



## **The annual cycle of intensity and frequency of extreme precipitation events across the UK in observations and future projections**

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Precipitation in the UK shows a pronounced annual cycle. For the assessment of past, present and future agricultural and hydrological impacts it is important to study intensity and frequency of extreme events together with their spatial and temporal occurrence throughout the year. Especially in a downscaling approach it is important to model intensity and occurrence frequency independently, since different predictors might act differently on intensity and occurrence.

We design a statistical model based on extreme value statistics (EVS) and fit the statistical model to a selection of daily precipitation series based on the MIDAS land surface observation data provided by the British Atmospheric Data Centre. The selection comprises 689 rain gauges covering the whole UK and a period from 1961 to 2006. We study spatial and temporal patterns of the annual cycle of intensity and rate of occurrence respectively.

Here we model extreme precipitation in the UK as a Poisson process with a non-stationary threshold. We determine the threshold by normalizing the data relative to the “day of the year” mean precipitation, then calculating a high quantile, e.g. 95% quantile, of the normalized data and by transforming these values back to the original scale we obtain the threshold values for each day of the year. We use a sinusoidal model for the location and scale parameter of the corresponding generalized extreme value (GEV) distribution and a constant shape parameter.

In a second step we validate the representation of the annual cycle of extreme precipitation events simulated by 14 regional climate models (RCMs) with a resolution of 25km, used in the ENSEMBLES project. As a reference data set we use the gridded UK Metoffice data set. We fit the statistical model to the reference data set and the ERA40 driven RCMs and the annual cycle of intensity and frequency simulated by the RCMs with the observational results. We then assess future changes of the local scale annual cycle in extreme precipitation in the ensemble of RCMs. To this end we analyse the projection of the validated RCMs driven by the SRES scenario A1B.

We detect a shift in the annual cycle of the frequency or a trend in the annual cycle of the intensity of extreme precipitation events.