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Spatial analysis of precipitation extremes in Switzerland

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Return values of rare precipitation extremes are an important quantitative reference for the assessment of risks and the planning of protective measures related to heavy precipitation and flooding. Univariate extreme value analysis (EVA) is a well established method for obtaining such information from long station records, but its results are of limited representativity away from stations, particularly so in complex terrain. This calls for theoretically well-founded methods of spatial interpolation for extremes. Procedures frequently employed in practice today suffer limited flexibility in modelling spatial dependence and they fail to provide reliable measures of uncertainty from both the estimation of in-situ return values and the spatial interpolation. Recent theoretical developments have proposed stochastic models for extremes with spatial dependence. In this study we adapt and apply one of them, the "latent spatial process model" of Cooley et al., to derive high-resolution grids of extreme return values and their uncertainty for daily precipitation in Switzerland. Our application of the method combines a GEV model for block maxima with a latent spatial dependence model for the distribution parameters (with covariates and dependent Gaussian residuals). Inference with this Bayesian hierarchical model is made via an MCMC algorithm. The poster will evaluate the approach, illustrate its flexibility to integrate covariates for topographic effects and show the advantage of the Bayesian framework to quantify uncertainties.