Continuous Spatial Process Models for Spatial Extreme Values

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Abstract

We propose a hierarchical modeling approach for explaining a collection of point-referenced extreme values. In particular, annual maxima over space and time are assumed to follow Generalized Extreme Value (GEV) distributions, with parameters μ , σ , and ξ specified in the latent stage to reflect underlying spatio-temporal structure. The novelty here is that we relax the conditionally independence assumption in the first stage of the hierarchial model which has been adopted in previous work. We offer a spatial process model for extreme values which provides mean square continuous realizations, where the behavior of the surface is driven by the spatial dependence which is unexplained under the latent spatio-temporal specification for the GEV parameters. In addition, we are able to implement spatial interpolation for extreme values based on this model. A simulation study and a study on actual annual maximum rainfalls for a region in South Africa are used to illustrate the performance of the model.