Evidence of anomalous Pacific-Antarctic Ridge volcanism during the penultimate glacial termination

S. McCart[1*], A. Mudahy[1], D. Lund[1], M. Lewis[2], P. Asimow[2],

University of Connecticut, Marine Sciences, Groton CT, USA (*presenting author)
[2]California Institute of Technology Pasadena, CA, USA

The last million years of Earth's history is dominated by the ice ages, the repeated waxing and waning of large continental ice sheets that shaped the Earth's surface and climate. Growth of ice sheets during glacial periods caused global sea level to lower by approximately 120 m [1]. Lowering of sea level enhances the decompression rate in the upper mantle, which should lead to greater magmatism and hydrothermal activity at mid-ocean ridges [2]. Analysis of sediment cores from the Southern East Pacific Rise provides evidence for increased hydrothermal activty during glacial terminations, raising the possibility that ridge magmatism acts as negative feedback on ice sheet size [3]. While hydrothermal records indirectly reflect magmatic budget, ridge-proximal basaltic ash layers are the unequivocal product of submarine volcanism and they be dated using standard paleoceanographic techniques. Here we report the discovery of a basaltic ash layer from a core on the Pacific-Antarctic Ridge (PAR) that leads glacial Termination 2. The shards have a composition consistent with an axial magma source and they have angular and curved fluidal morphologies that are typical of pyroclastic deposits created by submarine volcanism [3]. At the time of the eruption, the PAR core site was ~7 km from the ridge crest, suggesting that the ash particles were lofted by bouyant hydrothermal plumes before settling out onto the ridge flanks. Using deep sea current data from ARGO floats and ash settling velocities, we estimate that the plume(s) occupied most of the water column near the PAR. We will also discuss well-dated sedimentary archives of submarine volcanism from other locations along the global mid-ocean ridge system.

[1] Clark et al. (2009), *Science* 325, 710-714. [2] Lund and Asimow (2011), *G-cubed* 12, 1-26. [3] Lund et al. (2016), *Science* 351, 478-482.