Evidence for seismicity influencing deep sea primary productivity: A year-long study of microbial processes at the Juan de Fuca ridge using biological osmotic samplers

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Hydrothermal vents host some of the most productive ecosystems on Earth. Hydrothermal fluid flow provides reductants to support chemoautotrophic activity, though the relationship between geochemical composition and microbial activity in these systems is poorly constrained. Moreover, the degree to which geological processes, e.g. seismicity, influence geochemistry are equally unconstrained. Here we present data from a unique assemblage of osmotically powered fluid samplers that collected co-registered fluid samples and preserved them *in situ* for microbial analyses (DNA and protein characterization), dissolved ion analyses (cations and anions), and volatile analyses (e.g. methane). The osmotic samplers were equipped with a temperature logger at a diffuse vent site at the Juan de Fuca ridge. The samplers collected nearly 300 samples over a one-year deployment. Changes in protein representation from select samples were analyzed via tandem mass spectrometry, while changes in microbial community diversity over time are currently being assessed via 454 pyrosequencing. Changes in protein expression during the last ninety days of deployment suggest a notable increase in chemoautotrophy, which correlated with seismic activity in the vent field. These data further suggest that geological processes may have pronounced impacts on microbial activity over short time scales in hydrothermal systems.

Novel, mat-forming *Thiomargarita* spp. thrive on a sulfidic fluid outflow at the Amon mud volcano (Eastern Mediterranean)

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Thiomargarita spp. are giant, colorless sulfur bacteria which gain their energy from oxidizing sulfide or internally stored elemental sulfur with oxygen or nitrate. In this study, a dense population of single, spherical *Thiomargarita* cells thriving on a sulfidic mud outflow at the Amon mud volcano (Eastern Mediterranean) was investigated. Visual observations and *in situ* microprofiling during ROV dives indicated episodic coverage of the mat with briny fluids, creating non-steady state conditions. With an average diameter of 47 ± 8 μm, cells of the novel *Thiomargarita* spp. population were significantly smaller than previously observed cells of this genus. All cells showed a vacuolated phenotype. A retrieved 16S rRNA gene sequence clustered with other published *Thiomargarita* phylotypes. As *Thiomargarita* spp. possess an exceptional ability to survive temporal cut-off from their electron acceptors as well as high concentrations of oxygen and sulfide [1-3], they are able to populate dynamic habitats such as brine and mud flows. At the Amon mud volcano, brine supplies *Thiomargarita* cells with sulfide, but at the same time separates them from oxygenated bottom water. If anoxic conditions are resulting, *Thiomargarita* spp. could use their internally stored nitrate resource [3]. Once a brine flow has passed, *Thiomargarita* cells could oxidize residual sulfide in the upper sediment layers and internally stored elemental sulfur aerobically and replenish internal nitrate reservoirs [4].

[1] Kalanetra *et al.* (2005) *Environ. Microbiol.* **7**, 1451–1460. [2] Schulz *et al.* (1999) *Science* **284**, 493–495. [3] Schulz (2006) *The Prokaryotes* 3rd edn. 1156–1163. [4] Girnth *et al.* (In review) *Environ. Microbiol.*