Fluctuation of sea ice during 30 kyrs in the Kuril basin, Okhotsk Sea, by analysis of IRD for sediment cores MR00K03-PC1 and PC4.

Tatsuhiko Sakamoto[1], Miyako Sato[1], Naomi Harada[2], Masao Uchida[2], Naokazu Ahagon[3], Katsunori Kimoto[3]

[1] Earth and Planetary Sci., Hokkaido Univ, [2] JAMSTEC, [3] MIO, JAMSTEC

The Okhotsk sea is the area of sea where the sea ice is formed in the lowest latitude in the Northern Hemisphere. As for the sea ice, an expansion stage affected by climate change by the power of Aleutian Low and associated wind field. The formation of the sea ice is thought to influence the climate of the northwestern Pacific Ocean and the production of the north Pacific intermediate water so that it may be involved in the formation of sea ice concerning with low temperature, high salt, high dissolved oxygen concentration. On this point of view, it is very important of the elucidation of change in the sea ice in the long time scale in the Okhotsk Sea for understanding of climatic changes in the high latitude of Pacific Ocean. The terrigenous clastics were taken in transported by sea ice. After sea ice was melt they accumulate in the bottom of the sea. The series of these grains are called as ice rafted debris (IRD). There are many cases that grain size and mineral assemblages of IRD are different from surrounding layer. If IRD is found at a interval in sediment core, it becomes proof directly that the sea ice was distributed in the location and the age.

This study focused on reconstruction of sea ice history during 30 kyrs in the Okhotsk Sea based on analyses of IRD in sediment cores by grain size and mineral assemblages. In this study, we used two piston cores MR00K03-PC-01 and PC4, which were collected by the R/V MIRAI in and out of Kuril Basin. The length of the core PC-01 is 865.9 cm, which consists of diatomaceous silt. Ages of bottom of cores are estimated at about 30 and 120 kyrs, respectively. Time resolution between the samples is an interval for 200 years for PC1 and 360 years for PC4 in an average.

By grain size analysis for ranging from 0.04 to 2000 micrometers, during 30 kyrs, the bi-modal grain size distribution which has the peak in the grain diameter 300 - 500 micrometers with clay and silt fractions. It is examined about the sample, which shows the characteristic grain size distribution, with detail visual description on the ship, soft X-ray images, and composition of grains by the microscope. As results, these grains are interpreted with IRD carried by the sea ice, accompanying dropstones in the diameter of several mm and cm in the intervals of no specific sedimentary structure. As for the core PC-04, a similar grain size distribution pattern is recognized before last glacial maximum (LGM). The volume percent of the particles ranging 100 to 2000 micrometers in diameter are calculated about each core as IRD fraction.

The following are concluded for changes of sea ice in the Okhotsk Sea during the past 30 kyrs in comparison with the IRDs with previous results in the center of the Okhotsk sea. 1) The sea ice was distributed twice before LGM at the location of the core PC-04. 2) During the LGM, sea ice wasn't distributed at the location of the core PC-04, but the sea ice expanded at the location of the core PC-01. 3) Sea ice expanded twice after LGM at the location of the core PC-01. In addition, we are concluded for changes of sea ice in the Okhotsk Sea during the past 120 kyrs. 4) Sea ice expanded third times to the location of the core PC-04 during early LGM. 5) Sea ice expanded to the location of the core PC-04 forth from 78 to 90 kyrs ago and twice from 100 to 107 kyrs. 6) The Okhotsk Sea was relatively cold from 78 to 90 kyrs and 100 to 107 kyrs. This study revealed several times of expansion of seasonal sea ice around the Kuril Islands where sea ice is not distributed the present time.