Geophysical structure of Suiyo Seamount with related to its hydrothermal system

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Surface geophysical, airgun-OBS (ocean bottom seismograph) and deep towed surveys by R/V Kairei KR01-15 cruise, heat flow measurements by manned or remotely-operated submersibles during four research cruises in 2001-2002, and ten OBS array observation from Aug. 5 to Oct. 9, 2002 were conducted to characterize geophysical features of a hydrothermal system at Suiyo Seamount as a part of Archaean Park Project. Geomagnetic results from surface and deep towed magnetometers suggest 1) the seamount was formed during Brunhes Epoch (after 0.78Myr), 2) low magnetization area exits on its summit and is limited only in eastern side. 2-D ray tracing results, using four OBS data with a GI gun across the seamount in NE-SW direction, indicate 1) P wave velocity of 2.2-4.2 km/s (2km thickness) locates all over the observation line, and 2) relatively low velocity area exits under the caldera. The SW-NE seismic reflection image from a deep towed system indicates two layers beneath the caldera; their thicknesses are 11m and 23m at the center of the hydrothermal site and both of them become thicker in the SW side. The spatial distribution of heat flows in the caldera indicates heat flow contrast with two different scales; several meters scale and a few tens of meters scale, suggesting that a dual scale hydrothermal circulation system. Two month OBS observation reveal the seismic activity, which is characterized by dominance of earthquakes with S-P times of 1-2 sec. The hypocenter determination indicates that the locations of these earthquakes are focused just beneath the Suiyo volcanic cone at a depth of 5-10 km. We propose that the former main conduit of Suiyo Seamount is in the middle of cooling after the last eruption and that it is the heat source of the hydrothermal system. The hypocenter locations probably correspond to the locations close to the former main conduit boundary where high thermal stress is expected due to high thermal gradient. The relatively low velocity area under the caldera is probably due to the heat from the former main conduit. The few tens of meters scale hydrothermal circulation can be explained by the heat source with related to the layers beneath the caldera. The low magnetization area is probably results from high alteration of the rock through the hydrothermal activity. We will present the results of the geophysical observations with this cooling model of the former main conduit of Suiyo Seamount to explain these features.