

Implementation Plan
for the Multidisciplinary Action Group of SCAR's SSG/PS
Pan-Antarctic Observations System (PantOS)

Introduction

Antarctica is a region with a very limited record of conventional observations – with low spatial coverage and only about half a century of regular observations. Although climate changes across the Antarctic continent and Southern Ocean are not yet as pronounced as are currently seen in the Arctic, expected environmental changes in the Antarctic might be abrupt and pose specific concerns such as a high risk of rapid sea level rise due to melting and destruction of the West Antarctic ice sheet. Connecting solar-terrestrial (geospace) physical processes to the Antarctic atmosphere dynamics and the latter's interaction with the Southern Ocean may help in identifying triggering mechanisms for environmental change in the snow and sea ice cover and ice sheets dynamics.

These make compelling arguments for an evaluation of the existing Antarctic observation infrastructure and recommending improvements that will help deliver a coherent set of pan-Antarctic, long-term, and multidisciplinary observations focused on the entire chain of effects from geospace to the Earth's surface. An important focus will be on integrating conventional observations with the vast amounts of satellite remote sensing data that are (and will be) available for high latitudes of the Southern Hemisphere. It is impossible to describe current environmental conditions in the Antarctic without these synthesized observations, let alone understanding of some of the climatic changes that are underway around the Antarctic Peninsula and their connections to the rest of the Earth climate system.

PantOS Goals

The SCAR's multidisciplinary Action Group on the Pan-Antarctic Observations System (PantOS) focuses on compiling details about the currently existing or planned observational networks over the Antarctic in various scientific disciplines covered under the umbrella of the SSG/PS. **The PantOS Group main goal is to address the scope and implementation strategies for the follow-on development of the multidisciplinary Pan-Antarctic Observations Network encompassing the Antarctic Continent and the surrounding Southern Ocean.** The optimum network scale for each element of the observing system will be investigated. This system of observing networks will focus on the measurement of conditions and detection of fundamental variations of physical parameters in the Antarctic system, providing data that are easily compared and analyzed via cyberspace-based tools (e.g., virtual observatories). The network will serve both scientific and operational needs, and will help for high-resolution regional climate reanalysis poleward of 50°S.

PantOS Objectives

The PantOS network can be built on and enhance existing national and international observing efforts for the delivery of easily accessible and reliable pan-Antarctic observations. The PantOS Action Group objectives are the following:

- 1. Address, identify, and understand current and planned observation networks over the Antarctic:**
 - In disciplines carrying their own networks of ground- and marine-based scientific observations;
 - In routine ground- and marine-based observations (meteorology, ice cover, etc.) carried by either science groups or national logistics operators;
 - In satellite observations of the Pan-Antarctic region.
- 2. Identify key variables that need to be observed in the Antarctic over long time for terrestrial climate change studies,** as well as understanding climatology of near-Earth space (geospace) and corresponding solar activity regimes ultimately affecting Earth's climate.

3. **Deliver a comprehensive analysis of the existing observations networks** with an initial assessment of where deficiencies or over-provision exist, and recommend protocols for assembling networks' data via a family of Virtual Antarctic Observatories.
4. **Provide recommendations to SCAR for improving and enhance existing systems** for the forming of the interconnected multidisciplinary Antarctic observing network.

PAntOS Deliverables

December 2007 Prepare a preliminary analysis of existing/planned observational networks with an initial assessment of where deficiencies or over-provision exist, and recommend protocols for assembling networks' data via a family of Virtual Antarctic Observatories.

March 2006 Organize an international workshop to address the PAntOS Action Group objectives, understand current and planned observational infrastructure of the Antarctic, and form a Task Force to begin working on the PAntOS Report.

July 2008 Provide recommendations to XXX SCAR for establishing an Expert Group on Development and Coordination of the Integrated Multidisciplinary Pan-Antarctic Observations Network (PAntON; pronounced 'pan-tee-on') which encompass the Antarctic Continent and surrounding Southern Ocean.

PAntOS Metrics

Scientific disciplines and geographical areas to cover:

- Southern Ocean and its interaction with the atmosphere - climate changes and terrestrial weather
- Sea ice around the Antarctic continent - seasonal regime and multiyear buildup
- Antarctic snow and firn - current and recent history of climate changes
- Antarctic ice sheets - deep history of global climate changes and impacts on modern climate
- Permafrost and long-term environmental observations
- Antarctic seismicity, modern tectonics, and volcanology
- Antarctic meteorology and atmospheric observations
- Stratospheric ozone and dynamics of Antarctic ozone hole
- Mesosphere - low thermosphere region and its dynamic coupling with the troposphere
- Upper atmosphere and ionosphere - solar forcing on climate
- Magnetosphere - ionosphere coupling and space weather
- Astronomy and astrophysics from Antarctica

Focus areas to address:

- The need for Antarctic observations
- Existing observations and critical gaps
- Key variables to observe for long time
- Antarctic data fabric, data collection and management potential
- Vision for the Pan-Antarctic Observations Network

PAntOS Action Group Membership (* - not yet confirmed)

Palo, Scott (aeronomy and thermosphere; USA) –
Co-Chair

Bromwich, David (atmospheric sciences; USA)

Fahrbach, Eberhard (oceanography; Germany) *

Jacka, Jo (ice sheets; Australia) *

Lyons, Berry (atmospheric sciences; USA)

Lyttle, Victoria (cryosphere; Norway)

Mayewski, Paul (atmospheric sciences; USA)

Shanklin, Jonathan (meteorology; UK) –
Co-Chair

Milinevsky, Gennadi (aeronomy and ozone;
Ukraine)

Prick, Angélique (permafrost; Norway)

Weatherwax, Allan (solar-terrestrial physics; USA)

Worby, Tony (sea ice; Australia)

Papitashvili, Vladimir (STP, USA) – *ex officio*