An approach to determination of origin of deep-sea sediments using organic matter composition, example from the Nankai Trough

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Deep-sea turbidite is useful for paleoseismicity analysis. We have to determine the origin of turbidite, because turbidite is formed by not only slope failure with large earthquake but also flood or storm. The purpose of this study is to examine the origin of deep-sea sediments (turbidites) using sedimentary organic matter composition and stable carbon isotope values of organic matter.

Piston cores (GF00-01, GH97-307 and KUPC-03) were taken from the Kanasunose Trough and the Kumano Trough, and were used for facies and organic matter analyses. The Kanasnose Trough is situated at southern of the Omaezaki Spur. The large earthquake fault (Tokai Trust) is existed along the Kanasunose Trough. Ikehara (2001) suggested that the turbidites deposited in the Kanasunose Trough originate from slope failure deposits. The core GF00-01, which is composed of silt and turbidites, was taken from the Kanasunose Trough. By using the foraminifer radiocarbon ages, the recurrence intervals of turbidites were calculated as 100-600 years. The Kumano Trough has several canyons on the continental slope. The cores GH97-307 and KUPC-03 were taken from offing of the Anoriguchi Canyon on the northeastern slope of the Kumano Trough. The site GH97-307 is situated near the continental slope and the site KUPC-03 is on the sub-marine fan. Turbidites occur below K-Ah ash (7,325 years BP; Fukusawa, 1995) and turbidite is not recognized above K-Ah ash in the core KUPC-03. Omura and Ikehara (2006) suggested that the turbidites, including coarse-grained terrigenous materials, were deposited through the Anoriguchi Canyon during the early stage of transgression. The turbidites occur below and above K-Ah ash in the core GH97-307. We examined that the origin of turbidites in the core GH97-307 using sedimentary organic matter composition and stable carbon isotope values of organic matter.

Sub-samples for organic matter analyses were taken from above each turbidite layers. The procedure of preparation and observation of sedimentary organic matter is the same as that in Omura and Ikehara (2006). We plotted the organic matter composition on a ternary diagram with apices of woody-coaly organic matter, herbaceous organic matter with pollen and spores, and amorphous organic matter (AOM) with alginite (Omura and Hoyanagi, 2004). The organic matter in the core GF00-01 are distributed on the diagram near the AOM+alginite apex. The organic matter in the core KUPC-03 are distributed between the woody-coaly organic matter and AOM+alginite apices. The stable isotope values of organic matter of the core GF00-01 and KUPC-03 vary between -22.4 and -22.7 per-mil and -22.3 and -23.6 per-mil, respectively. The differences of organic matter distribution on the ternary diagram and stable carbon isotope values between cores GF00-01 and KUPC-03 indicate the origin of deep-sea sediments, such as slope failure (GF00-01) and inflow of terrigenous material through a sub-marine canyon (KUPC-03). The organic matter in the core GH97-307 are distributed near the AOM+alginite apex. The stable isotope values of organic matter of the core GH97-307 vary between -22.1 and -22.5 per-mil. These results suggest that turbidites of the core GH97-307 originate from slope failure deposits.