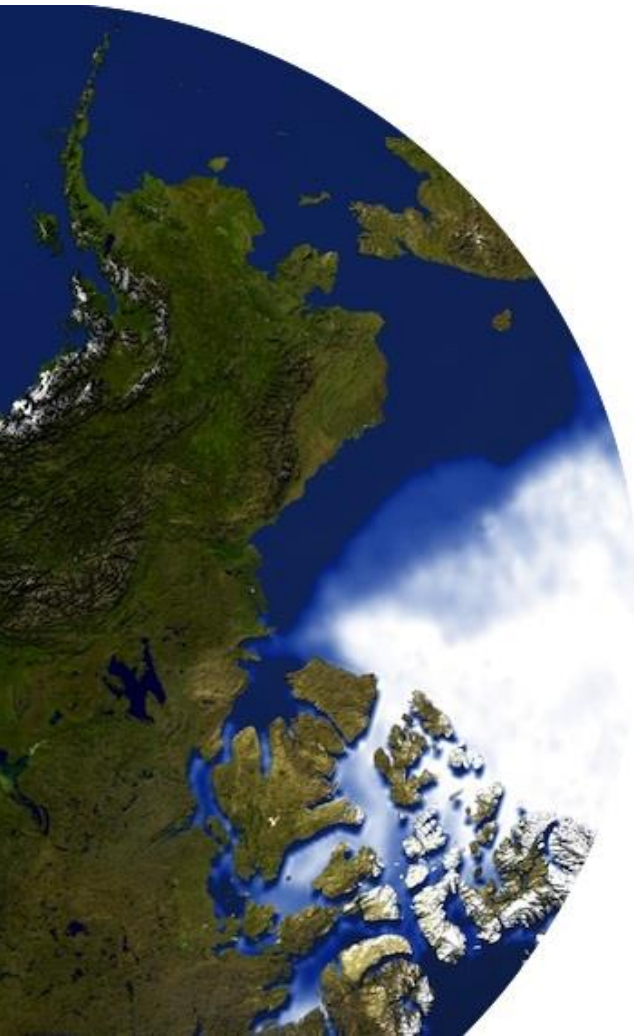


# The Global Cryosphere Watch

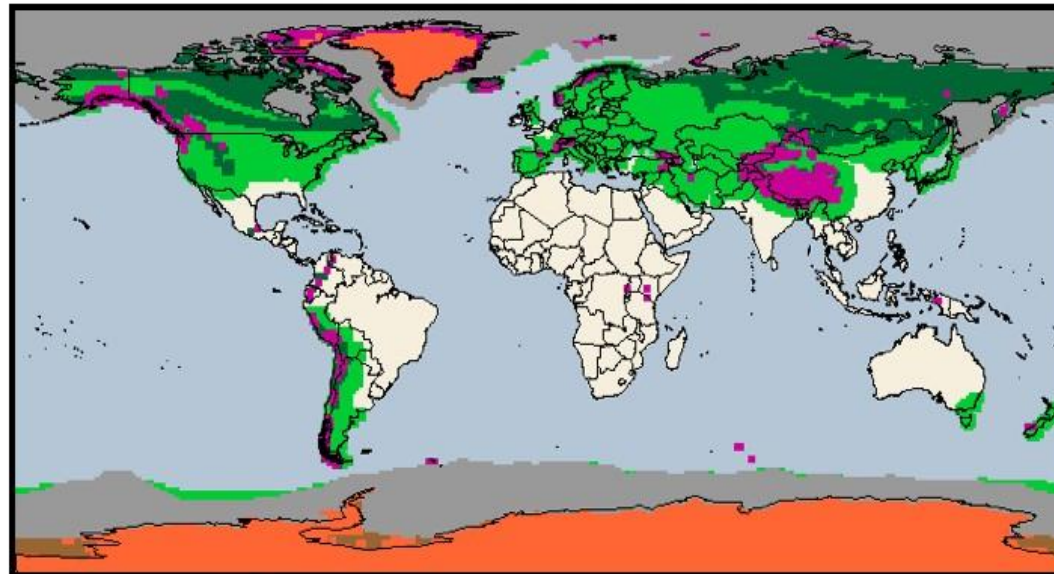
Jeff Key

*NOAA/NESDIS, Madison, Wisconsin USA*





### Global Cryosphere by Type



Glacier 

Ice Sheets 

Ice Shelves 

Sea Ice 

Permafrost 

Snow Cover 



# 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.

**CRYOSPHERE  
THEME  
REPORT**



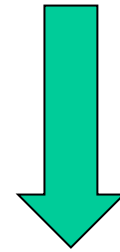
For the Monitoring of our Environment from Space and from Earth



**2007**

An international partnership for  
cooperation in Earth observations

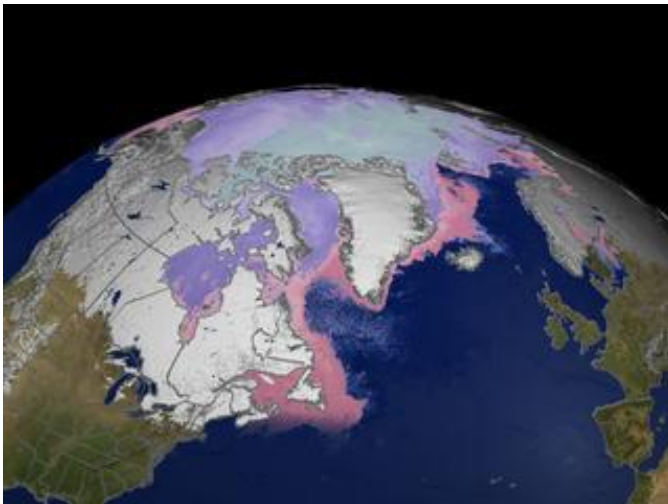
# ***The IGOS Cryosphere Theme (2007)***



***Global Cryosphere Watch***

# The Global Cryosphere Watch (GCW)

The 16<sup>th</sup> WMO Congress (2011) agreed that *“WMO needs to have a focus on global cryosphere issues to be able to provide authoritative information to meet Members’ responsibilities on regional and global weather, climate, water and related environmental matters”* and decided to embark on the development of the Global Cryosphere Watch (GCW), **as an IPY Legacy**, with a view of an operational GCW.



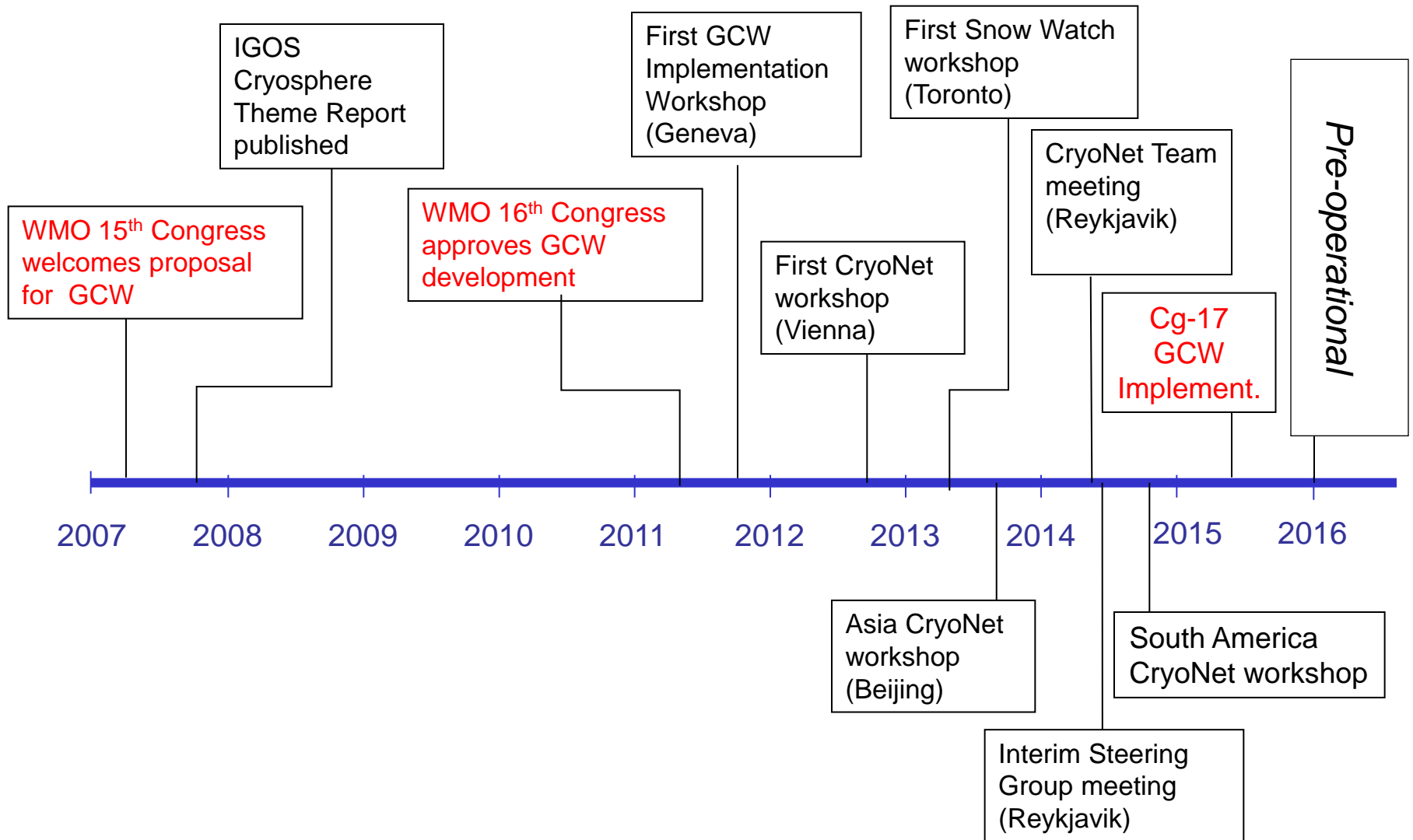
# Global Cryosphere Watch – Mission & Objectives

**Mission:** *GCW will provide authoritative, understandable, and useable data, information, and analyses on the past, current and future state of the cryosphere to meet the needs of WMO Members and partners in delivering services to users, the media, public, decision and policy makers.*

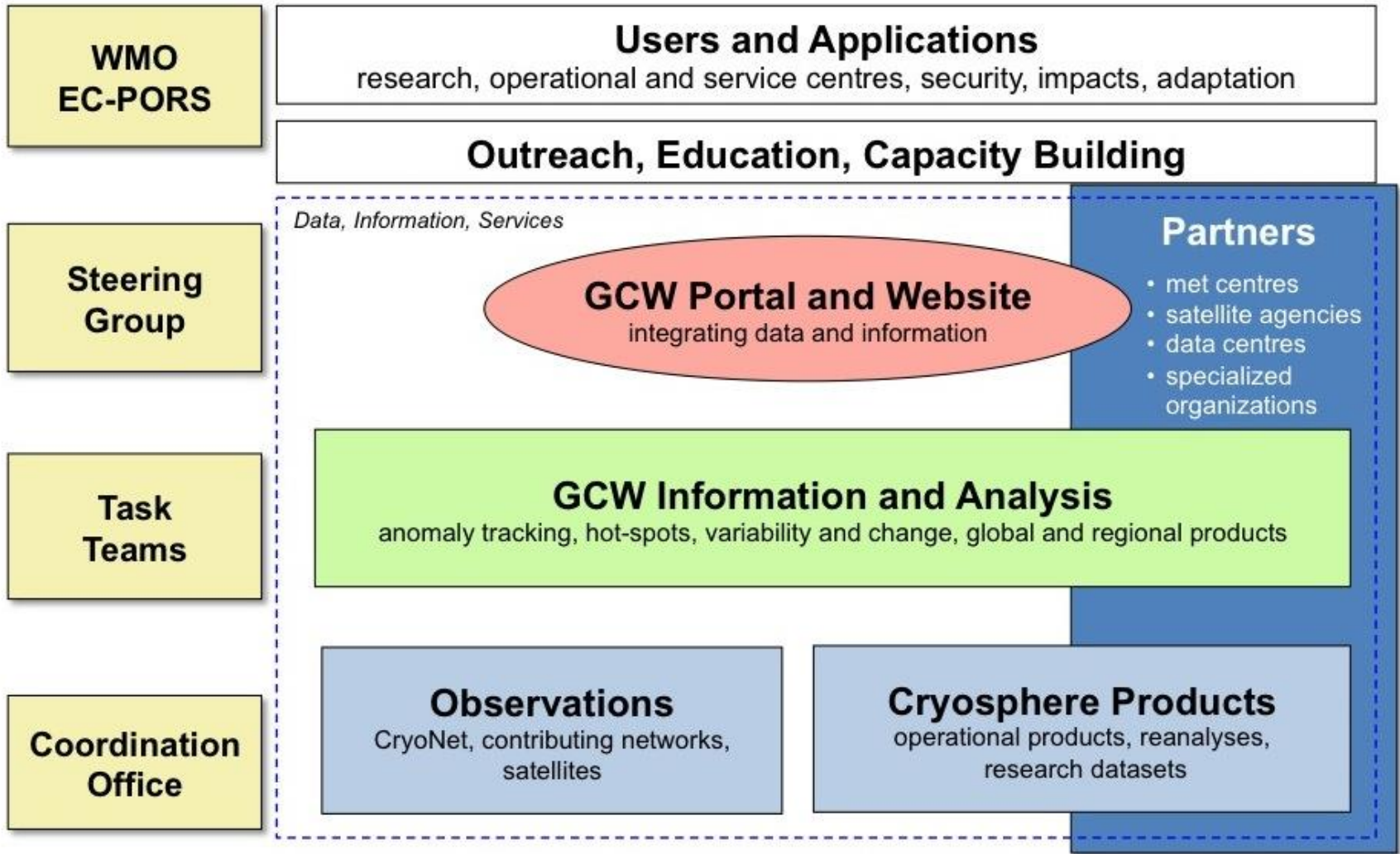
## **GCW will:**

- Implement the IGOS (Integrated Global Observing Strategy) Cryosphere Theme (CryOS);
- **Facilitate reliable, comprehensive observations through an integrated observing approach 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;
- Facilitate the assessment of changes in the cryosphere and their impact; 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 – meet user needs.

# GCW Development History



# Organization: GCW Conceptual Framework



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



# 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, **intercomparisons of products**, e.g., the **GCW Snow Watch** project;
- contributing to WMO's space-based capabilities database (with PSTG);
- 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.

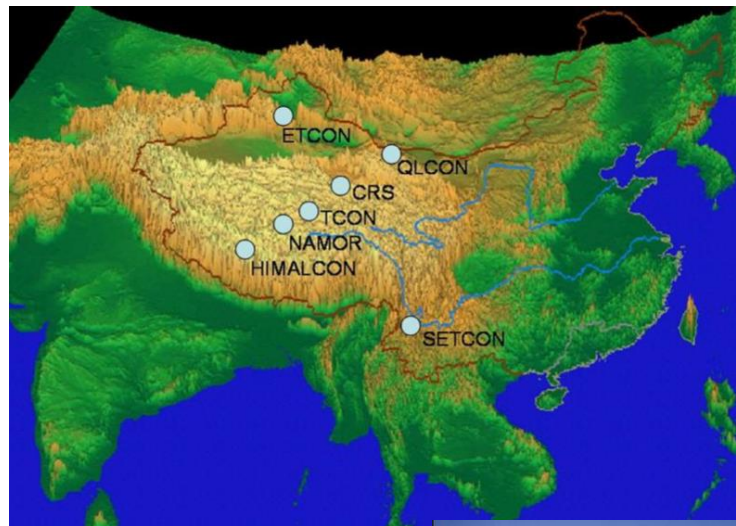
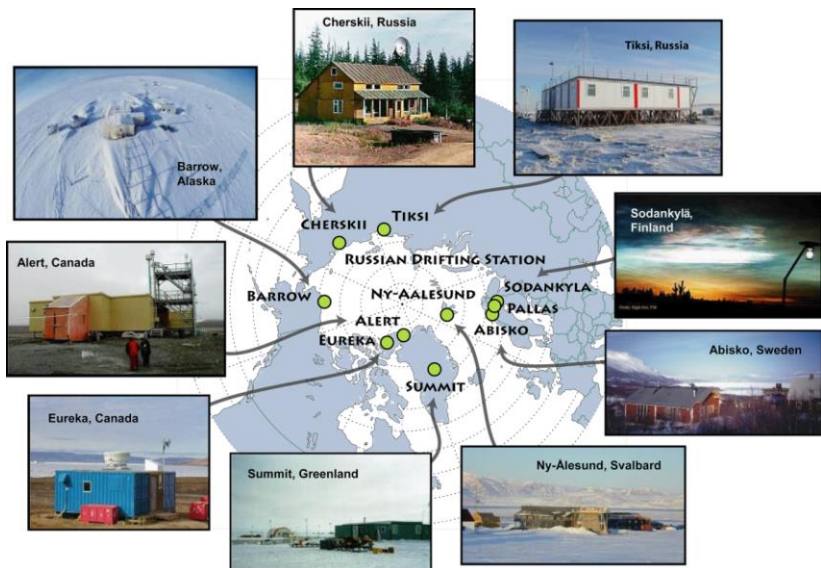
# CryoNet – the core GCW Network

*...an immediate priority in GCW development.*

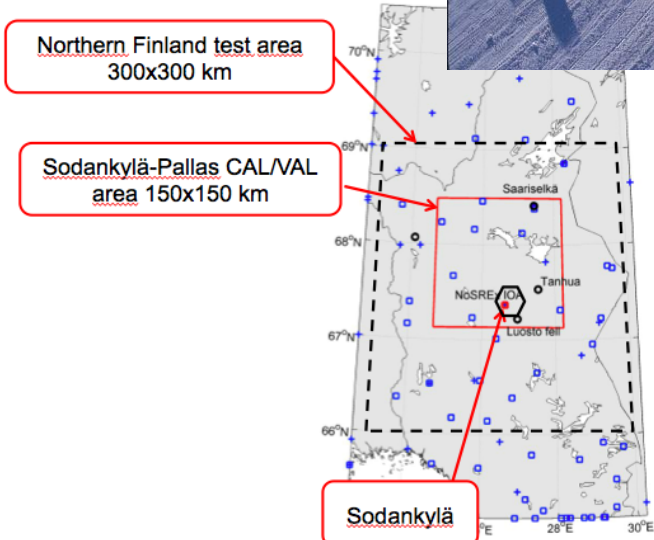
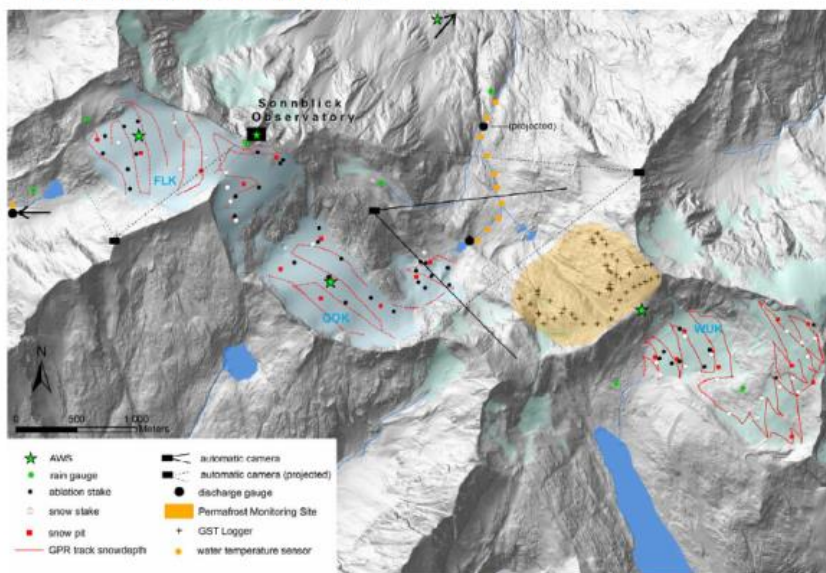
- Establish the core network of GCW surface measurement sites – **CryoNet**.
- CryoNet is one part of the whole **GCW observing system**, which is a component observing system of the WMO Integrated Global Observing System (**WIGOS**).
- CryoNet covers **all components of the cryosphere** (glaciers, ice shelves, ice sheets, snow, permafrost, sea ice, river/lake ice) through an extensive approach of **in-situ** observations.
- CryoNet is initially comprised of **existing stations/sites**, rather than creating new sites.



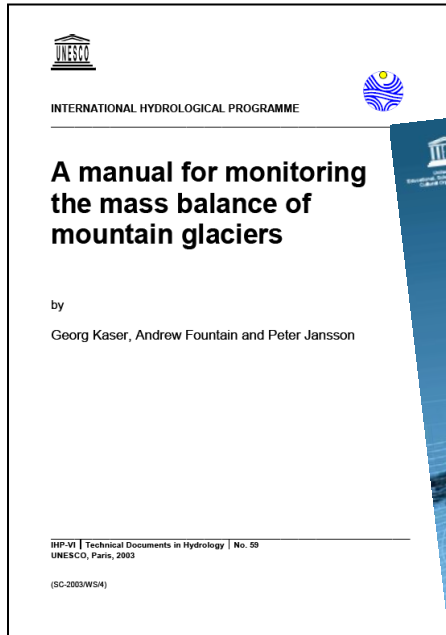
# GCW CryoNet



## SONNBLICK network:



# Measurement standards and practices



WORLD METEOROLOGICAL ORGANIZATION

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## TECHNICAL REGULATIONS

General M  
Rec

Basic Documents No. 2

**WMO - No. 49**

Secretariat of the World Meteorological Organization – Geneva – Switzerland  
1988

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

# Requirements and Capability for observations

- GCW Requirements are **being** formulated and documented on the GCW website;
- They will **draw** from various sets of existing user requirements and will be vetted by the scientific community;
- Those requirements will become part of the WMO **Rolling Review of Requirements (RRR)**;
- Will be accessible through the Observing Systems Capability Analysis and Review Tool (**OSCAR**), the official source for WMO requirements, which has a cryosphere theme;
- Need for a new application area “GCW”.**



## Observational Requirements

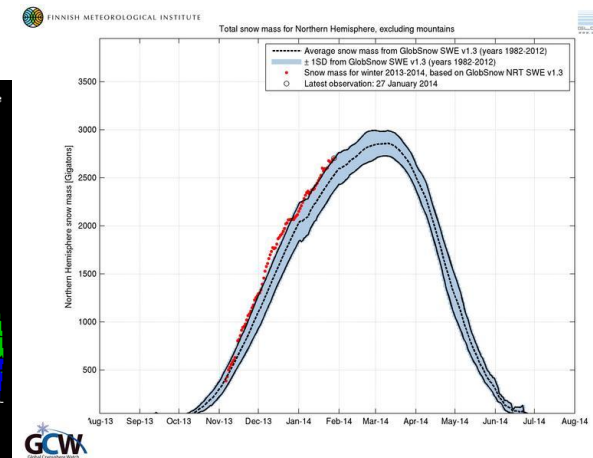
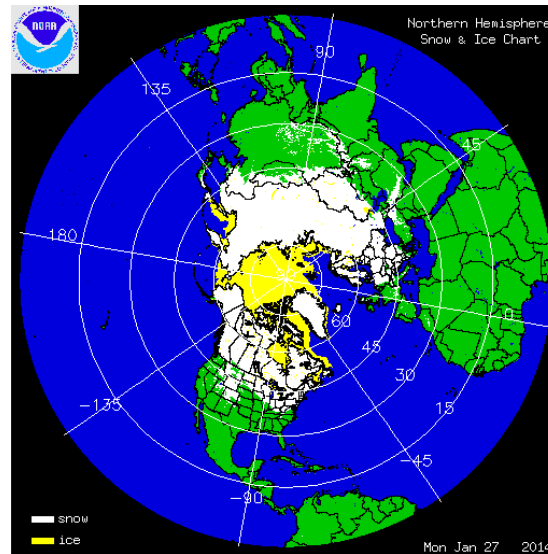
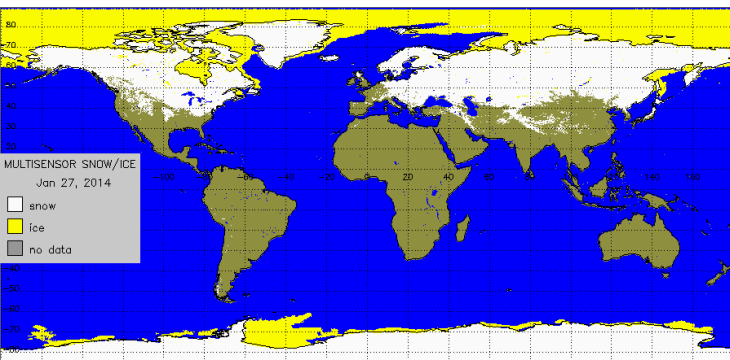
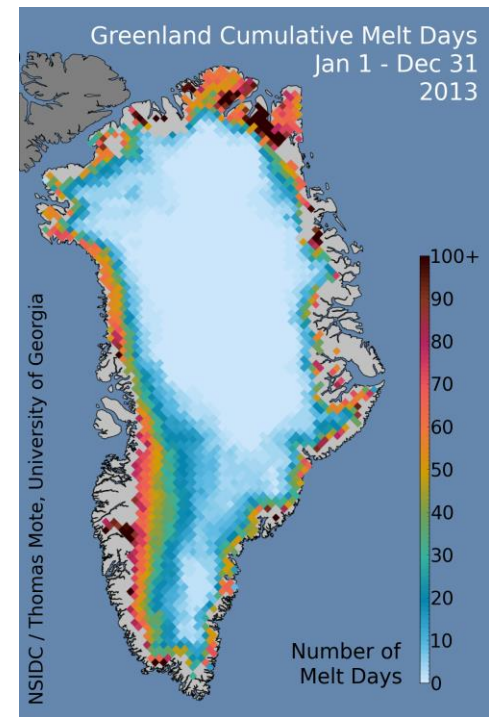
GCW observational requirements are being formulated. They will draw from various sets of existing user requirements and will be vetted by the scientific community. They will become part of the WMO Rolling Review of Requirements (RRR) and will be accessible through the [Observing Systems Capability Analysis and Review Tool \(OSCAR\)](#), which has a [cryosphere theme](#). **OSCAR is the official source for WMO requirements.** The [IGOS Cryosphere Theme Report](#) (see [Documents](#)) contains the most comprehensive set of observational capabilities and requirements for the cryosphere. It is the starting point for GCW. The IGOS and OSCAR cryosphere requirements are given below. *Click the **Filter Options** button to filter the results.* Each entry in the table gives the **current measurement capability** in green, the **threshold requirement (minimum necessary)** in blue, and the **objective requirement (target)** in orange, if available.

### Filter Options

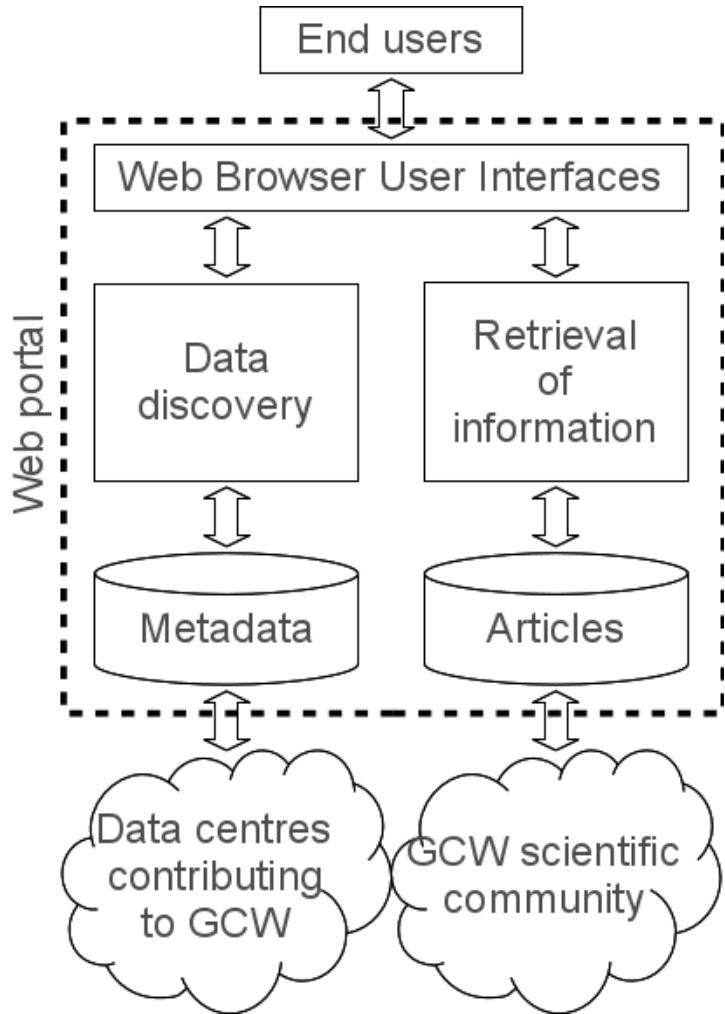
Variable	Element	Application Area	Special Conditions	Measurement Range, Low	Measurement Range, High	Uncertainty	Spatial Res	Temporal Res	Timeliness	Source
Ice thickness	Sea ice	CLIC		-	-	-	-	-	-	WCRP (OSCAR)
				-	-	200 cm	500 km	30 day	90 day	
				-	-	100 cm	200 km	7 day	30 day	
Ice thickness	Sea ice	IGOS	Climate	0 m	10 m	0.5 m	0.5 km	0.5 year	-	IGOS 200
				0 m	10 m	-	0.5 km	-	-	
				0 m	10 m	0.1 m	25 km	1 month	-	
Ice thickness	Sea ice	IGOS	Operational	0 m	10 m	10%	0.5 km	1 week	-	IGOS 200
				0 m	10 m	-	-	-	-	
				0 m	10 m	10%	0.5 km	1 day	-	
Ice thickness	Sea ice	Global NWP		-	-	-	-	-	-	John Eyrn (OSCAR)
				-	-	100 cm	250 km	30 day	30 day	
				-	-	20 cm	15 km	1 day	24 hour	
Ice thickness	Sea ice	High Res NWP		-	-	-	-	-	-	T Montmer (OSCAR)
				-	-	100 cm	40 km	2 day	3 day	
				-	-	20 cm	2 km	12 hour	12 hour	
Ice thickness	Sea ice	Climate-OOPC		-	-	-	-	-	-	OOPC (OSCAR)
				-	-	1 cm	500 km	7 day	24 day	
				-	-	0.1 cm	100 km	1 day	24 hour	
Ice motion	Sea ice	IGOS	Climate	0 km day <sup>-1</sup>	100 km day <sup>-1</sup>	5 km day <sup>-1</sup>	25 km	1 day	-	IGOS 200
				0 km day <sup>-1</sup>	100 km day <sup>-1</sup>	3 km day <sup>-1</sup>	25 km	1 day	-	
				0 km day <sup>-1</sup>	100 km day <sup>-1</sup>	1 km day <sup>-1</sup>	1 km	1 day	-	
Ice motion	Sea ice	IGOS	Operational	0 km day <sup>-1</sup>	100 km day <sup>-1</sup>	0.5 km day <sup>-1</sup>	1 km	3 day	-	IGOS 200
				0 km day <sup>-1</sup>	100 km day <sup>-1</sup>	3 km day <sup>-1</sup>	25 km	1 day	-	
				0 km day <sup>-1</sup>	100 km day <sup>-1</sup>	0.5 km day <sup>-1</sup>	0.1 km	1 day	-	

# Other Products and Services

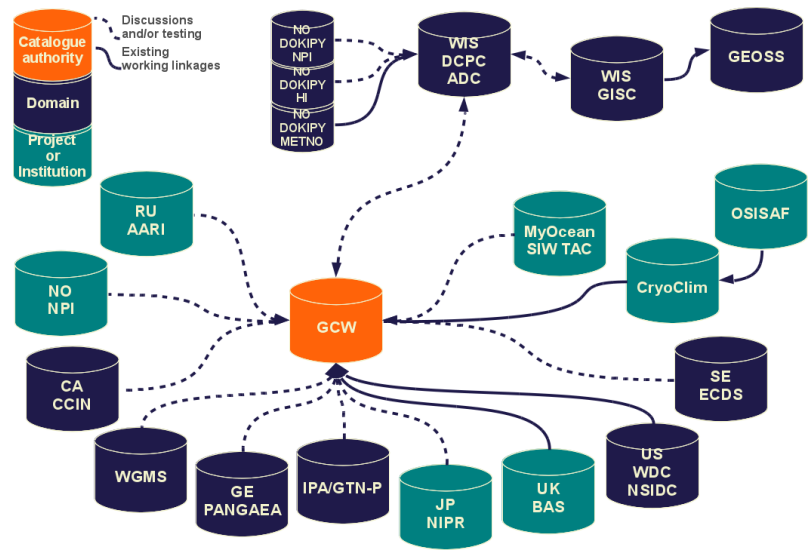
- Identification and development of initial products
- Development of hemispheric snow "anomaly" trackers for snow cover & SWE
- An inventory of snow datasets
- Product intercomparison:
  - Snow intercomparison project
  - ESA SnowPEX
- Glossary



# Portal and Website



<http://gcw.met.no>



root page World Meteorol... Google Translate WIGOS TT-WRM Mindfulness Bell

Global Cryosphere Watch

Search for GCW datasets

Metadata search  
View Basket (0)  
Help  
Subscription  
login

Current search (Clear all)  
Topics and variables  
Institutions  
Areas  
Map search  
Datacollection period  
Text  
Search

# Portal and Website

- About GCW – impact, framework
- GCW News
- Cryosphere now - products
- CryoNet – site requirements, practices
- Activities – mtgs, projects
- Outreach – forum, video
- References – Glossary, acronyms, GCW documents

The screenshot shows the Global Cryosphere Watch website homepage. At the top, there is a blue header with the WMO logo and the text "Global Cryosphere Watch". Below the header is a navigation menu with links for Home, About, News, Cryosphere Now, CryoNet, Data, Activities, Outreach, Reference, and a search box. The main content area is divided into several sections:

- Highlights:** Features the GCW logo and a welcome message: "Welcome to the Global Cryosphere Watch website! GCW is evolving, so please check back periodically for additional information on GCW projects, CryoNet stations, and the *Cryosphere Now*." Below this is a section titled "GCW website is now live!" with a row of small thumbnail images.
- The Cryosphere Now:** A central section featuring a polar projection map of Antarctica. To the left of the map is a vertical menu with categories: Sea and Freshwater Ice, Snow and Solid Precip, Glaciers & Ice Caps, Ice Sheets, Permafrost, Atmosphere, and Satellite Products. The map is dated "Aug 25 2013 Antarctic" and shows ice concentration percentages.
- Cryosphere in the News:** A sidebar on the right containing several news snippets with titles and dates, such as "Study finds earlier peak for Spain's glaciers" and "Frontal ablation and temporal variations in surface velocity of Livingston Island ice cap, Antarctica".
- GCW News and Highlights:** Another sidebar on the right with news items like "Barry Goodison awarded the 2012 Patterson Distinguished Service Medal" and "The new SWE Tracker is showing anomalously high snowfall in the Northern Hemisphere this winter!".

At the bottom of the page, there is a footer with the text "Problem with website? Contact the webmaster", social media icons for Facebook and Twitter, and a statement: "This website is operated on behalf of WMO by SSEC. It is not an official WMO website." The SSEC logo is also present.

<http://globalcryospherewatch.org>



# Why be a part of CryoNet and GCW?

- Being a CryoNet site means being part of an international, operational, global observing system providing observations of known quality for research and knowledge beyond a site's local region.
- Being part of a global network not only brings better visibility, but also a recognition of the importance of the observations made at your site.
- This in turn can bring better support, either funding or logistical support.
- GCW promotes the exchange of knowledge and data, so CryoNet sites may see broader use of their data and products.

