

Bayesian inferences on environmental exceedances and their spatial locations

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Abstract

A frequent problem in environmental science is the prediction of extrema and exceedances. It is well known that Bayesian and empirical-Bayesian predictors based on integrated squared error loss tend to “over-shrink” predictions of extrema toward the mean. In this paper, we propose a new loss function called the integrated weighted quantile squared error loss (IWQSEL) as the basis for prediction of exceedances and their spatial location. The loss function is based on an ordering of the underlying spatial process using a spatially averaged cumulative distribution function. We illustrate this methodology with a Bayesian analysis of surface-nitrogen concentrations in the Chesapeake Bay.