

Sea surface temperature change off the east coast of Japanese Islands during the last 20,000 years

Tadamichi Oba[1]

[1] Environmental Earth Sci., Hokkaido Univ.

Paleo sea surface temperatures off the east coast of Japanese Islands were estimated from the oxygen isotopic values of both benthic and planktonic foraminiferal tests in four sediment cores between the Oyashio and Kuroshio currents region. As the result, the paleotemperatures off Kushiro and Erimo remained similar values as present since the last 20,000 years. Whereas the temperatures off Sanriku and Kashimanada at 20,000 years ago were about 3 and 9 degree centigrades lower than today, respectively.

The northwest Pacific Ocean is a region where pronounced temperature changes occurred in the surface waters during the last glacial age. However, we do not know exactly the magnitude of the cooling in the sea surface temperature (SST). Four piston cores were collected extending from the cold Oyashio to the warm Kuroshio regions off the east coast of Japan. The oxygen isotopic differences (δ) between benthic (δ_{BF}) and planktonic (δ_{PF}) foraminifera are getting larger from the northernmost core (0.9 permil) to the southernmost core (3.7 permil) during the Holocene, because of the increasing SST towards south. On the contrary, these differences are much smaller during the last glacial maximum (LGM) than during the Holocene, i.e. from 1.0 permil in the northernmost core to 2.0 permil in the southernmost core at the LGM. This suggests the surface water mass off the east coast of Japan had shifted southward by about 3 to 5 degrees in latitude. Such shifts are also evident from the occurrence of warm water planktonic foraminifera in the southern cores at the LGM.

The SST off the east coast of Japan during the Holocene can be calculated from a relationship between the present temperature difference (SST - BT, bottom temperature) at the four cores sites and their $\delta(\delta_{BF} - \delta_{PF})$ in a planktonic-benthic foraminiferal species pair (*Globigerina bulloides*-*Uvigerina akitaensis*). This relationship has been used to calculate the SST at the LGM. The result shows that the SST at the northernmost core site remains almost the same as present, because the site has been occupied by the cold Oyashio Current since the LGM. On the other hand, the decreased SST of about 9 degree centigrades at the LGM is found at the southernmost core site, where the Kuroshio Current was replaced by a mixed water mass between the Kuroshio and the Oyashio Currents.