Poster #15

Modeled Nitrogen Dynamics in the NGEE-Arctic Polygonal Tundra Landscape at Barrow Alaska

W.J. Riley[1], R.F. Grant[2], N.J. Bouskill[1], B. Dafflon[1], D. Graham[3], Z. Mekonnen[1], Ji-Won Moon[3], J.Y. Tang[1], M.S. Torn[1], and H.M. Wainwright[1]

[1] Lawrence Berkeley National Laboratory
[2] University of Alberta
[3] Oak Ridge National Laboratory

Contact: William Riley [wjriley@lbl.gov]

Most tundra ecosystems are nitrogen (N) limited, yet most large-scale land models of nitrogen dynamics and nitrogen limitations to the carbon cycle have very large uncertainties. Here we apply the *ecosys* model, which has been tested in a wide range of high-latitude sites, to analyze N cycling at the NGEE-Arctic Barrow, AK sites. Our NGEE-Arctic site is dominated by polygonal tundra, and a wide range of measurements has been taken over the past several years in low-centered, high-centered, and transitional polygons. For the modeling analyses, we developed a three-dimensional coupled representation of a polygon and initialized simulations with site observed soil and vegetation properties. *Ecosys* accurately captured observed diurnal and seasonal cycles of net ecosystem carbon exchange, surface energy and water fluxes, thaw depth and soil temperatures, plant biomass, LAI, and soil moisture. Using the well-tested model, we report here on model sensitivity analyses of: (1) the importance of the moss layer in insulating the soil during the summer, and thereby affecting the thaw depth; (2) non-growing season root dynamics and effects on plant N; (3) coupled hydrological and thermal dynamics; and (4) N leaching and gas losses. Implications for long-term ecosystem responses and needed mechanistic treatments in Earth System Model land models are discussed.