Temporal flux change in diatom assemblages in seasonal sea-ice covered region off Sakhalin Island in the Okhotsk Sea

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"Ice" is a subsystem of the Earth's climate system and reconstruction of past ice-sheet and sea-ice dynamics is one of the important topics for paleoenvironmental sciences. Sea-ice floating on the sea-surface plays a key role in constraining sea-surface temperature because of its high albedo and insulation effect between atmosphere and ocean. Ice algae in sea-ice and ice-rafted debris (IRD) are representative proxy for past sea-ice coverage. Diatom frustules are made of biogenic opal which can be well-preserved in sediments as a micro fossil. Therefore, to understand a relationship between modern diatom assemblage and sea-ice coverage helps to reconstruct past sea-ice distribution.

Time-series sediment trap was moored at Station M4 off Sakhalin in the Okhotsk Sea from September, 1999 to June, 2000. Based on satellite observation, sea-ice covered at Station M4 December 1999 to April 2000. Nakatsuka et al. (2004) reported biogenic opal flux at Station M4, showing the low fluxes when sea-ice was covered.

In this study, We investigated diatom assemblages in 21 sinking particle samples at Station M4 from September, 1999 to June, 2000 by using light microscope (LM) and field emission scanning electron microscope (FE-SEM). A total of 36 diatom species including sea-ice and sea-ice related species were encountered during the microscopic observation. Diatom fluxes at Station M4 were significantly low when sea-ice covered. The diatom flux in November (sea-ice free) was greater than 30 times as that in April (sea-ice maximum). Diatom assemblage at Station M4 also changed with sea-ice coverage. During sea-ice free period, *Shionodiscus* and *Proboscia* species were abundant. Sea-ice related species started to increase with sea-ice coverage. Resting spore of *Bacterosira bathyomphala* was a major diatom taxa during sea-ice development. During sea-ice maximum, *Fragilariopsis cylindrus* flux showed pronounced peak. We found that flux peaks of each sea-ice related species. This suggests that diatom assemblages have a potential to reconstruct not only for presence of past sea-ice but also for magnitude of past sea-ice.

Reference:T. Nakatsuka, T. Fujmune, C. Yoshikawa, S. Noriki, K. Kawamura, Y. Fukamachi, G. Mizuta, and M. Wakatsuchi (2004). Biogenic and lithogenic particle fluxes in the western region of the Sea of Okhotsk: Implications for lateral material transport and biological productivity. Journal of Geophysical Research 109, C09S13, doi:10.1029/2003JC001908

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