

The middle Miocene paleoceanography based on diatoms and chrysophyte cysts in the Atlantic sector of the Southern Ocean

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The Southern Ocean, which is composed of the Antarctic Circumpolar Current (ACC) and several water masses, is an important element as having great influence on global climate change. Therefore, it is significant to reconstruct the paleoceanographic history in the Southern Ocean including the ACC, and many researchers have been approaching this issue using various methods. For example, changes in sediment structures derived from seismic profiling of deep-sea sediments have been widely accepted as an evidence for the past ACC fluctuations. However, there are almost no previous studies that show long-term and detailed ACC changes, while many of paleo-ACC studies have been made with order of “epoch” or have been focused on much shorter time-range.

In the Southern Ocean, abundant and continuous occurrences of siliceous microfossils such as diatoms and chrysophyte cysts are often found from the Neogene sediments. Generally, diatoms thrive in high-latitude or upwelling regions and they show clear segregation of their habitat corresponding to the distribution of the water masses. Therefore, it is likely that the changes in abundance of subtropical diatom taxa, which inhabit north of the ACC, reveal the long-term migration history of the ACC from north to south vice versa. In addition, as most chrysophytes inhabit freshwater environment, the occurrences of fossil chrysophyte cysts in the Southern Ocean are mainly originated from Antarctic terrestrial freshwater (i.e., melt-water of the ice sheet). Therefore, fossil chrysophyte cyst can be treated as a useful tool to reconstruct the changes of the Antarctic ice sheet in the geological past. In this presentation, we would like to present and discuss on several paleoenvironmental events in the Southern Ocean during the late Miocene–Pliocene (ca. 9–3 Ma) based on fossil diatom and chrysophyte cyst analysis preserved in sediment core samples from the Atlantic sector of the Southern Ocean (ODP Leg 113 Site 689 and DSDP Leg 71 Site 513), which include repetitive north-south migrations of the ACC in a 100–200 kyr cycle observed in 7–4.8 Ma.

Keywords: Diatom, Chrysophyte cyst, Southern Ocean, Antarctic Circumpolar Current, DSDP, ODP