

Paleoceanographic changes in the northwestern North Pacific during the late Quaternary based on radiolarian records

Yusuke Okazaki[1]; KOZO TAKAHASHI[2]; Naomi Harada[3]; Makio Honda[4]

[1] Earth and Planetary Sci., Kyushu Univ.; [2] Earth and Planetary Sci., Kyushu Univ.; [3] JAMSTEC, MIO; [4] MIO, JAMSTEC

Rapid and significant climate changes such as Dansgaard-Oeschger cycles during the late Quaternary have been demonstrated by the high resolution studies using ice and sediment cores. The North Pacific Intermediate Water (NPIW) is thought to play an important role in the climate change. An intermediate water of the Okhotsk Sea is indicated as a plausible source for the NPIW (e.g., Talley, 1991). During the last glacial maximum (LGM), the extent of NPIW formation increased and extended to the low latitude suggested by a model study (Ganopolski et al., 1998) and foraminiferal isotope records (e.g., Keigwin, 1998; Kennett et al., 2002). The source region of the NPIW during the LGM is not well specified. Takahashi (1998) pointed out the possibility that the OSIW in large quantity flowed into North Pacific during the LGM with the increase of sea-ice. On the other hand, Ohkushi et al. (2003) suggested that the NPIW was formed in the Bering Sea during the glacials, rather than in the Okhotsk Sea based on the glacial distribution of microfossils. In our study, we report the modern seasonal changes in radiolarian flux in the northwestern North Pacific for over two years and the past radiolarian accumulation rate changes from three piston cores in the northwestern North Pacific during the late Quaternary to evaluate their relationships to the physical and biological environmental conditions.

Time-series sediment traps were deployed at three stations (Stations 50N, KNOT, and 40N) in the northwestern North Pacific during 1997 to 2000 during Cruises of R/V Mirai. Station 50N (50 degree N, 165 degree E) is located in the center of Western Subarctic Gyre (WSAG), Station KNOT (44 degree N, 155 degree E) is located in the edge of WSAG, and Station 40N (40 degree N, 165 degree E) is located in the region of the Subarctic Boundary. Total radiolaria fluxes at Station 40N showed higher values than those at other two stations, mainly attributing to the influence of subtropical gyre water with relatively high temperature and high salinity. Radiolarian fluxes were classified according to their geographic water mass and vertical distributions based on the previous studies using sediment samples. As a result, seasonal changes of radiolarian fluxes in each water mass showed respective patterns responding their controlling factors such as hydrographic and food conditions. Among them at Station 40N, temporal changes in radiolarian taxonomic composition in the upper layer (0-100 m) seemed to well reflect the SSTA changes, affected by El Nino and La Nina events. Therefore, radiolarian assemblages can be used in reconstructing the past SSTA changes and furthermore understanding the past El Nino and La Nina teleconnection in the Kuroshio-Oyashio Extension region.

Among the radiolarian taxa, *Cycladophora davisiana*, which is an intermediate dweller, is characterized as an indicator the glacial oceanographic conditions. The sediment trap study clearly unraveled that the distinct peaks of *C. davisiana* fluxes occurred during summer to autumn in the northwestern North Pacific. The production of *C. davisiana* is closely related to the microbial production in the intermediate water. In the Okhotsk Sea, the distinct microbial biomass in the intermediate water, which is associated with the seasonal sea-ice rejected brine water during winter, may support the high *C. davisiana* abundance. Therefore, the significantly high *C. davisiana* abundance during the Last Glacial Maximum (LGM) in the high latitude open oceans implies the distinct microbial biomass in the intermediate water caused by the seasonal sea-ice coverage analogous to the present Okhotsk Sea.

Based on the information on modern radiolarian flux such as their seasonality, we will discuss the past oceanographic conditions in each of the water masses from surface to intermediate water in the northwestern North Pacific.