

# Changes of microbial community during decay and reconstruction processes of Suiyo-Seamount hydrothermal plume

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Hydrothermal fluids, venting from deep-sea hydrothermal vents, arise a few hundreds meters into the Oceanic water column, widespread in the ocean, and construct deep-sea hydrothermal plumes. The deep-sea hydrothermal fluids contain 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. Recently, we found two specific microbial phylotypes, named SUP05 and SUP01, were predominant in a hydrothermal plume in Suiyo Seamount, located at Izu-Bonin arc. Vertical distribution of the two phylotypes were strongly connected with hydrothermal originated chemical concentrations in the plume and the SUP05 was suggested to grow actively. In this study, we investigated time-series changes of the microbial community in the Suiyo Seamount and found out interesting phenomenon.

Hydrothermal plume were sampled at 1,200-m deep in the Suiyo Seamount caldera in 6 dives during 6 to 16 September 2002, using a Niskin bottle sampler attached to a manned submersible Shinkai 2000. A nephelometer was also attached to the Shinkai 2000 to measure a vertical distribution of turbidity as an indicator of the hydrothermal originated chemicals. The turbidity was measured in 12 dives during two cruises in September 2001 and the September 2002. 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 protocol (Maruyama & Sunamura 2000 AEM).

In the all dives conducted both in 2001 and 2002, anomalies of the turbidity were observed at 1,100 - 1,250-m deep layer in the caldera and a maximum of the turbidity profile in each dive was varied from 0.04 to 0.15 FTU. The starting position of each dive was within 150-m in horizontal distance and no difference of turbidity had been found within the small area in other cruise (KR01-15). These indicated that the variations of the turbidity maximum depended on differences of sampling dates. Moreover, just after typhoon onding around this area, the maximum decreased to below 0.04 in FTU and it increased up to 0.15 in FTU with each succeeding day. We could not conclude the effects of typhoon onding, however, the hydrothermal plume in the Suiyo Seamount caldera seemed to repeat decay and reconstruction.

During the reconstruction process, total microbial cell density increased from  $0.58$  to  $1.7 \times 10^5$  cells  $\text{ml}^{-1}$  with the turbidity and the increased cell numbers corresponded to the SUP05 cell numbers. In situ maximum production rate of the SUP05 cells were estimated c.a.  $30,000$  cells  $\text{ml}^{-1} \text{day}^{-1}$ . From the area ( $1,200,000 \text{ m}^2$ ) of the caldera at 1,200-m deep and the thickness (100 m) of the hydrothermal plume, the volume of hydrothermal plume was estimated to be  $120,000,000 \text{ m}^3$ . Using the coefficient of 20 fg organic carbon per one cell, total production in the hydrothermal plume was estimated to be  $3.6 \times 10^{19}$  cells  $\text{day}^{-1}$ , which corresponded to 72 kg organic C.