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# Changes in the annual cycle of heavy precipitation across the British Isles within the 21st century

Anne Schindler (1), Douglas Maraun (2), and Luterbacher Jürg (1)

(1) Justus-Liebig-Universität Giessen, Institut für Geographie, Giessen, Germany (anne.schindler@geogr.uni-giessen.de), (2) Leibnitz Institute of Marine Sciences at the University of Kiel, Germany

Understanding shifts in the seasonal cycle of heavy precipitation and the amplification of its amplitude are relevant for assessing future flood risk and other related hazards, and in particular their impacts on agriculture and water management. Dividing the analysis of changes in heavy precipitation into different seasons is too coarse to precisely detect and quantify subtle changes of timing and amplitude. Therefore, we explicitly analyze the annual cycle of heavy precipitation in response to anthropogenic greenhouse gases, providing timely insight relevant for hydrological modeling.

We investigate future changes in the annual cycle of heavy daily precipitation events across the British Isles in the periods $2021-2060$ and $2061-2100$, relative to present day climate. Twelve combinations of regional and global climate models forced with the A1B scenario are used. The annual cycle is modeled as an inhomogeneous Poisson process with sinusoidal models for location and scale parameters of the generalized extreme value distribution. Although the peak times of the annual cycle vary considerably between projections for the $2061-2100$ period, a robust shift towards later peak times appears for the South-East, while in the North-West there is evidence for a shift towards earlier peak times. Elsewhere no changes in the peak times are projected. For $2021-2060$ this signal is weak. The annual cycle's relative amplitude shows no robust signal, where differences in projected changes are dominated by global climate model differences. The relative contribution of anthropogenic forcing and internal climate variability to changes in the relative amplitude cannot be identified with the available ensemble.

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