

ENVIRONMENTALLY NON-DISTURBING UNDER-ICE ROBOTIC ANTARCTIC EXPLORER (ENDURANCE): OBJECTIVES AND SCIENCE RESULTS. P. T. Doran¹, W. Stone², J. C. Priscu³, K. Richmond², S. Gulati², C. Flesher², B. Hogan², V. Siegel², M. Obryck¹, A. Johnson¹ and C. P. McKay⁴ University of Illinois at Chicago, ²Stone Aerospace, ³Montana State University, ⁴NASA Ames Research Center.

Permanently ice-covered liquid water environments are among the leading candidate sites for finding evidence of extant life elsewhere in our solar system (e.g. on Europa and other Gallean satellites). In order to have the proper tools and strategies for exploring the extant ice-covered planetary environments, we have developed an autonomous underwater vehicle (AUV) which has generated for the first time, 3-D biogeochemical datasets in the extreme environment of perennially ice-covered Antarctic dry valley lakes.

ENDURANCE (Environmentally Non-Disturbing Under-ice Robotic ANtarctic Explorer) at the time of writing this abstract is 3 days away from completing the second of two Antarctic field seasons with great success. Our new dataset for West Lake Bonney (WLB) includes unprecedented hi-resolution sonar maps of the entire lake including through the connecting channel and into East Lake Bonney, 3D (at 100 m xy and subcentimeter z resolution) temperature, conductivity, pH, REDOX, photosynthetically-active radiation, chl-a fluorometry, turbidity and dissolved organic matter. The drop sonde science package (Fig. 1) also includes a bottom imager which collected 100's of images of the benthic microbial community (Fig. 2). An upward looking camera on the vehicle itself captured information on sediment distribution in the ice cover, which in conjunction with the PAR measurements will be used to generate whole lake photosynthesis models. Variation in ice thickness across the lake was acquired both by sonar and pressure transducer readings while the vehicle was at rest under the ice. A forward looking camera in conjunction with swath sonar was used to confirm the location of the grounding line of Taylor Glacier at the west end of the lake. Our preliminary assessment of the data suggests that the depth of the grounding line coincides with anomalous water characteristics near the glacier face, suggesting either a subglacial discharge or some previously undocumented mixing phenomenon.

Data are still being collected and a review of results will be given in this presentation.



Figure 1: Science package that is lowered through the water column while the vehicle holds station under the ice cover



Figure 2: Example of bottom image collected showing what appears to be a subaqueous flow feature on the north side of the lake