Subduction of Kyushu-Palau Ridge can cause local thermal disturbance, as estimated from new heat flow data in the forearc in the eastern Kyushu, Japan

*Masataka Kinoshita[1], Rie Nakata[1], Yoshitaka Hashimoto[2]

1. Earthquake Research Institute, University of Tokyo, 2. Kochi University

In the Hyuga-nada forearc region off eastern Kyushu, weaker degree of plate coupling is inferred from frequent seismicity and the slow slips inferred from seafloor geodetic data. This exhibits a clear contrast against the strong coupling in the Nankai Trough region to the east. Based on 3D numerical simulation and the low heat flow values, Yoshioka (2007) suggested that the weaker coupling in Hyuga-nada is attributed to the lower temperature in the seaward side of the plate boundary. However, the tectonics around Hyuga-nada is much complicated from plate-scale to sub-km-scale, In a reginal scale, a colder and probably rough-surface crust (west Philippine Basin; ~60 Ma) is subducting with steeper dip angle at depth, in contrast to the young, smoother Shikoku Basin to the east. Along the old/young boundary, the Kyushu-Palau Ridge (KPR; trending N60W) is obliquely subducting toward N30W since several Ma B.P., possibly scraping off the overlying forearc block westward.

Here we present heat flow data including new ones obtained along JAMSTEC seismic lines to discuss how the heat flow is affected by these tectonic/morphological disturbances.

The heat flow marks a sharp boundary across KPR; it is 50-100mW/m2 to the east and 25-40mW/m2. The transition from high to low heat flow occurs in only 20 km across KPR. Higher heat flows of 100 mW/m2 to the east are located near the axis of Nankai Trough, similar to those reported off Muroto. It is attributed to the fluid discharge along decollement. The lack of such high heat flow to the west may simply the lack of measurement in the corresponding area.

We performed a simple 3D thermal modeling, considering the subduction of old and young crusts (age difference of 20 Ma) neighboring to each other. Both orthogonal and oblique azimuth of subduction are tested. Due to thermal exchange between the neighboring crusts the width of thermal transition becomes wider with time, but not much difference along subducting direction, probably because of rapid subduction. Calculated heat flow profile is generally in good agreement with the observed heat flow trend, consistent with Yoshioka (2007) results.

A closer inspection of heat flow and the morphological feature, however, reveals a coincidence between heat flow minimum and the location of subducted KPR (as supported by the magnetic anomaly) and the location of flow-frequency tremors. Seamount subduction is inferred to cause a local stress anomaly and an elevated pore pressure, which is associated to heat flow anomalies. We will discuss this local effect as well.

Keywords: Kyushu-Palau Ridge, Heat flow, Slow earthquake

