Latest Pleistocene and Holocene Environmental Changes based on Diatom Assemblages from the East Sea Core Sediments

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The diatom floral record from the piston core (00GHP-07) taken from the southwestern margin of the Ulleung Basin, East Sea, reveals a series of well-defined changes in glacio-eustatic sea level and paleoenvironmental conditions during the late Pleistocene-Holocene. Four assemblage zones in 00GHP-07 are erected on the basis of frequency of variations in, and occurrences of, biostratigraphically significant diatom species. Four assemblage zones are recognized from core 00GHP-07, which is mainly composed of benthic faunas suggesting a strong coastal influence on sedimentation. The followings are explanations of the four assemblage zones (AZ). 1) *Paralia sulcata-Cyclotella striata* AZ (775-440 cm) is characterized by the high proportion of benthic to total diatoms, which strongly means this interval as a sedimentation period in very shallow water such as a near-coastal environment. 2) *Rhizosolenia hebetata* var. *hiemalis* AZ (440-270 cm) is distinguished by the occurrence of displaced freshwater, benthic, and reworked diatom fossils. This assemblage may explain that a depositional area at this interval was close to mainland and continental shelf where a significant amount of terrigenous materials may have been brought by turbidity currents. This may also be closely related with glacial lowering of sea level at this interval. 3) *Paralia*

sulcata-*Thalassionema nitzschioides* AZ (270-140 cm) indicates a sharp decline in the number of shallow-water diatoms. 4) *Pseudoeunotia doliolus*-*Thalassionema nitzschioides* AZ (140-0 cm) represents inflow of high saline and warm Tsushima water. The sea level rose during this interval, and thus cold water and low-salinity water was introduced to the East Sea. This assemblage zone indicates environmental conditions similar to those prevailed in the East Sea today, which is characterized by a strong influence of both warm and cold water current, and by ventilated bottom-water condition.

The four diatom assemblages may correlate with global sea level change, and each assemblage in the core may reflect the different environmental conditions influenced by sea level fluctuations. Fortunately, many diatoms recovered in the core sediments have specific ecological tolerance that can be used to make paleoclimatic and paleoceanographic interpretation of the East Sea. The relative frequencies of *Pseudoeunotia doliolus* (dominant in highly saline areas) and *Paralia sulcata* (dominant in low salinity areas) provide a useful clue to estimate the degree of influence of low salinity water on the upper surface water of the southern part of the East Sea. *P. doliolus* flourishes in open sea under the influence of high salinity warm water, and is rarely present in cold glacial intervals (Oba et al., 1991). In the lower part of core sediments, *P. doliolus* is rare. Absence or such a minor presence in core sediments may reflect the minor influence of the Tsushima Warm Current since that time. Epiphytic genera such as *Cocconeis* and *Diploneis* and presumably *Delphineis* recorded here reflect close proximity to the coast, whereas thick-shelled genera including *Biddulphia, Diploneis, Grammatophora* and *Hemiaulus* are representative of relatively shallow neritic environments. Since the species indicative of low salinity are benthic, they must be autochthonous rather than allochthonous. Moreover, the presence of freshwater and river-mouth dwelling species indicates a

considerable influx of freshwater taxa into a landlocked basin at the time of late Pleistocene. The high abundance of *Rhizosolenia hebetata*, ranging from Miocene to present day, suggests that the interval represented by this species was under extremely cold conditions, because this species occurs in modern sediments of the Beringian Sea (Sancetta, 1982). The most striking peculiarity of the diatom assemblages is the presence of *Cyclotella striata* that is abundant of 33% at 775 cm horizon in core sediments, respectively. This brackish water species inhibits low salinity areas of the seas, such as river-mouths (Jousé, 1972; Mukina, 1976 Schuette and Schrader, 1979). The predominance of benthic species at the lower and middle part of core sediments indicates a shallow marine environment. In addition, the core samples contain a great number of reworked species including displaced freshwater and benthic diatoms, which may have been brought in by turbidity currents. This also means that the glacial lowering sea level occurred between 10 and 20 ka. During the rise of sea level, fewer displaced benthic diatoms were transported to the basin. However, the salinity and temperature of surface waters are considered to increase when sea level rises, and thus the number of marine planktonic species increases. Finally such an analysis on the basis of reworked species throughout the section indicates that there were several sea level fluctuations.

In conclusion, the diatom assemblages of core sediments (00GHP-07) represent an apparently continuous Late Quaternary record, spanning the Last Glacial Maximum, Bølling-Allerød, Younger Dyras and Holocene(Gorbarenko, 2000; Keigwin and Gorbarenko, 1992; Tada, et al,1999). High abundance of a low-salinity, coastal water diatom *Paralia sulcata* may reflect the influx of the East China Sea water through the Korean Strait to the East Sea. During the Last Glacial Maximum, the sea level was low enough that selected basin with shallow sills along the margin of the East Sea became isolated from the Pacific Ocean. Salinity also decreased due to increased

freshwater input from rivers draining the surrounding lands. The density-stratified water column may have prevented vertical mixing and resulted in anoxic bottom-water conditions.

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