Environmental fluctuations recorded in dark-light alternations of sediment in the southern Japan Sea offshore Wakasa Bay

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Alternations of dark and light color are observed in the last glacial sediments of the Japan Sea, and change in brightness of sediments resembles millennia cycle of δ18O in the Greenland ice core (Dansgaard-Oeschger cycle: DO cycle). Although brightness (L*) of Japan Sea sediment mainly reflects total organic carbon (TOC) content, as TOC content changes due to various factors, such as primary production in the ocean surface and post-depositional degradation etc., it is difficult to reconstruct marine environmental change only by TOC content in sediments. Chemical composition of planktonic foraminiferal tests record the information of surface water at the time of shell formation, and the oxygen isotope ratio and Mg/Ca are excellent proxies for reconstructing past ocean temperature. Therefore, paired analysis of TOC and planktonic foraminiferal geochemistry would give an insight into surface process and its relation to TOC variation in the Japan Sea sediments. However, there have been no attempt to reconstruct millennial-scale surface water temperature change corresponding to the TOC content variation in the Japan Sea. In this study, we aimed to understand the change of the marine environment of Japan Sea in conjunction with the DO cycle by reconstructing the surface water temperature and analyzing TOC content at high resolution in a piston core sediment (KR-15-10-WB-6_PC, water depth 845 m) collected off the Wakasa Bay in the southern Japan Sea.
Variations of L * and TOC contents of WB6_PC are highly correlated as previously reported by several studies. Changes in sea surface temperature (SST) inferred from oxygen isotope and Mg/Ca of planktonic foraminifera also show good correlation with TOC, and warmer temperature corresponds to higher TOC. Therefore, it is suggested that the change in TOC content is closely related to surface water property change, implying primary production co-varied with SST. Coupling of TOC and SST could be due to the millennial-scale variation of the East Asian summer monsoon (EASM). The strength of EASM could change nutrient influx into Japan Sea via terrestrial nutrient discharge from Changjiang River. Enhanced nutrient availability during strong EASM periods would stimulate primary production. In addition, northward shift of the westerly jet axis during the strong EASM could affect SST in the Japan Sea due to expansion of subtropical warm air mass. Therefore, the EASM could be an important component linking climate of the Greenland and Japan Sea.

Keywords: Last glacial period, Japan Sea, Organic carbon, East Asian summer monsoon, Dansgaard-Oeschger cycle

