Non-stationary extreme rainfall estimation for the UK

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Extreme rainfall events are the cause of major natural hazards including fluvial floods and landslides which have significant social and ecological implications. Despite classical rainfall event analyses allowing inference to unobserved events inference, confidence intervals are needed to quantify the uncertainty in extreme estimates. Confidence intervals of extreme rainfall records in six UK catchments are examined using three approximating approaches, namely (1) a normal approximation based on the Taylor expansion, (2) a bootstrapping method and (3) an order statistics approach. Results of the bootstrapping method and the order statistics approach converge but the widely used normal approximation appears to be inadequate due to the highly skewed distribution of extreme values. Although results show that the generalised extreme value (GEV) distribution can provide a fairly good representation of the annual rainfall extreme series, a model-based approach using Generalised Linear Models (GLMs) to assimilate global circulation information removes the need for the assumption of identical distribution in traditional GEV analysis and gives insights into nonstationary extreme rainfall at catchment scales. Based upon the current results, a framework for investigating the relationships between continental climate signals and local rainfall extremes under climate variability is presented.