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Circulation changes in the abyssal South Pacific during the last glacial-interglacial transition

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The deep Southern Ocean overturning cell comprises the upwelling of Circumpolar Deep Water (CDW) onto the Antarctic shelves, where heat loss and salt rejection during sea ice formation drive the formation of bottom waters [1]. Upon mixing with overlying CDW, these bottom waters penetrate northwards into the adjacent abyssal ocean basins [1]. Based on neodymium (Nd) isotopes (expressed as ε_{Nd}), it has been suggested that changes in the abyssal circulation of the South Pacific influenced the carbon storage capacity of the glacial deep ocean [2]. However, this was based on the assumption that the Nd isotope signature of Ross Sea Bottom Water (RSBW) was invariable in the past and an ε_{Nd} record from site PS75/054 that is largely limited to the deglacial period.

Here we report authigenic Nd isotope data from Southeast Pacific core PS58/270-5 (62.03°S/116.13°W) recovered from 4981 m water depth in the RSBW layer [1]. Using a mild sequential leaching approach we extracted the authigenic fraction from the virtually carbonate-free sediments. Our ε_{Nd} results range from ~-3 to -6 over the past ~30,000 years. These values are systematically more radiogenic than other contemporaneous Nd isotope data from the deep Southern Ocean. A strong correlation between Nd and strontium (Sr) isotope signatures suggests that our leach extracts contained a lithogenic component. We use this correlation to correct for the lithogenic contribution thus yielding glacial-interglacial Nd isotope variability between ~-5.5 and -8 for core PS58/270-5 in the RSBW layer, consistent with other reconstructions from the deep South Pacific [2,3]. The RSBW ε_{Nd} data will be compared with existing [2] and new data from the more northerly core PS75/054-1 (56.15°S/115.13°W, 4113 m water depth) refining the existing picture of glacial-interglacial circulation changes in the abyssal Southeast Pacific.

[1] Orsi, Johnson & Bullister (1999), *Progress in Oceanography* **43**, 55–109. [2] Basak et al. (2018), *Science* **359**, 900–904. [3] Wilson et al. (2020), *Earth and Planetary Science Letters* **544**, 116405.