



Southeastern Australia climate variations 1860–2009: using historical data to test teleconnection stability

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The southeastern region of Australia is home to over half of the nation's population, and is responsible for a third of the country's food production. The climate in this important region is influenced by large-scale circulation features, including El Niño–Southern Oscillation (ENSO) and the Indian Ocean Dipole (IOD). The influence of these features has been known to fluctuate over time. However, the current climate records for southeastern Australia begin at the start of the 20th century, restricting our ability to explore long-term changes in teleconnection patterns.

Historical datasets of instrumental temperature, pressure and rainfall observations have recently been developed for southeastern Australia for the 1860–1909 period. In this study we use these historical records in conjunction with modern climate observations to conduct the first examination of southeastern Australian climatic changes over the last 150 years.

We describe the newly extended datasets, and reveal several relatively unknown variations in southeastern Australian climate during 1860–1909. To explore how teleconnections in the southeastern Australia region may have changed over time, we then apply a path analysis to the extended datasets, using partial and semipartial correlations to determine independent relationships between climatic features.

The most outstanding feature of the path analysis is a decrease in the influence of ENSO on southeastern Australian rainfall during 1920–1959, particularly in the austral winter. Increasing correlations between the IOD and annual southeastern Australian rainfall and pressure are also found in the recent 1970–2009 period, suggesting that the IOD is becoming more important in the modulation of southeastern Australian climate.

Similar results are obtained using 20th Century Reanalysis for 1871–2009, supporting the quality of the extended historical datasets and providing verification for the reanalysis data in southeastern Australia from the late-19th century.