Oman ophiolite ICDP: outline and expected outcome

*Eiichi TAKAZAWA[1,2], Yoshihiko Tamura[2], Katsuyoshi Michibayashi[3], Tomoaki Morishita[4], Natsue Abe[2], Takashi Miyazaki[5], Ryoko Senda[5], Moe Kyawthu[2]

1.Department of Geology, Faculty of Science, Niigata University, 2.R & D Center for Ocean Drilling Science, Japan Agency for Maine-Earth Science and Technology, 3.Institute of Geosciences, Shizuoka University, 4.School of Natural System, Colleage of Science and Technology, Kanazawa University, 5.Department of Solid Earth Geochemistry, Japan Agency for Maine-Earth Science and Technology

The proposal for drilling at the southern Oman ophiolite (lead proponent: Dr. P.B. Kelemen of Columbia University, USA) has been approved by International Continental Scientific Drilling Program (ICDP). The 1st phase of drilling is scheduled for August 2016 and the 2nd phase for January-March from August 2017 (http://www.omandrilling.ac.uk). In the context of the Oman ICDP we propose drilling of a new hole through a crust-mantle boundary with a matching fund from Japanese side. In addition, advanced techniques will be introduced for borehole logging and core description to clarify lithology and physical properties at the crust-mantle boundary.
The main targets of Oman ICDP are drillings of gabbroic layers in the typical crust section, the crust-mantle boundary around a mantle diapir and altered peridotites (serpentinite and carbonate) at the basal part of mantle section. We're planning to drill a crust-mantle boundary away from the ridge axis and intensively describe the successive cores using advanced analytical facilities on the drilling vessel "Chikyu". We will systematically analyze major and trace element contents in whole rocks and minerals, Sr-Nd-Pb-Hf isotopes, Re-Os isotopes, compositions of melt inclusions in core samples. These data will be used to achieve next five objectives. (1) To clarify the characteristics of Moho discontinuity by examining fresh core samples. (2) To clarify both high temperature igneous processes and low temperature alteration processes around the Moho. (3) To identify strength and shear sense of the mantle flow and inspect the gradient of mantle flow velocity beneath Moho. (4) To conduct borehole logging to understand physical properties around the crust-mantle boundary. (5) To understand how continental crust generated from oceanic crust.
The Oman ICDP is the biggest chance to obtain fresh core samples from Oman ophiolite. At the same time, it offers a preliminary test for future drilling through oceanic Moho. In the Oman ophiolite ICDP, low temperature processes such as serpentinization, groundwater and a microorganism are given priority. Our new drilling hole will be specialized in igneous process and mantle deformation to contribute to understand "high temperature process" which lacks in the current Oman ICDP. This attempt will advance our knowledge of the reality of the Moho that is one of unsolved problems in Earth science. By organically uniting the spatial information obtained by field survey of the Oman ophiolite with the successive information obtained from drilling cores, we will reach overall understanding of the crust-mantle boundary including low and high temperature processes, mantle flow and physical nature of the Moho. The Oman ophiolite ICDP also contributes to improvement of drilling technology and the researcher development for young scientists. We will introduce the most advanced logging tools such as NeoScan. Students analyze the core intensively under researcher's guidance using latest facilities of a deep earth research vessel "Chikyu". The expected outcome is that students being superior to core description and borehole logging grow up through the Oman ICDP.

Keywords: Oman ophiolite, ICDP, crust-mantle boundary, Moho, borehole logging

