Stable isotopes of living subarctic planktonic foraminifera and hydrography of the far northwestern Pacific Ocean

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The realm of Kuril islands is a mixing area between Oyashio, outflow water from the Okhotsk Sea, and Kuroshio warm-core rings and is characterized by the generation of anti-cyclonic eddies with a diameter of 150-200 km. This results in a strong vertical and lateral gradient in surface water properties: not only water temperature and salinity but also nutrients, faunal composition and carbonate chemistry. In this study, living planktonic foraminiferal assemblages and stable isotopes of their carbonate shells were analyzed in the surface water (6m below sea surface) which were recovered from the Okhotsk Sea and the adjacent area during the R/V Mirai cruises on May to June, 2000 and June to July, 2001.

Sampling locations are 18 stations in total. Surface water were collected continuously by water pump equipped on the R/V Mirai and sieved out using 150 um mesh. Only three cold-water species were found: Globigerina bulloides, Globigerina quinqueloba, and Neogloboquadrina incompta. Standing stock of total planktonic foraminifera in the Okhotsk Sea was less than 30 per cubic meter, whereas it occurred more than 100 per cubic meter at the southern part of the Kuril Islands, especially at the edge of eddies. Standing stock of G. bulloides and N. incompta increased in high chlorophyll a and the area of upwelling, and the center of eddy, respectively. G. quinqueloba increased at warmest temperature station in this area.

The calcification temperature equation were calculated from d18O(carbonate) and d18O(water) in each species. In this study, we got a good lineation from N. incompta as follows:

d18O (carbonate-water) = -0.212 * temperature +3.715

This equation was very close to that of inorganic calcite (O'Neil et al, 1969). It means that N. incompta secreted carbonate shells under isotopical equilibrium condition in sea water. The d13C composition of N. incompta showed heaviest values compared to the other two species. It suggests that N. incompta inhabit in upper layer and relatively low nutrient of surface water. This result would be important for the study of subarctic paleo-hydrography.