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**A spatio-dynamic model for assessing frost risk in south-eastern Australia**

A number of climatic indicators have strong influence on daily minimum temperature and hence on determining frost risk. Some of these variables, e.g., El Nino/La Nina Southern Oscillation and blocking index are measured at monthly level and have no spatial variation. They may have a spatially and temporally varying impact on observed point level daily minimum temperature data. There are also grid-referenced covariates obtained from deterministic computer simulation models, e.g., NCEP reanalysis data, that is spatially misaligned with the observed data. Motivated by the need to model point and grid level spatio-temporal data, we develop a Bayesian hierarchical spatio-dynamic model which has the ability to address both the spatially varying impact and the spatio-temporal misalignment problems through spatially and temporally varying parameters. The proposed model has the ability to capture the diurnal data pattern through a second stage state-space hierarchical

structure. Utilising suitable prior distributions, the Markov chain Monte Carlo technique has been applied to make inferences for the model and hence for predictions. We apply the model to minimum temperature data from south-eastern Australia with the purpose of predicting frost risk. We show that the proposed model performs well using out-of-sample validation techniques.