

Seismic crustal structure of the Kyushu-Palau Ridge and Daito Ridges, paleo-island arcs in the Philippine Sea plate

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We, Japan Coast Guard, had conducted a number of multi-channel seismic reflection and refraction experiments to the south of Japan in 2004-2008 under the Japanese Continental Shelf Survey Project. We summarized P-wave velocity structural models of the Kyushu-Palau Ridge, a remnant intra-oceanic island arc extending north-south at the center of the Philippine Sea plate, from 28 seismic profiles across and along the remnant arc. We also present 11 seismic models beneath the three large bathymetric highs at the northwestern end of the Philippine Sea plate. They are the Amami Plateau, Daito Ridge and Oki-Daito Ridge from north to south and their origins seem to be paleo-island arcs and/or intraplate volcanoes.

1. Variation in crustal structure along the Kyushu-Palau Ridge (KPR)

The crustal thickness of the KPR varies from 8 to 23 km along the ridge and is roughly thicker in the north of the ridge than in the south. The thick crust is mainly attributed to the lower crust with P-wave velocity (V_p) of 6.8-7.2 km/s. Rather thicker mid crust with V_p of 6.0-6.8 km/s exists in the limited area of the northern KPR. P_n velocities just beneath the KPR are less than 8 km/s, often accompanying with rather high V_p of 7.2 km/s at the base of the crust. Reflection signals observed at far offsets along several lines suggest some reflectors exist at the depths of 23-40 km beneath the KPR.

2. Seismic structure of the Daito Ridges

The middle crust of the Amami Plateau has a thickness of about 4 km and V_p =6.0-6.8 km/s in the east of the plateau, rather thicker than that in the west with deeper water depths. V_p of the lower crust is 6.8-7.2 km/s. The maximum depth of the Moho and P_n velocity beneath the plateau are 19 km and about 7.6 km/s, respectively.

The materials with V_p \leq 6.3 km/s and a thickness of 6-11 km characterize the southern part of the Daito Ridge, while the materials with V_p \geq 6.3 km/s ascend to near the seafloor in the northern area. This feature may show the evidence for rifting between the Daito Ridge and Amami Plateau.

The crust at the northwestern part of the Oki-Daito Ridge shows a structure similar to that of the Daito Ridge. On the other hand, the crust at the southwestern part of the ridge has very thin mid crust and the crustal thickness is about 10 km, which may indicate different origin, such as an intraplate volcanism.