical framework. Results will quantify the uncertainty related to the Climate Model parameters which are cascaded into the modelling chain. This study highlights the issues facing hydrological cycle management, due to changing spatial and temporal trends in order to anticipate and adapt to hydro-hazard changes in an uncertain context.