

7 October 2002
End-Summer Projects Activity Report.
V. Romanovsky

Fieldwork (April 26 - 27) on the CALM sites along the Dalton Highway. Investigator D. Sergueev in cooperation with Chen-Lu Ping and Skip Walker groups. Measurements of the snow cover thickness at the Chandalar Shelf, Galbraith Lake, Happy Valley, Franklin Bluffs, Deadhorse, and West Dock sites. In general, the snow cover thickness this year was significantly larger compared to the thickness at the same time last year at the same sites. However, this year values are more common for the long-time averages for the entire period of observations (1996-2002). At Galbraith Lake the snow cover was slightly thinner than in previous years (about 15-20 cm).

Fieldwork and Biocomplexity seminar at Prudhoe Bay (June 2)
North Slope sites were visited, data downloaded and equipment serviced. Also, data were recorded from the frost-heave devices.
Detailed information on the Biocomplexity seminar can be found in the Skip Walker's report.

Fieldwork (July 24 - July 25) at the ATLAS Council sites. Investigators - V. Romanovsky and D.Sergueev.
Four "soil climate" sites (C1, C2, C3, C4) continued to operate during the 2002 campaign. The ground temperatures were surprisingly colder. That linked with early AL freezing during 2001 fall. At Tundra site the mean annual air temperature at 2001-2002 was -1.8°C (0.9°C increase), mean annual ground surface temperature was -0.1°C (1.5°C decrease) and mean annual temperature at 1m depth was -1.8°C (1.5°C decrease).

Fieldwork (July 29) at the ATLAS Iivotuk sites. Investigators - V. Romanovsky, D. Sergueev, D.Nikolsky.
Data from the loggers at four sites (air, ground surface and soil temperature, soil moisture at three depths) were downloaded. Four sites were established in 1998 at the locations of the flux measurement towers. At each site, the air temperature, ground (including ground surface and six to seven depths down to 60 to 80 cm) temperatures at two locations (six meters apart), and ground moisture at three depths were recorded hourly during the entire year of Summer 2001 - Summer 2002. Data show that mean annual air temperature in 2001-2002 was about 1°C warmer than in 2000-2001 (except for the SHRB site, where air temperature was warmer only by 0.1°C). It was -9.5°C at the MAT site, -10.0°C at the MNAT site, -9.9°C at the SHRB site and -9.8°C at the MOSS site. Ground surface temperatures were also significantly warmer than during 2000-2001. Mean annual temperatures at the ground surface in 2001-2002 were -0.8°C at MAT (1.1°C increase), $+0.5^{\circ}\text{C}$ at MNAT (2000-2001 data were lost because in the 2000 summer-end a bear made the solar panel not functional), 0°C at SHRB (2.0°C increase), and -1.1°C at MOSS (1°C increase). We would like to emphasize that it is for the first time (according to our knowledge) the recorded mean annual temperature at the ground surface exceeded 0°C at a site within the North Slope of Alaska. If somebody knows that this happened in the past, please, correct us. Ground surface warming provoked increase in temperatures

within the active layer. Mean annual temperatures at 50 cm depth in 2001-2002 were -1.4°C at MAT (0.9°C increase), -1.0°C at MNAT (2000-2001 data was lost), -1.6°C at SHRB (1.0°C increase), and -2.2°C at MOSS (0.6°C increase).

August 2002: Fieldwork (August 8 - August 11) at the Barrow Permafrost Observatory sites. Investigators - V. Romanovsky and K. Yoshikawa.

Data were downloaded from several loggers, which record permafrost temperatures from deeper boreholes (depths between 8 and 50 meters). Two new shallow measurement sites were established next to two deeper boreholes. A standard set of measurements (air, ground surface, and upper 1 meter of soil temperatures, soil moisture at three different depths) will be taken automatically every five minutes and hourly means will be saved by dataloggers. Additionally to this, snow cover thickness will be also recorded hourly. Two Vertical Electrical Soundings using Direct Current method were performed to estimate the depth of a brine layer, which was discovered this spring during the drilling of the deeper boreholes.

Fieldwork (August 14 - August 20) at the Biocomplexity and CALM projects sites along the Dalton Highway and Prudhoe Bay. Investigator - V. Romanovsky, N. Romanovsky, D. Sergueev, I. Semiletov in cooperation with Skip Walker's group.

Active layer depths measurements were completed on five 100x100 m CALM grids. The data show the stability of the active layer depth at near-shore sites compared with the last year data. However, at southern sites on the North Slope, in the foothills, and in the Brooks Range the average active layer depth decreased in comparison with 2001 by 3.6 cm at Franklin Bluffs, by 7 cm at Galbraith Lake and by 7.6 cm at Chandalar Shelf. Air, ground surface, and soil (down to 1 m depth) temperatures and soil moisture data were downloaded from the data loggers at the West Dock (WD), Deadhorse(DH), Franklin Bluffs (FB), SagMNAT (SMNT), SagMAT (SMAT), Happy Valley (HV) (new and old), Galbraith Lake (GL) and Chandalar Shelf (CS) sites. Technical service of the equipment was accomplished.

A slight decrease in air temperature was detected at Deadhorse and West Dock (the mean annual air temperature here were -11.6°C that by 0.3°C colder than in 2001). However, all sites to the south, starting from Franklin Bluffs, show warmer mean annual air temperatures (0.5°C warmer at FB and 1°C warmer at Sagwan and Galbraith Lake). Mean annual ground surface temperatures were warmer at WD (0.2°C), at DH (0.7°C), and much warmer at sites to the south: by 2.5°C at FB, by 2.6°C at SMNT and SMAT, and 0.1°C colder at Galbraith Lake. Mean annual temperatures at the permafrost surface were 0.3°C warmer at WD, 0.4°C warmer at DH, 1.7°C warmer at FB, 1.9° at SMNT, and 1.5°C at SMAT.

Additional new site was established at Howe Island and two more sites at Franklin Bluffs. A standard set of measurements (air, ground surface, and upper 1 meter of soil temperatures, soil moisture at four different depths) will be taken automatically every five minutes and hourly means will be saved by dataloggers. Additionally to this, ground heat flux at 7 cm depth and snow cover thickness will be also recorded hourly. At all three new sites, as well as at our new Happy Valley site that was installed last year, two sets of sensors were installed; one in the frost boil and another in nearby inter-scar area. All this new instrumentation together with frost-heave measurement devices, that were

installed during 2000-2002 at all sites north from Toolik Lake, were made as a part of Skip Walker's et al. Biocomplexity project. The measurements at frost heave observing devices were continued. The mini-logger surface temperature data at study sites were collected and new data-loggers were installed.

On the whole, within the North Slope the warming at the permafrost table continues, regardless to the slight local decrease in mean air temperatures. Average active layer depth doesn't show significant changes compared to the previous year within the northern portion of transect, but decreased noticeably in the southern portion.



Fieldwork in Mongolia (August 23 - September 2, 2002). Investigator - V. Romanovsky. As a continuation of collaborative efforts between Mongolian and American scientists, which were activated significantly as a result of the September 2001 International Symposium on Mountain and Arid Land Permafrost (September 2-6, 2001, Ulaanbaatar, MONGOLIA), first joint fieldwork was performed in the Hovsgol Lake (Northern Mongolia) area. Several 6 to 10 meters boreholes were equipped by mini-loggers and two automatic meteorological stations were established. The measurements at the stations include ground temperature and moisture measurements. We plan to revisit all these sites and establish several new sites during the 2003 field season.