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Glacial-interglacial changes in water mass structure and flow in the S.W. Pacific Ocean

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Depth profiles of benthic oxygen and carbon isotopic values are based on averaged values over selected times in 0-160 ka. The data are from eastern New Zealand, mainly North Chatham Rise, under the Southwest Pacific's Deep Western Boundary Current. This is the main point of entry for several water masses into the Pacific Ocean. The benthic isotopic profiles show that the water masses at present and inferred for the past have retained a constant structure of of Lower Circumpolar Deep Water – Upper Circumpolar Deep Water/North Pacific Deep Water – Antarctic Intermediate Water with no significant changes in the depths of water mass boundaries between glacial and interglacial states. Sediment grainsize data for four cores also show that, the vigour of the inflow to the Pacific appears to have remained fairly constant. Some of the lowest LGM values of benthic δ^{13}C in the world Ocean (-1.03 ‰ based on *Cibicidoides wüllerstorfi*) occur here at ∼2200 m. Comparable values occur only in the Atlantic sector of the Southern Ocean, while those from the rest of the Pacific are distinctly higher, confirming that in the glacial the Southern Ocean was the source for the nutrient-enriched water seen here, whereas at present the nutrient-enriched waters here come from the N. Pacific. Oxygen isotopic data are compatible with a glacial cold deep water mass of high salinity, but lower nutrient content, below ∼3500 m depth. This contrasts with the South Atlantic where highly nutrient-enriched water extends all the way to the sea bed. This implies that the deeper reaches of the Antarctic Circumpolar Current were not homogeneous all around the Southern Ocean, and

the Kerguelen and Macquarie-Balleny Ridges were barriers to eastward spread of the deepest low-δ^{13}C water out of the South Atlantic in glacials.