Amagmatic tectonics in the southern Parece Vela Basin -preliminary geophysical mapping results from KH03-3

Kyoko Okino[1]; Yasuhiko Ohara[2]; Daniel Curewitz[1]; Kin-ichiro Koizumi[3]; Carmen Gaina[4]; Ryo Miura[5]; Yumiko Noda[6]; Junhua Guo[7]

[1] ORI; [2] Hydrographic and Oceanographic Dept.of Japan; [3] ORI, Univ. Tokyo; [4] School of Geoscience, University of Sydney; [5] ORI, Univ. of Tokyo; [6] Earth Science,Toyama Univ; [7] Institute of Oceanology, Chinese Academy of Sciences

http://ofgs.ori.u-tokyo.ac.jp/~okino

The Parece Vela Basin (PVB) is an extinct backarc basin in the southern Philippine Sea and was formed between 29Ma and 12 Ma. The remnant spreading center is now an array of deep depressions, called the Parece Vela Rift (PVR). The PVB is an very interesting and important study target because of the following two reasons, 1) the recent studies of the area reveal its magma-starved spreading tectonics with the well-developed oceanic detachments in the northern PVB, and 2) the tectonic relationship between the southern PVR and the Yap Trench is an important clue to understand the evolution of the arc-trench system surrounding the Philippine Sea Plate.

Our previous surveys in the northern PVB reveal the features of several mullion structures with flow-line parallel corrugations near the PVR and a chaotic terrain with mullion structures, high MBA and deeper seafloor in the western PVB. Fertile mantle peridotite samples were also recovered in the area. These results indicate that tectonic extension was dominant under the magma-starved environment and the lower crust / mantle material was exposed along the oceanic detachment faults. The characteristics of the detachments in the PVB are morphologically similar to those reported along the Mid-Atlantic c Ridge, but they have some anomalous features such as their anomalously large areal size (the largest Godzilla Mullion is about 10 times as large as that of a typical mega- mullion on the MAR) and the high intermediate-spreading rate (7~cm/yr) of the system. The tectonic dominant spreading under the intermediate spreading rate supports the idea that the ridge morphology and lithosphere characteristics are not strictly dependent on spreading rate, but may be dependent on the balance between melt supply and separation rate. Moreover, the spatial and temporal resolution of the detachment-related phenomena can be improved under the higher spreading rate condition, which leads the better understanding of the formation process of oceanic detachments.

Two survey cruises, YK03-09-2 (Shinkai 6K) and KH03-03, were conducted in 2003, as the first challenge for the unmapped southern part of the PVB. This presentation mainly focuses on the preliminary result of the geophysical mapping during the Hakuho-Maru KH03-3 cruise. The axial zone of the PVB between 15N and 13-20N was mapped and the detailed bathymetry, magnetic and gravity data were collected. The closely spaced, NNE-SSW trending fracture zones are developed in the southern PVB like in the northern PVB, however the segment length is much shorter, ~20 km. Two prominent mullion structures with continuous corrugation are recognized, and one of them extends about 90 km, as large as the Godzilla Mullion. A couple of remnant inside corner highs are also found. In some segments, remnant nodal deeps deeper than 6500m are located side by side and the final rift axis is unidentifiable. In off-axis regions, hooked pattern of the abyssal hills, lineaments oblique to the fracture zones, and chaotic hills are dominated on the deep seafloor, instead of typical, well-organized abyssal hills parallel to the rift axis. These complicated morphologies may suggest the magma-starved spreading and the effect of shear stress. The magnetic and gravity anomaly data are now under investigation, however the magnetic anomaly profiles across the rift show different pattern of each, indicating the complicated evolution process of the basin.