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Late Pleistocene radiolarian changes related to the melt-water discharge and deep-water environments in the Bering Sea

Takuya Itaki[1*], Sunghan Kim[2], Masao Uchida[3], Ryuji Tada[4], Boo-Keun Khim[2]

[1]AIST, Geological Survey of Japan, [2]Pusan National University, [3]NIES, [4]University of Tokyo

Radiolarian skeletons, composed of opal, are well preserved in the sea-floor sediments of the subarctic Pacific region, and their fossil record can be used as paleoceanographic indicators not only for surface conditions, but also for deep-sea environments due to discrete habitat depths of many species related to the vertical water structure. In this study we examined millennial-scale changes of the late Pleistocene radiolarian assemblage in the northern Bering Sea slope using a piston core PC-23A obtained during MR06-04 cruise by R/V Mirai of JAMSTEC.
Totally 58 taxa of radiolarians were identified, and accounted for 56 to 91 % of the assemblage in each sample. From paleoceanograohic reconstructions based on major 28 taxa, it is revealed surface and deep water conditions in the Bering Sea related to the Dansgaad-Oescheger (D-O) cycles of the millennial-scale climatic changes. During interstadial periods of the D-O cycles, the assemblage characterized by the high latitude coastal area and the intermediate water species such as Cycladophora davisianaincreased, while the sea-ice related species and the deep-water assemblage reduced their abundance. This pattern is more apparent in the laminated deposits correlated with the Melt-water pulse (MWP)-1a and MWP-1b during the last deglaciation. Such faunal composition suggests following conditions; (1) increase of melt-water discharge from the continental ice-sheet with warming, (2) reduced duration of sea-ice season, (3) increase of surface productivity, (4) intrusion of the surface water into the upper intermediate layer (ca. 200-500 m), and (5) poor oxygen deep-water (ca. 1,000 m). On the other hand, the sea-ice season might expanded during stadial periods of the D-O cycles and the last glacial maximum (LGM), compared with the interstadials. In these cold periods, abundance of the deep-water assemblage increased in spite of reduced organic matter as their important food source. This might suggest that the oxygen-rich water was present in the deep-layer resulted from the expanded ventilation and small decomposition of organic matter.

Keywords: Paleoceanography, Micropaleontology, Deep water circulation, subarctic Pacific