

ITASE Synthesis Workshop Report

International Trans Antarctic Scientific Expedition (ITASE) Synthesis Workshop:

Recent Change in the Climate and Atmospheric Chemistry over Antarctica

Castine, Maine, USA, September 2-5, 2008

Submitted by Daniel Dixon¹, Massimo Frezzotti², Elisabeth Isaksson³, Thamban Meloth⁴

¹ Climate Change Institute, University of Maine, Orono, USA; ² ENEA, Lab. Climate Observations, Rome, Italy; ³ Norwegian Polar Institute, Tromsø, Norway; ⁴ National Centre For Antarctic & Ocean Research, India

Changing global climate is forcing scientists to vigorously test the existing paradigms and to find improved evidence of how the climate system really works at various time scales. With polar regions being the pacemakers of climate change, it is imperative to gain critical knowledge on the role and response of the cryosphere 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 that provide valuable information on climate change from interannual to millennial scales. One such multi-national effort to obtain climate archives from Antarctica is the International Trans-Antarctic Scientific Expedition (ITASE). Operating since 1990, twenty one countries are now involved in ITASE programs to understand the impact of global change on the Antarctic continent and the influence of Antarctica on global change during the last ~200-1000+ years (see www2.umaine.edu/itase/).

At the idyllic coastal Maine village of Castine, Prof. Paul Mayewski and his group from the Climate Change Institute at University of Maine collected 32 glaciologists, geophysicists and climate modelers to discuss and synthesize the results obtained thus far from the ITASE programs. This synthesis workshop generated many fruitful discussions on the data, and also future directions.

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.

The main focus for this workshop was to get an updated overview of newly collected firn/ice cores and available data sets. A large effort is planned to make the data available online in order to facilitate a number of synthesis products. In addition, we had a number of presentations from the participants with information both on syntheses of previously collected data and also new developments from the many participating countries. One of the important new results discovered by members of the ITASE group is that the climate of West Antarctica appears to have warmed during the last several decades.

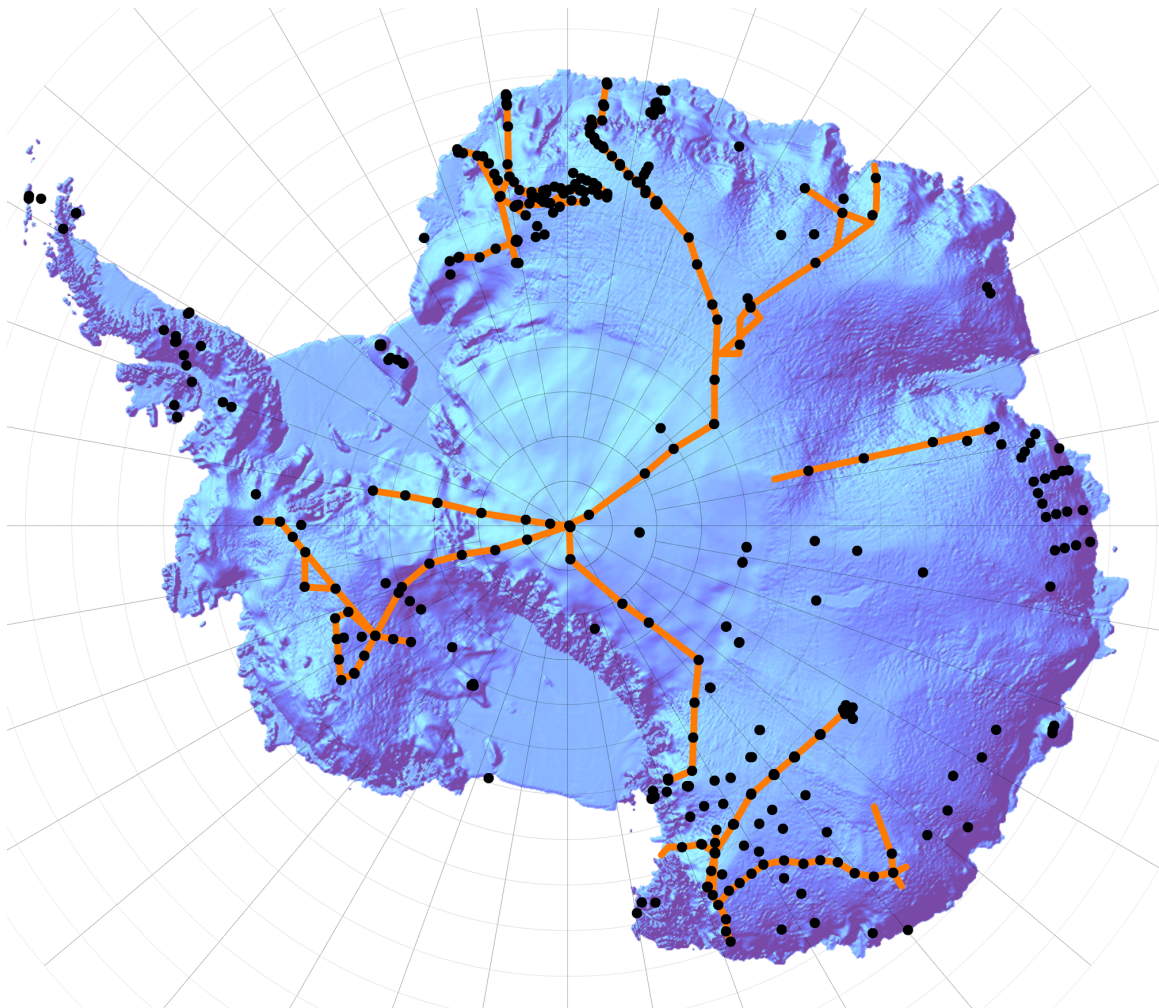
Other interesting aspects discussed were the importance of the Southern Annular Mode (SAM) in Antarctic climate change as well as climate teleconnections related to extra-tropical systems like the El Nino Southern Oscillation (ENSO). It was also concluded that firn/ice core records should be interpreted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

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

1. Temporal variability of snow accumulation using well-dated firn/ice cores with reference horizons such as sulphur peak from the eruptions of Tambora 1815 as well as the atomic bomb tests of 1964/65.
2. Sea ice proxy reconstruction using a combination of sea salt and methanesulphonic 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 which has sailed many times to Greenland.

ITASE is jointly sponsored by the Scientific Committee on Antarctic Research (SCAR) and the Past Global Changes (PAGES) project of the International Geosphere Biosphere Program (IGBP). The next workshop is planned to take part in connection with the SCAR meeting in Buenos Aires (Argentina) in July 2010.



Location of Antarctic ice cores (black dots) and GPR routes (red lines) from Ice READER.



Attendees.

Annex

ITASE Castine, Maine 2008 Synthesis Workshop Products

Submitted by:

ITASE Chair: Paul Mayewski (USA) <paul.mayewski@maine.edu>

ITASE co-Chair: Ian Goodwin (Australia) igoodwin@els.mq.edu.au

(1) Workshop description

A short description of the workshop was prepared by Massimo Frezzotti (Italy), Elisabeth Isaksson (Norway), Meloth Thamban (India), and Dan Dixon (USA) for submission to both the PAGES and AGCS newsletters (above).

- (2) Abstracts (22) and powerpoints (19) presented at the workshop are posted on the ITASE website.

<http://www2.umaine.edu/itase/content/Workshop-Report.html>

- (3) Participants agreed that an ITASE Workshop and a dedicated ITASE volume (JGR?) should be planned for the 2010 SCAR Buenos Aires meeting. A planning team was designated (Nancy Bertler (New Zealand), Mark Curran (Australia), Massimo Frezzotti (Italy), Paul Mayewski (USA), Liz Thomas (United Kingdom)).
- (4) An ITASE Data Sharing Policy was established and agreed upon at the workshop. All data will be available through the Ice READER website.

<http://www.icereader.org>

This portal will be available as of 31 October 2008 and instructions will be sent by email.

Purpose: to collect ITASE core data from people/institutions willing to supply data

Ice READER will contain two types of data:

- (i) Metadata (available publicly) as currently defined on the website (ice core, GPR, other) including: location, date collected, types of measurements, sampling and analytical methods to be submitted by individual ITASE researchers, teams, institutions directly to Ice READER.

- (ii) Data (password protected), either stored on Ice READER or available through Ice READER on other websites, will be available only to data contributors.

Examples of types of data to include:

Metadata

Raw data measurements

Raw depth

Depth/age and uncertainty

Measurement (planned, finished, analytical method, sample processing method)

Model output

Data storage location (ie. existing data center)

Data ownership

Policy for use of password protected data:

Available to any Ice READER data contributors, but ONLY for viewing (plotting, comparison).

Email alerts will be sent automatically to all password holders signaling input of new data.

Password protected data will be available for use in scientific products (papers, reports, websites, etc.) ONLY with permission of the data "owner".

Andrei Kurbatov akurbatov@maine.edu will coordinate access to Ice Reader for metadata uploading and password protected data so that input can be made directly by data holders.

- (5) Workshop participants developed a preliminary compilation of ITASE and related research based on published data and near or in review research (Appendix).

The compilation revealed an important new potential view of recent (past 200 years) changes in temperature over West Antarctica and portions of coastal East Antarctica, sea ice extent, and atmospheric circulation (zonal westerlies and SAM) that demonstrated the necessity for several ITASE study projects.

- (6) ITASE study projects. Four major research activities were developed from the workshop. Plans for undertaking these activities follow. Several people have offered to be involved in these activities and contribute institutional resources.

(i) Proxy Atmospheric Reanalysis of Antarctica (PARAT)

Synoptic climate anomalies for ENSO, SAM, circumpolar westerlies, lows, etc. eg., 1960-90.

Stage 1 - Self Organized Mapping (SOMS) and time series of climate reanalysis data at seasonal resolution available on Ice READER.

Stage 2 – Mapping proxy climate data by ice core measurement.

Stage 3 – Mapping of proxy climate data to synoptic climate types.

Stage 4 – Calibration and verification of proxy climate data to reanalysis data.

Stage 5 – Development of proxy atmospheric reanalysis climatology for 1960-2008.

Stage 6 – Extend proxy atmospheric reanalysis climatology to 1815 (Tambora).

Stage 7 – Evaluate partial SAM indices against instrumental SAM reconstructed indices.

(ii) ITASE Antarctic sea ice reconstruction (1850 to present)

Stage 1 – Data request, review goals.

Stage 2 – Contour map synthesis project.

Stage 3 – Sea salt budget – frost flower contribution – test proxy.

Stage 4 – Sea ice reconstruction from sea salts.

Stage 5 – Sea ice reconstruction from MSA.

(iii) Synthesis of accumulation and physical properties using GPR, ice core etc. over at least the bomb layer era to Tambora across Antarctica in order to address: quality control, change/variability in spatial distribution, temporal variability/change of snow accumulation at pluriannual/decadal/atomic bomb (1966-1955)/Tambora (1816)/Kuwae (1453), snow accumulation vs isotope temperature variability at decadal scales, improvement of surface mass balance knowledge, verification/validation of snow accumulation prediction models, and to develop a distribution map with change respect average, and a data base available on the website.

(iv) Temperature reconstruction for Antarctica (last 200 years).

Appendix

Antarctic status and change - compiled by ITASE Synthesis Workshop, Castine, ME, September, 2008

