# Estimation of microbial chemosynthesis efficiency in deep sea hydrothermal plume

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In the deep sea hydrothermal plume, chemolithotrophic microorganisms producing organic materials from inorganic carbons, such as sulfur oxidizing microorganisms, predominate. There is an estimate that in situ production of organic matter exceeds that of derived from surface photosynthesis. More than 99% of the chemical components contained in the hydrothermal fluids from the seafloor are released into deep-sea water and maximum chemical potential energy is thermodynamically calculated under low temperature condition by mixing hot hydrothermal fluid and sea water. Therefore, it is important for both deep-sea carbon dynamics and deep-sea ecosystems to estimate the microbial production in a hydrothermal plume. To estimate the primary production of microorganisms in a hydrothermal plume, it is necessary to understand the dynamics and functions of chemolitzotrophic microorganisms together with the physicochemical process of hydrothermal plume formation. We analyzed the formation process and chemical environment of hydrothermal plume and combined the dynamics of microorganisms with them to estimate the efficiency of hydrothermal energy use in microbial growth process. The formation process of the hydrothermal plume are regulated by the topography such as caldera, the stirring effect due to the deep ocean current intensity, and the density vertical structure of the water column. The composition of microbial community are known to be defined by chemical components of hydrothermal fluid. However, our result suggested that the energy efficiency and microbial total production of microorganisms is affected by these physical factors.

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