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Seasonal precipitation forecasting for the Melbourne region using a Self-Organizing Maps approach

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The Melbourne region experiences highly variable inter-annual rainfall. For close to a decade during the 2000s, below average rainfall seriously affected the environment, water supplies and agriculture. A seasonal rainfall forecasting model for the Melbourne region based on the novel approach of a Self-Organizing Map has been developed and tested for its prediction performance. Predictor variables at varying lead times were first assessed for inclusion within the model by calculating their importance via Random Forests. Predictor variables tested include the climate indices SOI, DMI and N3.4, in addition to gridded global sea surface temperature data. Five forecasting models were developed: an annual model and four seasonal models, each individually optimized for performance through Pearson's correlation r and the Nash-Sutcliffe Efficiency. The annual model showed a prediction performance of r = 0.54 and NSE = 0.14. The best seasonal model was for spring, with r = 0.61 and NSE = 0.31. Autumn was the worst performing seasonal model. The sea surface temperature data contributed fewer predictor variables compared to climate indices. Most predictor variables were supplied at a minimum lead, however some predictors were found at lead times of up to a year.