

Recent change in the climate and atmospheric chemistry over Antarctica

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DANIEL DIXON¹, M. FREZZOTTI², E. ISAKSSON³ AND T. MELOTH⁴

¹Climate Change Institute, University of Maine, Orono, USA; ²Laboratory of Climate Observations, National Agency for New Technologies, Energy and the Environment, Rome, Italy; ³Norwegian Polar Institute, Tromsø, Norway; elisabeth.isaksson@npolar.no; ⁴National Centre For Antarctic and Ocean Research, Vasco-da-Gama, India

Changing global climate is forcing scientists to vigorously test existing paradigms and find improved evidence of how the climate system really works at various timescales. Since polar regions are the pace-makers of climate change, it is imperative to gain critical knowledge on the role and response of the cryospheric system in a warming scenario. However, due to the lack of long-term instrumental climate records in remote places like Antarctica, scientists are focusing on ice core proxy climate records buried in the vast ice sheets of Antarctica, which provide valuable information on climate change on interannual to millennial timescales. One such multinational effort to obtain climate archives from Antarctica is the International Trans-Antarctic Scientific Expedition (ITASE). Operating since 1990, 21 countries are now involved in ITASE programs that aim to understand the impact of global change on the Antarctic continent, and the influence of Antarctica on global change during the last ~200 to over 1000 years. By combining available meteorological data from the Antarctic and Southern Ocean with firn/ice core proxies for a variety of climate parameters (e.g., moisture balance, atmospheric circulation and temperature), ITASE is actively working to extend the Antarctic climate and atmospheric chemistry records back at least ~200 years. This offers the temporal perspective needed to assess the multi-decadal variability of natural Antarctic climate.

At the idyllic coastal Maine village of Castine, Paul Mayewski and his group from the Climate Change Institute at the University of Maine invited 32 glaciologists, geophysicists and climate modelers to discuss and synthesize the results obtained thus far from the ITASE programs. The main focus for this workshop was to obtain an updated overview of newly collected firn/ice cores and available datasets. A large effort is planned to make the data available online, in order to facilitate a number of synthesis products. In addition, there were a number of presentations on both syntheses of previously collected data and new developments from the many participating countries. One



Figure 1: ITASE Synthesis Workshop participants. **Inset:** The Ice Reader shaded relief map of Antarctica showing ITASE core locations (black dots) and Ground Penetrating Radar transects (orange lines).

important new result discovered by members of the ITASE group is that the climate of W. Antarctica appears to have warmed during the last several decades.

Other interesting aspects discussed were the importance of the Southern Annular Mode (SAM) in Antarctic climate change, and climate teleconnections related to extra-tropical systems like the El Niño Southern Oscillation (ENSO). It was also concluded that firn/ice core records should be interpreted in combination with snow Ground Penetrating Radar (GPR) surveys to ensure continuous chronology and climate data from the cores.

Based on the available data and our current state of knowledge, the ITASE community agreed that the following synthesis products would be created in the near future:

1. Temporal variability of snow accumulation, using well-dated firn/ice cores with reference horizons such as sulfur peaks from the eruptions of Tambora AD 1815 and the atomic bomb tests of AD 1964/65.
2. Sea ice proxy reconstruction using a combination of sea salt and methane-sulfonic acid (MSA) records from coastal ice cores around Antarctica.
3. Proxy Atmospheric Reanalysis of Antarctica (PARAT).
4. Temperature reconstruction during the past 200 years using ice core proxy data.

In addition to the interesting talks and discussions, we also enjoyed an afternoon of sailing in Penobscot Bay on the polar-class schooner Bowdoin that has sailed many times to Greenland.

ITASE is jointly sponsored by the Scientific Committee on Antarctic Research (SCAR; www.scar.org/) and PAGES. The next workshop is planned in conjunction with the next SCAR Open Science Conference in Buenos Aires, Argentina in July 2010.

