The Global Cryosphere Watch

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The cryosphere collectively describes elements of the earth system containing water in its frozen state and includes:

- solid precipitation, snow cover, sea ice, lake and river ice, glaciers, ice caps, ice sheets, ice shelves, permafrost and seasonally frozen ground.

The cryosphere is global, ~100 countries
Assessment with the goal of integration: *Integrated Global Observing Strategy Partnership*

The IGOS themes were developed primarily to assess current observing systems, including capabilities and requirements.
The IGOS Cryosphere Theme was developed primarily to:

• create a framework for improved coordination of cryospheric observations

• assess current capabilities and requirements for cryospheric observations

Over 100 recommendations provide the basis for subsequent actions. But who will take action?

Global Cryosphere Watch
Global Cryosphere Watch (GCW)

The 15th World Meteorological Congress (May 2007) welcomed the proposal of Canada to create a WMO Global Cryosphere Watch. The congress requested the Task Group on IPY to establish a group to prepare recommendations for GCW development.

A legacy of IPY

A component of WIGOS

A contribution to GEOSS

The WMO Executive Council panel on Polar Observations, Research, and Services (EC-PORS) oversees GCW.
GCW MISSION

GCW will provide authoritative, clear, and useable data, information, and analyses on the past, current and future state of the cryosphere.

GCW will include observations, monitoring, assessment, product development, prediction, and research.

GCW is not assuming the mandate of any of its partners or collaborators. Instead, GCW enables partners/collaborators to exercise their mandate effectively.
Global Cryosphere Watch
First Implementation Workshop
21-25 November 2011 Geneva

EC PORS/GCW Task Team: Jeff Key; Árni Snorrason; Hans-Wolfgang Hubberten; Karl A. Erb; Eric Brun; Xiao Cunde; Barry Goodison

Nations
• Austria, Switzerland, Germany, France, UK, Finland, Norway, Iceland, Tajikistan, Russian Federation, China, Japan, Canada, USA, Argentina, New Zealand,

“Agencies”
• WMO, ECMWF, GPCC, BAS, IACS, IASC, AWI, NSIDC, universities, NIWA, WGMS, Norwegian Computing Center and Space Center, Arctic and Antarctic Research Institute, Agency for Marine-Earth S&T, SVALI, GTN-P & G, CliC, CIMG, plus NMHs

Partnership and Collaboration is Essential
The WMO Executive Council expert panel on Polar Observations, Research, and Services (EC-PORS) oversees GCW.
Task Teams

- CryoNet Team
- Requirements and Capabilities Team
- Infrastructure and Practices Team
- Products Team
- Portal Team
- Outreach Team

The *CryoNet Team* will establish the surface-based network of sites. It will define types of surface sites. It will develop formal procedures for establishing the GCW network.
What is GCW doing?

- developing a **network of surface observations** called "CryoNet", which builds on existing networks;
- developing **measurement guidelines** and best practices;
- refining **observational requirements** for the WMO Rolling Review of Requirements;
- engaging in, and supporting, **intercomparison of products**, particularly satellite products;
- assessing snow cover products through the **GCW Snow Watch** project;
- creating **unique products**, e.g., the SWE Tracker, in collaboration with partners;
- engaging in **historical data rescue** (e.g., snow depth);
- building a **snow and ice glossary**;
- developing international training and outreach materials;
- providing **up-to-date information on the state of the cryosphere**;
- providing **access to data** through a portal;
- co-sponsoring workshops.
General objective of CryoNet:

- Provide a comprehensive network of cryospheric in-situ observations using standardized procedures as well as enabling a related framework of network-services according to user needs.

Specific objectives include:

- Linking different cryospheric observational networks to achieve its comprehensive potential
- Extensive monitoring of cryosphere
- Providing cryo-data for improved process understanding
- CAL/VAL for cryospheric models
- Link cryo ground truth observations to satellite data
- Training for cryo-observations
- Standardized guidelines for cryo-observations
GCW coordination: Develop CryoNet

Concordia Station, Antarctic
CryoNet Structure

- **Three classes** of observational sites:
  
  - **Baseline Sites**
    - Single sphere
    - Standardized
  
  - **Reference Sites**
    - Single sphere
    - Long-term
    - Cal/Val
    - Standardized
    - Long-term financial commitment
  
  - **Integrated Sites**
    - Multi sphere
    - Cal/Val
    - Strong research focus
    - Training
    - Onsite staff
    - Standardized
    - Long-term financial commitment

- Over 80 sites have been suggested, e.g., Sodankylä, China, Sonnblick, IASOA(S), Svalbard
- Site capabilities are being surveyed and site type; measurement standards and practices – Existing documents being evaluated
GCW coordination: Measurement standards and practices

“IUGG urges snow and ice scientists, practitioners, and scientists from related disciplines to adopt these new schemes as standards.”
**GCW coordination:**

**Observational requirements**

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**Variable: Sea-ice cover**

**Definition**

- **Full name:** Sea-ice cover
- **Definition:** Fraction of an ocean area where ice is present
- **Measuring Units:** %
- **Uncertainty Units:** %
- **Horizontal Res Units:** km
- **Vertical Res Units:** N/A

**Classification**

- **Domain:** Ocean
- **Theme:** Ocean and sea ice
- **Variable:** Sea-ice cover
- **Measured in Layers:** Surf/sea

**Used in Application Areas:**

- CLIG
- CLIMAP
- Climate Modelling
- Research
- Global NWP
- Climate - GCOS
- High Res NWP
- Hydrology
- Newcastle
- Ocean Applications
- Climate-GOOS

**Comment:** N/A
**Last modified:** 2011-08-08

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**Requirements defined for Sea-ice cover (11)**

This table shows all known Requirements defined for this variable area. For more operations/export, please go to the main Requirements page.

*Note: in reading the values, goal is marked Likely breakthrough and threshold when Applicable.

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<th>Resolution</th>
<th>Vertical Resolution</th>
<th>Observing Cycle</th>
<th>Availability</th>
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GCW coordination: Integration across observing systems
GCW coordination: Authoritative Products

- Routine evaluation of products
- Product intercomparisons
- Self-assessments of maturity, etc.
- Products meet user needs
- Sustainable product development and production
- Transfer from research to operations
Outcomes/Actions:

- Improve real time flow and access to in situ snow measurements
- Initiate a satellite snow products evaluation/intercomparison activity
- Development of hemispheric "snow anomaly trackers" for SE and SWE
- Develop inventory of existing snow datasets
- Initiate activity to standardize snow-related nomenclature, and promote standards and best practices as a contribution to CryoNet
SWE Tracker:
Total Snow Mass for NH, excluding Mountains

**Average snow mass from GlobSnow SWE v1.3 (years 1982-2012)**
- ±1 SD from GlobSnow SWE v1.3 (years 1982-2012)
- Snow mass for 2013, based on GlobSnow NRT SWE v1.3
- Latest observation: 01 May 2013
The **GCW web portal** will provide the ability to exchange cryosphere data, metadata, information and analyses among a distributed network of providers and users in support of informed decision-making.

**Facilitating Knowledge to Action**

**Data quality, sharing and access are fundamental principles**
- improve access to, and utilization of observations and products from WMO and other observing systems and from national and international data centres
- **built using the principles developed for IPY2007-2008.**
- facilitates the interaction between users and providers of the products
- uses WIS, INSPIRE, GEOSS protocols
The website differs from the METNO GCW data portal in that it contains more dynamic information (news, state of the cryosphere plots, highlights, calendar), as well as background, higher-level information, GCW documents, and outreach material. It links to the METNO data portal.

http://globalcryospherewatch.org
GCW Data Portal

http://gcw.met.no/metamod/
The purpose of the Asia CryoNet Workshop is to continue efforts in implementing CryoNet, but with an emphasis on the measurement sites, observations, and issues in Asia.

- Aims and need for CryoNet
- Classification of the CryoNet station network
- Selection procedure of CryoNet stations
- Measurement standards
- Data policy within CryoNet
- Suggest showcase projects for CryoNet
- Sustainability of CryoNet sites