Global Cryosphere Watch (GCW): A WMO Initiative

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presented by
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“The 15th WMO Congress (May 2007) welcomed the proposal of Canada that WMO will create a Global Cryosphere Watch which would be an important component of the IPY legacy. Congress requested the WMO Inter-commission Task Group on IPY to establish an ad-hoc expert group to explore the possibility of creation of such global system and prepare recommendations for its development.”

A legacy of IPY

A component of WIGOS and WIS

A legacy of WCRP/CliC in the area of observations

A contribution to GCOS & GEOSS
The Report

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Executive Summary
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2. Applications of Cryospheric Data
3. Terrestrial Snow
4. Sea Ice
5. Lake and River Ice
6. Ice Sheets
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9. Permafrost and Seasonally Frozen Ground
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11. An Integrated and Coordinated Observing System
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App. A. References
App. B. Observational Capabilities and Requirements
App. C. Satellite Missions in Support of the Theme
App. D. Acronyms
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Contributions from ~80 people in 17 countries throughout the development phase.

http://igos-cryosphere.org
GLOBAL CRYOSPHERE WATCH:

observation, monitoring, assessment, product development, research through to prediction

Mission:

• implement the IGOS Cryosphere Theme (CryOS);
• support reliable, comprehensive observations of the elements of the cryosphere through an integrated observing approach on global and regional scales, in collaboration with relevant national and international programmes and agencies;
• provide the scientific community with the means to predict the future state of the cryosphere, resulting in improved prediction of the earth system;
• facilitate and stimulate assessment of changes in the cryosphere and their impact, and to use this information to aid the detection of climate change, support decision making and environmental policy development;
• provide authoritative information on the current state and projected fate of the cryosphere for use by the scientific community, media, public, decision and policy makers.
Global Cryosphere Watch: Way of work

- GCW will contribute to WMO’s integrated global observing and information systems (WIGOS and WIS) and to the Global Climate Observing System (GCOS) as the Global Atmospheric Watch (GAW) does.

- GCW will work with, and build on, existing programs such as GOOS and GTOS (GTN-G, GTN-P, GTN-H), and work with partners such as WMO Technical Commissions (JCOMM), co-sponsored programs (WCRP/CliC), space agencies and World Data Centers. It will contribute to GEOSS through the implementation of CryOS and as an IPY Legacy for observation, monitoring and provision of data and information.

- There is strong community desire to establish a network of stations, CryoNET, working on a coherent agreed program monitoring changes in all components of the cryosphere, producing valuable long-term records, covering key areas of the globe with cryospheric observations, including sea-ice and land-fast ice. Can IICWG help?

- GCW is not seen to be a data archive, but would link to associated data centres.

- GCW will need a one-stop portal for authoritative up-to-date cryosphere data and products/information, helping existing elements to be better integrated and contributing to a global data system. Can there be a link to the IICWG Ice Logistics Portal?
Ice Service Products and Information: Commonalities with GCW Principles and Characteristics

- Regional sea ice analyses are derived from the near real-time integration of remotely sensed and in-situ oceanographic/meteorological observations.
- These analyses are produced following standard analysis procedures which optimize the use of data that vary widely in availability, scale, and resolution.
- These operational data sources can be grouped into the following categories: satellite derived data, aerial ice reconnaissance, ship/shore station observations, drifting buoy reports, meteorological guidance products, ice prediction model output, climatology and sea ice information produced in cooperation with international partners such as foreign ice services.
Perspective and Scale

Point

100s of meters

10s of km

Arctic-wide and Global

Remote Sensing

Field Measurements

Modeling

100s of meters

10s of km

Point

= Calibration/Validation Scales

From Waleed Abdalati ICARPII
We need:

spatial information and temporal information
Comparison of Arctic Ice Extent
NERSC (Arctic ROOS) vs NSIDC Sep 23 09

Arctic Sea Ice Extent SSMIS, daily from different algorithms, updated 16 September 2009

Sea Ice Extent, million square km

NASA Team
Bootstrap
Norsex
ASI
SAR mosaic illustration of the historical minimum in Arctic ice extent in September 2007, from Envisat ASAR (courtesy of ESA) together with navigable routes through the northwest and north-east passages. Red box (region shown below) inset showing new ice conditions one month later on 24 October in the Prudhoe Bay region, Alaska from TerraSAR-X (courtesy of A. Roth, DLR).

**Prediction** of ice-free northern sea routes is a key economic and environmental need.
GCW Status and Next Steps

• Scoping document prepared by ad-hoc expert team defining feasibility of developing and implementing the Global Cryosphere Watch accepted by WMO Executive Council in June 2009.

• The Council requested the preparation of a GCW implementation strategy for consideration by the WMO Congress in 2011.

• Recommended initial actions:
  – Standards, guidelines, best practices for cryosphere components (with GCOS)
  – Initiation of a CryoNet as part of CryOS implementation (IGOS/GEO)
  – Develop pilot projects:
    • for each cryosphere component;
    • with research groups and World Data Centres (eg NSIDC, ESA’s “Glob” projects)
    • with outside providers (IPA (permafrost), WGMS (glaciers));
    • with operational agencies (eg met.no, ice centres, GPCC);
  – Develop demonstration projects within countries and regions,
  – Antarctica – determine a way forward
  – Establish/test a demonstration/trial portal(s)
Moving GCW Forward: Pilot and Demonstration Projects

Pilot Projects would focus on the components of the cryosphere, identify how they would contribute to implementing CryOS, identify how they meet the GCW principles and characteristics, and would contribute to integration of cryospheric data and information from research to prediction.

Demonstration Projects would focus on regional or national contributions as well as focus on specific tasks to demonstrate standardization, integration and interoperability.
Potential Contributions of IICWG and Partners to GCW

- Development of Guidelines and Standards of Observation and Measurement of Sea Ice
  - For in-situ, airborne and satellite products for operational and research use
  - Compilation of existing guidelines and procedures (IICWG, JCOMM, WCRP/CliC, GOOS etc. and consolidation/development as required)

- Development of GCW portal
  - Test of interoperability between ice logistics portal and GCW and possible provision of IICWG products to GCW

- Evaluation/validation of sea ice products for climate analyses, model validation and initialization
  - Intercomparison of commonly used algorithms and the resulting products
  - Define “reference data sets”
  - Develop intercomparison protocols and metadata requirements

- Contribution/development of ice climatologies from operational ice charting initiatives

- Others………..

*GCW can only be successful through collaboration and partnership*