Coupled Stochastic Weather Generation Using Spatial and Generalized Linear Models

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Abstract. We introduce a stochastic weather generator for the variables of minimum temperature, maximum temperature, and precipitation occurrence. Temperature variables are modeled in vector autoregressive framework, conditional on precipitation occurrence. Precipitation occurrence arises via a probit model, and both temperature and occurrence are spatially correlated using spatial Gaussian processes. Additionally, local climate is included by spatially varying model coefficients, allowing spatially evolving relationships between variables. The method is illustrated on a network of stations in the Pampas region of Argentina where nonstationary relationships and historical spatial correlation challenge existing approaches. The covariance structure of this network of stations is then used to produce daily gridded weather scenarios which can be used to drive hydrologic models. Inclusion of other covariates such as seasonal total precipitation and global climate drivers allows the potential for decadal projections, an increasingly useful tool for decision support.