

The paleoceanographic reconstruction in the late Miocene–Pliocene Southern Ocean based on siliceous microfossil assemblages

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As the Antarctic Circumpolar Current (ACC) is an influential component of the present-day global climate system, it is essential to clarify ACC history. Although many studies focusing on hiatus recorded in the deep-sea sediments have made substantial progress in understanding the timing of the ACC onset and its developmental history, the problems seem to lie in the difficulty in determining the precise age of the hiatus. In addition, there has been little attempt to reconstruct the Neogene ACC history, as most previous studies focused on Oligocene or post-Pleistocene ages.

In this study, the Late Miocene to Pliocene (ca. 9–3 Ma) fossil records of diatoms and chrysophyte cysts from the Deep Sea Drilling Project (DSDP) Leg 71 Site 513 (48°S, 28°W) and the Ocean Drilling Program (ODP) Leg 113 Site 689 (65°S, 3°E), the Atlantic sector of the Southern Ocean, are presented in order to discuss the paleoenvironmental changes including the paleo-ACC route migrations.

The abundance of subtropical diatoms at Site 513 showed significant fluctuations (~200–600 kyr cycle) during ca. 9–5 Ma, which strongly suggest that there had been repetitive north-south migrations of the ACC across Site 513 (~48°S) during at least ca. 9–5 Ma. In order to reconstruct more detailed ACC-route migrations during the late Miocene–Pliocene, changes in the abundance of *Thalassionema nitzschioides* var. *parva*, a typical subtropical diatom, at Sites 513 and 689 are compared to those at several drilling sites (ODP Site 697, 62°S, 40°W; ODP Site 699, 52°S, 31°W; ODP Site 704, 47°S, 7°E) referring to the previous data reports. As a result, it was presented that the ACC during the late Miocene had experienced north-south migrations with an amplitude of ca. 5° or more in latitude. These ACC migrations seem to be closely related to the paleo-climatic/oceanographic changes. Changes in fossil diatom assemblages also suggest a possibility that the cooling and sea-ice expansion at high latitudinal region induced the northward shift of the ACC.

Keywords: diatom, chrysophyte cyst, Southern Ocean, Antarctic Circumpolar Current