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Early-nineteenth-century southern African precipitation reconstructions from ships' logbooks

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Atmospheric circulation in the oceans surrounding southern Africa plays an important role in determining its precipitation. This study uses wind information recorded in ships' logbooks in order to statistically reconstruct summer and winter season precipitation at four southern African weather stations from 1796 to 1854. The reconstruction was obtained by first relating gridded 8° × 8° NCEP-DOE reanalysis seasonal mean wind vectors in the adjacent oceans to station precipitation. Over a 30-year calibration period (1979–2008), significant correlations between wind and precipitation at Cape Town, Mthatha and Royal National Park showed particular correspondence with those areas with the greatest concentration of logbook observations.

Principal component regression was used to assess the potential of the dominant patterns of variability in the wind vectors as predictors to reconstruct precipitation. Cross-validation in the calibration period gave confidence that precipitation could be reconstructed at several stations across South Africa, meaning the regression relationships derived in the calibration period could be applied to the gridded seasonal mean logbook data to produce reconstructions of precipitation from 1796 to 1854. The reconstructions show a degree of correspondence with other regional data sets. For instance,the decade beginning in 1810 was the wettest of the period at Mthatha and Royal National Park, while the 1820s were the driest. At Cape Town, the 1820s were the wettest decade, with drier conditions observed in the 1830s. An index of west–east circulation in the summer season revealed correspondence with two documentary reconstructions of El Niño events and increased westerliness, although this did not always result in drier conditions. Attention is also drawn to the remaining 3000 yet to be digitised English East India Company logbooks which would provide a high-resolution picture of atmospheric circulation back to 1700 in the region under consideration.