LARISSA Glaciology: Ongoing studies of borehole-derived surface temperature history, and continuing AMIGOS results and plans

Ted Scambos[1], Victor Zagorodnov[2], Oleg Nagornov[3], Atsu Muto[1,4], E. Mosley-Thompson[2], Sergei Tyuflin[3], Erin Pettit[5], Martin Truffer[6]

[1] National Snow and Ice Data Center, CIRES, University of Colorado, Boulder CO 80303 USA
[2] Byrd Polar Research Center, The Ohio State University, Columbus OH 43210 USA
[3] Moscow Engineering Physics Institute, Kashirskoe Shosse 31, Moscow 115409, Russia
[4] now at Dept. of Geosciences, Pennsylvania State University, State College, PA 16802, USA
[5] Geology and Geophysics, University of Alaska Fairbanks, Fairbanks, AK, USA
[6] Geophysical Institute University of Alaska Fairbanks, Fairbanks, AK, USA

The Larsen Ice Shelf System, Antarctica (LARISSA) is an International Polar Year (2007-2009) multi-disciplinary investigation of physical and environmental changes in the region of the Larsen B Ice Shelf embayment. As part of the glaciological component, a series of studies are underway investigating the past climate history and ongoing response to climate change. Future work will integrate these observations with oceanography, marine geology, geophysics, and biosciences for the region.

One near-complete study (led by V. Zagorodnov) investigates a 430 m borehole thermal profile collected at the summit of the ice divide above the southwestern Larsen B and northwestern Larsen C, at the Bruce Plateau (óSite Betaô) drill site. Inversion of this profile provides a 200-year proxy record of surface temperature at the drill site. AMIGOS (Automated Meteorology-Ice-Geophysics Observation Systems) thermal monitoring to 120 m at the same site shows that the thermal record measured shortly after drilling was stable for the following several months (i.e., there is no evidence of thermal disturbance from drilling). A comparison of the surface temperature record derived from the inversion at Site Beta with other proxy temperature records from manned weather stations, ice core analysis, and other borehole thermal inversions along an 18-degree latitude transect of the Peninsula region (Orcadas to Rutford Ice Stream) shows a consistent and interesting pattern of climate change for the past ~150 years. A multi-decade cool period occurred around the years 1890 ï 1950 (0.5 to 1.0 C cooler than the long-term mean), followed by rapid warming (~1.5 C) in the 1950-2010 period that may have recently slowed or stopped.

Ongoing work with AMIGOS stations and cGPS stations located on two outlet glaciers draining the Bruce Plateau into the remnant Larsen B Ice Shelf (Scar Inlet Shelf area) show that climate in the past two summer seasons has been relatively cool, with few extensive melt events. An additional AMIGOS system, with a high-resolution camera, is planned for installation in November 2011 on a rock bluff overlooking the Scar Inlet Ice Shelf front.

- Multi-discipline system science in WAIS: PIGð LARISSAð WISSARDð Ice2Sea