Understanding Lateral Hydrological Flow Paths in the Arctic Coastal Plain

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This study examines lateral factors and processes critical to predicting the carbon-, nitrogen-, and water-balances of tundra ecosystems and will inform modeling efforts for predicting hydrologic and ecosystem responses with projected climate change and landscape evolution. Water and nutrient dynamics of tundra ecosystems are being studied as part of the DOE Next Generation Ecosystem Experiment (NGEE) Arctic project. This presentation synthesizes results from Phase I of the NGEE Arctic project in Barrow, Alaska (USA) and includes individual polygon-scale tracer testing as well as isotopic and geochemical indicators of lateral connectivity/transport. The tracer tests were implemented on separate high- and low-centered polygons with the Barrow Environmental Observatory (BEO) in July, 2015. A bromide solution was sprayed on the surface of the polygon centers. Radial arrays of rhizon soil water samplers were used to track tracer movement out to adjacent troughs at up to three depths within the active layer. Grab samples were also taken in troughs and ponded areas. Results to date suggest that most of the transport has been vertical within the shallower depths within the centers of the polygons. However, there has been some lateral transport to the troughs at the low-centered polygon, although this has been limited to just a few sample locations. Sampling will continue over the 2016 warm season. At the landscape scale we have collected isotopic and geochemical data from interlake polygonal areas, drained thaw lake basins, and key drainages. Results suggest that isotopic and geochemical variability increase with scale from the polygons in the BEO intensive area to the larger landscape scale. These results suggest it will be important to consider the effects of the thaw lake basins and drainages at Earth System Model grid scales.