NORTH ATLANTIC OSCILLATION VARIABILITY IN NORTHWESTERN ICELAND: LINKAGES BETWEEN GDGTs, LACUSTRINE SEDIMENTS AND WATERSHED PROCESSES

*Bolaski, Benjamin and Lisa Doner
Department of Environmental Science and Policy, bebolaski@plymouth.edu
Faculty Advisor: Dr. Lisa Doner

A new proxy for continental mean annual air temperature (MAAT) and soil pH, the MBT/CBT paleothermometer, relies on the temperature and pH dependent dispersal of bacterial membrane lipids, branched glycerol dialkyl glycerol tetraethers (GDGTs), in soil organic matter. The Branched and Isoprenoid Tetraether Index (BIT), based on the relative abundance of terrestrially-derived branched tetraethers versus lacustrine-derived crenarchaeol tetraethers, is a novel proxy for examining provenance of sediment organic carbon. As part of a multiproxy approach, we'll use the MBT/CBT paleothermometer and BIT Index on sediments from a >6000 year-long piston core record from Lake Vatnsdalsvatn, an oligotrophic lake in northwest Iceland. Trace element geochemistry in a 1996 freeze core from this lake shows an 80-100 year periodicity for the past 900 years, hypothesized to result from erosion associated with strong, positive phases of the North Atlantic Oscillation (NAO), (Doner 2003). This new study combines GDGT-inferred paleotemperature and sediment provenance with environmental magnetism, X-Ray Fluorescence (XRF) geochemistry, and TOC from Vatnsdalsvatn lake and soil records, to examine linkages between soil erosion, lake deposit geochemistry and the NAO since the mid-Holocene. Additional evidence of paleoenvironmental change will be provided by the analysis of carbon stable isotope ^{13}C and nitrogen stable isotope ^{15}N of Vatnsdalsvatn watershed soils.

Research Questions:

What is the applicability of the MBT/CBT paleothermometer and BIT index to sediments from Lake Vatnsdalsvatn, northwest Iceland?

Was the North Atlantic Oscillation a source for abrupt climatic variability through the late Holocene in northwest Iceland?