Holocene environmental changes in intermediate and deep water regions in the SW Sea of Okhotsk

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A Holocene history of the intermediate and deep-water environment in the southwestern part of the Sea of Okhotsk is reconstructed on the basis of benthic foraminiferal analysis. The Sea of Okhotsk is located at the lowest latitude among the seas with sea-ice in the world. In addition, the southwestern part of the sea is in the peculiar condition since the Soya Warm Current flows there along the Hokkaido coast. So the climate change appears sharply and notably (e. g., Shimada et al., 2000; Itaki, 2002). Therefore, it is expected that the environmental change is reconstructed in the Holocene, it is generally supposed that climate was comparatively stable during.

The following three cores in the SW Sea of Okhotsk, off Shari, eastern Hokkaido are used for the analysis.

1) MD01-2412 (56.11m), WD=1,225 m; 44 31.65'N, 145 00.25'E (IMAGES2001).
2) GH01-1009 (4.22m), WD=1,214 m; 44 31.62'N, 144 59.71'E (GH01 Cruise).
3) GH01-1011 (5.06m), WD=778 m; 44 16.51'N, 144 58.50'E (GH01 Cruise).

The samples for foraminiferal analysis are 2.5cm- or 1.9cm-cubes cut from MD core or from GH01 cores, respectively. All the samples are freeze dried, weighed, and washed on a sieve with 0.063mm-openings.

Stratigraphic distribution of foraminiferal assemblages in each cores are, as follows:

*MD01-2412(WD1,225m)

Nonionellina labradorica and Uvigerina akitaensis occur at the upper part of the core (above 3m). Brizalina pacifica and Stainforthia loeblichi, so called anoxic-water species, are abundant at about 6m in depth.

*GH01-1009 (WD1,214m)

Elphidium batialis, Globobulimina auriculata and Islandiella norcrossi occur throughout the core.

*GH01-1011 (WD778m)

Cassidulina norvangi occurs throughout the core. S. loeblichi is very abundant occur at basal part of the core (below 1.5m in sub-surface depth).

The central part of the Sea of Okhotsk is characterized by its stratified ocean structure, which consists of subsurface cold water of 20 to 200m in depth formed by cooling during winter, warm deep water of 700-800 to 1,500m originated in the North Pacific, and transitional water (the intermediate water of the Sea) between the two water masses that is brine water discharged from the seasonal sea-ice (Kitani, 1973). The distribution of benthic foraminiferal assemblages is corresponding to such stratified water masses in the present Sea of Okhotsk (Yoshimoto et al., 2000; Abe and Hasegawa, 2002). Correspondingly, the assemblages at the core sites both of MD01-2412 and GH01-1009 at around 1,200m in depth and of GH01-1011 at 778m are characterized by the species of the warm deep water and the transitional water, respectively.

In the cores both of GH01-1009 and MD01-2412, the core-top assemblage of the benthic foraminifera is found into 3 to 4m below the surface, suggesting that the same bottom condition has continued in this interval of deposition. On the other hand, the core-top assemblage ranges the upper 1 to 1.5m in GH01-1011 core. In the middle part of the GH01-1011 core, benthic assemblage consists mainly of S. loeblichi, a typical anoxic-water species. This interval is also characterized by higher content of framboidal pyrite (Komori et al., 2002). These data suggest the disoxic bottom condition in this interval. In addition, this phenomenon seems to indicate an oxygen minimum layer in the middle bathyal depth, because such a faunal change is not recognized in the two other cores from deeper sites.

In the MD01-2412 core from deeper sites, an assemblage consisting of anoxic-water species is found in about 6m below the surface, but it differs from the assemblage in the GH01-1011 core in faunal composition characterized by abundance of two species, B. pacifica and S. loeblichi. According to an estimation of sedimentation rate about 1m/kyr in this area by Shimada et al. (2000), this anoxic event is too old than that in the GH01-1011 core. Thus, it sems to much older another dysoxic event in the SW Sea of Okhotsk.