

Oceanography Seminar

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“Hydrothermal exploration in three dimensions”

Hydrothermal fluids venting from mid-ocean ridges and arc volcanoes extensively modify the crust via fluid-rock reaction. This chemical interaction impacts ocean budgets as fluids are expelled into the overlying water column. The sub-seafloor environment is inaccessible in most cases. Thus, processes occurring within the crust are often inferred through the geochemical analysis of naturally venting hydrothermal fluids and mineral deposits at the seafloor. This talk will present an updated geothermobarometry model to estimate pressure and temperature conditions of fluid formation at hydrothermal vents, applied to 9°50'N East Pacific Rise (EPR). Next, these observations will be further examined to propose a new paradigm for understanding an interconnected origin of high-temperature vent fluid flow within this well-studied system. Subseafloor mixing of high temperature hot-spring fluids with cold seawater creates moderate-temperature diffuse fluids that are replete with potential chemical energy. This energy is harnessed by a chemosynthetic deep biosphere that permeates hydrothermal regions on Earth, and drives the search for life on other ocean worlds. Diffuse hydrothermal fluids are often characterized by variable shifts in the abundance of redox reactive species. Such shifts are often interpreted to reflect the direct influence of subseafloor microbial activity without consideration of concurrent abiotic reactions. I will discuss how previously unrecognized abiotic processes consume energy that would otherwise support key metabolic strategies employed by the subseafloor biosphere. Finally, I will describe results from sampling subseafloor fluids directly, in the third dimension, at Brothers Arc volcano.

Thursday November 7th, 2019 3:00p.m. MSB 114