

Shallow Sub-seafloor Reservoir at Hydrothermal Site of the Suiyo Seamount, Izu-Ogasawara Arc, Western Pacific

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A high-temperature hydrothermal system related to deictic arc-volcanism has been drilled using a tethered, submarine rock-drill system BMS (Benthic Multi-coring System) on-board the R/V Hakurei-Marunohachi as a part of Archaean Park Project. The drilled hydrothermal field spreads for 200 meters by 200 meters on the caldera floor (depth=1,390m) of the Suiyo Seamount (28deg 34'N, 140deg 38'E), Izu-Ogasawara Arc, western Pacific. Numerous short black smokers (T_{max}=317 deg.C) were observed on the sandy floor. Six out of seven shallow drilled holes (av. hole-length=5m) produced fluid of various temperatures ranging from 9 to 308 deg.C. Casing pipe has been inserted to prevent the holes from the collapse.

The drilling intersected dacite lava and/or pyroclastic rocks about 1-3 meter below the unconsolidated sediments of volcanic sands and pumice fragments. Intensive hydrothermal alteration is observed in sedimentary unit and the upper part of the volcanic rocks. The drilling indicated that an impermeable sheath develops beneath each high temperature vent that prevents the end-member fluid to mix with low-temperature seawater within the permeable sediment layer. Clay minerals and anhydrite cement are the main component of the sheath in addition to pyrite and other sulfide minerals. The sheath is likely to be formed by self-sealing process of anhydrite. The end-member fluid is ponding beneath the sheath and the sheath acts as a cap rock of the terrestrial geothermal systems. The degree of hydrothermal alteration within the volcanic rocks decrease downwards.

The cased holes were visited by ROV Hakuyo 2000 during the Shinsei-Marunohachi cruise one month after the drilling. We noticed that sulfide minerals clog the high-temperature holes. On the other hand, low-temperature holes were sealed by a mixture of iron-hydroxide and bacterial mat. These lines of observation suggest that the aquifer structure beneath the hydrothermal system of the Suiyo Seamount is extremely shallow within a range between 0 and 10 meters beneath sea floor. JAMSTEC conducted two Natshushima/ Shinkai 2000 cruises and a R/V Kairei cruise to the Suiyo Seamount which were attended by Archaean Park scientists.