

BAYESIAN MODELING OF SPATIALLY CORRELATED CLIMATE EXTREMES

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A Bayesian hierarchical model is used to model the annual minimum temperature in Iceland from 1961 to 2007. The marginal distribution at each site is modeled with the generalized extreme value distribution. The temporal correlation is not significant while there is a strong spatial correlation between the annual extreme values within the same period. This spatial correlation at the data level is modeled using a Gaussian copula with a correlation matrix based on the Matern correlation function.

Since the annual minimum temperature is the variable of interest then one of the goals is to obtain a spatial prediction of a percentile in the left end of the distribution, e.g., the first percentile, for a set of unobserved sites. For this kind of a prediction the location parameter and the log-scale parameter of the generalized extreme value distribution need to be modeled spatially, the shape parameter is assumed to be an unknown constant. As a model for the location parameter and the log-scale parameter, we propose two dimensional B-splines with a Markov random field prior on the parameters of the B-spline kernels. In addition, the models for these two parameters include linear terms consisting of altitude, distance from open sea, latitude and longitude.