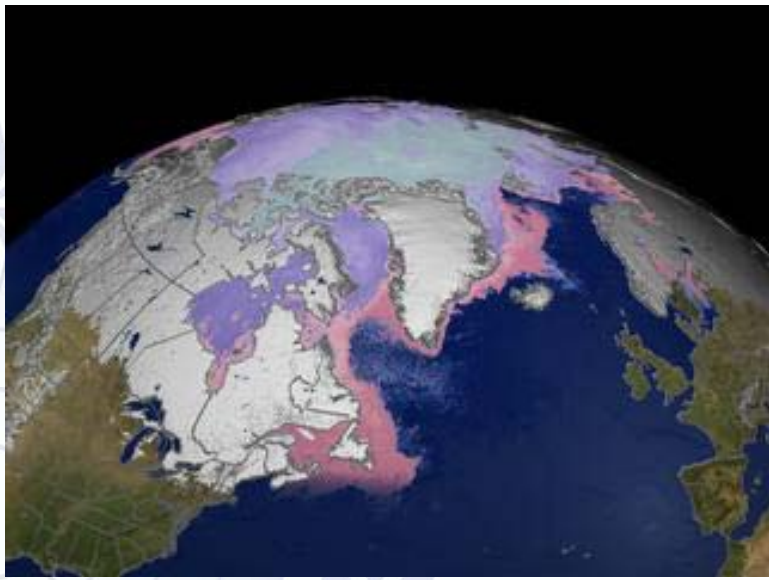
Global Cryosphere Watch (GCW):
A WMO Initiative

IICWG Meeting, Geneva, Switzerland
October 12-16, 2009

Vladimir Ryabinin (WCRP)
for Barry Goodison,
Chair, GCW Expert Team

Global Cryosphere Watch-
A WMO Initiative



A legacy of IPY

A component of WIGOS

A legacy of WCRP/CliC in the area of observations

A contribution to GCOS & GEOSS

"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."

WMO
OMM

WCRP·SCAR·IASC
CliC

Media and Policy Perspectives

Socio-economic Impacts

Observing, Monitoring, Understanding, Prediction

Inuit say spring in the Arctic is becoming more dangerous

No turning back on arctic warming

Warning for the North; Polar bears could face extinction as global climate change warms the Arctic

Melting Ice sheets, glaciers and global sea level rise

Thawing permafrost, GHG emission and coastal erosion

Farmers worried about absence of snow

Tourism at risk

Floods feared as glaciers melt

Disappearing Glaciers Menace Water Supplies

Roof collapses, Basmanny Market, Moscow

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: The Sea Ice Challenge

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

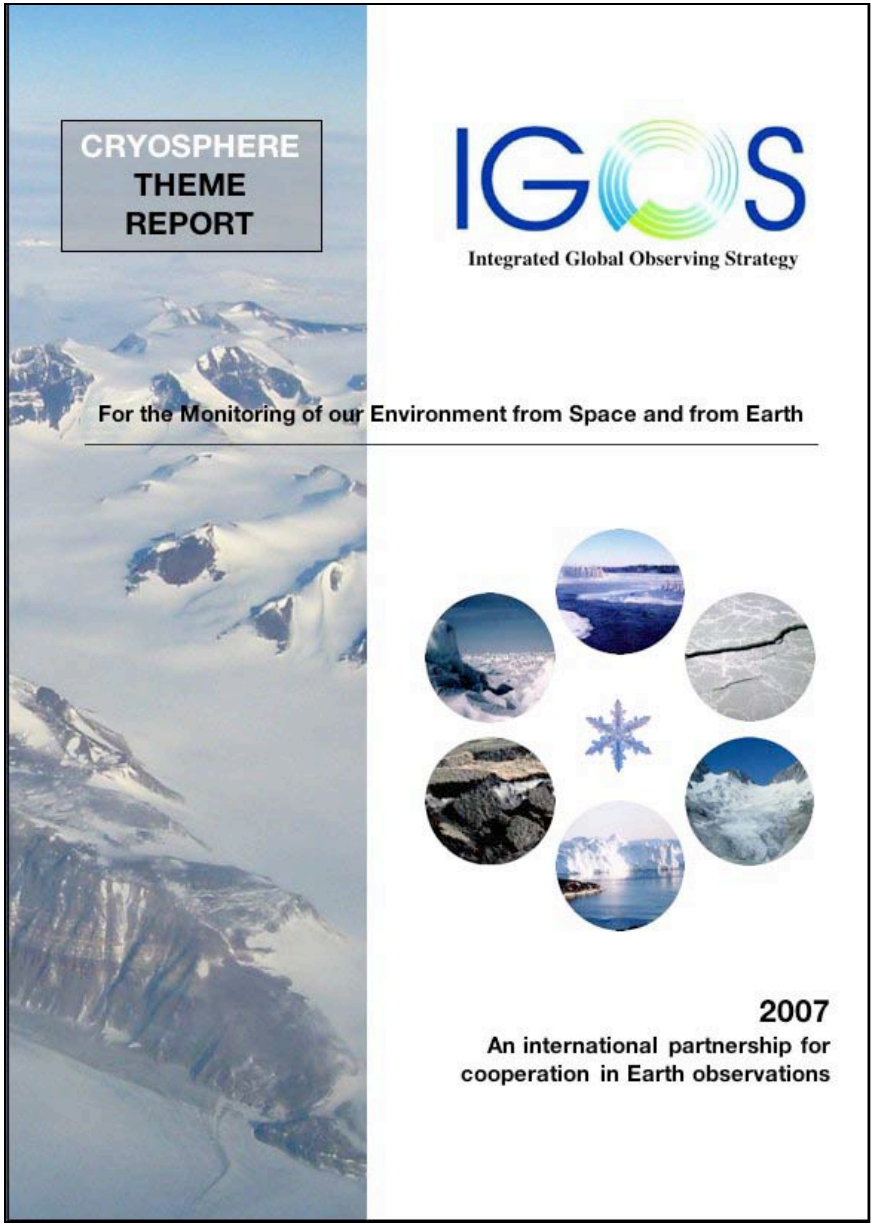
- There is strong community desire to establish a network of stations, CryoNET, working on a coherent agreed program monitoring changes in all components of the cryosphere, producing valuable long-term records, covering key areas of the globe with cryospheric observations, including sea-ice and land-fast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

- GCW 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.

- GCW will contribute to GEOSS through the implementation of CryOS and as an IPY Legacy for observation, monitoring and provision of data and information.

- 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?*

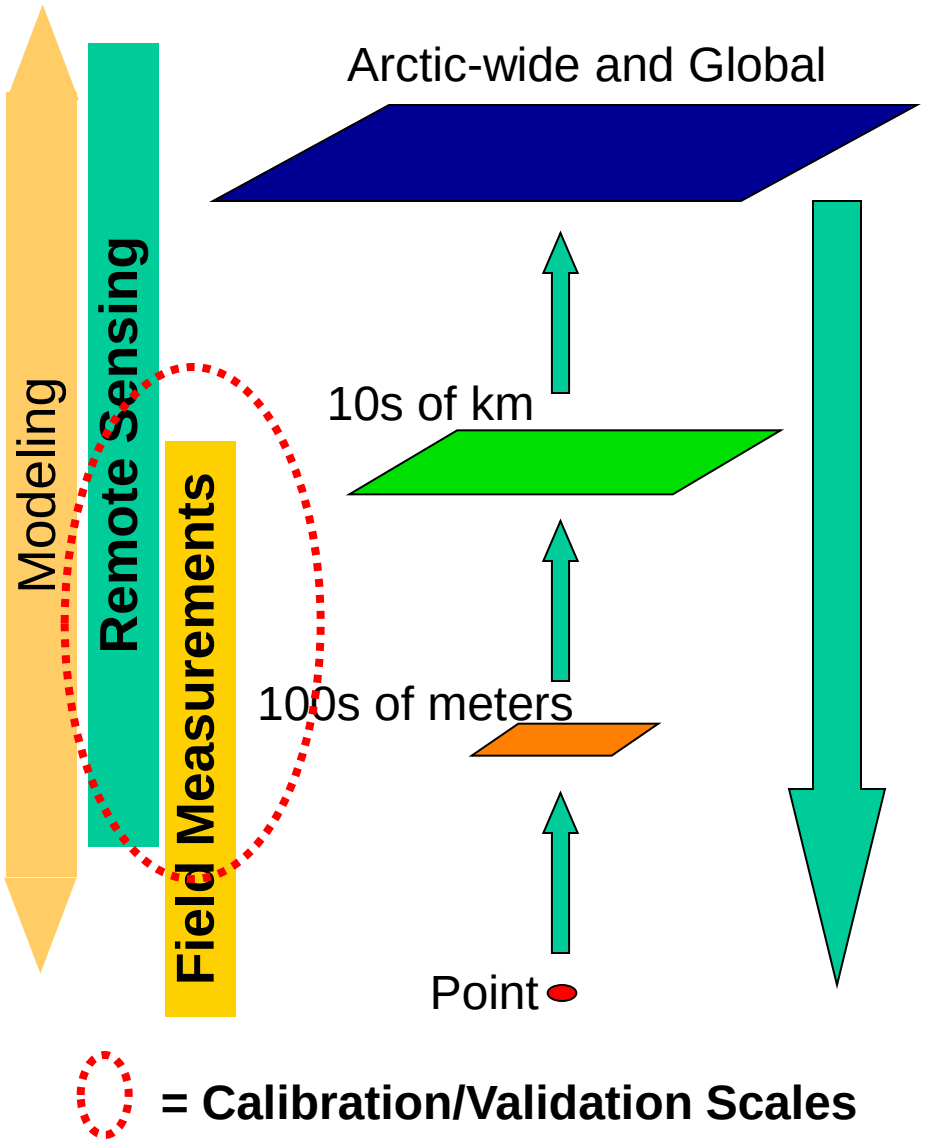


The Report

Contributions from ~80 people in 17 countries throughout the development phase.

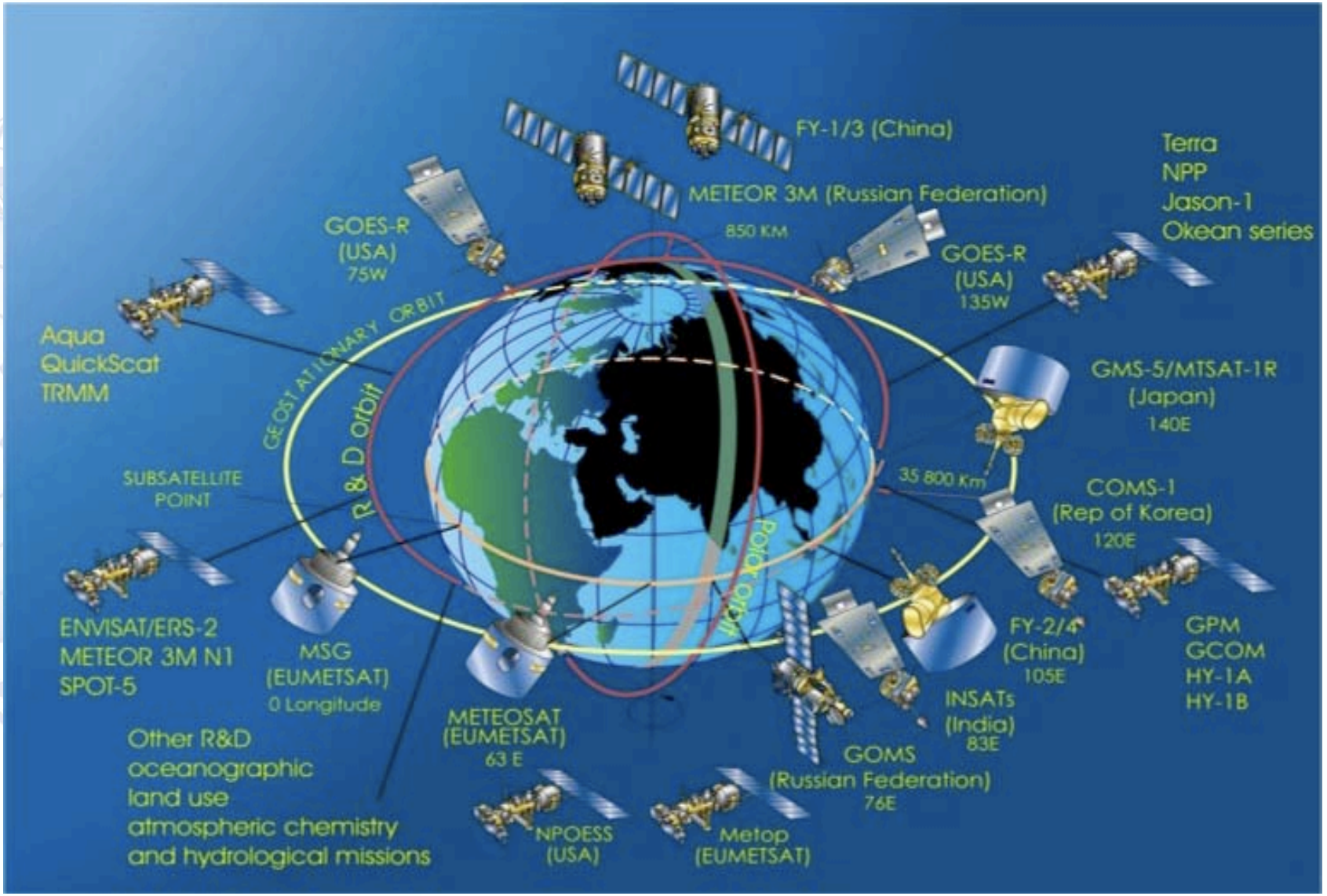
http://igos-cryosphere.org

Perspective and Scale



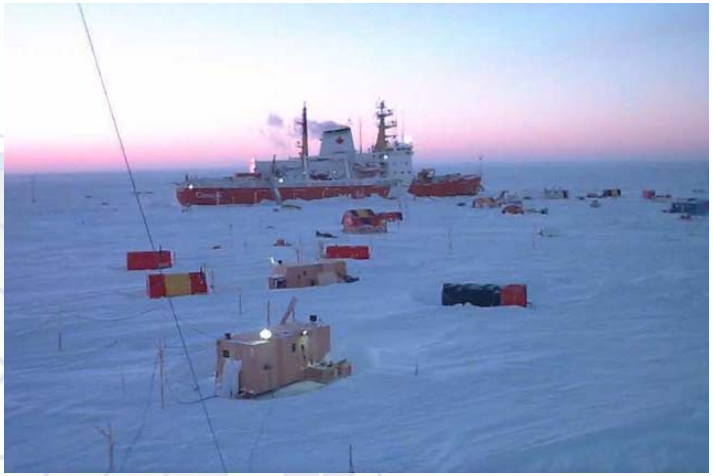
From Waleed Abdalati ICARPII

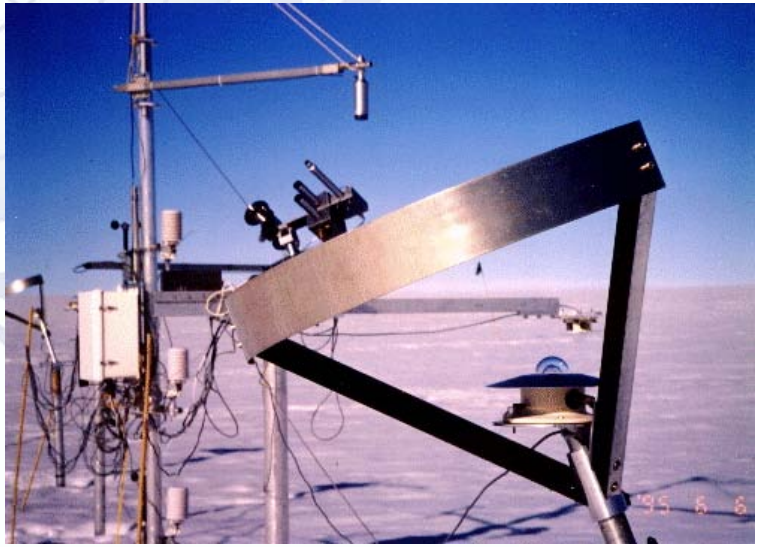
The cryosphere observing system includes satellites…

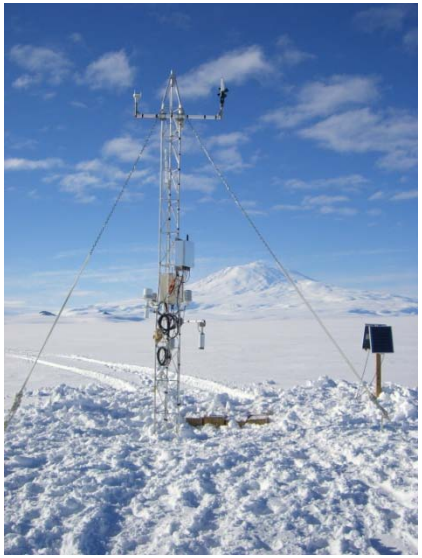


IPY
2007
2008

..... and, of course, in situ, marine and aircraft measurements.



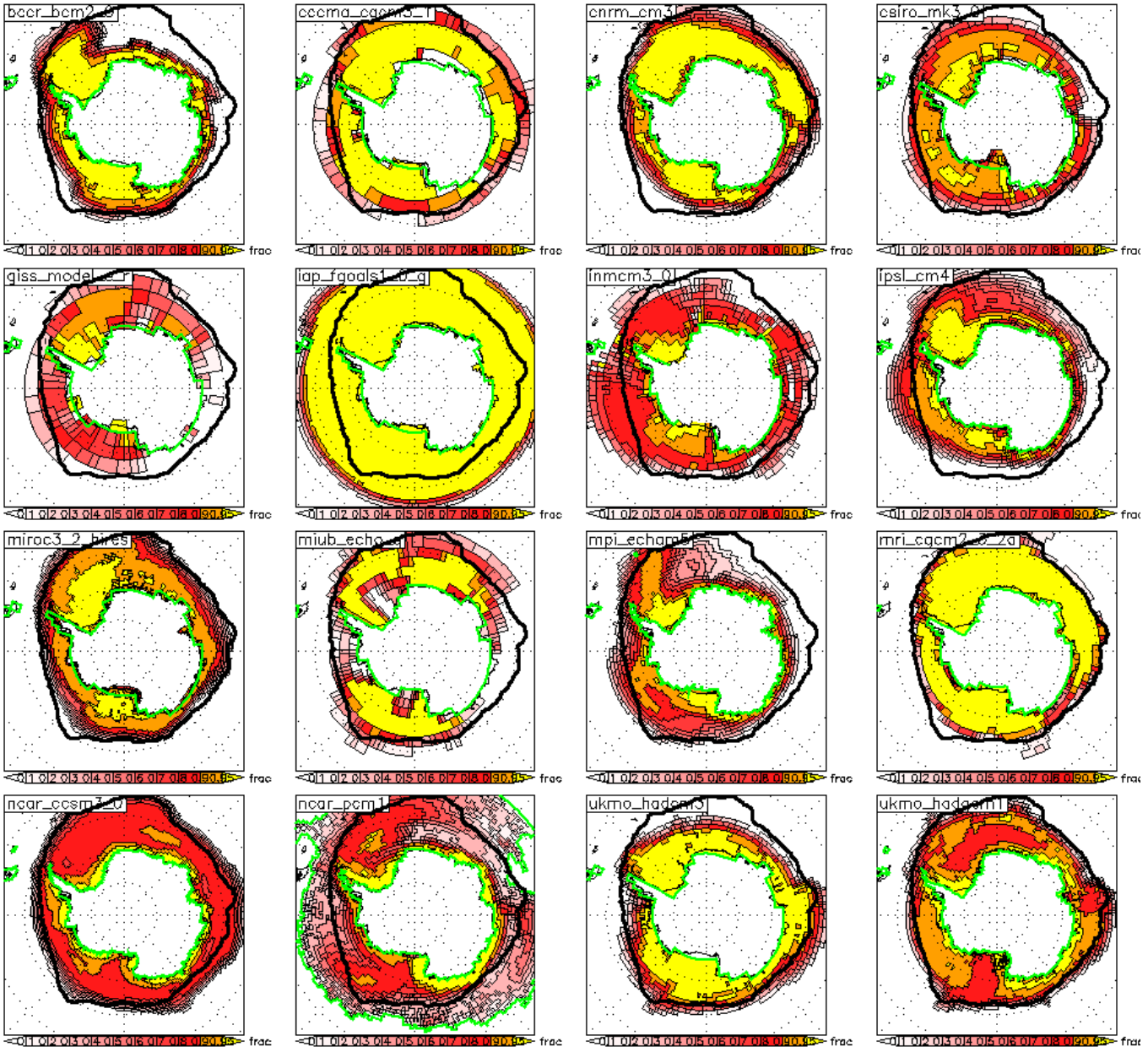


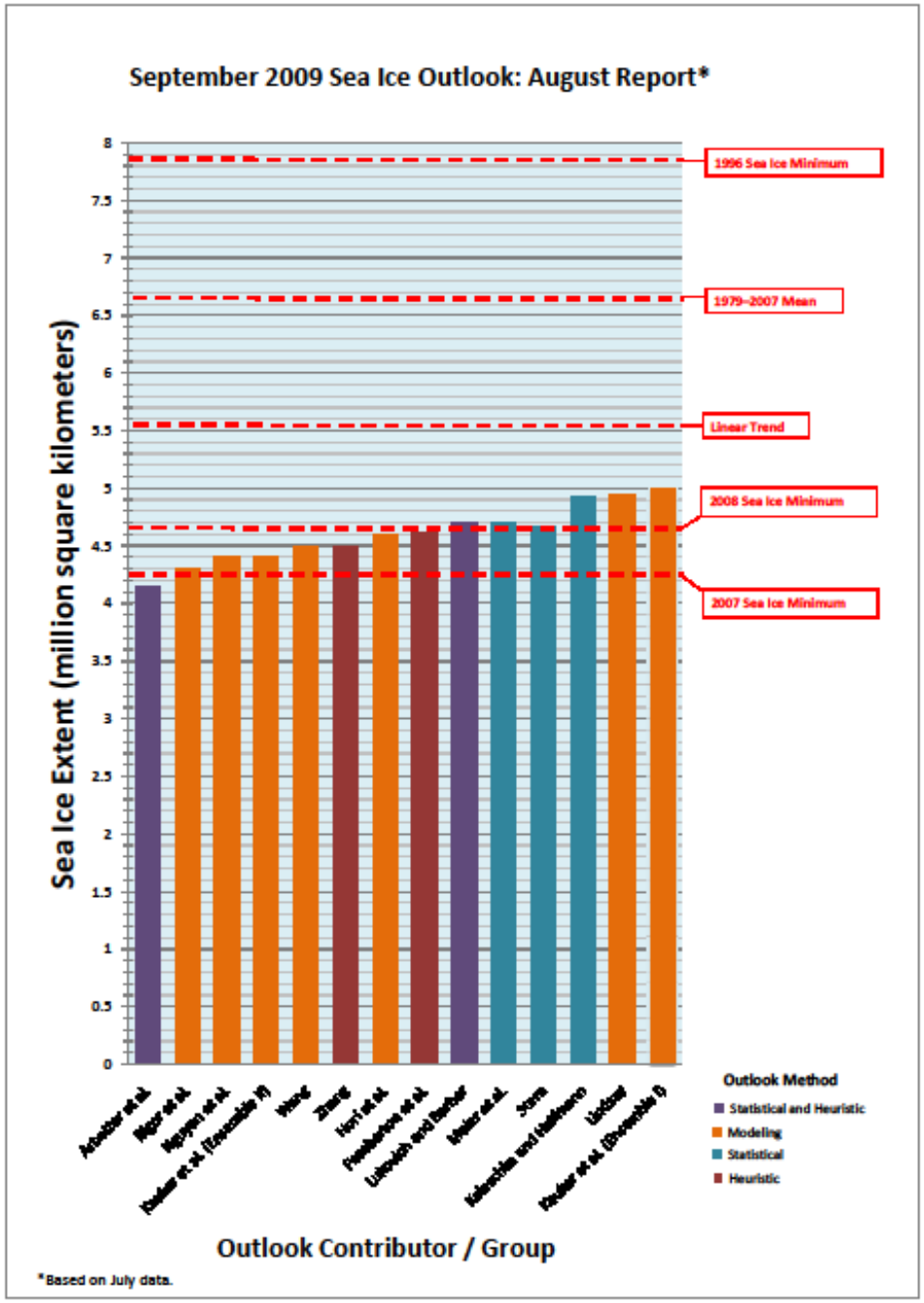


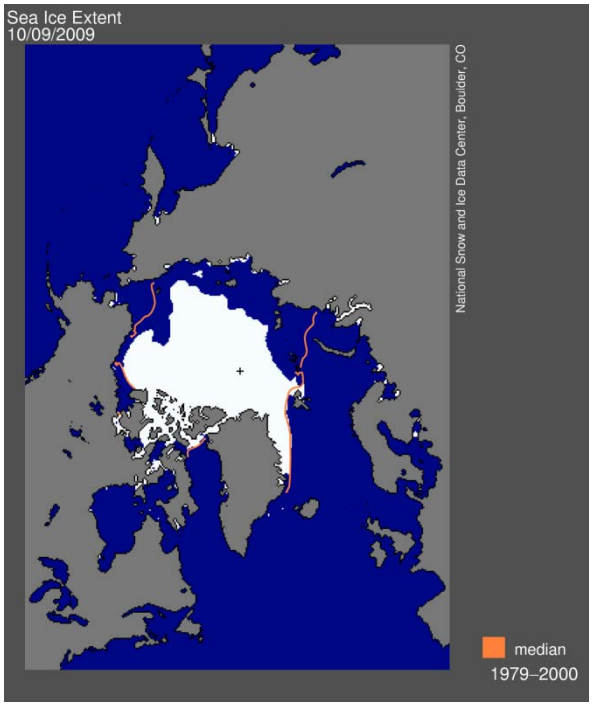
WMO
OMM

Mean sea ice concentration as simulated by the AR4 models

- September sea ice concentration (1979-2000).
- Bold line shows observed extent (Comiso).
- Large inter-model variation.




September 2009 Sea Ice Outlook: August Report*
Sea Ice Extent (million square kilometers)
8
7.5
7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
1996 Sea Ice Minimum
1979–2007 Mean
Linear Trend
2008 Sea Ice Minimum
2007 Sea Ice Minimum
Outlook Method
Statistical and Heuristic
Modeling
Statistical
Heuristic
Outlook Contributor / Group
*Based on July data.

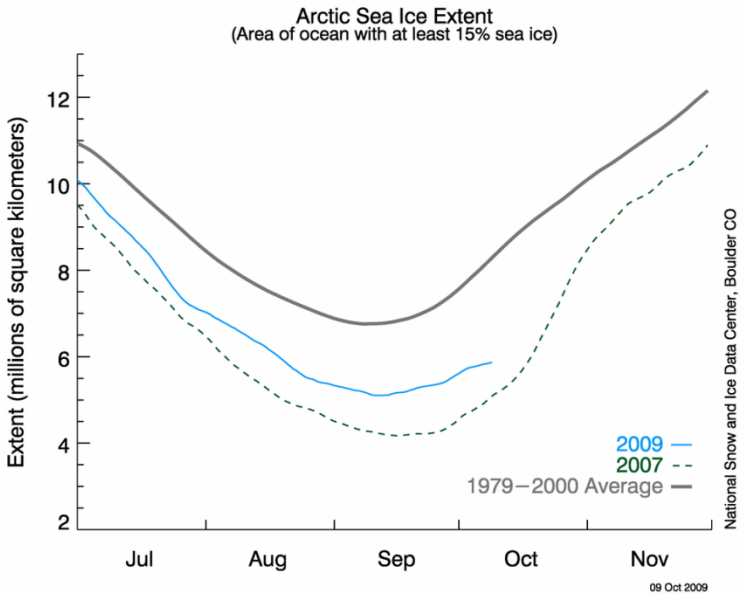


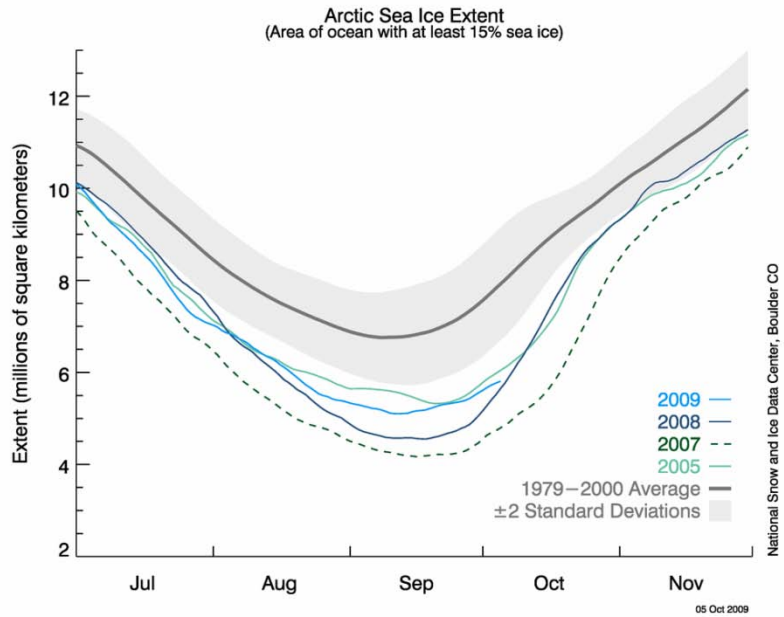
We need:

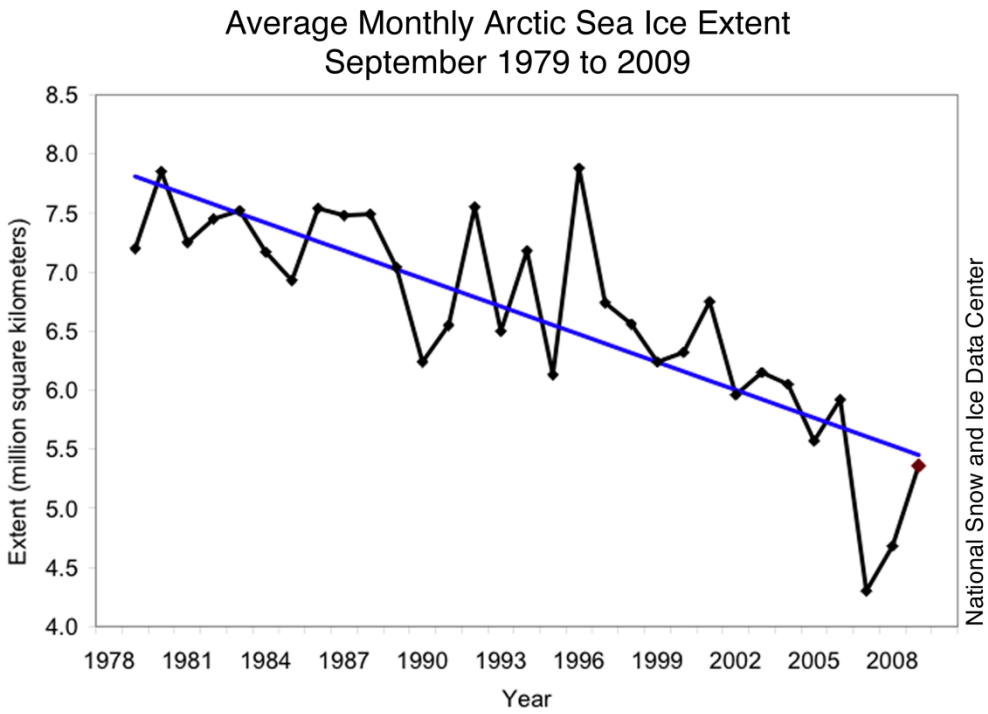
spatial information

and

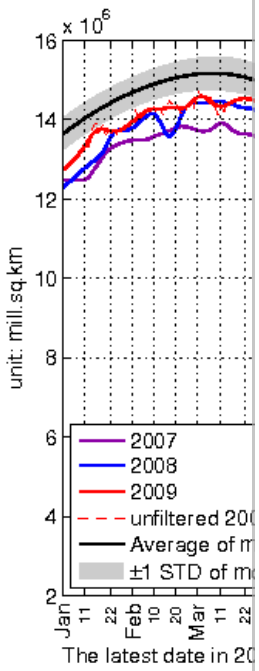
temporal information

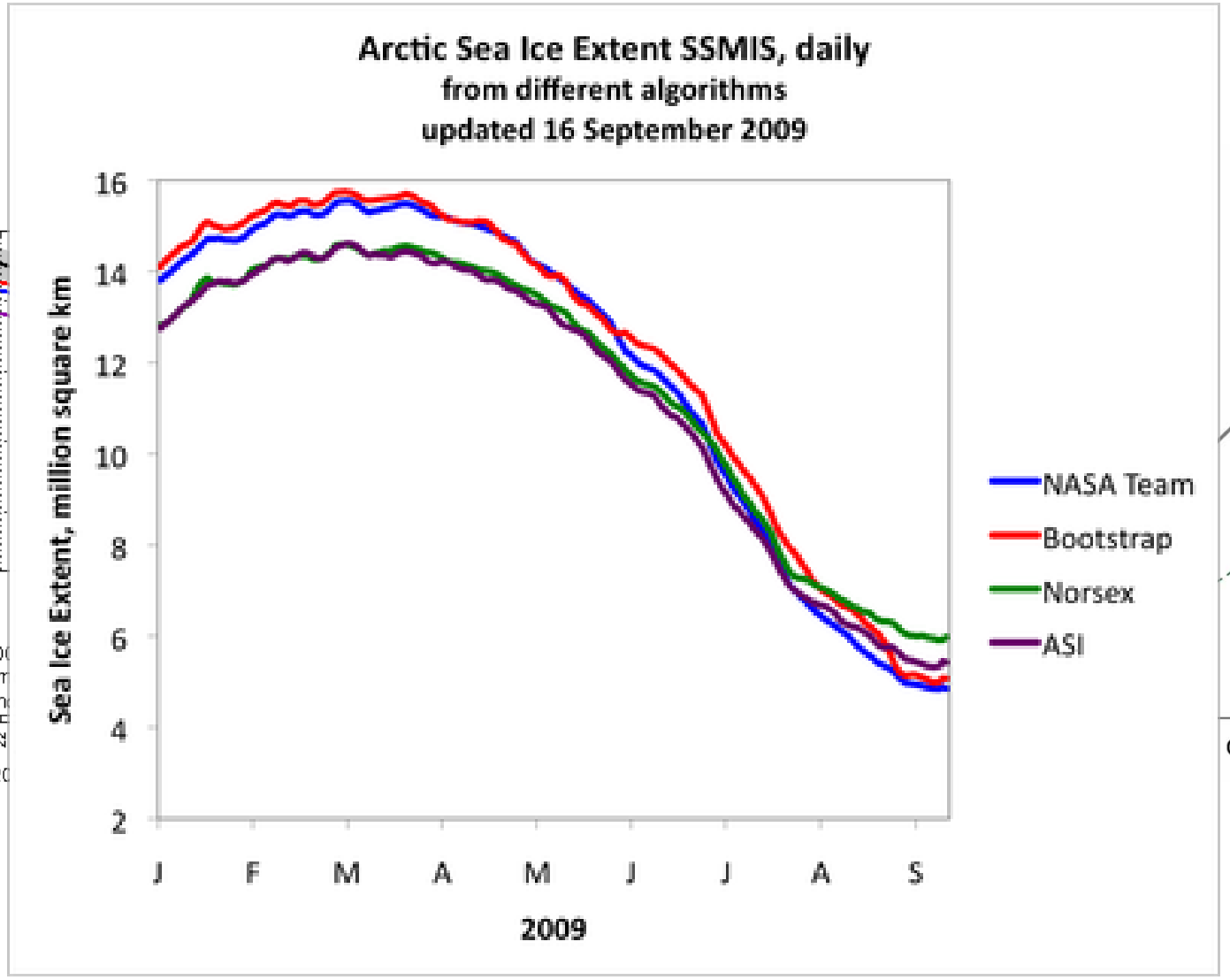


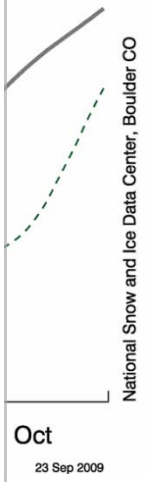


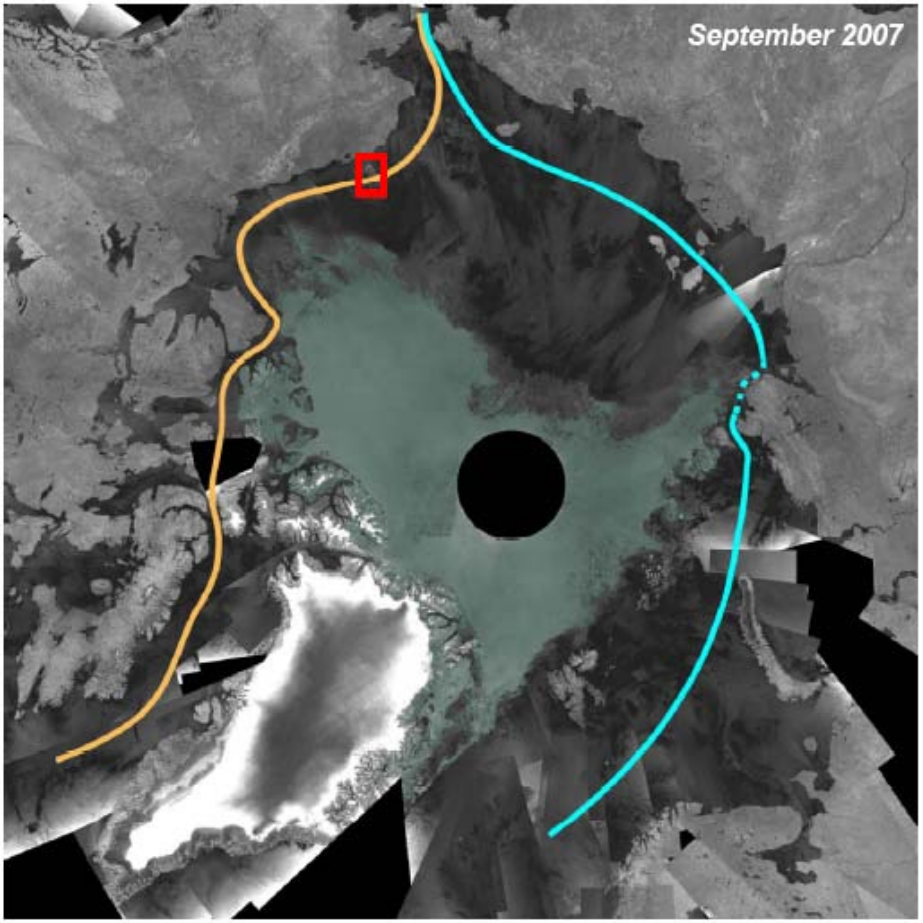


Comparison of Arctic Ice Extent
NERSC (Arctic ROOS) vs NSIDC Sep 23 09



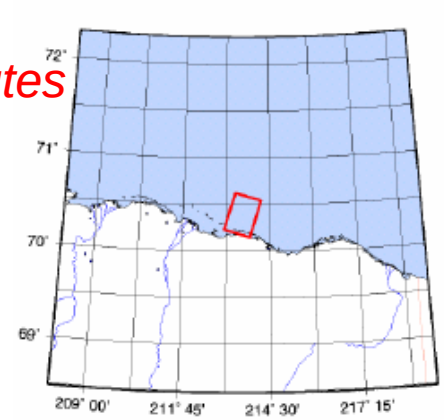


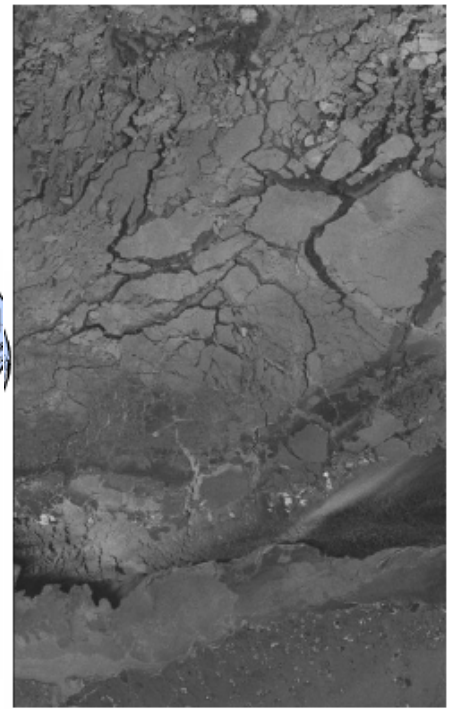




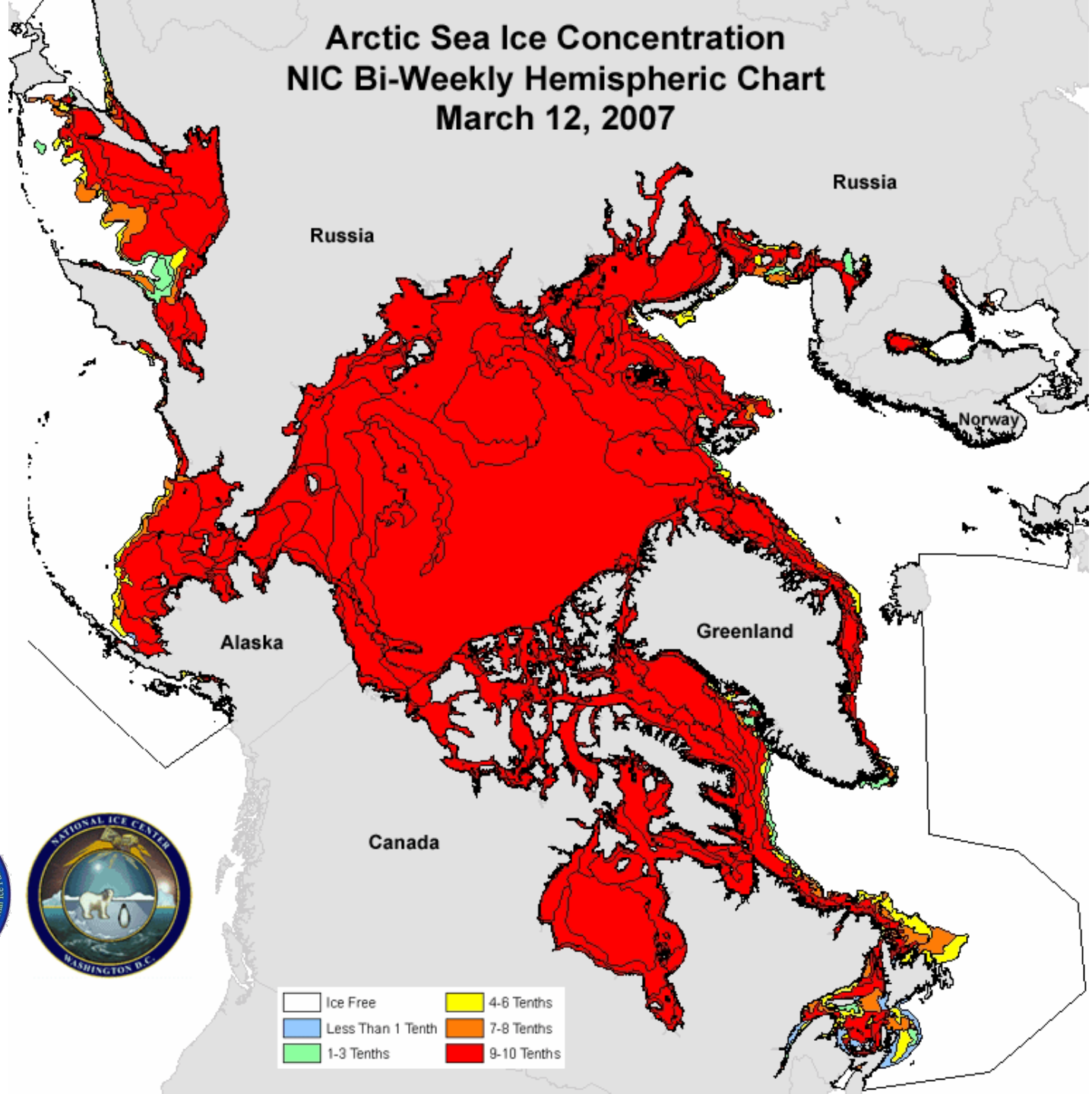
SAR mosaic illustration of the historical minimum in Arctic ice extent in September 2007, from Envisat ASAR (courtesy of ESA) together with navigable routes through the north-west and north-east passages.
Red box (region shown below) inset showing new ice conditions one month later on 24 October in the 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.*





Arctic Sea Ice Concentration
NIC Bi-Weekly Hemispheric Chart
March 12, 2007



Moving GCW Forward: Pilot and Demonstration Projects

Projects would:

- show the range of information that can be provided for the cryosphere components, both globally and regionally,
- show how GCW can build on existing efforts by the cryospheric community,
- identify the time and resources required to create a fully functional integrated cryosphere information system,
- document standards, guidelines and best practices being used in observing and product development, and
- identify challenges/gaps/needs that the GCW and partners could address in a logical manner.

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 noted above, and would contribute to demonstrating 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.

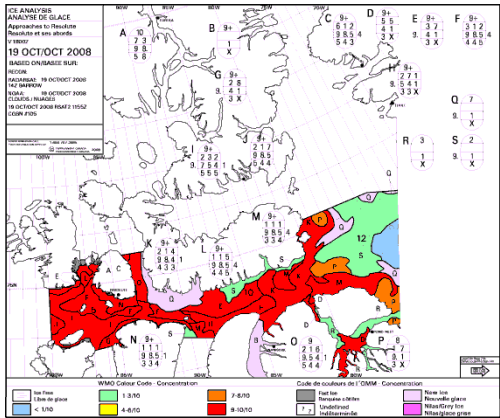
GCW Status and Next Steps

- 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.

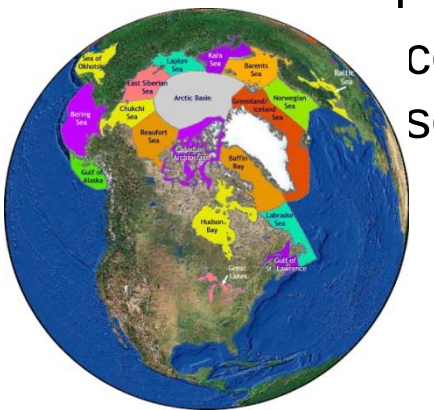
- Recommended initial actions:
  - Standards, guidelines, best practices for cryosphere components (with GCOS)
  - Initiation of a CryoNet as part of CryOS implementation (IGOS/GEO)
  - Develop pilot projects:
    - for each cryosphere component;
    - with research groups and World Data Centres (eg NSIDC, ESA'a "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)



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 co-operation with international partners such as foreign ice services.



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 set”
  - 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

WMO Initiative: Global Cryosphere Watch