

The microbial community structure in deep-sea hydrothermal plumes of Okinawa trough and Southern Mariana back arc

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Hydrothermal fluids, which are venting from deep-sea hydrothermal vents, arise a few hundreds meters into the oceanic water column, reach the same density as surrounding seawater, widespread in the ocean, and construct deep-sea hydrothermal plumes. The hydrothermal plume contains several orders of magnitude higher reduced chemicals, e.g. methane, reduced sulfur compounds, irons, and manganese. Microbial density in the plume is also 2-3 times higher than surrounding seawater. The elevated microbial population are in part depending on chemolithoautotrophs which utilize the reduced chemicals as energy sources. However, the contribution of these chemolithoautotrophic microbes in total microbial population was only understood in plumes of Suiyo seamount and Juan de Fuca ridge. In this study, we investigated microbial community structures in plumes of back arc hydrothermal field at Okinawa trough and southern Mariana trough through quantitative microbial community analysis.

Hydrothermal plume were sampled with CTD-RMS by vertical casts and tow-yo investigation from R/V Kairei and R/V Taisei-maru at 2003 and 2005, respectively. Immediately from sample retrieval, the plume samples for microbial analysis were fixed by formalin, filtered on PLL-filters, stained with fluorescent in situ hybridization (FISH), and observed by fluorescent microscope, according to a FISH-DC (Maruyama & Sunamura 2000 AEM) and a CARD-FISH (Pernthaler et al. 2002 AEM) protocol.

Signals of hydrothermal plume was monitored around 12.94-12.97 N and 143.61-143.63 E on the ridge of Mariana back arc. Geochemical and geological feature of hydrothermal plume at Okinawa trough will be reported by Tsunogai et al. in this meeting. Microbial population was estimated to be 1.7 to 3.3×10^4 cells ml^{-1} at Marina plume. The total cell density was closely related with manganese concentrations and temperature anomalies. 7.2 to 36.5×10^4 cells ml^{-1} was estimated below 700-m-water depth at Okinawa trough. Especially at Hatoma area, up to 5 times elevated microbial cell densities were observed at hydrothermal plume depth compared to surrounding control seawater at almost the same depth. Methane oxidizing microbial population in the plume occupied up to only 1.2% of total cells. Most of the elevated microbial population could not depend on methane. More analysis should be needed to understand the elevated microbial population.