[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-P02]The record of hydrothermal alteration in the lower oceanic crust sampled by Oman Drilling Project Holes GT1A and GT2A

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Keywords:Oman ophiolite, mid-ocean ridges, hydrothermal alteration

Hydrothermal circulation is a fundamental Earth process that is responsible for the cooling of newly formed ocean crust at mid ocean ridges and imparts a chemical signature on both the crust and the oceans. Recent studies highlight the requirement for deep hydrothermal circulation in the lower crust, but the critical samples necessary to resolve the nature of this deep hydrothermal system are poorly sampled in the ocean basins. The Oman Drilling Project successfully cored 3 boreholes into the lower crust of the Semail ophiolite (Holes GT1A layered gabbros, GT2A foliated gabbros and GT3A dike/gabbro transition). These boreholes have exceptionally high recovery (~100%) and have been characterised using both traditional and novel core description methods. These cores provide a timely and important opportunity to quantitatively characterise the hydrothermal system in the lower oceanic crust.
Hydrothermal alteration in Holes GT1A and GT2A is ubiquitous and manifests as secondary minerals

replacing primary igneous phases and secondary minerals precipitated in hydrothermal veins and hydrothermal fault zones. Hydrothermal alteration of the host rock was classified as either background, halos, patches or deformation related. Hydrothermal veins were individually logged and cross cutting relationships were recorded to determine the relative timing of hydrothermal alteration. The total alteration intensity in Hole GT1A ranges between 10 -100%, with a mean alteration intensity of 60%, and shows no overall trend downhole. However, there are discrete depth intervals (on the scale of 30 - 100 m) where the total alteration intensity increases with depth. Alteration assemblages are dominated by chlorite + albite + amphibole, with variable abundances of epidote, clinozoisite and quartz. Hole GT1A intersected several hydrothermal fault zones, these range from 2-3 cm up to >1m in size and are associated with more complex secondary mineral assemblages. Hydrothermal veins are abundant throughout Hole GT1A, with a mean density of 37 vein/m. Alteration intensity in Hole GT2A ranges between 6-100%, with a mean alteration intensity of 45%, and is highly variable downhole. Alteration halos and patches are slightly more abundant in Hole GT2A than in Hole GT1A. The secondary mineral assemblage is similar to Hole GT1A, but Hole GT2A has higher abundances of epidote, clinozoisite, quartz, laumontite and iron-oxydroxides. Vein density in Hole GT2A is 61 veins/m. In both holes, cross cutting vein relationships indicate a relative timing from earliest to latest of: amphibole; epidote + zoisite + quartz; chlorite + prehnite + quartz, calcite-laumontite-anhydrite; gypsum.