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Neodymium Isotope Ratios in Seawater and Sediments from the Pacific Sector of the Southern Ocean

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The South Pacific encompasses the largest part of the circum-Antarctic ocean, yet it is the least studied region of the Southern Ocean. It accommodates major areas of intermediate and bottom water formation and is therefore an important end-member of the global meridional overturning circulation.

Neodymium isotope ratios (^{143}Nd/^{144}Nd, expressed as ε_{Nd}) in seawater and marine sediments are an important tracer for the origin and transport of water masses, and the provenance of terrigenous material supplied to the ocean. Characterization of the Nd isotope signature of water masses near their formation sites is therefore crucial to their use as water mass tracers in the present and past ocean. Here we present water column and surface sediment leachate ε_{Nd} data from the Pacific sector of the Southern Ocean collected during expedition ANTXXVI-2 (*R/V Polarstern*). The bottom water Nd isotopic composition shows ε_{Nd} values of -7 at 69°S (3850m water depth) and ε_{Nd} = -9 at 53°S (5190m water depth). A similar trend of poleward increasing ε_{Nd} is seen in surface sediment leachates from two core sites north and south of the Subantarctic Front (SAF). The vertical seawater ε_{Nd} profile at 69°S exhibits a distinct change from ε_{Nd} = -7 at depth (3800-3000m) to ε_{Nd} = -8 at 2000m, and -9 at 1000m water depth, with a return to -8 near the surface. The upper water column ε_{Nd} is consistent with the isotopic composition considered characteristic of the Antarctic Circumpolar Current that reflects the mixing of Atlantic, Pacific, and Indian Ocean water masses. The more radiogenic bottom water ε_{Nd} south of the SAF suggests contributions from radiogenic Antarctic sources.