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A southern-hemisphere perspective: Late Quaternary climate variability in two austral continents inferred from aeolian dust and fluvial mud as recognized in grain-size distributions of the terrigenous fraction in marine sediments

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With the data we present in this study we try to stimulate the discussion about the importance of the Southern Hemisphere in global climate change. We argue for synchronous latitudinal shifts in the atmospheric and oceanic frontal zones in the Southern Ocean during the Late Quaternary, with hemisphere-wide consequences for the winter-rain regions of the three continents. We present grain-size distributions of the terrigenous sediment fraction from cores from the SE Atlantic offshore Namibia, and the SE Pacific offshore Chile. The grain-size distribution data of all cores were 'unmixed' into subpopulations, and interpreted as 'coarse' aeolian dust, 'fine' aeolian dust and fluvial mud, respectively. The downcore ratios of the proportions aeolian dust and fluvial mud represent palaeo-continental aridity records of the rainfall regions of south-western Africa and northern Chile for the last 300,000 yr, and 45,000 yr, respectively.

All records show a relatively wet Last Glacial Maximum compared to a relatively dry Holocene, but different orbital variability on longer time scales. When comparing the continental aridity records to published palaeoclimate records we conclude that there is a pronounced high-latitude southern-hemisphere signal in all the records, probably caused by latitudinal shifts in the position of the moisture bearing Southern Westerlies, which lead to increased winter rainfall in the western parts of all three continents. In the transect offshore Chile we observe that the influence of the Southern Westerlies

gradually decreases from South to North and is overprinted by tropical forcing towards the equatorial parts of the Southeast Pacific Ocean.

We hypothesise that climate in the winter-rain regions on the Southern Hemisphere was dominated by latitudinal movements of the oceanic and atmospheric frontal zones, thereby explaining the reconstructed increased precipitation during glacial periods and increased aridity during interglacial periods throughout the Quaternary.