DSDP/ODPの遠洋性粘土コアに記録された北太平洋における新生代の環境変動

Environmental changes of the North Pacific Ocean through the Cenozoic era recorded in DSDP/ODP pelagic clay cores

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Deep-sea sediment records paleo-environmental changes thorough geologic time. Pelagic clay, one of the most common types of deep-sea sediment, is an important medium recording changes of atmospheric/oceanic circulations and surface ocean productivity that occurred in pelagic realm [1]. Despite its importance, however, less attention has been paid to the pelagic clay than to other sediments, mainly due to the two following reasons: (1) pelagic clay lacks visible features, which hampers clarifying the stratigraphic variations within pelagic clay units, (2) determining the depositional age is very difficult due to lacks of siliceous/calcareous microfossils and difficulties in identifying paleomagnetic reversals.

Our recent studies [2,3] have shown that bulk chemical composition is a very useful tool to characterize apparently homogenous pelagic clay. We previously determined bulk geochemistry of pelagic clay samples obtained from ODP sites 1149 and 1179 in the western North Pacific Ocean [2], and compared with that from LL44-GPC3 in the central North Pacific Ocean [1]. The results indicate that pelagic clay in the North Pacific is composed of common three layers, each having characteristic major- and trace-element composition [2,3]. This suggests that the problem (1) (i.e., difficulty in stratigraphic characterization) can be solved on the basis of geochemistry. Moreover, regarding the problem (2) (i.e., difficulty in age determination), we have applied biostratigraphy of ichthyolith (microfossils of fish teeth) to constraining the depositional ages of pelagic clay at sites 1149 and 1179 [3]. These achievements suggest that the problems in using pelagic clay as a recorder of paleo-environment can be overcome.

Here, we newly determined bulk chemical compositions of pelagic clay cores at DSDP sites 576, 578 and ODP Site 886, whose depositional ages were constrained [4,5]. By combining the results with our previous data, we constructed a dataset of bulk geochemistry and depositional age of pelagic clay covering a broad area in the North Pacific Ocean. The data show that the common chemostratigraphy we have reported [2,3] is truly a general feature of pelagic clay in the North Pacific Ocean. Moreover, the integration of the geochemical features and paleogeographic reconstruction suggests that the common chemostratigraphy in the North Pacific Ocean reflects the global environmental changes through the Cenozoic era.

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