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Late Quaternary aridity changes in the winter-rain areas on the Southern Hemisphere: inferences from the marine sediment archive

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At present, the Southern Westerlies migrate zonally over the southern hemisphere through the seasons and cause winter rains in the generally dry west coasts of South America, South Africa, and the southern parts of Australia. On a geological time scale this winter-rain causing atmospheric system has shifted zonally as well, with a more equator-ward position during glacial times and a more pole-ward position during interglacial times. These glacial-interglacial changes are recorded in the marine sediment archive where aeolian dust and fluvial mud are deposited depending on the environmental conditions on land.

Here we present aridity records from sediment cores off three continents on the southern hemisphere that register changes in runoff on different timescales throughout the late Quaternary. We demonstrate how the zonal movements of the atmospheric frontal systems dominate past environmental conditions and try to put these in a global context.

The sediment records were retrieved from the sea floor at about the same latitude offshore the three large austral continents. The two aridity records off South America and South Africa show a pertinent southern-hemisphere signal with relatively wet glacials and dry interglacials, a pattern that is opposite to the general pattern on the northern hemisphere with dry glacials and wet interglacials. The record offshore northwestern Australia does not show the typical southern-hemisphere winter-rain pattern, which we explain by the strong influence of the Australian monsoon.