Methane cycling in the High Antarctic – Paradigms lost?

Andrew Thurber, Sarah Seabrook, and Rory Welsh

Oregon State University; athurber@coas.oregonstate.edu

The Southern Ocean remains an enigma in its role in the methane cycle. Despite future predictions of large methane release from Antarctic reservoirs, areas of active seepage have largely evaded study. This results in questions about whether our current understanding of the methane cycle applies to the Southern Ocean. In 2012, we discovered a microbial mat with methane present at 78°S in the Ross Sea. This habitat formed in 2011, extends 60m across the 10m isobath, and persisted until 2016. We evaluate here if taxa involved in methane cycling in other parts of the globe are present and investigate the successional pattern of fauna in this region. Methane concentrations were determined to be ≥0.5 μM in the porewater and benthic flux chambers quantified ~2 mM CH4 m-2 d-1 flux from the sediment. In 2012, the microbial community was largely dominated by Sulfurovum, a sulphide-oxidizing bacteria, at the surface with a diversity of Gamma- and Deltaproteobacteria, including sulfate-reducers, becoming more abundant with depth. Microbes involved in the methane cycles were present including aerobic methanotrophs at the sediment surface and Methanococcoides, a methanogenic archaea, deeper down. Anaerobic methanotrophic microbes, the dominant global marine methane sink, were not present in 2011. Adding on to these initial findings with analysis of samples collected in 2016 we will be able to characterize this feature, its microbial succession and biogeography, and place it in a global context. The rate and trajectory of microbial colonization of methane-fuelled habitats may directly impact the rate of climate change while impacting the function of local marine communities in the Antarctic; this study is a step towards understanding these critical marine ecosystem dynamics.