Marine and terrestrial biomarker analyses of hemipelagite in the Pleistocene Kazusa forearc basin: Evaluation of the effect of turbidity current

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Hemipelagic muddy sediments (hemipelagite) are mainly deposited by the interplay of continuous vertical settling, and advection of fine-grained clastic and biogenic particles superimposed by turbidity currents and some other deep-water currents. The effects of turbidity currents in the hemipelagic sedimentation processes, however, have not yet clearly investigated. In the present study, we conducted organic geochemical analyses, such as total organic carbon content (TOC), bulk organic carbon isotope ratios ($\delta^{13}C_{org}$), and biomarker compositions in some age-equivalent hemipelagic siltstone beds, which are locally intercalated with turbidite sandstone beds, to evaluate the effect of turbidity currents in hemipelagic sedimentation.

Samples were collected from two series of the age-equivalent hemipelagites in the Kiwada Formation, Boso Peninsula, Japan. This formation is mainly composed of siltstones intercalated with turbidite sandstones and volcanic ash beds, and is interpreted to have deposited in slope to basin-plain settings in the Kazusa forearc basin. In the studied succession, turbiditic sandstones and siltstones gradational fine-upward to bioturbated hemipelagic siltstones and is intercalated with a volcanic ash bed named Kd8 (ca. 1.2 Ma), which consists of three volcanic ash beds, tentatively named herein as Kd8A to Kd8C in descending. These ash beds can be mapped for over 30 km from the proximal (SW) to distal (NE) environments. The samples were obtained from upper (U) and lower (L) parts of the two siltstone beds named Kd8a and Kd8b, which are encased between Kd8A–B and KdB–C, respectively. A turbiditic sandstone and siltstone bed is developed just beneath the Kd8b in the most distal area, indicating that hemipelagic sedimentation for Kd8b-L may have been affected by turbidity currents.

The TOC contents of the siltstones just above the turbidite bed (Kd8b-L) are lower (TOC = 0.23 %), and the $\delta^{13}C_{org}$ values of these siltstones are lighter (-23.3 ‰) than those in the overlying siltstones (-21.3 ‰). These variations likely indicate inefficient deposition of organic matter in association with higher contribution of terrigenous organic matter.Concentrations of friedelin, which is a plant triterpenoid and derived mainly from tree bark, in the TOC are also remarkably higher in the same siltstone samples. These results suggest that turbidity currents may have contributed to the deposition of terrigenous organic matter during hemipelagic sedimentation and the lower TOC content are considered to have been resulted from preferential deposition of siliciclastic clastic particles.The lower $\delta^{13}C_{org}$ values and higher concentrations of friedelin observed in the Kd8b-L in several sites are also likely a result of fine-grained sediment supply from turbidity currents. On the other hand, the Kd8b-L are obviously lower TOC contents in the all study sites. In addition, the long-chain *n*-alkanol (> C_{20}) distribution maximizing at C_{26} and C_{28} are found in all siltstone sampled from the Kd8b-L, while that in siltstone samples from the other beds show abundant C_{22} and C_{24} *n*-alkanols as well as C_{26} and C_{28} homologues. Although long-chain *n*-alkanols in marine sediments are generally considered to be derived from higher plant wax, several zooplankton species such as copepod also contain the C_{22} and C_{24} *n*-alkanols. Thus, the distinctive distribution of the long-chain *n*-alkanol in the Kd8b-L can be attributed to selective deposition of plant leaves by the fractionation of organic matter from turbidity currents. The present study indicates that the combination of biomarkers can be used for the evaluation of contribution of turbidity currents to hemipelagic

sedimentation.

Keywords: Turbidite, Hemipelagite, Biomarker

