NATEX studies in 2000 field season

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TOOLIK LAKE

We initiated our 2000 field season at Toolik Lake in late-April with a major new initiative - understanding rooting dynamics of moist tussock tundra. We installed over 20 minirhizotron tubes in moist tussock tundra at our snow fence experimental site. All the tubes were installed such that they extended from the tundra surface into permafrost. Root images were collected weekly from June through September. Over 3000 images were collected as part of an REU project by Tom Antonini. Root biomass cores were collected in September in conjunction with the last set of images to develop root density-biomass relationships. An analysis protocol has now been developed and we will begin to analyze and synthesize the data with the root software program. In the coming years we plan additional belowground studies in western and central AK and will be cooperating with other NATEX teams to study warming and snow removal effects on root dynamics.

Water vapor and CO2 exchange measurements were also made every one to two weeks from June through early September in our four climate change scenarios (ambient snow-ambient temps, ambient snow-warmed, deep snow-ambient temps, deep snow-warmed temps) in moist tussock tundra and dry heath. This data was collected as part of a second REU project (Mark McNeal) and the data is currently being analyzed and summarized.

Detailed studies of the temporal patterns and magnitude of leaf N content as altered by our four climate change scenarios were carried out at Toolik Lake in 2000 from May through September. Leaf samples from bud break to senescence were collected from Betula, Dryas, Arctostapylos, Vaccinium and Eriophorum on a weekly basis. We are especially interested in: whether our increased snow treatment only off-sets the patterns of plant C&N or whether deep snow actually results in higher leaf N and delayed senescence. In addition to these vegetation collections, we collected stem material every two weeks from our deep and ambient snow zones at the moist tussock tundra site to evaluate whether snow-melt water is used by plants during spring and summer growth. We are analyzing this using Symbol d Times_New_Roman 180 approaches. We collected rainfall, snow and meltwater and will be extracting water from stems and comparing it to values of precipitation. Over 20 precipitation samples were collected and water will be extracted from approximately 500 vegetation samples and analyzed for Symbol d Times_New_Roman 180.

ALEXANDRA FIORD, ELLESMERE ISLAND, CANADA

In cooperation with Greg Henry and Canadian colleagues, we started our first full field season at Alexandra Fiord in June. We initiated chamber-level CO_2 flux measurements in ambient and warmed plots in three vegetation types where long-term ITEX warming has been underway for 8 years. In wet, mesic and dry tundra CO_2 flux measurements were collected bi-weekly in June, July and August by Kevin as part of his MS studies. Weekly collections of vegetation from all vegetation types and both temperature treatments were also collected for mineral nutrition and isotopic analyses. To add on to our preliminary investigations from last summer, we also continued measuring soil respiration and microbial biomass at a glacier foreland along a chronosequence dating back to 1950. Since that time the Twin Glacier has been receding releasing previously entombed High Arctic tundra.

Besides our ecosystem CO_2 flux measures, we also initiated whole plant CO_2 flux studies in the three vegetation types in ambient and warmed conditions. These studies are designed to complement our chamber fluxes and should allow us to account for species-specific contributions to ecosystem photosynthesis and net CO_2 exchange. We initiated another set of studies addressing the role of physical properties on CO_2 flux and mineral nutrition of plants. At a contact zone between granite and carbonate parent material, we measured whole plant CO_2 flux under long-term warmed and ambient temperature conditions. Both Dryas and Salix are found on both parent materials and vegetation was collected for nutrient and isotopic analysis. This flux data is currently being analyzed and vegetation samples have been prepared for analysis. At a finer scale, the role of physical properties on whole plant CO_2 exchange, plant nutrition and soil chemistry was measured at a frost-boil site where distinct polygons are present that are dominated by Dryas. Comparative flux and chemical measures were conduced in the center of the polygons which are physically active and low in organic matter as opposed to the ridges where vegetation is abundant organic matter is much higher. This flux data is being summarized and the vegetation and soils have been prepared for analysis. In 2001 we plan to begin flux measures in late-May continuing through August in addition to expanding our studies of long-term fertilization effects on whole plant CO_2 exchange and mineral nutrition. We are also developing collaborations with other Canadians interested in carbon exchange in glacier forelands and hope to spatially extend our studies to Devon Island, NW Greenland and N. Ellesmere Island.