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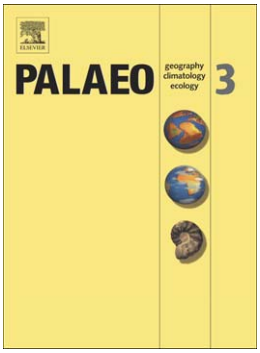

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The fate of diatom valves in the Subantarctic and Polar Frontal Zones of the Southern Ocean: sediment trap versus surface sediment assemblages.

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Abstract

An array of deep ocean sediment traps was initiated in 1997 within the Australian sector of the Southern Ocean, and serviced annually for over a decade (the Subantarctic site is ongoing as part of the Southern Ocean Time Series). Here, we expand on previous findings obtained from the shallow traps (~1000 m depth) in the Polar Frontal Zone (PFZ) and Subantarctic Zone (SAZ) by examining the chemical composition and diatom assemblages collected by sediment traps deployed at bathypelagic depths in the PFZ (1500 m depth; years 1997-1998, 1999-2000 and 2003-2004) and SAZ (2000 and 3800 m; year 1999-2000). Additionally, the diatom assemblages of the surface sediments below the traps were analyzed to document how the seasonal signal is recorded in the sedimentary record. Analysis of the changes of the BSi:POC ratios with depth at both sites confirms previous work suggesting that the decoupling between Si and C cycles in the Southern Ocean is not different from other biogeochemical provinces of the world's ocean. Comparison of the seasonal flux pattern registered by the traps indicates that the diatom assemblages in the sediments of the Antarctic Zone and PFZ mainly represent the summer period. In contrast, the assemblages found in the sediments of the SAZ are a reflection of the spring and summer months, a period characterized by a larger variability in chemical and physical parameters. The strong correlation between the POC fluxes and the relative abundance of a group of diatom species (mainly *Pseudo-nitzschia* and small *Fragilariopsis*) in the PFZ traps suggest that there is an intimate relationship between the development of these species and the POC pulses to the deepest layers of the water column in this region. Interestingly, analysis of the diatom assemblages in the surface sediments reveals that the strong dissolution in the sediment-

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