

Robust magmatic domain in a marginal basin: tectono-magmatic evolution of the northern West Philippine Basin

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We present the result of the detailed swath survey and bottom sampling of the northwestern West Philippine Basin (WPB) conducted by the Japanese Continental Shelf Survey Project. The data were obtained a series of cruises of S/V Shoyo (Hydrographic and Oceanographic Department of Japan) and R/V Hakurei 2 (Ministry of Economy, Trade and Industry). We describe the details of the complex bathymetry of the northwestern domain of the WPB for the first time, providing new constraints on the early history of the WPB evolution.

The northwestern WPB exhibits very complicated bathymetry. The area is bordered by a narrow curved trough to the east, and a long linear fracture zone (Okinawa-Luzon Fracture Zone) extending NE-SW from the Ryukyu Trench. Abyssal hills in the area trend NW-SE, suggesting NE-SW spreading formed this area. Large part of the area is characterized by an extensive bathymetric high, Okinawa Rise (Urdaneta Plateau), which could have been formed by robust volcanism.

We revealed unprecedented detail and complexity on the tectonic fabric and history of the WPB. The most obvious structures are three dueling propagators and one large northern rift. Similar morphology is known in the southern East Pacific Rise between the Easter and Juan Fernandez microplate, that is interpreted to be the largest offset oceanic propagating rift system, or the early state of microplate formation.

Lavas from the Okinawa Rise are clearly oceanic island basalt (OIB)-like, having incompatible element enriched patterns with maximum normalized abundances of Nb and Ta. Ar-Ar ages of these lavas are about 39 to 40 Ma. We argue that the complicated bathymetry of the northern WPB was caused by excess of melt.