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Temporal Dependence in Extreme Santa Ana Winds

Benjamin Shaby *

bshaby@psu.edu

We analyze the behavior of extreme winds occurring in Southern California during the Santa Ana fire season using a latent mixture model. We formulate the mixture representation as a hierarchical Bayesian model and fit it using Markov chain Monte Carlo. The two-stage model results in generalized Pareto margins for exceedances and generates temporal dependence through a latent Markov process. This construction induces asymptotic independence in the response while allowing for dependence at extreme, but sub-asymptotic, levels. The hierarchical Bayesian formulation of the model results in efficient inference because it uses the full likelihood (rather than a composite likelihood), allows straightforward handling of missing data, and includes a natural mechanism to account for rounding and censoring. We present posterior inference for the extremal index and probability of multi-day occurrences of extreme Santa Ana winds over a range of high thresholds.

This is joint work with Gregory Bopp.

*Department of Statistics, Penn State University, 313 Thomas Bldg., University Park, PA 16802, USA