Japan Geoscience Union Meeting 2013
(May 19-24 2013 at Makuhari, Chiba, Japan)

SCG10-09 Room:101B Time:May 22 16:30-16:45

Temporal variation of OIB-like magmatism in the Western Philippine Sea-link to spreading of the West Philippine Basin-

Osamu Ishizuka[1*], Rex N. Taylor[2], Yasuhiko Ohara[3], Makoto Yuasa[1]

[1]Geological Survey of Japan/AIST, [2]University of Southampton, [3]Hydrographic and Oceanographic Department of Japan

We present new $^{40}Ar/^{39}Ar$ ages as well as geochemical data for samples recovered from oceanic plateaus in the West Philippine Basin (WPB) and Daito Ridge group in the Philippine Sea. This data defines the volcanic history of OIB-like magmatism in and around the WPB and enables a tectonic reconstruction of the early history of the Philippine Sea, which is crucial for understanding the subduction nucleation process along the Izu-Bonin-Mariana arc.

Benham Rise (south of the spreading centre), Urdaneta Plateau and Oki-Daito Rise (north of the spreading centre) are the oceanic plateaus in the WPB, distributed on both sides of the extinct spreading centre of the basin. The northern margin of the WPB is marked by Daito Ridge group, which is composed of Eocene-Mesozoic remnant arc structures. New drilling and dredge sampling recovered volcanics with OIB-like geochemical characteristics (an overall enrichment of incompatible elements and associated radiogenic isotopes) from the oceanic plateaus as well as volcanic edifices overlapping the remnant arc and neighboring ocean basin. In addition, basalts from the WPB are found to have variable enrichment relative to N-MORB.

The age range obtained from the OIB-like basalts from the Urdaneta Plateau (34.6 to 38.0Ma) agrees with that reported from the Benham Rise, which is located at similar distance from the extinct spreading centre. Meanwhile, older ages of around 40.5-44.39 Ma were obtained from basalts from the Oki-Daito Rise, north of Urdaneta Plateau. The obtained $^{40}Ar/^{39}Ar$ age range implies that the Urdaneta Plateau and Oki-Daito Rise represent age-progressive record of OIB-like magmatism in the northern half of the West Philippine Basin, and the source for the OIB-like magmatism existed near the spreading centre of the WPB at least between c. 35-45 Ma. Based on this assumption, half spreading rate of the WPB is estimated to be about 5.5 cm/y between 35.8 and 44.4 Ma.

The OIB-like magmatism is not restricted to the plateaus, but is also found on the WPB floor. This might indicate that besides the continuous supply of the enriched mantle providing the magmatism that formed the plateaus, enriched asthenospheric mantle was also present as either irregularly distributed regions beneath Philippine Sea, or was dispersed and mixed with the active spreading regime.

Distribution of OIB-like magmatism at c. 44-48 Ma, which is older than those found from the plateaus in the WPB, on pre-existing Daito Ridge group appears to indicate that this magmatism is not necessarily associated with spreading, but might have been caused either by upwelling of enriched mantle or regional extension which triggered decompression melting of enriched mantle. Variable enrichment observed for the WPB basalts implies that the upwelling enriched mantle (or melt derived from it) contaminated the ambient asthenospheric mantle in this region. Upwelling of this enriched mantle plume head might have triggered initiation of spreading of the WPB by uplifting and heating of overlying arc crust by the similar process proposed for continental breakup (e.g., Courtillot et al., 1999).

Keywords: West Philippine Sea, OIB, 40Ar/39Ar age, oceanic plateau