

## Poster #10

### Macrotopographic Controls on Surface Water and Active Layer Chemistry in the Arctic Coastal Plain of Northern Alaska

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Surface water and active layer soil water geochemistry in Arctic environments reflects the chemistry of water sources, water-mineral interactions, soil saturation influence on redox conditions, and biogeochemical cycling of nutrients by plants and microbial communities. Geochemical variation in different types of macrotopography have been reasonably well studied (e.g. polygonal terrain and drained thaw lake basins (DTLBs)), but few comparisons of geochemistry between macroscopic landscape units have been made. Such comparisons are important for assessing hydrologic connectivity in changing Arctic landscapes and in addressing issues of scaling and incorporation of widespread remote sensing data together with sparse geochemical data in climate scale models of hydrology and landscape evolution. In this study, we have focused on characterizing chemical and isotopic signatures of surface water and pore water of perennially saturated active layer soils of different macrotopographic landscape units to assess primary controls on geochemical signatures and to evaluate relative degrees of hydrologic connectivity between units. The location of our study was in and around the Barrow Environmental Observatory (BEO) in Barrow, Alaska, USA. At the BEO, we investigated the geochemistry of three macrotopographic units: 1) relatively high-relief polygonal terrain located between DTLBs, 2) lower lying drainages, and 3) different-aged DTLBs. Active layer chemistry was relatively similar between macrotopographic units, though two locations may reflect additional sources of salinity. This additional source of salinity is possibly associated with cryopegs (partially frozen brine layers that occur in permafrost). At this scale of sampling, it is unlikely that similar chemistry represents strong subsurface hydrologic connectivity within the active layer, but rather similar degrees of water-mineral interaction in active layer soils. Surface water isotope signatures from DTLBs show strong evidence for evaporation, as do drainages connected to DTLBs. Drainages not originating in DTLBs lack strong evaporative signals, suggesting that water isotopes are a useful tool for understanding hydrologic processes and connectivity at the landscape scale. The nearly complete absence of detectable nitrate in the pore water of saturated soils emphasizes the important control soil moisture has on soil redox conditions and biogeochemistry. The effect of thawing permafrost on landscape evolution and soil moisture will have significant feedbacks on nitrate availability (see poster of Arendt et al.).