

Geophysical, geochemical and microbiological characteristics of hydrothermal plumes at southern Mariana Back-arc Spreading Center

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During the KR03-13 cruise, we conducted 5 CTD tow-yo surveys collecting 24 samples for chemical and microbiological analyses along and across South Mariana Back-arc Spreading Center. The survey area were designed to cover two active hydrothermal fields which were investigated by previous SHINKAI dive program (Utsumi et al., in this session); one at the backarc ridge axis 12_57.2N, 143_37.2E and the other at a seamount 12_55.1N, 143_39.0E. We also deployed a mooring system with two 3D-acoustic current meters for 14 days at 12_54.9579N, 143_36.8718E, depth-3040m.

The CTD tow-yo surveys located hydrothermal plumes by anomalies of potential temperature and of pH. The profiles seem to indicate two hydrothermal plumes (one at depth 2700-2750m and the other at depth 2800-2850m) originate from distinct sources. We did not find sign of plumes along the backarc ridge axis between 13_0N and 13_10N. Onboard analysis revealed chemical anomaly in manganese of the plume samples, which showed good correlation with the temperature anomaly. Onshore analysis of methane also showed anomalies in the plume samples.

The record of current meters showed that east-west direction current is dominant at 2440m depth while rather low current velocity (0.15cm/sec. in average) at 2780m depth. We also noticed significant perturbation caused by a typhoon (which attacked this region during 11/23-11/27) at 2440m depth. For future studies, molecular and cellular based microbial population analyses will be conducted to reveal ecology of microbes in the hydrothermal plumes such as viability, community structures, niches, and to discuss relationship between microbiological activities and chemical evolution of hydrothermal plumes.