07 - Climate change and hydrology: Projected changes in hydrological regimes of Irish catchments from the CMIP6 ensemble of climate models.

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ABSTRACT

Understanding climate change impacts on the hydrological cycle is critical to informing adaptation actions locally and nationally. Understanding plausible projected changes is fundamental to adaptation in the water sector, with impacts having implications for water resource and flood risk management, hydro power, aquatic ecosystems, and economic activity. In the past, research in Ireland has examined impacts on catchment hydrology using only a small subset of climate models and/or a limited number of catchments. Through the EPA funded HydroPredict Project, ongoing research is employing the latest ensemble of climate models (CMIP6) to explore projected changes across a large number of catchments in Ireland. The paper will detail results to date in providing an updated assessment of the impacts of climate change on seasonal mean, low and high flows for 37 Irish catchments. In doing so, we attempt to better represent the plausible ranges of future change by employing 12 Earth System Models (ESMs) that comprise the recently available Coupled Model Intercomparison Project Phase 6 ensemble forced using three SSP scenarios (SSP126, SSP370 and SSP585). Following downscaling and bias correction, changes in future flow regimes are evaluated using two structurally different conceptual hydrological models – the SMART model and GR4J model. This paper will provide an overview of the development of projections, steps taken to ensure key uncertainties are incorporated, and detail associated impacts across the flow regime under a range of different emissions scenarios for the middle and end of the century. Attention will also be given to projected changes in droughts and floods for selected catchments. To conclude, consideration will be given as to how best to integrate projected changes into adaptation decision making. Full details of the methods and results can be found in the open access publication in the Journal Water available at the following link: https://www.mdpi.com/2073-4441/14/10/1556

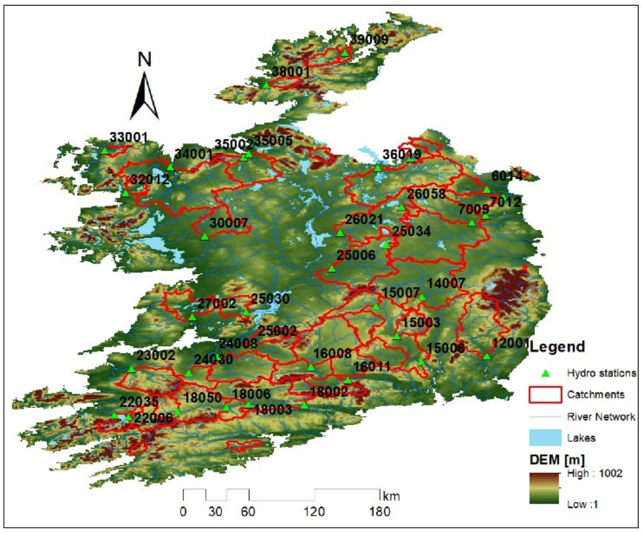
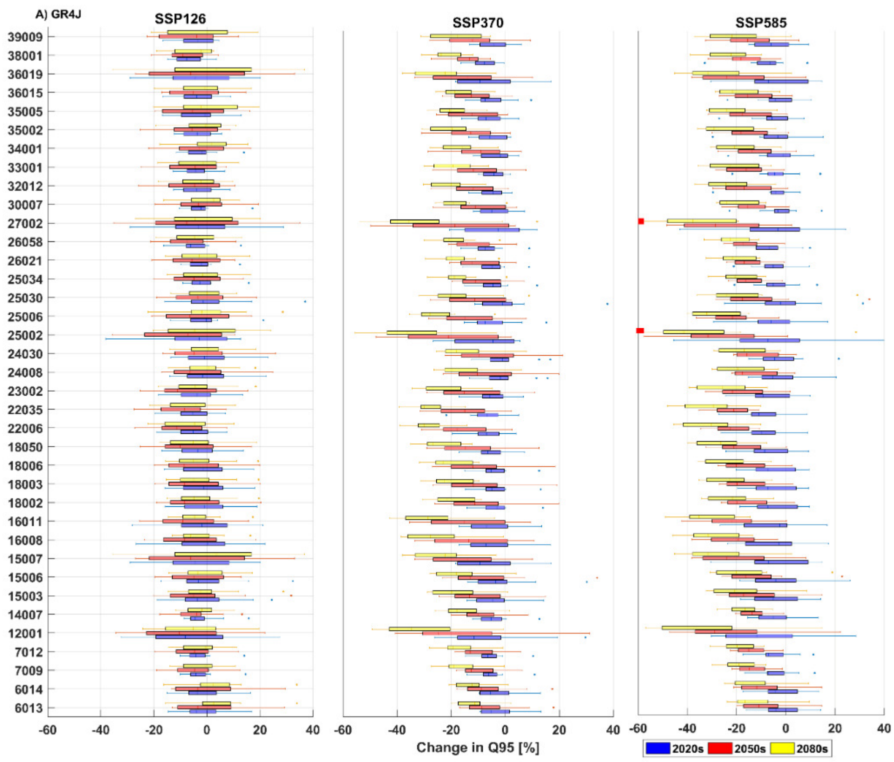


Figure 1 Distribution of the 37 catchments used in the analysis. The red line identifies the catchment boundary, while the green triangle indicates the location of the gauging station. The numbers listed are unique hydrometric codes used to identify gauges and correspond to those given in subsequent figures.



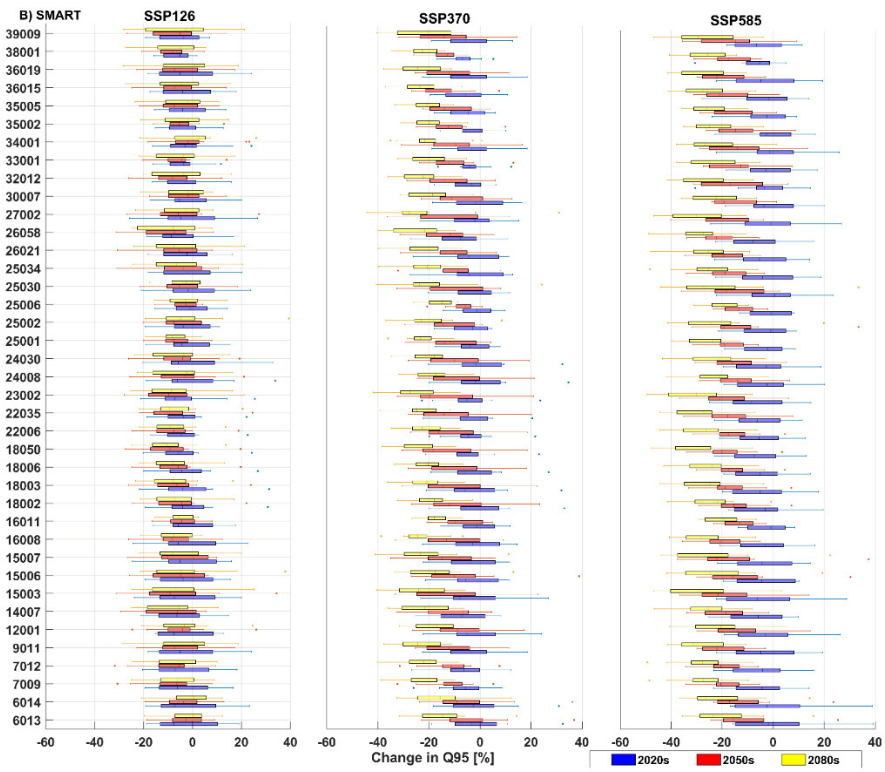


Figure 2 Projected percent changes in the annual Q95 for the 2020s, 2050s, and 2080s relative to the reference period 1976–2005 for each catchment, as simulated for SSP126, SSP370, and SSP585 for the GR4J model (A) and SMART model (B).

Full script available at: https://www.mdpi.com/2073-4441/14/10/1556