

Combining ensembles of regional climate model output via a multivariate Markov random field model

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Abstract

Climate models have become an important tool in the study of climate and climate change, and ensemble experiments consisting of multiple climate model runs are used in studying and quantifying the uncertainty in climate model output. However, there are often only a limited number of model runs available for a particular experiment, and the statistical challenge is to characterize the distribution of the model output. To that end, we have developed a multivariate hierarchical approach at the heart of which is a new representation of a multivariate Markov random field model. This approach allows for flexible modeling of the multivariate spatial dependencies, including the cross-dependencies between variables. We demonstrate this statistical model on an ensemble arising from a regional climate model experiment over the western United States and focusing on the projected change in seasonal temperature and precipitation over the next 50 years.