

Recognition of the sea-floor event deposits by continuous radiocarbon measurements of total organic carbon

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The depositional age of hemipelagic mud are generally determined by radiocarbon dating of planktonic foraminifera. Radiocarbon dating using total organic carbon of sediments is not common for age determination, because total organic carbon include organic carbon of various origins, such as marine, terrestrial, and reworked old fragments. In the forearc basins along the Nankai Trough, the amount of planktonic foraminifera in the sea-floor sediments is not enough for radiocarbon age determinations. Therefore, we try to determine the depositional age of hemipelagic mud by using radiocarbon dating of total organic carbon. Radiocarbon ages of total organic carbon were measured in 0.5 to one centi-meter intervals of sediment core, and compensated with small-scale radiocarbon sample measurement of planktonic foraminifera.

Radiocarbon ages were measured with accelerator mass spectrometer of Atmosphere and Ocean Research Institute, the University of Tokyo. Total organic carbon contents and stable isotope ratio of organic carbon were measured using an elemental analyzer and a mass spectrometer of the National Museum of Nature and Science, Tokyo.

Sediment core was acquired from the western part of Kumano Trough at 2000 m water depth by using multiple corer. The sediment is composed of olive black clayey silt in 40 cm long core. Two light colored layers, which include coarse silt, were observed in X-ray CT images of the hole core. Several ¹⁴C ages determined from total organic carbon were older than those of lower horizons. These may be because the organic carbon samples include some older carbon fragments remobilized from submarine slope. We excluded these ages from our estimation of depositional ages. ¹⁴C ages of total organic carbon were found to be about 900 to 1200 years older than those from planktonic foraminifera from the same horizons. We converted the ¹⁴C ages of total organic carbon to calibrated ¹⁴C ages by using the age difference between total organic carbon and foraminifera. Our results show that the 40cm long sediments were deposited during about past 600 years.

The organic carbon of the event layers, which excluded from estimation of depositional ages, is mostly marine origin. Therefore, we considered that these event layers were deposited as a consequence of submarine slope failure. The event layer in upper part of the core was considered to be deposited by shallow submarine slope failure or flood, because this layer includes terrestrial organic carbon. On the basis of our radiocarbon dating of total organic carbon and planktonic foraminifera, these event layers might be deposited as consequences of submarine slope failure associated with historical earthquakes and flood after fifteen century.

Radiocarbon dating with total organic carbon is possible tool for not only determination of depositional age but also recognition of event deposits in homogenous hemipelagic mud.

Keywords: hemipelagic mud, organic carbon, radiocarbon dating, earthquake