Modelling the anual cycle of extreme precipitation

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The frequency and intensity of precipitation can change significantly throughout the
seasons. Therefore the probability for extreme precipitation events with dangerous
consequences can be very different in different months of the year. To account for
this seasonal variation, many analyses consider only precipitation for a given season,
e.g., summer or winter, or even for a specific month. In the presented study, we use
a non-stationary generalised extreme value distribution (GEV) to describe the vari-
able occurrence rate of extreme precipitation events of 689 gauges across the UK.
We show that the seasonal variation of the location and scale parameters of the GEV
can be well approximated using harmonic functions. Compared to a monthly resolved
extreme value modelling the uncertainty in the GEV parameter estimation can be sig-
nificantly reduced. Another reduction in parameter uncertainty can be achieved by a
spatial averaging of the shape parameter. This allows for a more precise estimation of
the return level of extreme precipitation for a specific month.