# A field-work approach to investigate UltraH3-linkage hypothesis at Kairei Hydrothermal Field, Indian Ocean

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Under an umbrella of the interdisciplinary project, Investigation of 'UltraH3-linkage', a two-legs cruise was conducted. The first leg of the cruise - cruise ID: YK05-16 Leg.1 - is a geophysical and geological cruise, focusing on the tectono-volcanic environment for two distinct hydrothermal activity observed in Kairei and Edmond hydrothermal field, central Indian Ocean. The second half of the cruise, Leg.2 focuses on the bio-geochemical studies. Totally 10 dives of Shinkai6500 submersible were conducted in the first leg. Two of 10 were spent for the local geological observation around the two hydrothermal fields. Rest of 10 dives was spent for much wider observation, from RTJ through to the third segment of Central Indian Ridge (CIR).

Although respective hydrothermal fields were discovered in 2000 or 2001, they are still quite active; at least, several black smokers were ascertained. In spite of the quite distinct chemical compositions of vent fluid in both fields, their local geological and tectonic environments are rather similar. Both fields stand on the edges of latest abyssal hills parallel to the current ridge axis. Flat sheet flow dominates these abyssal hills; piles of pillow lavas frequently bound such sheet flows on steep slope. Aphyric pillow basalts are frequently sampled around the hydrothermal field, which may consistent with large magma supply when the abyssal hills formed.

Contrasting the local similarity between geological situations of both field, the regional tectonic environments are different each other. The third segment of CIR (CIR-S3), where Edmond field develops on its northern end, has wide zone of the regular ridge parallel abyssal hills extending to ˜35 miles away from the ridge axis. Thus, CIR-S3 is in magmatic robust condition for ˜2 m.y. On the other hand, 15 miles northwestward from Kairei hydrothermal field, a megamullion has been found. Three dives conducted on the eastern to southern slopes of the megamullion. Although gabbros dominated the obtained samples, two serpentinized peridotites were sampled from the eastern slope, at 2193m WD. Thus, this megamullion actually consists of deeper oceanic crust and uppermost mantle rocks.

Additionally, two small hills, located about 8 miles eastward from Hakuho-knoll, show distinct morphology contrasting with abyssal hills (hereafter Uraniwa Hills). The northern one shows a domed high and the southern one elongated with a corrugation perpendicular to the ridge axis. Two dives were conducted at Uraniwa Hills where gabbros were mainly sampled. Remarkably, a weathered Pl-dunite associated with troctolites was sampled on the northern slope of domed hill at 3170m WD. Thus, it is suggested that the southernmost CIR has been relatively tectonic dominant ridge segment for ˜1 m.y. These mullions are located on the possible feeding zones of hydrothermal vent water into deep-reaction zone and can provide the ferrous iron rich environment as the reducer of water to liberate hydrogen.