

Changes of water structures in the Sea of Japan during the Late Pliocene

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An analysis of fossil ostracode assemblages in the Kuwae Formation, central Japan, clarify the paleoenvironmental changes related to glacial and interglacial cycles during MIS G19 and G10 (Irizuki et al., 2007). Added to this, temperate intermediate waters which were warmer than those of today, were existed in interglacial periods during 3.5 to 2.8 Ma. Radiolarian faunas inferred that enhancement of ventilation due to global cooling started at approximately 2.5 Ma (Kamikuri and Motoyama, 2007). However, temperatures of the temperate intermediate waters and the timing are uncertain. So, our aims are to clarify quantitative temperatures of shallow and intermediate waters during the late Pliocene based on Mg/Ca, and to discuss change of water structures in the Sea of Japan.

Siltstones collected from the Kuwae Formation along the Tainai River were soaked in H₂O₂ for 24 hours before they were washed. Ostracode shells of genus *Krithe* (intermediate water species) and *Cytheropteron miurense* and *Cytheropteron sawanense* (shallow water species) were taken from the residues, and their Mg/Ca were measured by ICP-AES at Kochi University. Two intervals were identified in the study section based on quantitative temperature of intermediate and shallow waters and their vertical changes. Intermediate water temperatures ranged between 0 and 10 °C and fluctuated in short-time intervals during MIS G19-G16, although they were stable and showed a small amplitude between 3 and 7 °C during MIS G15-G13. Moreover, difference in temperature between shallow and intermediate waters was large in MIS G19 and G16, but was small in MIS G15-G13. These temperature difference and shifts suggest that strong stratification of shallow and intermediate waters during MIS G19-G16 changed to a condition in which temperature gradients were small due to enhance of ventilation in the Sea of Japan. MIS G15 and G13 were characterized by a large oxygen isotope values compared with those in other inter-glacial periods of the study intervals. The relative cooling in inter-glacial periods might be caused a beginning of ventilation in the Sea of Japan.

Keywords: Sea of Japan, Late Pliocene, ostracode, Mg/Ca, water structure