Heat flow distribution on the floor of the Nankai Trough to the south of the Ki-i Peninsula

Makoto Yamano[1]; Hideki Hamamoto[1]; Shusaku Goto[2]

[1] ERI, Univ. Tokyo; [2] GSJ, AIST

The temperature structure of the subducting oceanic plate is one of the most important factors controlling the subsurface thermal structure of subduction zone. The temperature structure of the the Shikoku Basin lithosphere, which is subducting along the Nankai Trough, may be reflected in heat flow observed on the floor of the Nankai Trough, since thick terrigenous sediment layers in the trough should seal hydrothermal circulation in the basement. Previous studies showed that the heat flow measured on the trough floor off eastern Shikoku (off Muroto) is conspicuously different from that to the southeast of the Ki-i Peninsula (off Kumano). In the area off Muroto, the mean of the observed heat flow is extremely high, about 200 mW/m^2, twice as high as the value corresponding to the seafloor age (about 15 m.y.) considering the effect of sedimentation. On the other hand, the heat flow observed off Kumano is 100 to 120 mW/m^2, close to the value estimated from the seafloor age (about 20 m.y.) with the sedimentation effect.

We have been conducting heat flow measurements on the floor of the Nankai Trough to the south of Ki-i Peninsula in order to examine the extent of the high heat flow anomaly in the off-Muroto area for investigating the cause of the anomaly and the thermal structure of the Shikoku Basin lithosphere. Although measurements can be made only in restricted areas due to the existence of submarine telecommunication cables, we managed to delineate the heat flow distribution on the trough floor. Heat flow generally decreases eastward and no clear boundary between the high heat flow off Muroto and the normal heat flow off Kumano can be recognized. Extremely high heat flow, about 200 mW/m^2 or higher, is observed only in the western part of the study area, west of 136^{o}00'E. In this western area, heat flow is highly variable and the mean value is comparable to that in the off-Muroto area.

The difference in the heat flow distribution between the western area and the eastern area indicates that the thermal structure of the Shikoku Basin may also be different between the two areas. This transition at around 136^{o}E could correspond to changes in characteristics of basement relief and magnetization of oceanic crust reported to occur in the same area. The vigor of hydrothermal circulation in subducted oceanic crust, which is claimed to be a possible cause of the high heat flow anomaly in the off-Muroto area, should be related to physical properties of the crust. The rupture segmentation boundary between the 1944 Tonankai and the 1946 Nankai earthquakes also lies to the south of the Ki-i Peninsula. The difference in the thermal structure of the Shikoku Basin may result in a difference in the temperature distribution in the rupture areas.