Sedimentary records and heavy minerals assemblages of the Bengal Fan deposits recovered during IODP Exp. 354

*Kohki Yoshida[1], Babu Ram Gyawali[2], Swostik K. Adhikari[5], Arata Nakajima[6], Ai Osaki[3], Nozomi Hatano[4]

1.Department of Geology, Faculty of Science, Japan, 2.Department of Earth Science, Tohoku University, Japan, 3.Department of Geology, Faculty of Science, Shinshu University, Japan, 4.Graduate School of Science and Technology, Shinshu University, Japan, 5.Department of Geoscience, Shimane University, Japan., 6.Department of Geology and Mineralogical Sciences, Yamaguchi University, Japan

The deep-sea Bengal Fan is the largest submarine fan in the world. The formation of this fan is a direct result of the erosion of the Himalayan orogen (Curray and Moore, 1971). Thus the change of the mineral and geochemical characteristics of this fan sediments records uplift, erosion, weathering history of the Himalayan orogenic system during Paleogene-Neogene period.
IODP Exp. 354 drilled seven sites in an E-W transect, with three deep and four shallow holes, at 8° N , in the mid fan region of Bengal Fan. The deepest site, U1451, ~1500 meters below seafloor recovered a complete sequence of the fan deposits which overlie on lower Oligocene pre-fan deposits (France-Lanord et al., 2015). The fan sediments drilled in the mid fan region mainly consist of mica- and quartz-rich sand, silt, and clay with several hemipelagic deposits. The hemipelagic deposits, which associated distinct seismic reflectors, consists of calcareous clay and nannofossil ooze. At the bottom of the hole, Eocene and Paleocene limestones were recovered. Above mentioned results are evidential for the record of early fan deposition by 10 My into the late Oligocene.
These sediments were documented mineralogical signatures relevant for reconstructing time series of development of Himalaya. Previously, several researches on heavy minerals of Bengal Fan sediments were carried out using the fan sediments on DSDP Leg 22, Site 218 (Thompson, 1974) and ODP Leg 116, Sites 717-719 (Yokoyama et al., 1990; Amano and Taira, 1992). In this study, we show the result of the modal proportions of heavy mineral in the sediments recovered from site U1451, by smear slides and thin sections, and discuss the historical change of the mineral assemblages.
The heavy mineral assemblage of the Late Oligocene sands, which is oldest sediments from the Bengal Fan, mainly consists of ultra-durable ZTR component (zircon-tourmaline-rutile) with rare garnet, amphibole and pyroxene. The heavy mineral assemblage, in the Early Miocene sediments, mainly includes ZTR component with small amount of garnet, apatite and rare aluminosilicates (kyanite). - At the early part of Middle Miocene sequence, amphibole and garnets rapidly increase with frequent occurrence of aluminosilicate. In the Middle Miocene sediments, the assemblage of heavy minerals become diverse and metamorphic minerals such as staurolite, chloritoid, aluminosilicate, amphibole and garnet, are frequently included in the sediments.
These results of preliminary measurement of heavy minerals show rapid uplift and sediment production from metamorphic terrane in the Himalayas during early part of the Middle Miocene period, though the erosional history in Early Miocene and Oligocene periods is still obscure.
References
Amano, K., & Taira, A. (1992). Two-phase uplift of Higher Himalayas since 17 Ma. Geology, 20, 391–394.
Curray, J. R., & Moore, D. G. (1971). Growth of the Bengal deep-sea fan and denudation in the Himalayas. Bulletin of the Geological Society of America, 82(March), 563–572.
France-Lanord, C., Spiess, V., & Klaus, A. (2015). Expedition 354 Preliminary Report Bengal Fan Neogene and late Paleogene record of Himalayan orogeny and climate: a transect across the Middle Bengal Fan, (March). doi:10.14379/iodp.pr.354.2015

©2016. Japan Geoscience Union. All Right Reserved.

Gansser, A., (1964). Geology of the Himalayas. Interscience publishers, London New York, pp. 1-289.
Thompson, R. W. (1974). Mineralogy of sands from the Bengal and Nicobar fans, Sites 218 and 211, eastern Indian Ocean. Initial Reports of the Deep-Sea Drilling Project, 22, 711–714.
Yokoyama, K., Amano, K., Taira, A., & Saito, Y. (1990). Mineralogy of silts from the Bengal Fan. Proceedings of the Ocean Drilling Program, Scientific Results, 116, 59-73.

Keywords: Bengal Fan, Himalaya, Heavy Minerals

©2016. Japan Geoscience Union. All Right Reserved.