

## Chemical characteristics of hydrothermal plumes around the Daiyon Yonaguni Knoll, Southwestern Okinawa Trough

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During the R/V Hakuho Maru KH-02-1 cruise leg-3 (June 2002), we have investigated chemical and isotopic characteristics of hydrothermal plumes around the Daiyon (fourth) Yonaguni Knoll in the southwestern Okinawa Trough. In this area, hot fluid venting up to 222 deg-C was observed at 1,300 to 1,400 m depths by Shinkai 2000 and Shinkai 6500 dives in 2000. We mapped areal distribution of hydrothermal plumes in detail, using 4 in-situ plume detector MAPRs (NOAA/PMEL) attached to the side-scan sonar system WADATSUMI (ORI, Univ. Tokyo). A CTD-Carousel system equipped with 24 Niskin-X bottles was used for seawater sampling from 5 stations where the MAPRs detected significant optical anomalies. Salinity, dissolved oxygen, pH and nutrients were measured on board the ship, and methane, manganese,  $\delta^{13}\text{C}$  of methane, and  $3\text{He}/4\text{He}$  ratio were measured in shorebased laboratories. Hydrothermal plumes were clearly identified from water column anomalies of  $\text{CH}_4$ , Mn and  $3\text{He}/4\text{He}$  at depths of  $\sim 800$  m and  $\sim 1200$  m. The maximum concentrations observed were  $\sim 1,000$  nmol  $\text{kg}^{-1}$  and  $\sim 85$  nmol  $\text{kg}^{-1}$  for  $\text{CH}_4$  and Mn, respectively. It is shown that the horizontal decrease of  $\text{CH}_4$  concentration from 1,000 nM to 10 nM in the 1,200 m plume was accompanied by the increase of the  $\delta^{13}\text{C}(\text{CH}_4)$  from -20 permil to +40 permil, demonstrating active microbial  $\text{CH}_4$  consumption with carbon isotope fractionation.