# A comprehensive analysis of methane oxidation events in mesocosm experiments

E. W. CHAN[1]* AND J. D. KESSLER[1]

[1]Earth and Environmental Sciences, University of Rochester, Rochester, NY 14627, USA (*correspondance: erik.w.chan@gmail.com)

Previous studies of microbially mediated methane oxidation in oceanic environments have examined the many different factors that control the rates of oxidation. However, there is debate on what factor(s) are limiting in these types of environments [1-3]. These factors include the availability of $CH_4$, $O_2$, trace metals, nutrients, the density of cell population, and the influence that $CO_2$ production may have on pH . While many have tried to study these factors together, it is a labor intensive process and is quite cumbersome. In order to look at this process in its entirety, a mesocosm incubation system was developed with a Dissolved Gas Analyzer System (DGAS) with a myraid of analytical tools to monitor insitu methane oxidation. On a recent expedition to recently discovered seep sites in Hudson Canyon, mesocosm experiments have been successfully carried out to examine methane consumption, $O_2$ consumption, nutrient consumption, and biomass production. With the addition of newer laser spectroscopy techniques (cavity ringdown spectroscopy), stable isotope fractionation caused by microbial processes was examined on a realtime basis as well. Cell counting, trace metal, nutrient, and DNA community analyses have been carried out in conjunction with these mesocosm samples to provide a clear understanding of methane oxidation dynamics. This presentation will detail the technique and results to date and provide insights into the chemical and isotopic kinetics of aerobic methane oxidation.

[1] Crespo-Medina, M., et al., *The rise and fall of methanotrophy following a deepwater oil-well blowout*. Nature Geoscience, 2014. [2] Dubinsky, E.A., et al., *Succession of hydrocarbon-degrading bacteria in the aftermath of the Deepwater Horizon oil spill in the Gulf of Mexico*. Environmental science & technology, 2013. **47**(19): p. 10860-10867. [3] Kessler, J.D., et al., *A Persistent Oxygen Anomaly Reveals the Fate of Spilled Methane in the Deep Gulf of Mexico*. Science, 2011. **331**(6015): p. 312-315.