[EE] Evening Poster | S (Solid Earth Sciences) | S-CG Complex & General

[S-CG54]Hard-Rock Drilling: Oman to Oceanic Lithosphere to Island Arc Formation and Beyond

convener:Eiichi TAKAZAWA(Department of Geology, Faculty of Science, Niigata University), Katsuyoshi Michibayashi(Department of Earth and Planetary Sciences, Nagoya University), Peter B Kelemen (共同), Damon A H Teagle (Ocean &Earth Science, National Oceanography Centre Southampton, University of Southampton, SO14-3ZH, Southampton, UK)

Mon. May 21, 2018 5:15 PM - 6:30 PM Poster Hall (International Exhibition Hall7, Makuhari Messe)

The on-going Oman Drilling Project (OmDP) has drilled numerous hard-rock cores of ancient oceanic lithosphere and the underlying subduction zone of the Samail ophiolite in Oman, with support from ICDP, IODP, the Sloan Foundation's Deep Carbon Observatory, and Japanese, US, and European research agencies. Moreover, a number of IODP expeditions have focused on hard-rock drilling over the last 5 years including Expedition 352 in 2014, which drilled the volcanic sequence associated with subduction initiation in the Bonin fore-arc, Expedition 357, which drilled the Lost City hydrothermal field, Expedition 360, which drilled the lithosphere associated with ultraslow-spreading at the Southwest Indian Ridge in 2016, and Expedition 366, which drilled the serpentinite seamounts in the Mariana fore-arc. In this session, we invite presentations on the scientific results of hard-rock drilling at these and other sites. We also invite related presentations on oceanic lithosphere, island arc formation, and any other significant issue that could be addressed by future hard-rock drilling. This includes marine studies of oceanic lithosphere and on-land geological investigations of ophiolites, accreted arcs, and subduction complexes. The session is intended to be interdisciplinary, including the fields of geophysics, geochemistry, petrology, engineering, and biology.

[SCG54-P12]Geochemistry of Wadi Tayin mantle section in the southern Oman mantle section with special reference to suprasubduction zone magmatism

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Keywords:ophiolite, mantle, mid-ocean ride, suprasabduction zone, mantle-melt reaction

In this study, we report the lithology and the mineral compositions of peridotites from the Wadi Tayin massif in the southern Oman ophiolite to investigate the influence of arc related magmatism during oceanic thrusting. Many studies have been conducted in the Wadi Tayin mantle section in the southern Oman ophiolite (Kelemen et al., 1995; Godard et al., 2000; HanghØj et al., 2010). Kelemen et al. (1995) demonstrated that the REE abundances in clinopyroxenes in dunites from Wadi Tayin massif are in equilibrium with those of MORB although harzburgite did not. Godard et al. (2000) considered that the basal part of Wadi Tayin mantle section corresponds to the asthenosphere-lithosphere boundary based on whole rock compositions and modal abundance of clinopyroxene. HangØj et al. (2000) discovered that dunite and uppermost impregnated samples have high Os isotope ratio. Furthermore, they revealed that the peridotites from the shallowest part of the mantle section recorded higher metamorphic closure temperature relative to the deeper ones.

We systematically corrected harzburgites, dunites and lherzolites along wadis to cover the mantle section from the boundary between lower crust and uppermost mantle namely “Moho” to the basal thrust. Spinel Cr# [=Cr/ (Cr+Al) atomic ratio] of harzburgite varies from 0.22 to 0.58 and they are plotted on

the abyssal peridotites area at compositional relationship diagrams. In addition, it tends to elevate from the basal thrust to the Moho. Spinel Cr# of dunites has a peak of frequency at 0.55 to 0.60, and some of it shows greater than 0.60. The highest spinel Cr# is 0.74. Those dunites occur both in the basal part of the mantle section and along NW-SE striking shear zone. The relationship between concordant dunites and discordant dunites (Arai et al., 2006) is also observed.
Abundances of trace elements in clinopyroxenes were analyzed by LA-ICP-MS. The chondrite-normalized patterns show that clinopyroxenes are depleted in LREE relative to HREE although abundance of LREE is more variable than that of HREE. Dunite with the highest spinel Cr# of 0.68 from the shear zone is the most enriched in MREE to LREE relative to other dunites. The trace element patterns for clinopyroxenes from this dunite show negative anomaly in high field strength (HFS) elements such as Nb, Ta, Zr and Hf. In addition, the diagram of Cr# vs Ce/Yb ratio for clinopyroxenes shows a positive correlation toward the compositional area of MTZ (Akizawa et al., 2012). We consider that these trends may be formed by flux-melting of harzburgites. Negative anomaly in the HFS elements indicates that fluid caused flux-melting in the mantle section might be ascended from metamorphic sole due to dehydration of oceanic crust during suprasubduction stage. Farther more, according to the distribution of dunites which contain high Cr# spinel, the fluid might have been locally infiltrated both in basal part and along share zone. On the other hand, we observed that clinopyroxenes that are contained uppermost mantle section and Moho transition zone dunites are equilibrium with N-MORB (Sun and McDonough, 1989) although harzburgites which exist in same area are depleted in LREE. This fact is consistent with that showed by Kelemen et al. (1995).