Evaluation of spatial correlations of dynamically downscaled rainfall data for eastern Australia

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As part of the Eastern Seaboard Climate Change Initiative (ESCCI) – East Coast Low project, we assess three high resolution dynamically downscaled regional climate model datasets simulated by the Weather Research Forecasting (WRF) model over the east coast of Australia. The datasets have been produced by the NARCliM (NSW/ACT Regional Climate Modelling) project at 10km resolution spanning a 60-year period (1950-2010) and driven by the NCEP/NCAR reanalysis.

In the analysis, the RCM simulated data was first examined considering the possible spatial reduction of the point rainfall intensity occurs when transforming point rainfall to areal average rainfall at the pixel level. The ability of RCM simulated data to reproduce the observed spatial correlations was assessed using two data sets: 1) point rainfall data for selected Bureau of Meteorology daily rainfall stations within the study area and 2) the Australian Water Availability Project (AWAP) gridded ($0.05° \times 0.05°$, 5km x 5km) daily rainfall dataset.

The standard deviation of the RCM time series is less than the standard deviation of the observed rainfall even when allowing for the differences between point scale observed data and pixel averaged RCM data. The spatial pattern of the RCM correlations was qualitatively similar to that of the observed data. A topographic influence in the spatial correlations was also found.

We studied the spatial correlation structure of both the RCM data and the observed raingauge data. The RCM correlation function was about 15-20% higher than the observed data for all separations from 10km to 200km.