

## Discovery of hydrothermal plumes at the Rodoriguez segment, Mid-Indian Ridge

# Kei Okamura[1]; Toshitaka Gamo[2]; Kaoru Kiyota[3]; Shinsuke Kawagucci[4]; Tamaki Ura[5]; Kensaku Tamaki[6]; Okamura Kei R/V Hakuho-Maru KH06-04 Leg3 Chemistry & AUV group[7]

[1] Kochi Univ; [2] Ocean Res. Inst., Univ. Tokyo; [3] Center for Advanced Marine Research, ORI, Univ. of Tokyo; [4] Earth & Planetary Sci., Hokkaido Univ.; [5] I.I.S., Univ. of Tokyo; [6] ORI, Univ of Tokyo; [7] -

In efforts to locate and characterize submarine hydrothermal systems, water column distributions of various chemical components give us much information. Although submarine hydrothermal activity is a very localized phenomenon at sea bottom, it usually accompanies hydrothermal plumes, cloud-like dispersing water masses, which are the mixture of hydrothermal end members and ambient bottom seawater. Areal extent of hydrothermal plumes can be traced from water column anomalies of light transmission (turbidity) and chemical components such as methane, manganese, iron, helium-3 etc., which are particularly enriched in hydrothermal solutions. Detailed mapping of hydrothermal plumes from research vessels could give an important clue to locate the very point of hydrothermal discharge, being indispensable for direct observations by ROV and/or manned submersibles as the next step.

Such geochemical surveys for the Rodriguez Segment of the Central Indian Ridge have been quite few so far. Jean-Baptiste et al. (1992) observed  $^3\text{He}$  and Mn anomalies at 19deg 29' S. German et al. (2001) conducted several CTD-hydrocasts along the spreading center of the segment to find light transmission and Mn anomalies. Hydrocasts and  $^3\text{He}$  measurements in the Indian Ocean were done during the GEOSECS program and the WOCE program. The  $^3\text{He}/^4\text{He}$  anomaly map strongly suggests the existence of hydrothermal active areas in the western Indian Ocean. One of the principal objectives of this cruise is to locate hydrothermally active sites along the plate spreading center of the segments 15 and 16 of the Central Indian Ridge. We conducted water column observations using a CTD (a package of Conductivity, Temperature, Depth, and light transmission sensors) + CMS (Carousel Multi-Sampling system) attached with an in situ Mn analyzer GAMOS (Okamura et al., 2001) in order to detect any anomalies due to hydrothermal plumes.

Summary of some highlighted results:

(1) Two typical hydrothermal active stations have been recognized; one is located east of East Brigitte Protrusion in the Roger Plateau (on the segment 15), and the other is close to Beak Rocks on the Great Dodo Lava Plain (on the segment 16).

(2) Both sites are characterized by light transmission (LT) anomalies of  $\sim 0.2\%$  at maximum, suggesting the existence of black (or white) smoker activity.

(3) While the  $\text{DMn}(\text{nM})/\text{DLT}(\%)$  at the former station is  $\sim 100$ , in a similar trend as that observed during KH-93-3 cruise (Kairei Field), the ratio at the latter station is only 10, an order of magnitude lower than that at station 20. There may be a significant difference in hydrothermal fluid chemistry at these two locations.