Generalized Extreme Value's shape parameter and its nature for extreme precipitation using long time series and Bayesian approach

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Assessing the probability of extreme precipitation events is of great importance in civil planning. This requires understanding of how return values change with different return periods, which is essentially described by the Generalized Extreme Value distribution's shape parameter. Some works in the field have suggested a constant shape parameter, while our analysis indicates a non-universal value. We first re-analyse an older precipitation dataset (169 stations) extended by Norwegian data (71 stations). We show that while each set seems to have a constant shape parameter, it differs between the two datasets, indicating regional differences. For a more comprehensive analysis of spatial effects, we examine a global dataset (1495 stations). We provide shape parameter maps for two models. We find clear evidence for the shape parameter being dependent on elevation while the effect of latitude remains uncertain. Our results confirm an explanation in terms of dominating precipitation systems based on a proxy derived from the Köppen-Geiger climate classification.