OCEAN-GLACIER INTERACTIONS IN THE MCMURDO SOUND: LESSONS FOR DEEP ICE ON OCEAN WORLDS? B. E. Schmidt[1], J. D. Lawrence[1], M. R. Meister[1], D. J. G. Dichek[1], C. D. Ramey[1], B. Hurwitz[1], A. M. Spears[1], A. D. Mullen[1], F. E. Bryson[1], J. J. Buffo[1], J. B. Glass[1], A. M. Stockton[1], [1]Georgia Institute of Technology (britneys@eas.gatech.edu)

Introduction: Without in situ information about the conditions of the ice-ocean interface on other planets, terrestrial analogs will provide the menu of options from which to choose as we cobble together the best physical processes to consider in modeling these new worlds and interpreting data from them. As part of an ongoing development of under-ice exploration technology geared at enabling planetary science research as well as accessing previously unknown regions of the Antarctic, we have had the opportunity to observe ocean interactions on a variety of scales from shallow accretionary environments powered by a long-range ice-pump circulation in large ice shelf cavities (see abstract J. Lawrence et al, this meeting), to ocean-sea ice interactions that provide constraints on how ice formation at the interface may operate on other worlds (see abstract by Buffo et al, this meeting), to places where the ocean is actively altering the base of deep draft ice. Here, we focus on the latter—where a combination of visual and sonar data of characteristic melt-induced textures and in situ oceanographic data capture the dynamic interaction between water and ice. While glaciers themselves are not analogs for Europa or other ocean words per se, the scale of these interactions allows us to begin to capture the rates associated with melting due to both temperature and pressure.

Observations: Here, we present direct observations from Evans Ice Wall (~50m depth), Barne Glacier (~150m depth) and Erebus Glacier Tongue (~300m deep draft), near McMurdo Station, Antarctica to link the physical ocean state with the ice texture induced by the interactions. Between October and December 2018, we operated the ROV *Icefin* for over 75 hours during 22 dives as part of the NASA-funded RISE UP program (Ross Ice Shelf and Europa Underwater probe, PI B. E. Schmidt).

The *Icefin* ROV was developed at Georgia Institute of Technology to enable subglacial and borehole-based science operations, making the deep polar ocean under ice more accessible. *Icefin* is 110 kg, 4 m long, and 0.24 m in diameter with approximately 2 km maximum range. Modular payloads include a CTD (conductivity, temperature, pressure), dissolved oxygen sensor, sonar, and imaging systems among other sensors to enable physical observations in challenging subglacial environments [1].

Local-scale ice-ocean interactions: In each of these environments, we find a host of different scale features related to ocean influence from thin brine channels were sea ice formed water carves the surface of the glacier, to small cupped textures at shallow depths to large scale undulations near the base of the glaciers. In particular, we observed changing scales in the erosion of the base of the Erebus Glacier Tongue from near its grounding line to 5km downstream, allowing us to observe how these interactions change with time and depth, and providing a window into the rates at which these interactions occur. Similarities between the features observed at shallow depths for all three glaciers may suggest the importance of turbulent flow.

We present several examples and preliminary interpretations of these new data as new constraints on how to think about the interaction of large and small scale thermohaline circulation on planetary ices.

References: [1] Meister, M., et al. (2018) *OCEANS 2018 MTS/IEEE* 10.1109/OCEANS.2018.8604725