

## Inferred the structure of hydrothermal regime according to heat flow data at Suiyo Seamount and Iheya North hydrothermal area.

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Heat Flow gives important boundary conditions to infer the regime of the hydrothermal systems. Giving the heat flow data as well as permeability, viscosity, and thermal conductivity, thermal and hydrological structure can be inferred conductivity.

Using submersibles and surface vessel, we measured heat flow at Suiyo Seamount(28-34°M 140-38°E) in the Izu-Ogasawara volcanic front, and at Iheya-North hydrothermal area in the mid-Okinawa trough. Based on the heat flow distribution and each temperature vs. depth profile, their hydrothermal circulation structures are inferred using numerical simulation.

Previously, 52 heat flow data have been obtained in the Suiyo Seamount hydrothermal area using submersible-operated, stand alone heat flow meter(SAHF). Heat flow is basically higher than  $10\text{W/m}^2$  within the active area at the bottom of caldera, and low heat flow values also exist very close (less than 20m) to vents. As the results of the observations, it is clear that the heat flow data varies by over 3 order of magnitude, because of local hydrothermal circulation around active ventings.

The NT05-16 cruise was carried out using R/V NATSUSHIMA and ROV 'Hyper Dolphin' from September 22nd to October 7th 2005. We conducted 4 dives at the hydrothermal area in the caldera of Suiyo Seamount. We obtained 10 new heat flow data. 8 measurements were made within 5m of an isolated hydrothermal vent, located 20m north of the center of Suiyo hydrothermal field. 4 measurements were aligned eastward and the other 4 were aligned northward, both separated 0.5-1m each. The eastward transect indicates that sub-bottom temperatures at 50cm below seafloor decreases from about 60 degC at 50cm apart from the vent to no temperature rise at ~4m from the vent. Furthermore the temperatures vs. depth profiles for the eastward 4 data are concave. It strongly suggests that the local recharge of sea water into the hydrothermal reservoir takes place in this area, with an estimated darcian velocity of  $1\text{E-6m/s}$ . Such a local circulation has been observed in other hydrothermal areas, such as Okinawa Trough, or TAG hydrothermal field of the Mid-Atlantic Ridge.

The WK06-09 cruise was carried out using R/V YOKOSUKA and 'Shinkai6500' and we obtained 8 new heat flow data. Heat flow is lower than the  $0.1\text{Wm}^{-2}$  in a basin 2km to the east of the active hydrothermal site (Iheya-north hydrothermal field). It suggests that the hydrothermal circulation occurs with at least 2km horizontal scale and the area of hydrothermal circulation is larger than that of the Suiyo Seamount.

The spatial scale and lifetime of a hydrothermal field would largely depend on permeability of surface sediment. We inspected its effect on surface heat flow distribution through a simple 2-D numerical analysis. For a horizontal two-layer model, we found that the thermal regime becomes almost conduction dominant if the permeability in the surface layer is more than two orders of magnitude lower than in the bottom layer.