Geophysical Research Abstracts
Vol. 13, EGU2011-2368, 2011
EGU General Assembly 2011

Introducing MIMOSA - A Microbial Methane Observatory for Seafloor Analysis

Beth Orcutt (1), Laura Lapham (1), and Peter Girguis (2)

(1) Center for Geomicrobiology, Aarhus University, Aarhus, Denmark (beth.orcutt@biology.au.dk), (2) Harvard University, Cambridge, MA, USA

Methane, a powerful greenhouse gas, is produced in marine sediments in large part through the activity of microorganisms degrading organic matter. The largest reservoir of methane on Earth occurs in marine sediments in the form of dissolved, "free" (i.e. bubble) and trapped (i.e. in methane hydrates) gas. Crucially for the balance of methane in the atmosphere (which is currently responsible for $\sim$20% of global warming), microbial methane oxidation in shallower sediment horizons leads to its efficient consumption, preventing the emission of this greenhouse gas into the atmosphere. Despite decades of research into the pathway and dynamics of microbial methane oxidation in sediments, there is still uncertainty regarding the range of microorganisms responsible for this process, the energy generating mechanisms used by microorganisms to fuel growth from methane oxidation, and the factors that control the presence and concentration of methane within the sediments. Considering that continued global warming may destabilize high latitude sediments containing methane, the development of in situ observatory systems that allow for temporal records of gas dynamics are critical for monitoring these environments. Furthermore, inclusion of experimental materials for evaluating the parallel developments with the sedimentary microbial communities will provide essential information for identifying major players in methane cycling and associated sediment biogeochemistry. Here, we describe the development of a next generation sediment observatory – MIMOSA, the Microbial Methane Observatory for Seafloor Analysis - that allows for continuous temporal monitoring of sedimentary gas and geochemistry dynamics and the associated microbial community evolution as well as for active experimentation to determine how microbiology regulates methane flux. MIMOSA combines four proven technologies in a versatile platform for monitoring gas and pore-water chemistry dynamics over time, characterizing the in situ microbial community over time, and conducting active microbial perturbation experiments using a suite of substrates.