Drilling on forearc shelf in NE Japan to decipher late Cenozoic Sea-level changes

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Conclusion from onshore studies

We examined the Pliocene shelf sediments, which is distributed in the northern Japanese mainland along the northwest Pacific Rim. Basically, late Pliocene was a warm period, but global cooling was considered to start at 3.0Ma. Therefore, shelf sediment of this age might record the climate change from warm period to cooling stage.

The sea-level changes, which are inferred from facies analysis, coincided with the trend of the oxygen-isotope curve of 200 ky-400 ky cycles. Variations of total organic carbon content (TOC), total sulfur content (TS) and stable carbon isotope ratio well documented the changes of environmental conditions on the shelf. During warm period, the amount of river discharge was increased by frequent flood of rivers. Abundant land-derived organic matter was transported to the shelf. As the result, the ratio of land-derived organic matter was high and, TOC value increases upward in the warm period (3.75-3.5 Ma). While global cooling on set in about 3.5 Ma, the cooling of the ocean had increased the productivity of diatom. Therefore, the ratio of marine microfossil was high, and TOC value also increased in the early cooling period (3.5-3.35 Ma). The sea-level fall in the last cooling stage took place shallowing of the shelf after 3.35Ma. Coarse sandy deposits and abundant land-derived organic matter was frequently transported into the sea. As the result, high TOC value depended on the increase of land-derived organic matter in this stage. And the considerable variations in TS, TOC and stable carbon isotope ratio values are seen at cooling stage after 3 Ma.

Significance of drilling on offshore area

This area is the most appropriate drilling site for testing the climate change in Pliocene age, because of the reasons as it follows:

1) Uninterrupted sedimentary sequence with high accumulation rate (more than 10 cm/kyr) provides us high-resolution continuous record from the late Miocene through the Pliocene.

2) As this area is within transitional region between warm and cold currents, it is the most sensitive for climate change and might monitor various climatic signals of high amplitude.

3) Because of the site location near the land, both land and marine signals can be obtained in the sediments. Land to ocean transect drilling will give us detailed information about the land-ocean linkage.