Japan Geoscience Union Meeting 2013
(May 19-24 2013 at Makuhari, Chiba, Japan)

APE34-13 Room:103 Time:May 21 09:00-09:15

Variation in marine primary production recorded by biomarker in northeastern edge of paleo-Japan Sea during the Miocene

Satoshi Furota[1*], Ken Sawada[1], Gentaro Kawakami[2]

[1]Faculty of Science, Hokkaido University, [2]Geological Survey of Hokkaido, HRO

The objective of this study is to reconstruct of marine primary production in shallow marine environment of northeastern edge of the paleo-Japan Sea during the middle to late Miocene. It has been known that diatom production increased in the North Pacific and paleo-Japan Sea during middle to late Miocene. In particular, shallow marine environment is thought to be one of the highest productivity area due to efficient supply of nutrient into the sea surface by terrestrial input and coastal upwelling. In the present, we analyze diatom-derived biomarkers in sedimentary rock samples from turbiditic sequences to evaluate depositional system and to reconstruct paleoproduction in shallow marine environment of the northeastern edge of Japan Sea during the middle to late Miocene.

Miocene (23Ma- 5.3Ma) is known to be a transition epoch in global climate that changed from warm to cold conditions since the mid-Miocene Climatic Optimum (MMCO; 15Ma). At the same time, expansion of the Antarctica ice sheet and intensification of Asia monsoon started (Zachos et al., 2001). Also, diatom productivity dramatically increased in the North Pacific and paleo-Japan Sea (Barron, 1998; Yamamoto et al., 1999). Moreover, it was suggested that C_4 plant expansion caused increasing diatom productivity by efficient transport of biogenic opal from land to ocean (Falkowski et al., 2004).

Opening of the Japan Sea was known to have started from the early Miocene. Biogenic silica and biomarker analyses inferred that diatom was a major primary producer in the paleo-Japan Sea during this epoch (Tada, 1994; Yamamoto et al., 1999). In addition, source rocks including the Onnagawa Formation were formed as a result of high diatom productivity and well preservation of organic matter under anoxic bottom environment. Thus, we performed biomarker analysis for the Miocene Kawabata Formation in Yubari area, central Hokkaido to understand long term paleoceanography and biogeochemical processes in interface between land and ocean. The Kawabata Formation is mainly composed by turbiditic sequences that filled Ishikari basin. F-T analysis for interbeded tuff layer and diatom biostratigraphy showed that the Kawabata Formation was formed during middle to late Miocene (Kawakami et al., 2002).

In mudstone samples of the Kawabata Formation, the ratio of C_{27} to C_{29} steranes, which indicate the relative abundance of eukaryotic alga to terrestrial plant, are almost similar to those of shallow marine sediment as reported previously (Sawada, 2006). The ratio of pristane to phytane (Pr/Ph) was generally used as a redox indicator, and suggests that anoxic bottom environment was distributed in the Ishikari basin during the Miocene. We detect 24-norcholestane and higher branched isoprenoid (HBI) alkane/thiophene. It is reported that 24-norcholestane and HBI alkane/thiophene are originated from *Thalassiosira* and *Rizoseolenia*, respectively (Rampen et al., 2006; Sinninghe Damste et al., 2004). The relative abundances of these diatom-derived biomarkers to total organic carbon (TOC) are closely related to those of sterane to TOC in sedimentary rock samples. These results suggest that the diatom was the major producer in the Ishikari basin. Interestingly, the decreasing spikes of Pr/Ph values correspond to the increasing peaks of the amounts of diatom-derived biomarkers in the Kawabata Formation. From these results, we interpret that high diatom productivity in the sea surface resulted in occurrence of anoxic waters in bottom of the Ishikari basin. Furthermore, the amounts of diatom biomarkers increased in the late Miocene sediment layer, which agree with the previous results from the Onnagawa Formation and the North Pacific sediment core (Barron, 1998; Yamamoto et al., 1999).

Keywords: Miocene, Japan Sea, paleoceanography, biomarker, diatom, turbidite