

Field Report – Early Season 2001 - Steven F. Oberbauer  
North American ITEX program, Florida International University component.

Participants:

Steve Oberbauer - P.I.

Gregory Starr – Research Scientist (visiting from University of Florida)

Lorraine Ahlquist - Graduate Research Associate

Sarah Colby – Graduate Research Associate

Inga Parker – Graduate Research Associate

Tracy Baldwin – REU

Andrea Kuchy – REU – to be stationed at Barrow for most of the summer with Michigan State group.

Project Objectives:

1) Examine effects of extended growing season and soil warming on long-term extended season study plots at Toolik Field Station

2) Run automated ecosystem flux system for primary study plots.

3) With University of Wyoming group, install minirhizotron tubes on sample plots immediately following plot clearing.

4) Measure ecosystem CO<sub>2</sub> fluxes in conjunction with Michigan State group (Pat Webber) at Barrow and Atqasuk ITEX warming treatments.

Study Sites: Toolik, Barrow, Atqasuk.

Narrative:

Toolik:

Starr and Oberbauer arrived at Toolik 1 May. Snow depths on study plots were fairly normal but temperatures were very low. Snow removal on the 24 plots removal treatment plots was completed by 3 May and tents were installed on plots to melt out the remaining snow and prevent further accumulation. Though additional snow fell on the plots after snow removal, it was not accompanied by wind so additional digging out of the plots was not necessary (unlike last year). However, the low spring temperatures resulted in very late melt out of the control plots, June 8<sup>th</sup>, the same date as last year, which was by far the latest in recent years. Treatment plots fully were melted out by 8 May. Ahlquist, Colby, Parker, Baldwin, and Kuchy arrived 15 May. Kuchy was trained in ecosystem gas exchange techniques by Oberbauer and crew until 31 May when she and Oberbauer left for Barrow. Oberbauer returned 8 June.

The hybrid power system for the automated flux system was flown to the site the end of April before the FIU field crew arrived thanks to VECO and Toolik Staff. The system was assembled by 12 May by VECO personnel and was fully operational by 25 May. Upon snowmelt off the control plots, 8 June, Oberbauer and crew installed the automated system chambers. Unfortunately the late snow melt delay of the initiation of installation

meant that the complete installation of the automated system was not done until 14 June. Oberbauer left on 15 June. Ahlquist, Colby, Baldwin, and Parker carry out seasonal measurements (described below) on study plots.

Minirhizotron tubes were not installed on the study plots. Instead, the Wyoming group opted to put them elsewhere.

Measurements taken at Toolik.

There are two sets of treatment plots: 1) the original plots started 1995 in which snow is removed may 2<sup>nd</sup>, and prevented from accumulating until 4 September. On some of the snow removal plots, soil is heated. 2) A second set of plots started in 1997 in which the effect of early and late season snow removal is tested separately. Each set of experiments has additional treatment plots set up for destructive sampling. No destructive sampling is done on the primary study plots. Phenological measurements are being taken weekly on both sets of study plots (by Parker)

Whole system carbon exchange was taken weekly on both sets of study plots until the automated system was activated on the original (started 1995) study plots. Manual measurements of flux will be taken on those plots biweekly as a check and backup.

(See attached document – CHAMBER1.MOV- for a video clip of chamber operation).

Physiological measurements on the key vascular species and moss species in response to the season length treatments (light response curves, CO<sub>2</sub> response curves, chlorophyll fluorescence).

Plant canopy development is measured weekly using the LI-COR LAI-2000.

Weekly measurements of soil depth of thaw and soil moisture.

Leaf nutrients will be collected four times during the growing season on the destructive sampling plots to document leaf N and P content in response to the treatments.

Concurrent with the leaf nutrient samples, soil nutrient solution was sampled from the main treatments plots for phosphorus, ammonium, and nitrate.

Observations:

This year demonstrated the importance of conducting multiple-year studies on the same treatments. Because of the very cold weather present after snow removal, many evergreen shrub were damaged or killed due to absence of the protective effect of snow cover. (We have been seeing a loss of shrubs on the study plots, a result that appeared in the meta-analysis of point frame data, probably for this reason). However, this year was extreme with even evergreen leaves of *Eriophorum vaginatum* damaged. For the first time in 7 years of treatment, the control plots were phenologically advanced relative to the snow removal treatment plots (ie, the snow removal treatment effect was negative rather than the usual positive.).

### Barrow-Atqasuk

Oberbauer and Kuchy left for Barrow 31 May (but got hung up in Prudhoe till 1 June). Oberbauer and Kuchy visited the study sites at Barrow which were still fully snow covered. Oberbauer and Kuchy and Michigan State personnel went to Atqasuk June 4-6 to and did a flux diurnal and LAI measurements on the ITEX dry site there. The wet site was still snow covered. Kuchy is to remain in Barrow until 14 August. Oberbauer returned to Prudhoe and Toolik 8 June. Kuchy and MSU personnel will be conducting weekly flux measurements on the ITEX plots at Barrow and bi-weekly measurements at Atqasuk until mid August.