

AN INSIGHT INTO MID-LATITUDE CIRCULATION ANOMALIES ASSOCIATED WITH THE SOUTHERN ANNULAR MODE OVER THE PAST 700 YEARS FROM EAST ANTARCTIC ICE CORE SEA-SALT TIME SERIES

I. D. Goodwin

*Environmental and Climate Change Group, School of Environmental and Life Sciences,
University of Newcastle, Callaghan NSW 2308, Australia*

The Southern Annular Mode (SAM) of climate variability is a pronounced feature on synoptic to decadal time scales. The extratropical Southern Hemisphere instrumental record is too short to adequately explore decadal circulation anomalies and variability in MSLP, rainfall and sea-surface temperatures. Recently, studies of sea-salt aerosol concentrations in ice cores have been used to reconstruct indices of the SAM history over the past millennium (Goodwin et al., 2004, Mayewski et al. 2007). A 700 year (1300-1995 AD), winter mid-latitude MSLP has been reconstructed from the sea-salt sodium (Na) ion concentration in ice cores from Law Dome (DSS), 66° 46' S, 112° 48' E, circum-Antarctic station MSLP observations, NCEP/NCAR Reanalysis (NNR) MSLP, and wind field data (Goodwin et al., 2004). Average MJJ Na concentrations are anti-correlated to the Southern Annular Mode (SAM) index of climate variability, and are also associated with the stationary Rossby wave number 3 circulation. High (low) Na concentrations occur during negative (positive) SAM phases. The time series contains significant decadal and interdecadal variability, and a shift towards a more zonal circum-Antarctic circulation in the last 450 years.

New research presented in this paper, describes the further potential for developing a time series of circulation (MSLP/SST) anomalies in the Australian and South-West Pacific region, using multiple ice-core sea-salt records, proxy SST time series derived from subtropical corals, and proxy rainfall time series derived from cave speleothems. An insight into these circulation and rainfall anomalies in the Southern Australian and South-West Pacific regions is presented for multi-decadal periods in the past few hundred years.

References

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