Iron, sulfide and hydrogen cycling in Kermadec Arc hydrothermal fluids: microbial turnover rates coupled to transcriptomics give insight into biogeochemical processes

KATHARINA SASS[1],STEFANIE BÖHNKE-BRANDT[2] AND MIRJAM PERNER[2*]

[1]Molecular Biology of Microbial Consortia, Biocenter Klein Flottbek, University of Hamburg, Hamburg 22609, Germany (katharina.sass@uni-hamburg.de)

[2] Geomicrobiology, GEOMAR Helmholtz Centre for Ocean Research Kiel, Kiel 24148, Germany (sboehnke-brandt@geomar.de, *correspondence: mperner@geomar.de)

Metal cycling in the ocean is likely more affected by hydrothermal emissions of volcanic arcs than by those of mid-ocean ridges. This can be explained by generally higher metal fluxes and the release of biogeochemically essential metals at shallower water depths. Hydrothermal fluids are typically enriched in hydrogen, methane, sulfide and other reduced inorganic compounds, which can be oxidized by microorganisms to gain energy. To study this microbially mediated element cycling in hydrothermal fluids, vents at the Kermadec Arc offer an eminent potential. Fluids of this location can have very low pH as well as low sulfide and hydrogen contents, but they are often enriched in trace metals, especially in iron.

Based on the local environmental conditions the aim of this study was to determine which of the available inorganic compounds primarily fuel autotrophic CO_2 fixation and which organisms are responsible for catalyzing these processes.

Here we report on incubation experiments with hydrothermal fluids from four actively venting sites on the Kermadec arc. Hydrothermal emissions were supplemented either with iron(II), sulfide or hydrogen and radioactively labeled bicarbonate followed by incubation for eight hours. Microbial consumption of inorganic electron donors as well as the amount of autotrophically fixed CO_2 into biomass was measured. At the end of the experiments the active microorganisms responsible for element cycling were identified through transcriptome analyses. Interestingly, the highest autotrophic CO_2 fixation rates were observed in iron(II) supplemented fluids with Epsilonproteobacteria and *Thiomicrospira* spp. as the likely responsible organisms.