World Meteorological Organization
Working together in weather, climate and water

WMO

WIGOS
WMO Integrated Global Observing System

Our Planet's Future Hub

for Weather, Climate & Water Observations

--For the 2nd Asia/Oceania MetSat User Conference

Dr W. Zhang
Director, Observing and Information Systems Department, WMO

WMO in The United Nations System

International Court of Justice

General Assembly

- Main and other sessional committees
- Standing committees and ad-hoc bodies
- Other subsidiary organs and related bodies

◆ UNRWA

◆ IAEA

◆ INSTRAW
◆ UNCHS
◆ UNCTAD
◆ UNDCP
◆ UNDP
◆ UNEP
◆ UNFPA
◆ UNHCR
◆ UNICEF
◆ UNIFEM
◆ UNITAR
◆ UNU
◆ WFC

◆ WFP
◆ ITC

Economic and Social Council

- FUNCTIONAL COMMISIONS
- REGIONAL COMMISSIONS
- SESSIONAL AND STANDING COMMITTEES
- EXPERT, AD-HOC AND RELATED BODIES

■ ILO
■ FAO
■ UNESCO(IOC)
■ WHO

World Bank Group
■ IBRD
■ IDA
■ IFC
■ MIGA

■ IMF
■ ICAO
■ UPU
■ ITU
■ WMO
World Meteorological Organization
■ IMO
■ WIPO
■ IFAD
■ UNIDO
■ WTO

Security Council

- Military Staff Committe
- Standing committees and ad-hoc bodies

◆ UNTSO
◆ UNMOGIP
◆ UNFICYP
◆ UNDOF
◆ UNIFIL
◆ UNIKOM
◆ UNAVEM II
◆ ONUSAL
◆ MINURSO
◆ UNPROFOR
◆ UNOSOM II
◆ UNOMIG
◆ UNOMIL
◆ UNMIH
◆ UNAMIR
◆ UNMOT

Secretariat

Trusteeship Council

◆ *UN programmes and organs (representative list only)*

■ *Specialized agencies and other autonomous organizations within the system*

● *Other commissions, committees and ad-hoc related bodies*

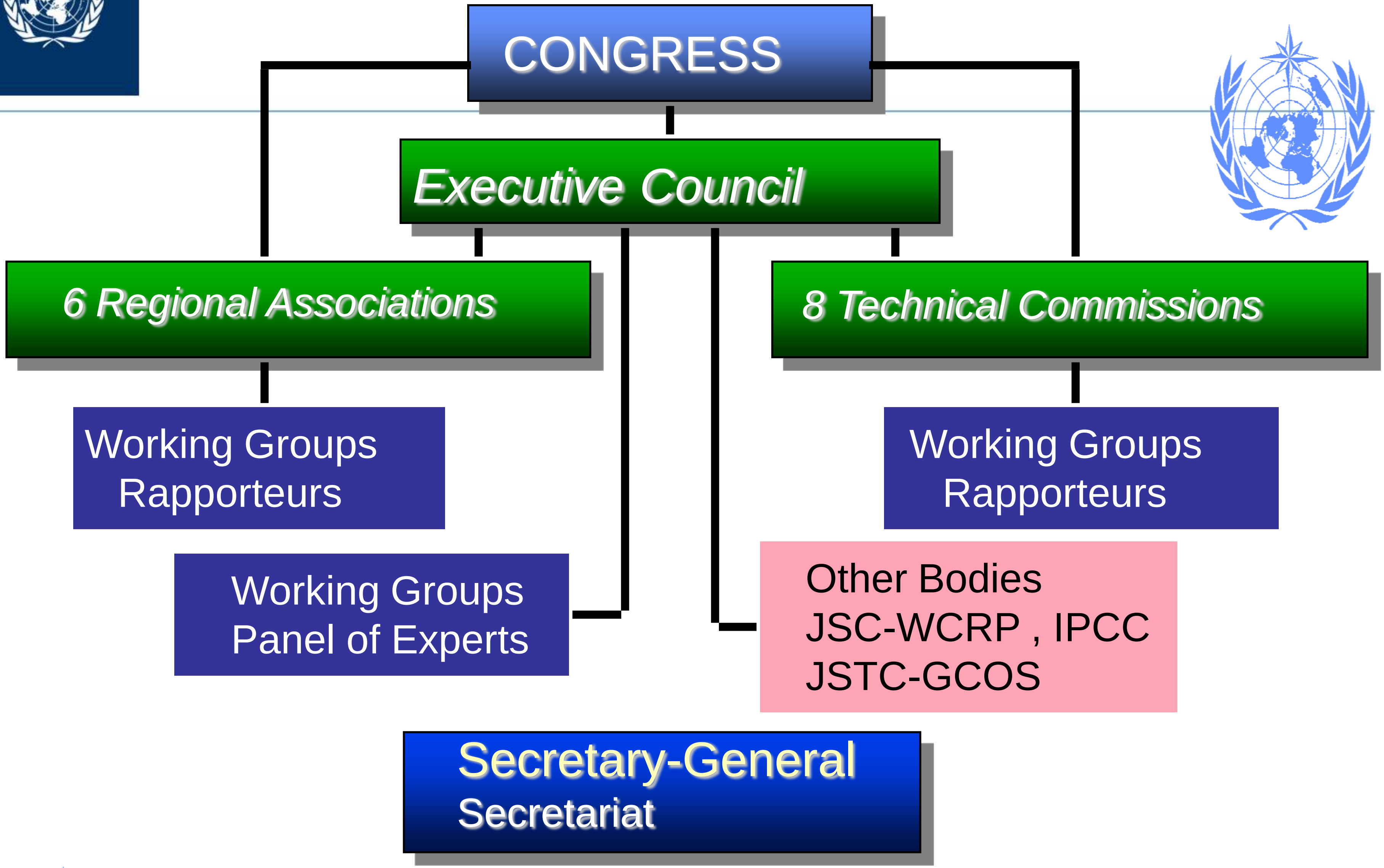
The Vision of the WMO

To provide world leadership in expertise and international co-operation in

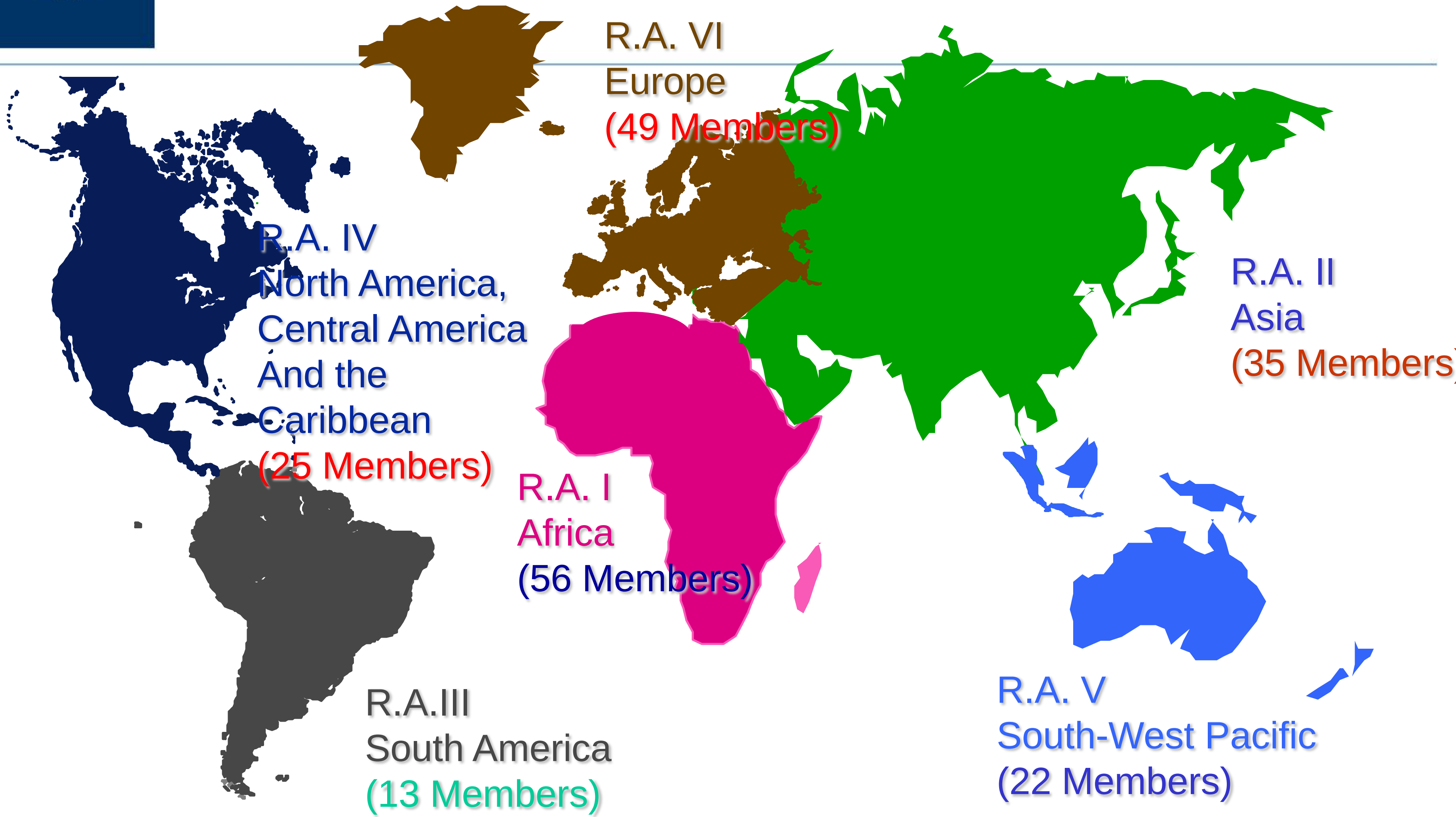
- Weather,
- **Climate,**
- **Water,**
- **and related environmental issues,**

and thereby to contribute to the safety and well being of people throughout the world and to the economic benefit of all nations.

Organizational Structure of WMO (*189 Members*)



Six Regional Associations



8 WMO Technical Commissions

Basic Commissions

- Commission for Basic Systems (CBS)
- Commission for Instruments and Methods of Observations (CIMO)
- Commission for Hydrology (CHy)
- Commission for Atmospheric Sciences (CAS)

Applications Commissions

- Commission for Aeronautical Meteorology (CAeM)
- Commission for Agricultural Meteorology (CAgM)
- Joint WMO/IOC technical Commission for Oceanography and Marine Meteorology (JCOMM)
- Commission for Climatology (CCl)

10 Major WMO Programmes

World Weather Watch Programme

WMO Space Programme

Natural Disaster Prevention and Mitigation Programme

World Climate Programme

Atmospheric Research and Environment Programme

Applications of Meteorology Programme

Hydrology and Water Resources Programme

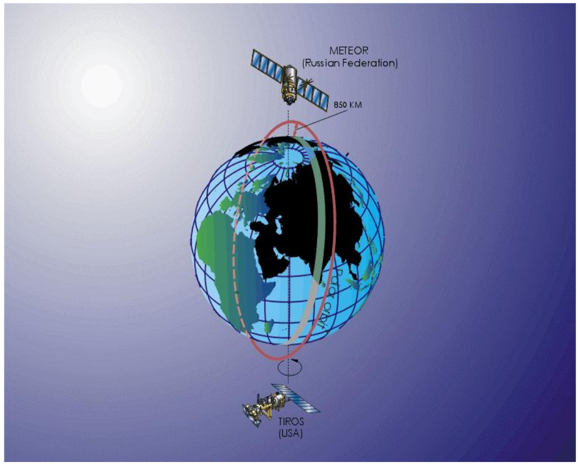
Education and Training Programme

Technical Cooperation Programme

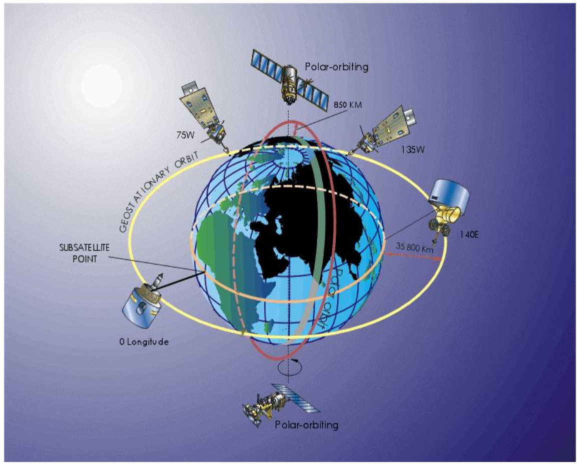
Regional Programme

WMO Space Programme development

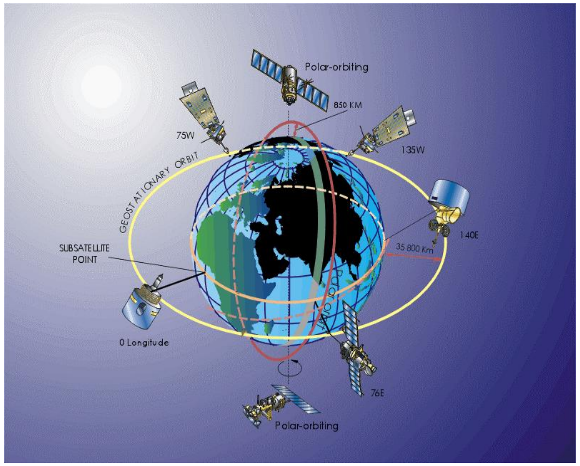
1961



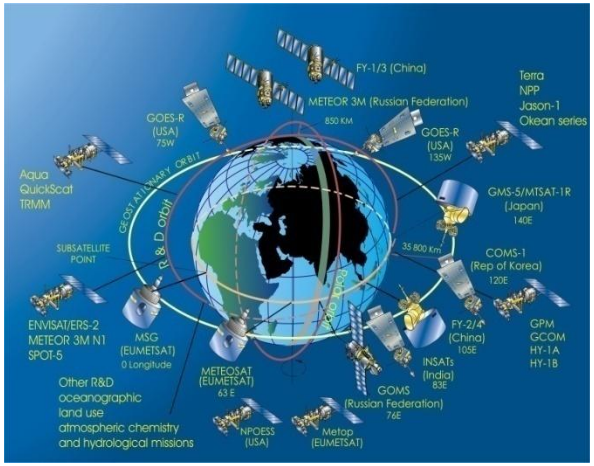
1978



1990



2011



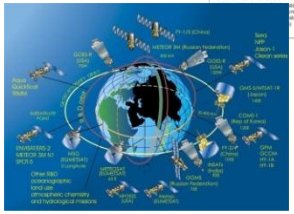
CCl Management Group meeting Geneva

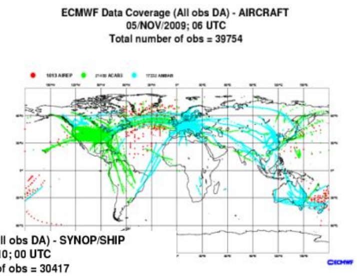
Why WIGOS is needed?

- Historically the WMO observing systems have been developed and administered separately to meet a diverse set of requirements;
- This multiplicity of systems has resulted in some incompatibilities and deficiencies, duplication of effort, and higher overall costs;
- Present observing capabilities fall short of meeting current and future WMO Members needs (in terms of quality & filling critical gaps) and are not delivering their full & potential benefits.

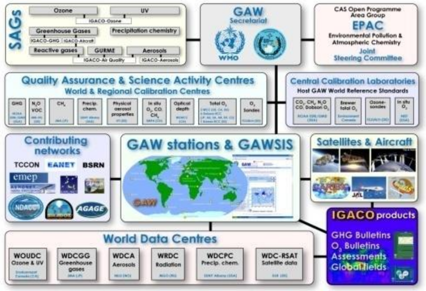
WMO INTEGRATED GLOBAL OBSERVING SYSTEM (WIGOS)

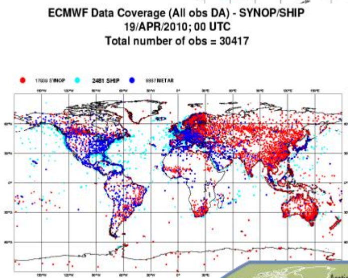
Background: WMO Global Observing Systems

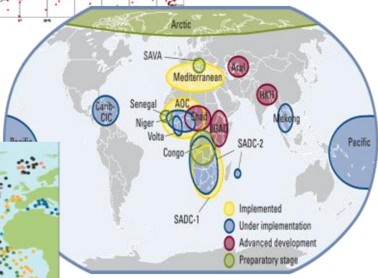


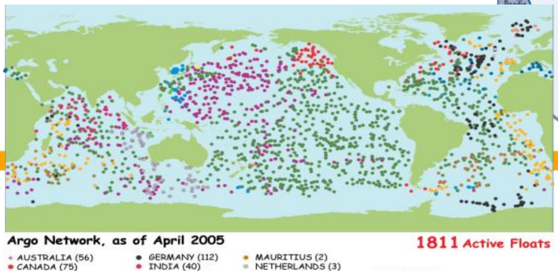


- Global Observing Systems (WWW/GOS)
  - RBSN, RBCN (>10,000 stations,1,000 upper-air)
  - AMDAR (39754/day)
  - Ship & Marine obs (30417/day)
  - Surface-based remote sensing
  - Meso-scale networks
- WMO Space Programme
- Global Atmospheric Watch (GAW)
- World Hydrological Cycle Observing System (WHYCOS)
- WMO Co-sponsored Observing Systems
  - GCOS, GOOS, GTOS









WMO INTEGRATED GLOBAL OBSERVING SYSTEM (WIGOS)

The whole is more than the sum of the parts--Aristotle

WIGOS Vision

An integrated approach

to improving and evolving the WMO observing systems into an integrated, comprehensive and coordinated observing system

to satisfy

in a cost effective and sustained manner

the WMO Members’ and Partners

observing requirements

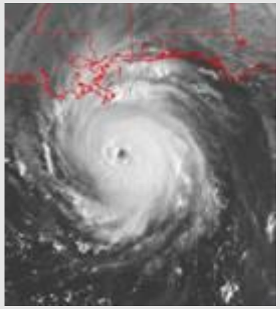
What is WIGOS

- ***More coordination, planning, and better management of observations based on meeting users requirements***
- ***Effective organizational, programmatic, procedural and governance structure that will:***
  - ***Maximize the return*** on investments in observations;
  - ***Increase optimization and utilization*** when developing future observing systems.

hours days weeks months seasons years

From Gerhard Muller, Federal Office of Meteorology and Climatology MeteoSwiss

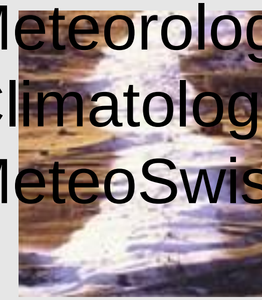
Thunder-storms



winter storms, hurricanes

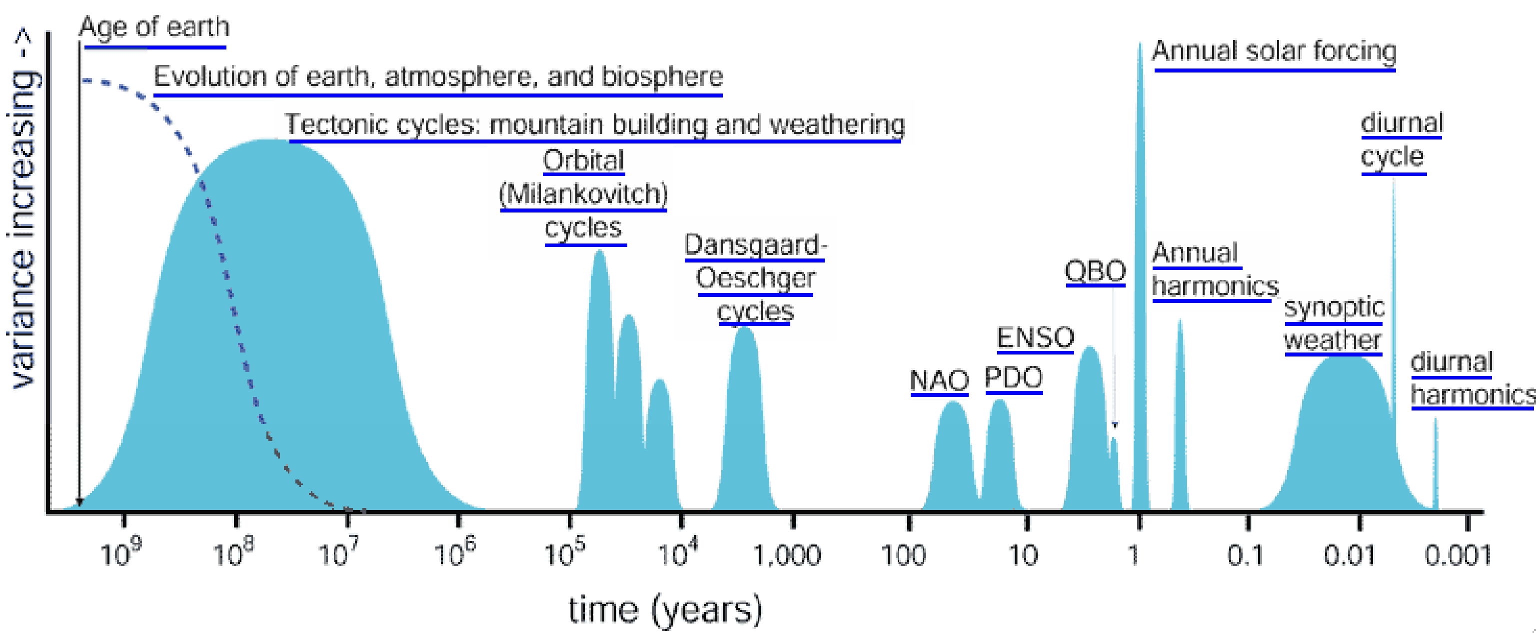
floods

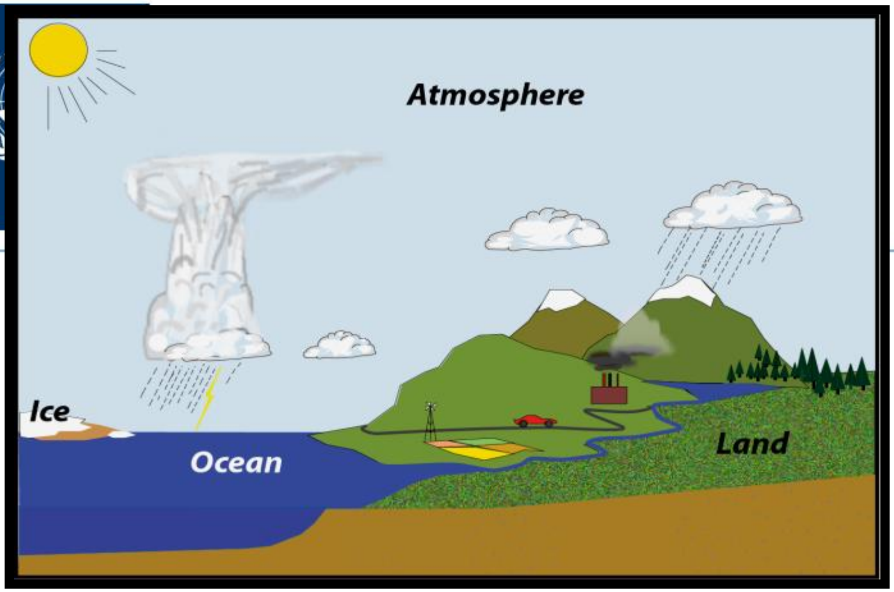
heat waves



snow

Global Change





The climate system:

Atmosphere
Land
Ocean
Cryosphere

Observations:

Atmosphere

Land

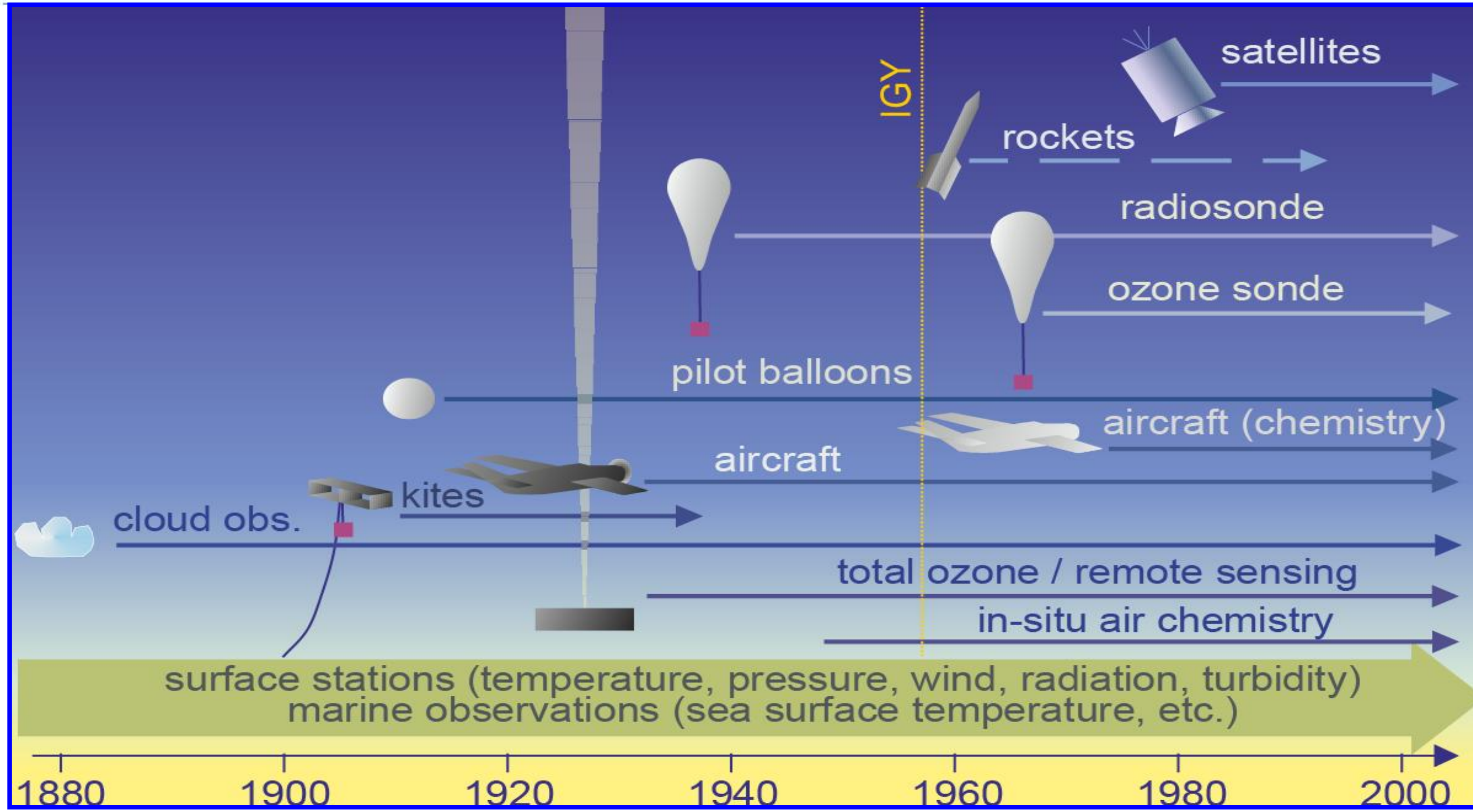
Oceans

Space

Courtesy:Tom Karl

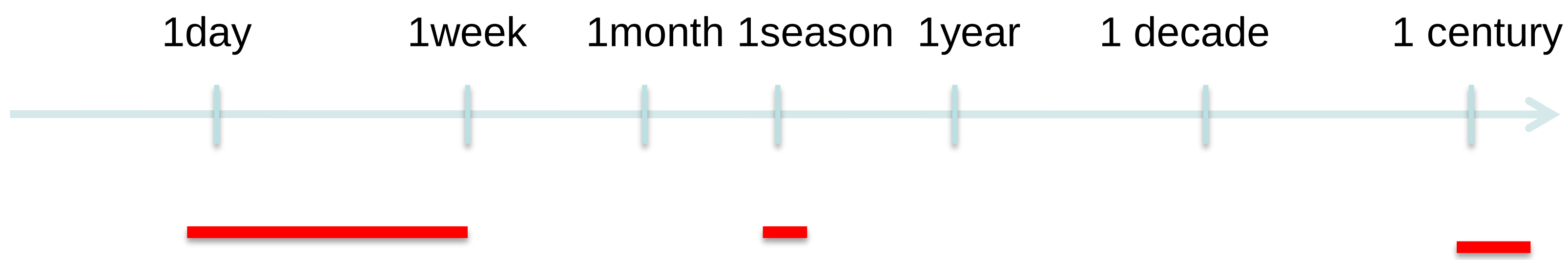
A challenge:

The changing observing system

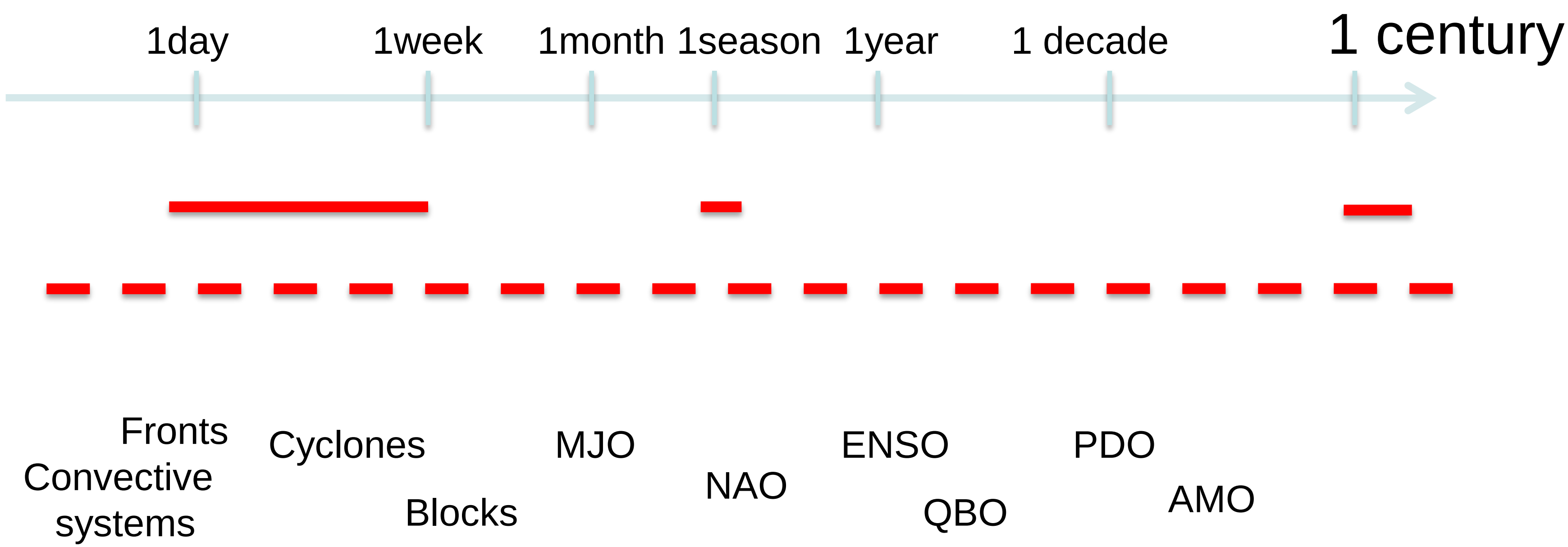


The continuing changing observing system

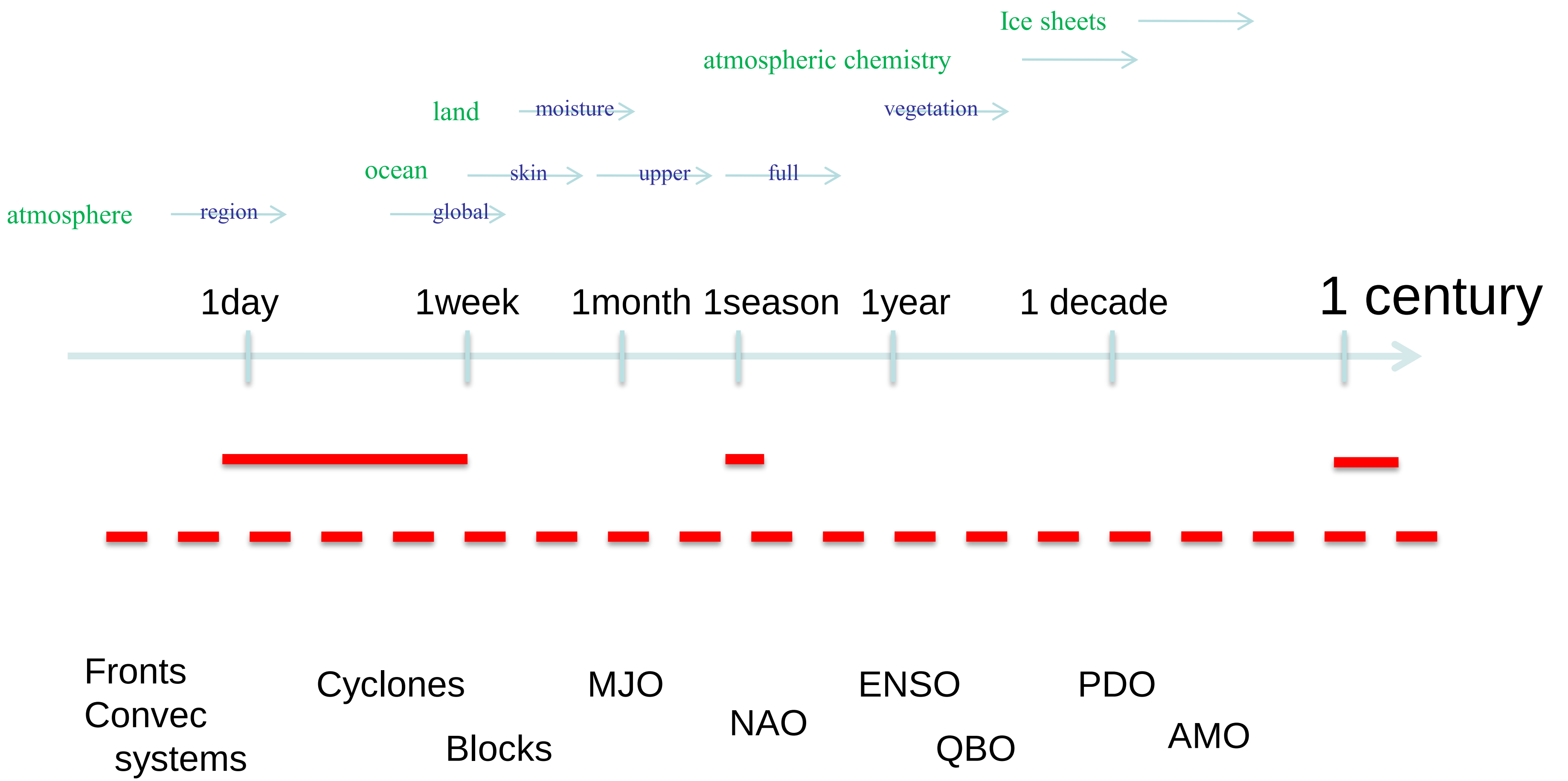
Weather & Climate Prediction Focus 1980-2005



The Seamless Prediction Problem

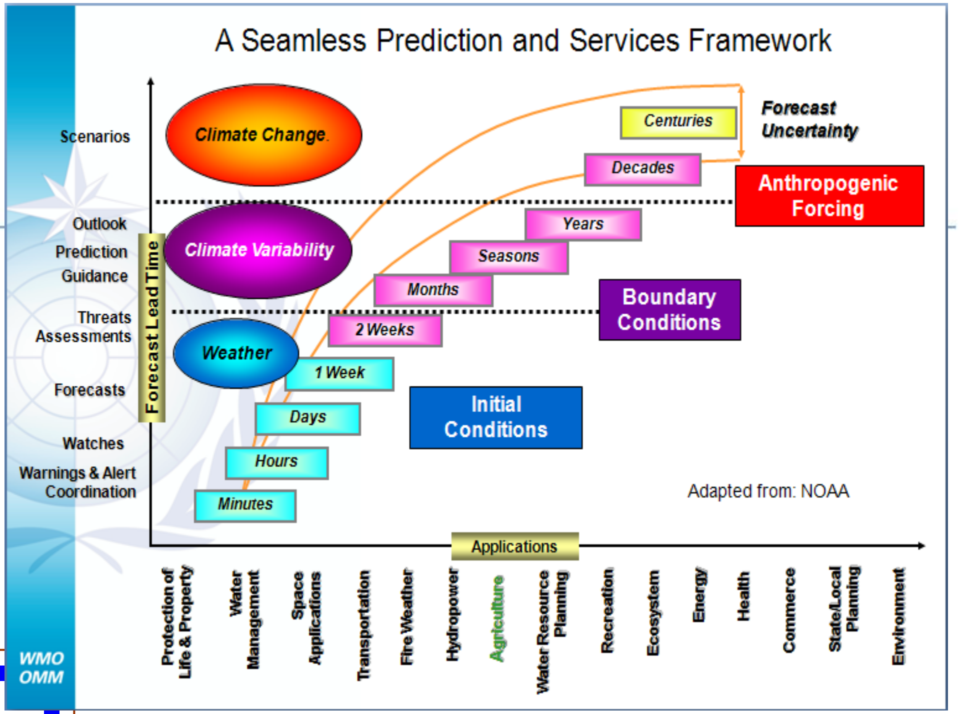


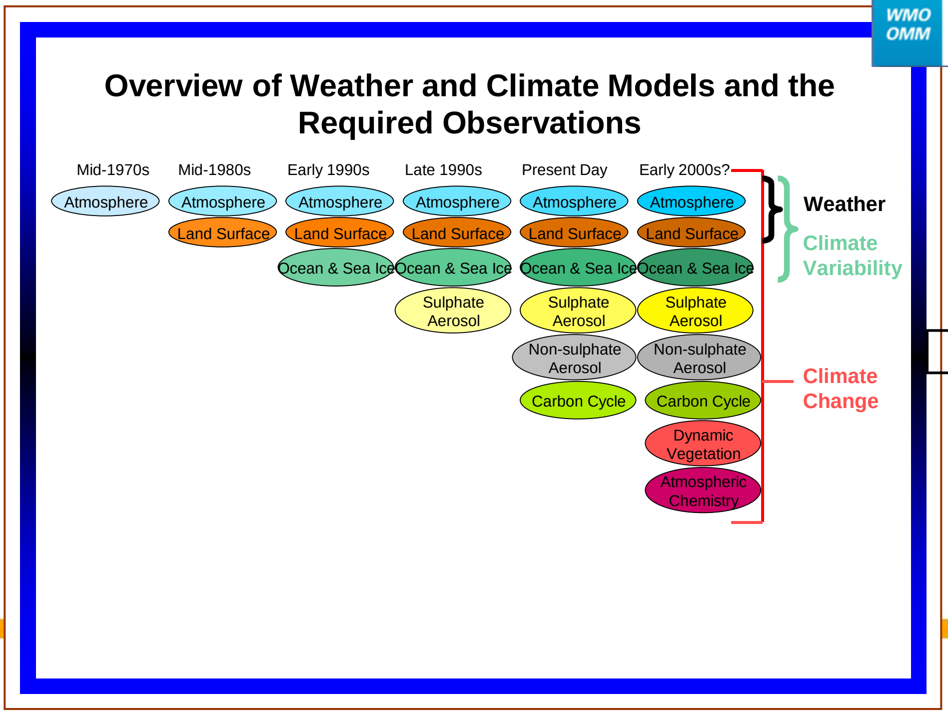
The Seamless Prediction Problem



WIGOS Initiative

- WMO Cg-15 decision
- EC WG on WIGOS
- CBS take leading role





Need an Integrated Global Observing System meet all requirements

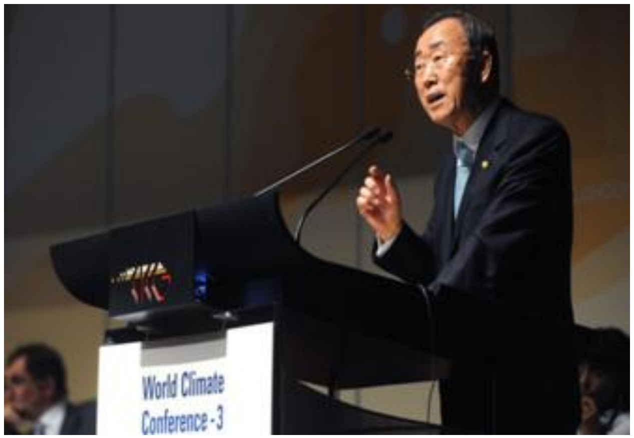
WIGOS IS ABOUT MORE OBSERVATIONS

Global Framework for Climate Services (GFCS)

Global Cryosphere Watch (GCW)

An Space Architecture for climate monitoring

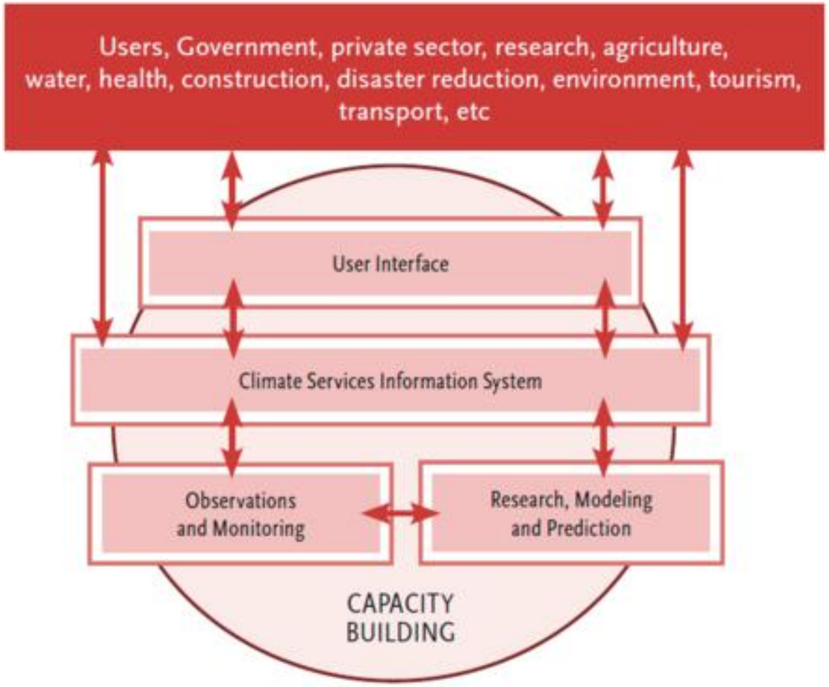
Polar Observation, Research and Services

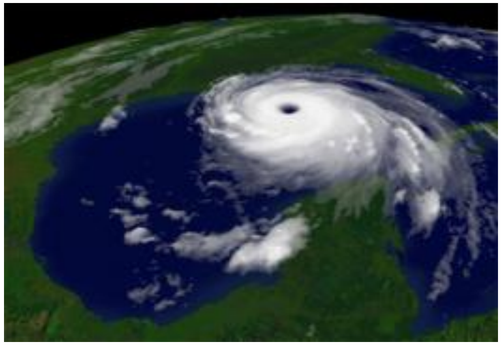


A historic event

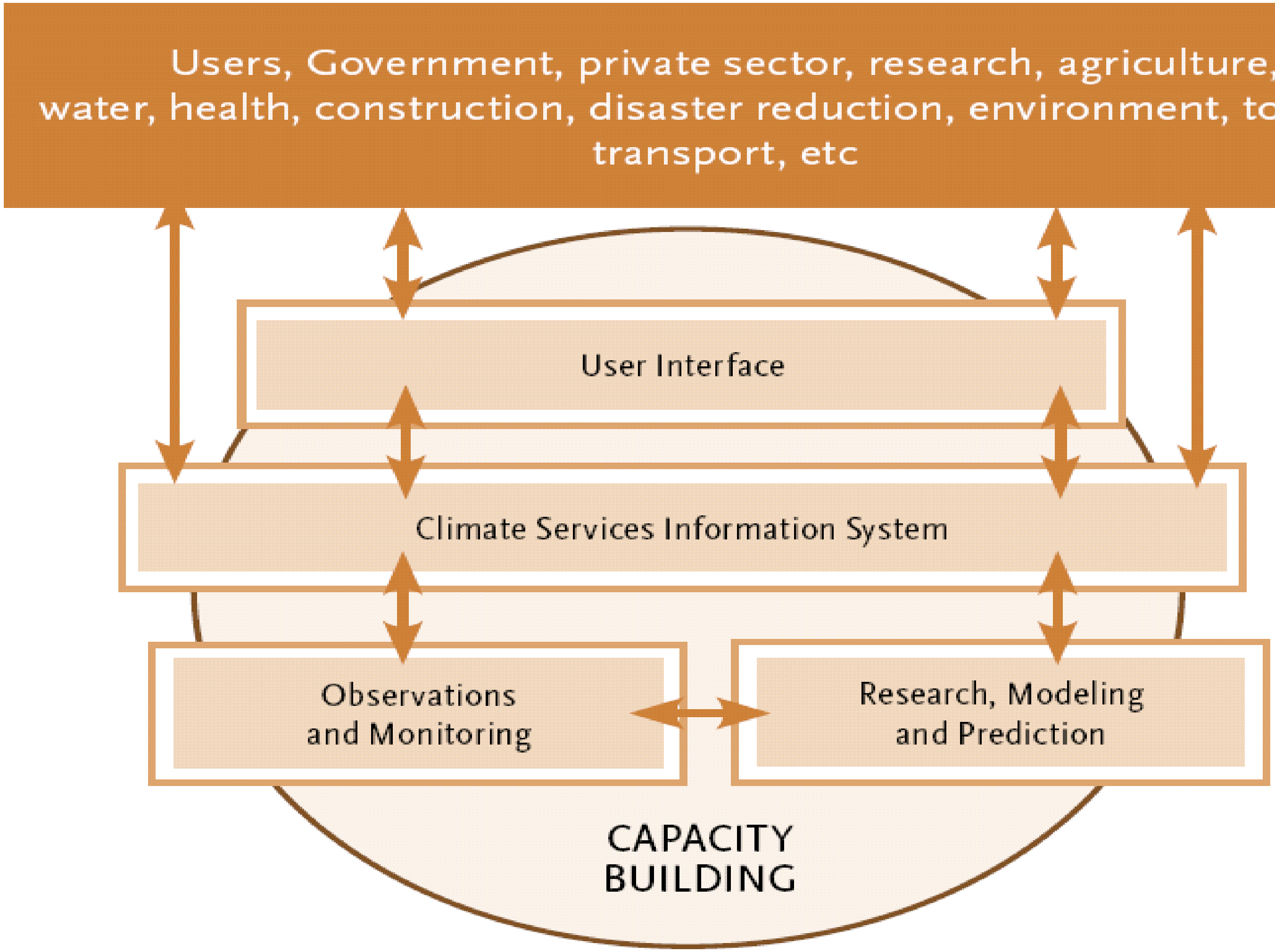
WMO Cg Decision on key priorities for 2012-2015

- ✓ Global Framework for Climate Services (GFCS)
- ✓ Capacity building
- ✓ WIGOS/WIS
- ✓ Disaster Risk Reduction
- ✓ Aeronautical meteorology





The vision of the GFCS



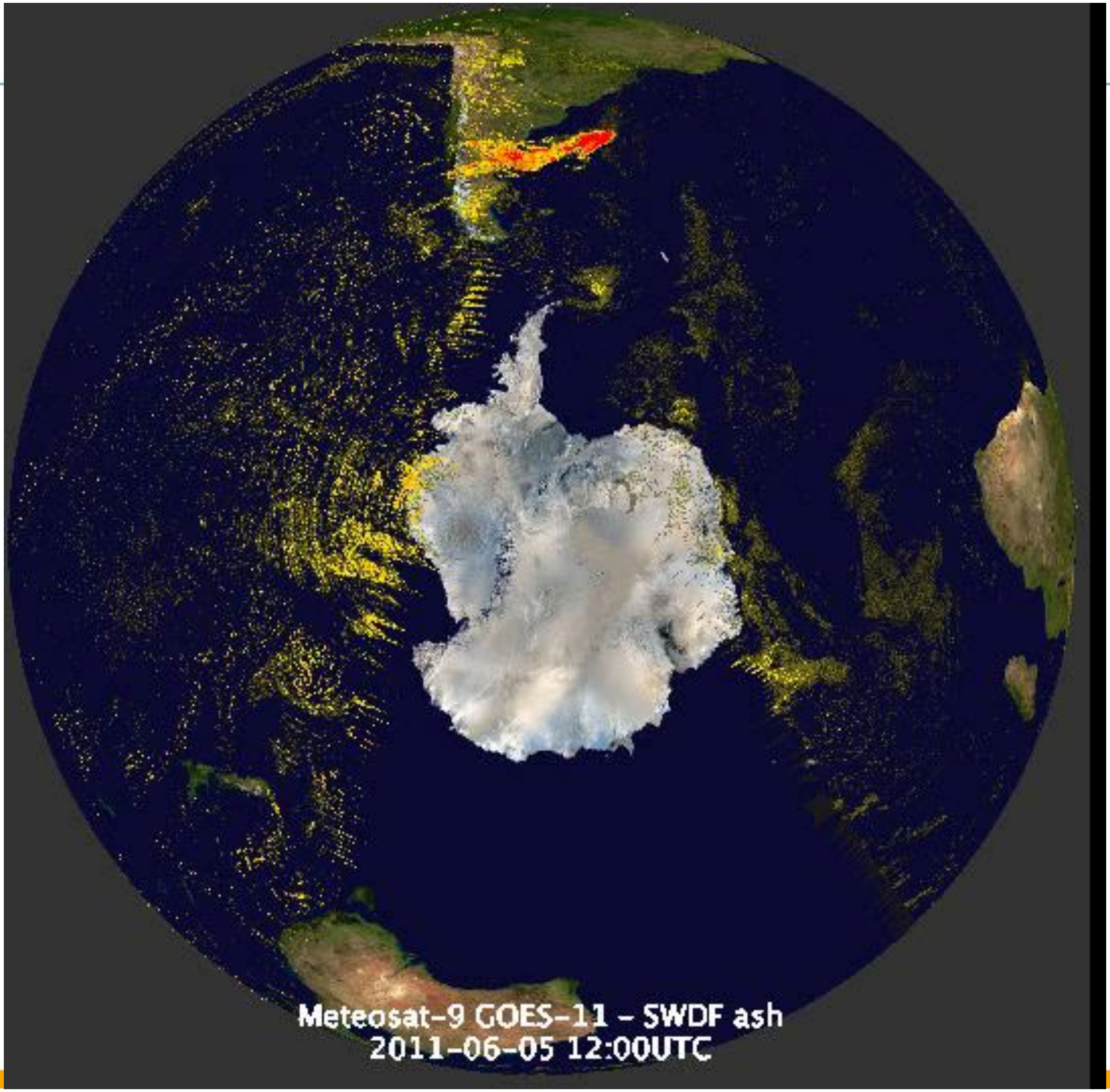
GFCS Priorities

All sectors to be tackled but in the first four years the GFCS is proposing giving priority to:

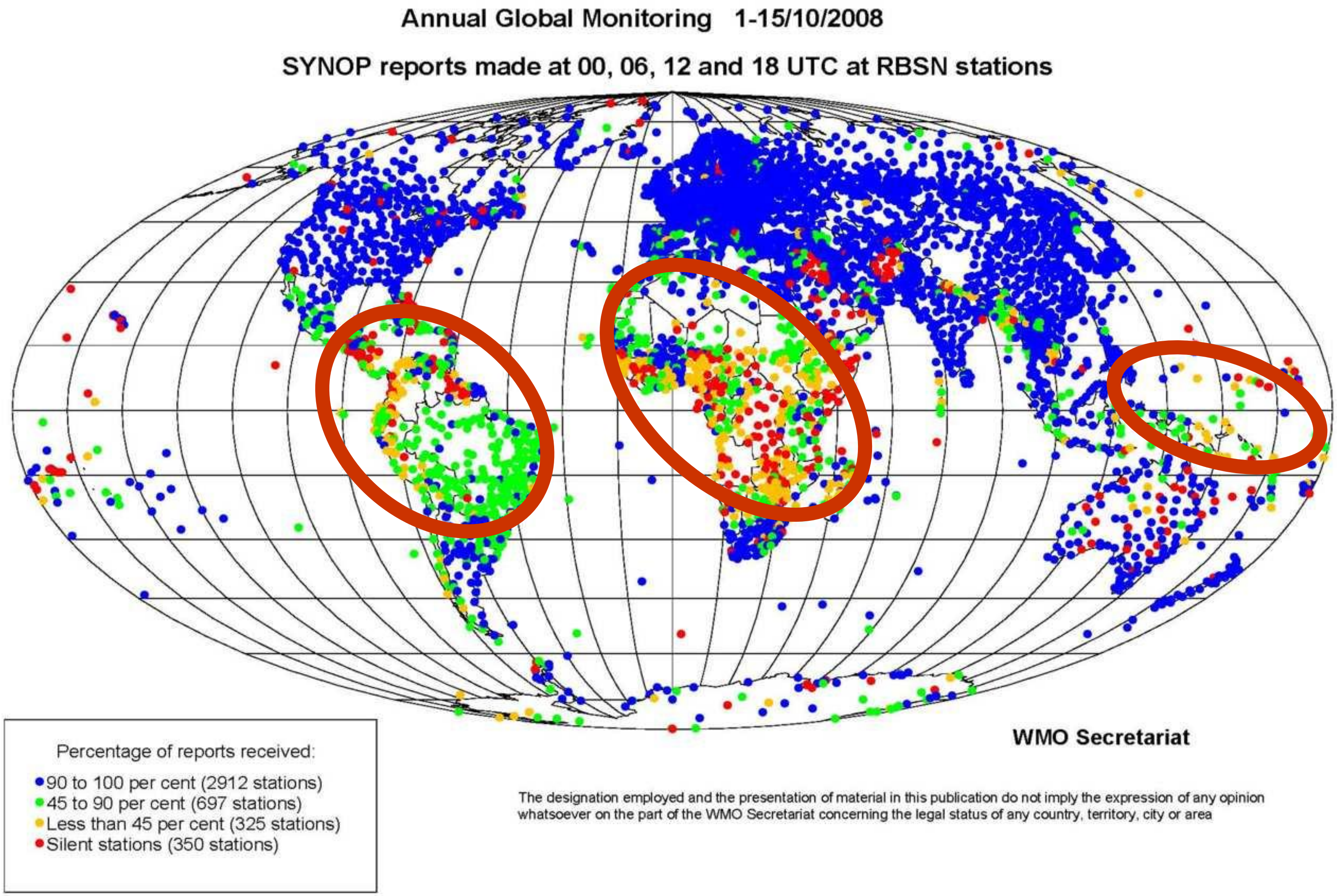
- Agriculture
- Disaster risk reduction
- Water
- Health



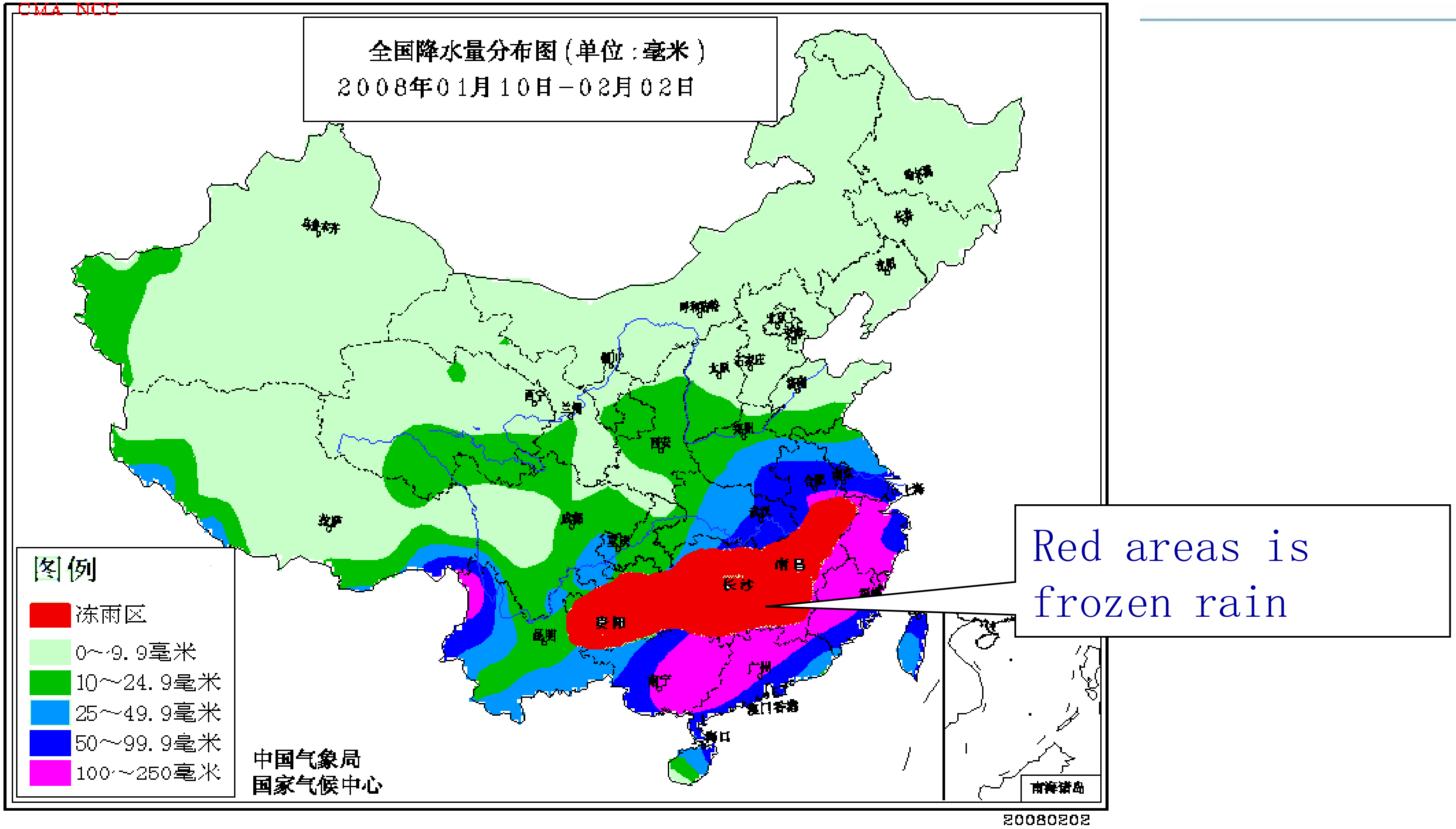




Meteosat-9 GOES-11 - SWDF ash
2011-06-05 12:00UTC

Why a Framework for Climate Services?

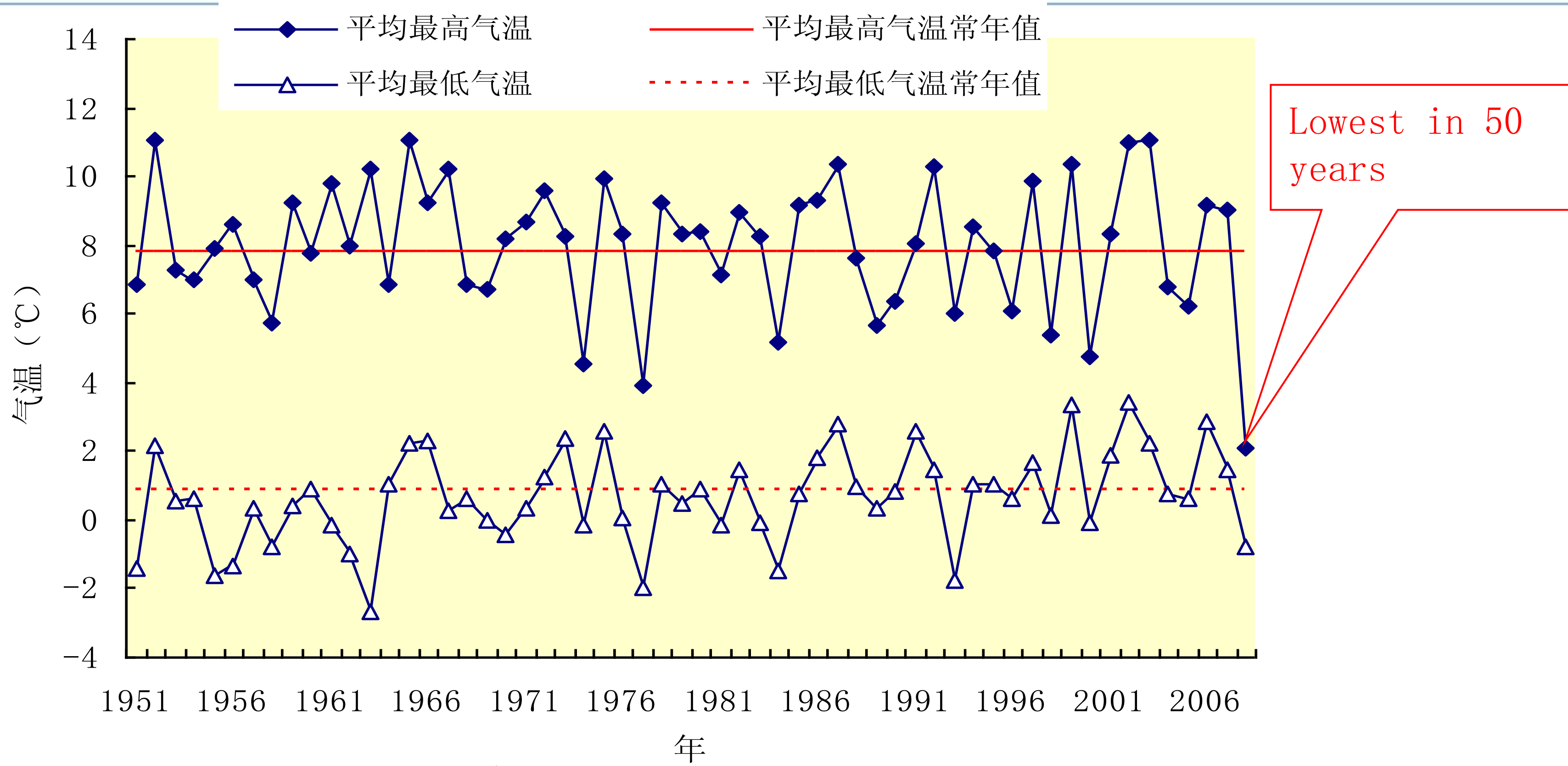


Jan. 10 - Feb 2 , 2008, cold climate and above average rainfall



气象灾害呈现多发、并发

50 years lowest temperature in historical records



Jan 10 - Feb 1 average temperatures
above: average max
below: average min


冰雪贵州005

2 3 3m 4 5 GREAT 6 7 WALL 8 9 10 1 2 3 4 5
冰雪贵州017


众志成城


众志成城


众志成城


冰雪贵州021


冰雪贵州012


黑石溪大桥
HEISHIXI BRIDGE
长480m
XINHUANET

Climate Service Priority

- Due to unable predicting the climate trend (long-lasting cold weather), Direct economic loss exceed 100 Billion RMB, more than 100 people died;
- Similar cases happen every year around the world
- 10 – 30 days forecasts and seasonal to inter-annual climate prediction are WMO Members priorities!

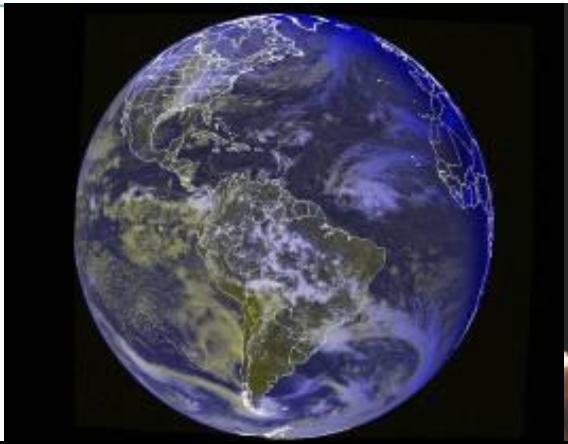
Developing a Space-based Architecture for Climate Monitoring

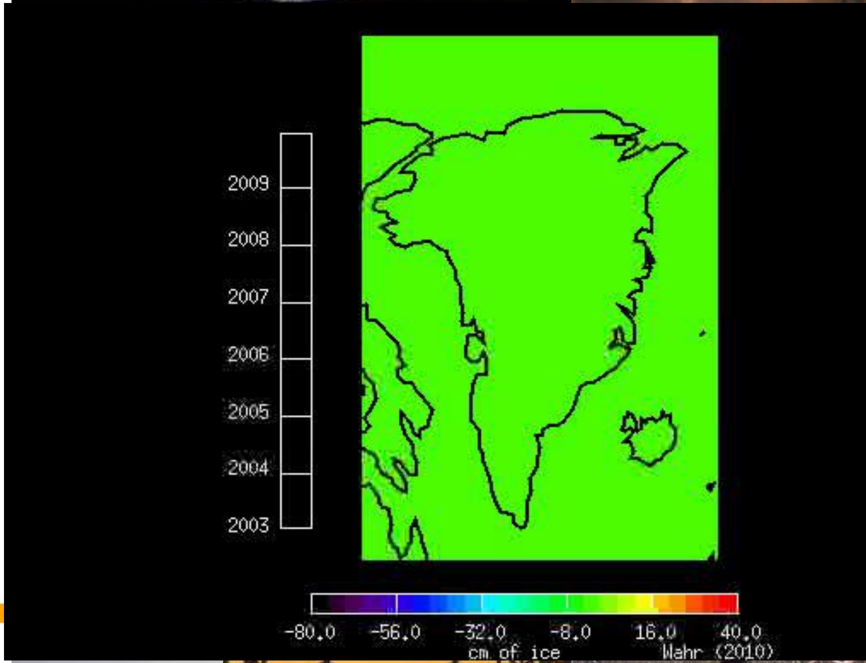
Challenges:

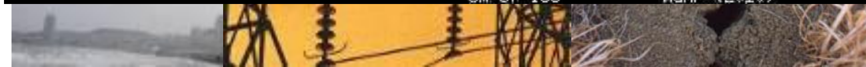
- Continuity and improvement of operational constellations
- Sustained observation of all ECVs observable from space
- Transition Research to operations for priority, mature observations
- Generation of QC products

Integration:

✓ network optimization,
✓ system interoperability,
✓ composite products







WIGOS
IS ABOUT BETTER QUALITY OF OBSERVATIONS

Instruments standardizations

Quality Management Framework (QMF)

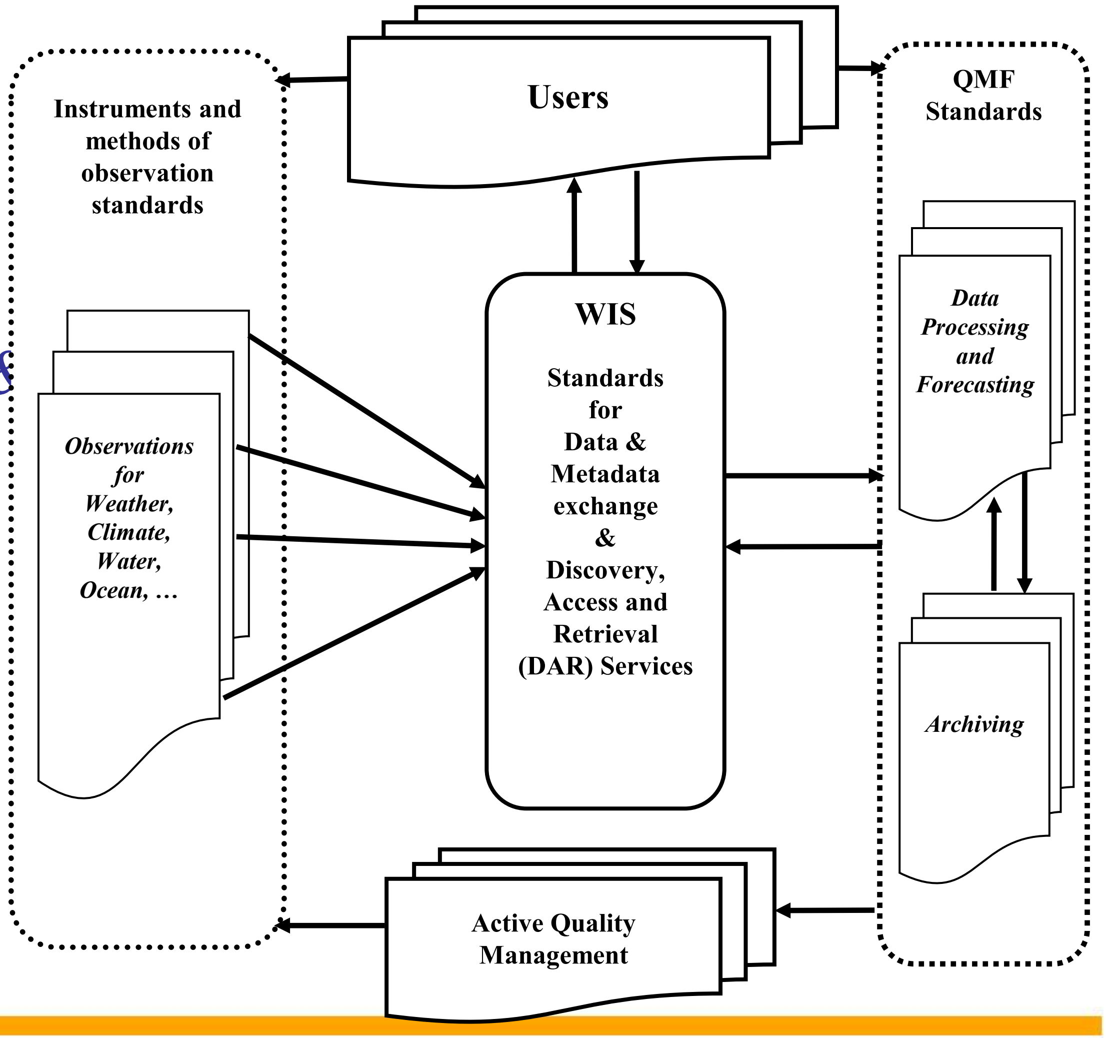
Climate Monitoring from Space

Major challenges in four Areas

1. Improve observations and products quality (from noise to music !)
2. Develop new observing capability with impact study guidance
3. Motivate users to maximize data utilizations
4. Data policy, access & resources

Standardization and Quality Management

- Three key areas on ***Standardization***
  - Instruments and Methods of Observation(RMICs & RICs are critical !)
  - WIS information exchange and discovery;
  - Quality Management Framework.



Ensure the quality of the observations to meet GFCS requirements, data rescue

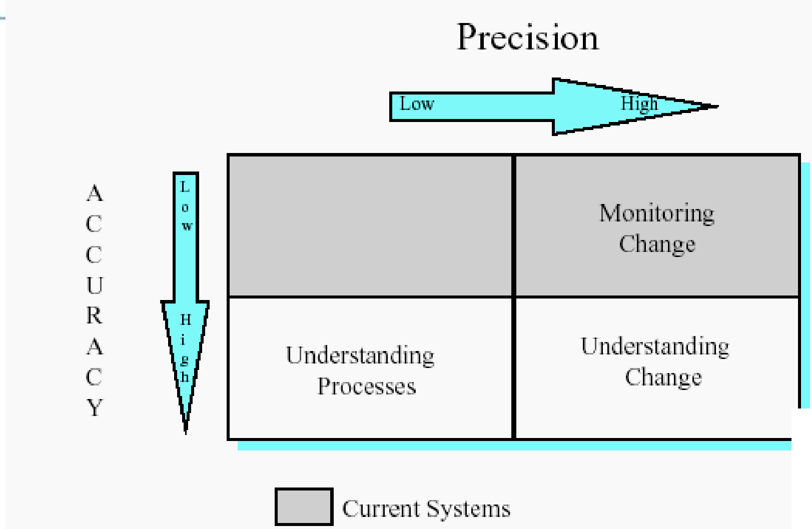
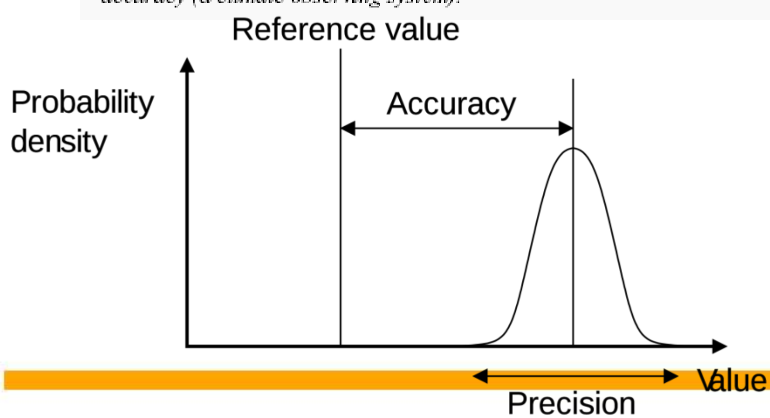
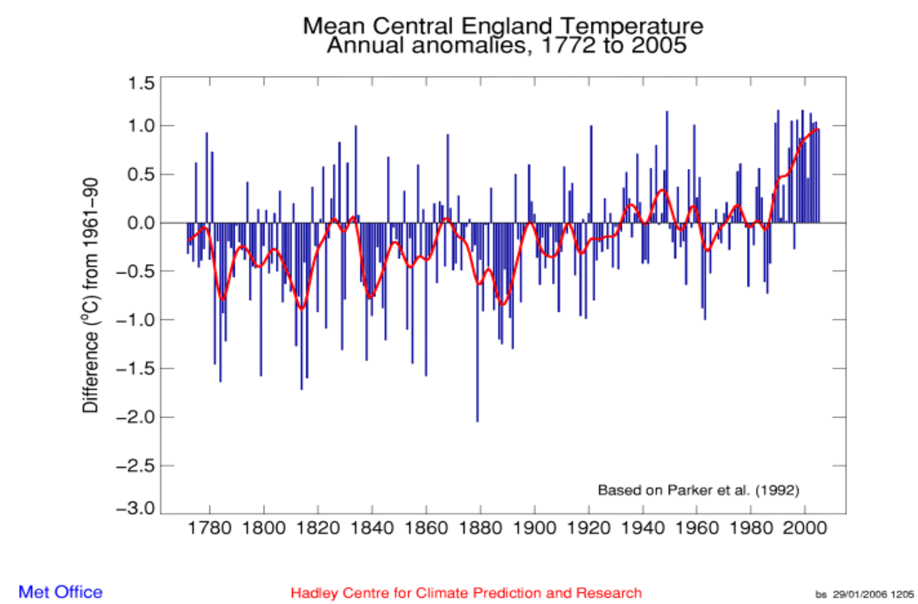


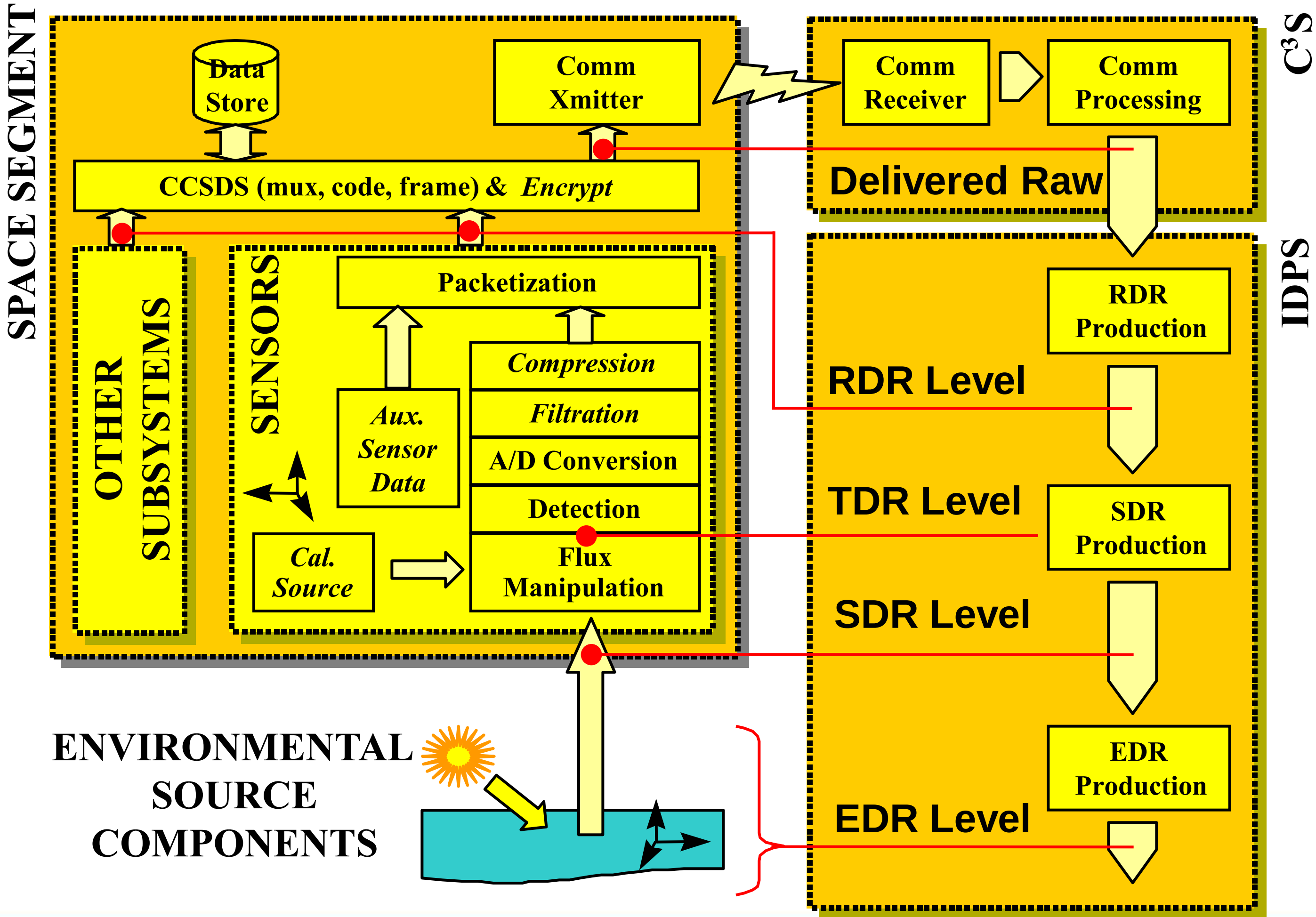
Fig. 1 The climate measurement problem - understanding climate processes requires accuracy (a measurement system) , monitoring climate change requires high precision (a monitoring system), detection and understanding climate change requires both high precision and high accuracy (a climate observing system).



Accuracy, Precision, Uncertainty
Representativeness
Measurement traceability
Long-time series consistency
……

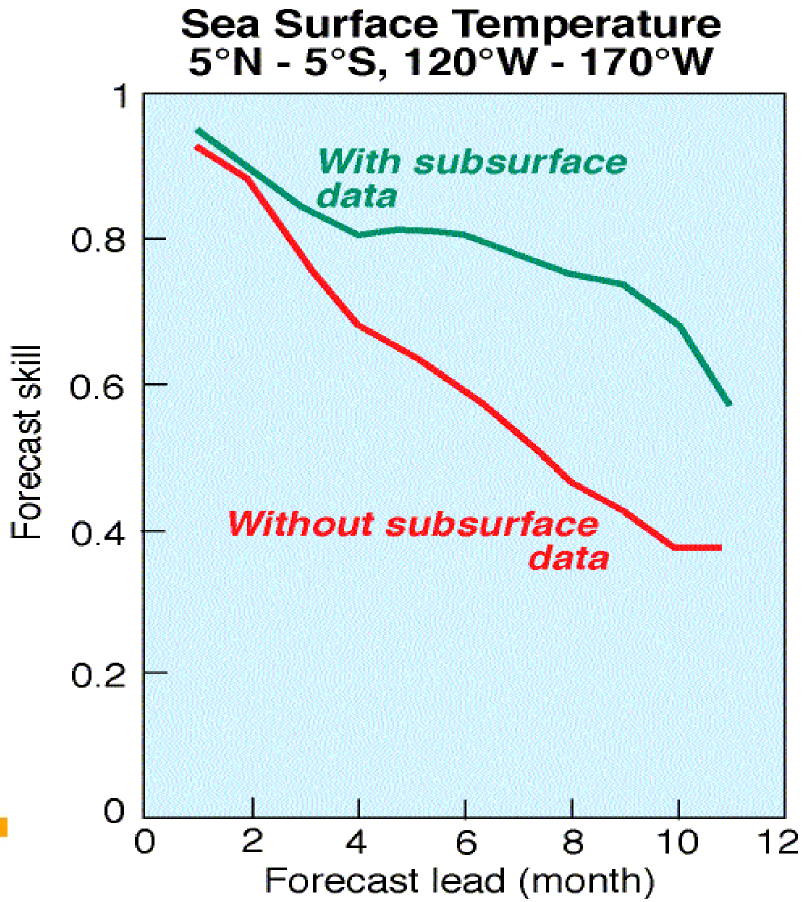


Satellite products delivered at multiple levels need full quality control process

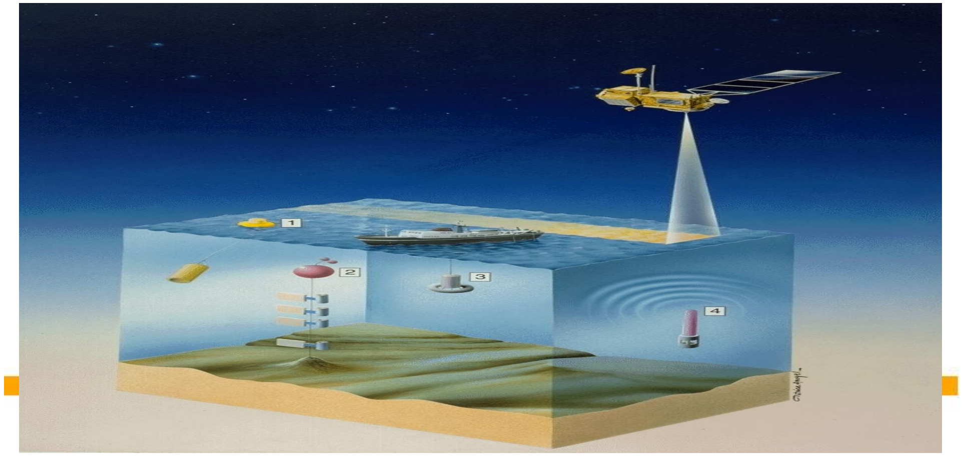


New observations for ocean subsurface are important

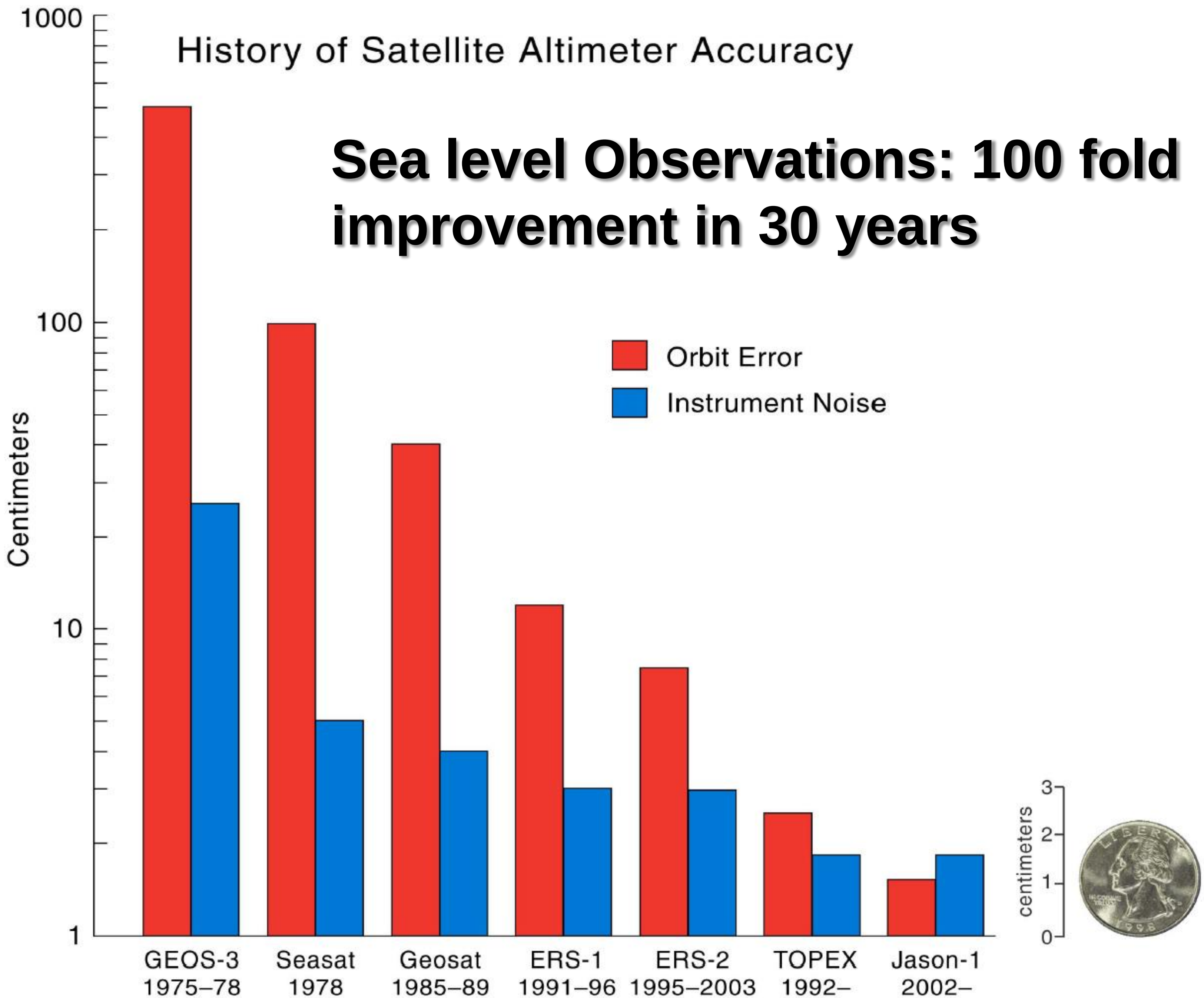
- The predictability of ENSO

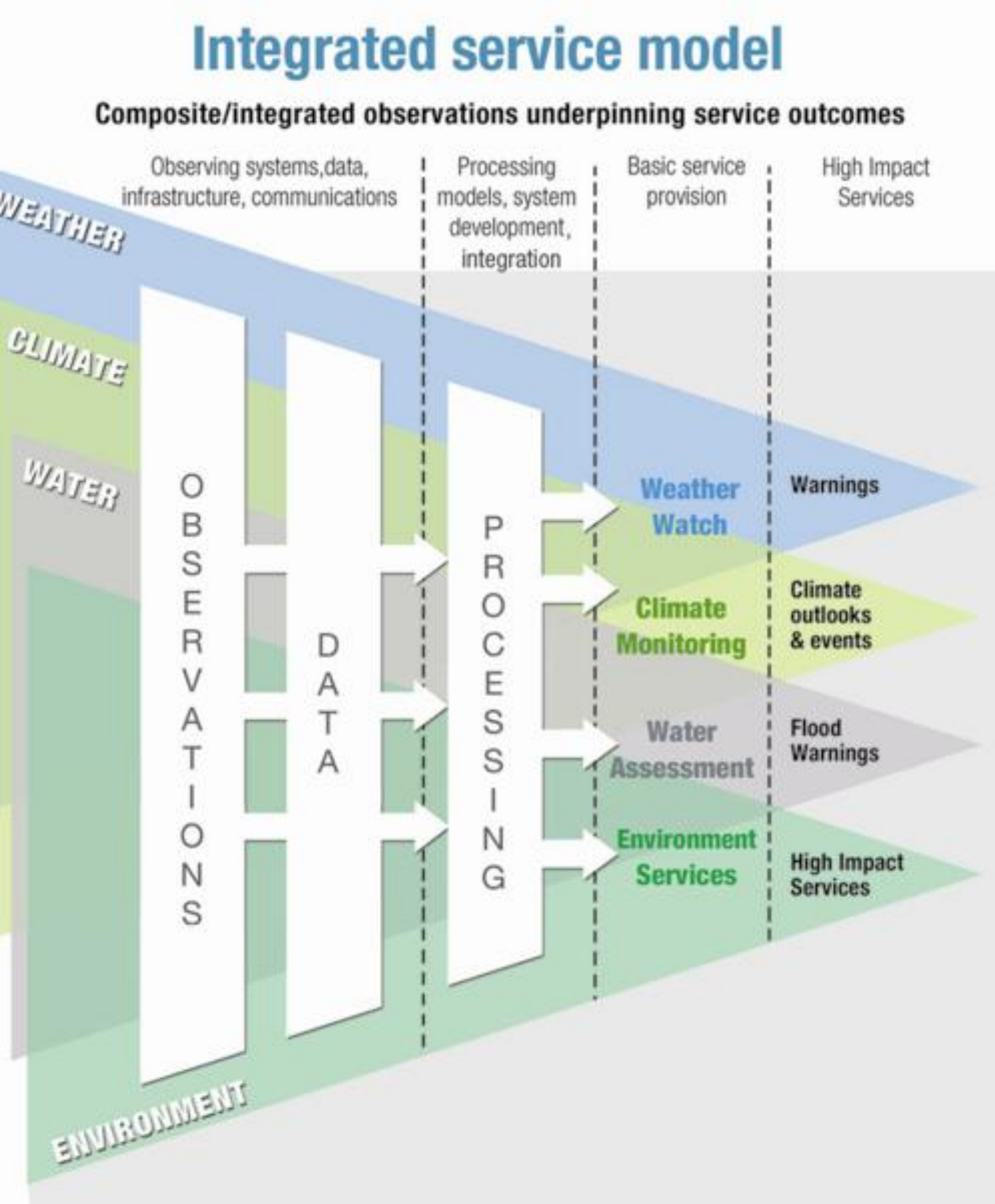


- Seasonal climate predictions require information below the surface for many tens of metres depth,
- For decadal climate prediction, information from the full depth of the ocean may be needed.



Sea level Observations: 100 fold improvement in 30 years





Integration

Composite systems, 'network of networks'

Integration through various aspects

– Support for diverse user needs
– Systems optimised for efficiency and effectiveness
– Integration through products, model and analysis
– End-to-end service delivery model

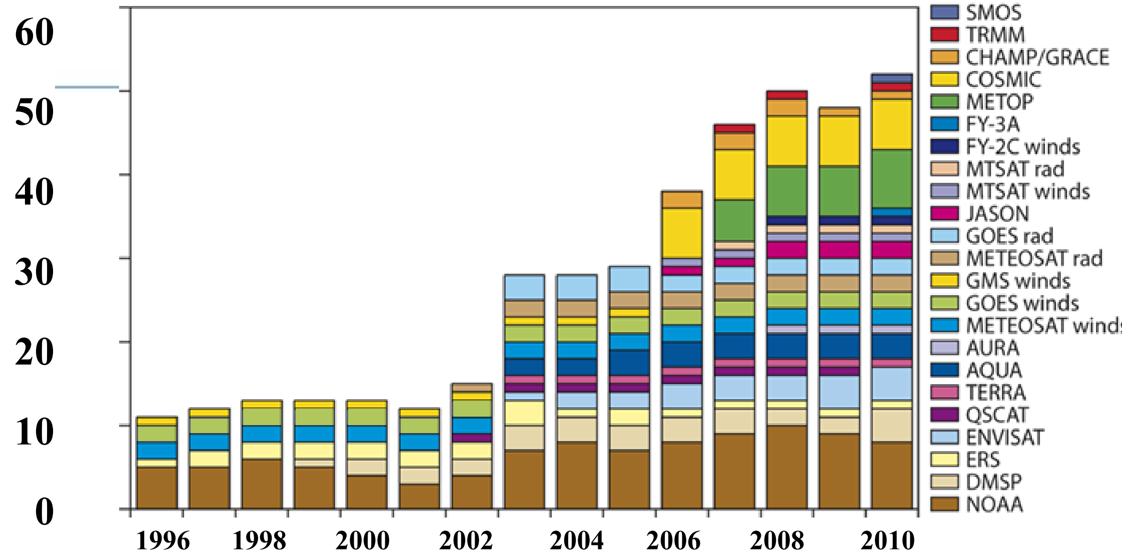
WIGOS

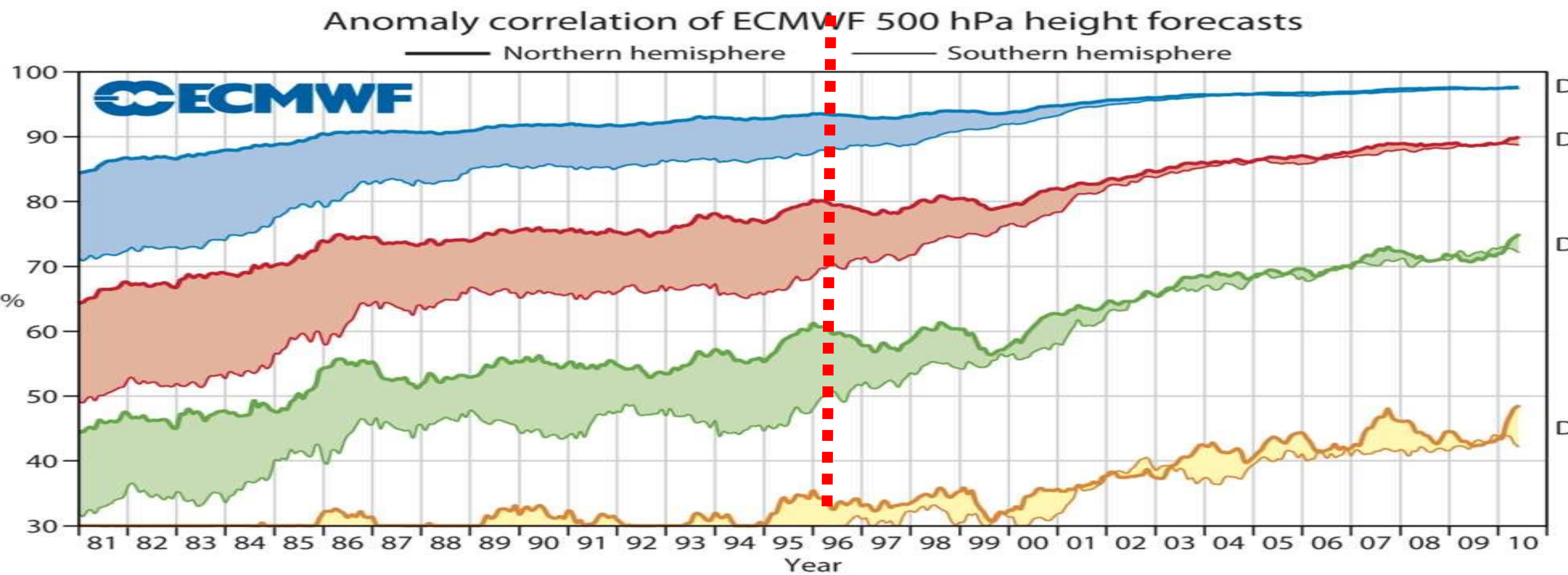
IS ABOUT BEST UTILIZATION

OF OBSERVATIONS

Increases in observational types and numbers

Number of satellite-borne instruments data were assimilated routinely by ECMWF from 1996 to 2010, expect the same for climate



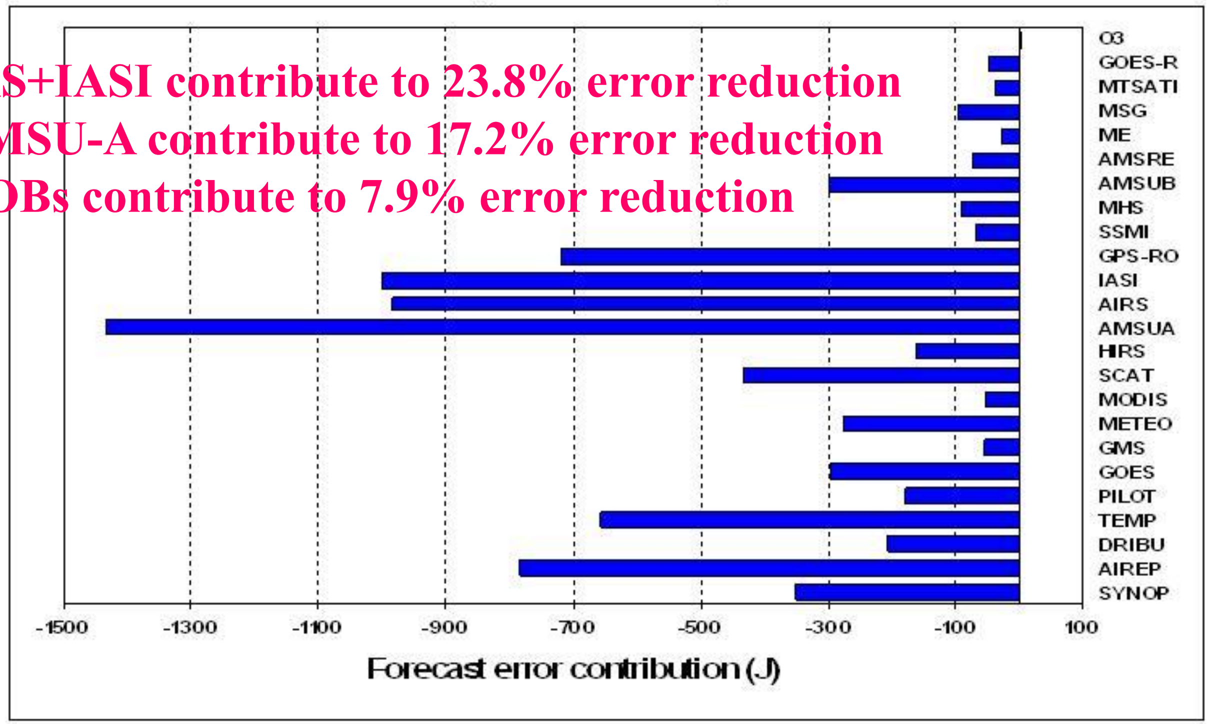


Courtesy of ECMWF. Adapted and extended from Simmons & Hollingsworth (2002)

WMO Impact Studies will give us the impact of the new observation to weather/climate services

FSO Results- Operational ECMWF system
September to December 2008. Averaged over all model layers and entire global atmosphere.

AIRS+IASI contribute to 23.8% error reduction
4 AMSU-A contribute to 17.2% error reduction
RAOBs contribute to 7.9% error reduction



The order of the top five and their contribution to error reduction is:
AMSU-A (4 satellites) 17.2%
IASI (one satellite) 12.0%
AIRS (one satellite) 11.8%
AIRREP (aircraft temperature and winds) 9.3%
GPSRO (bending angles) 8.5%
TEMP (radiosonde winds, humidity, and temperatures) 7.9%
QuikSCAT (scatterometer surface winds over the oceans) 5.2%

5 among
st Errors,

Courtesy: Carla Cardinali and Sean Healy, ECMWF
5 Oct. 2009

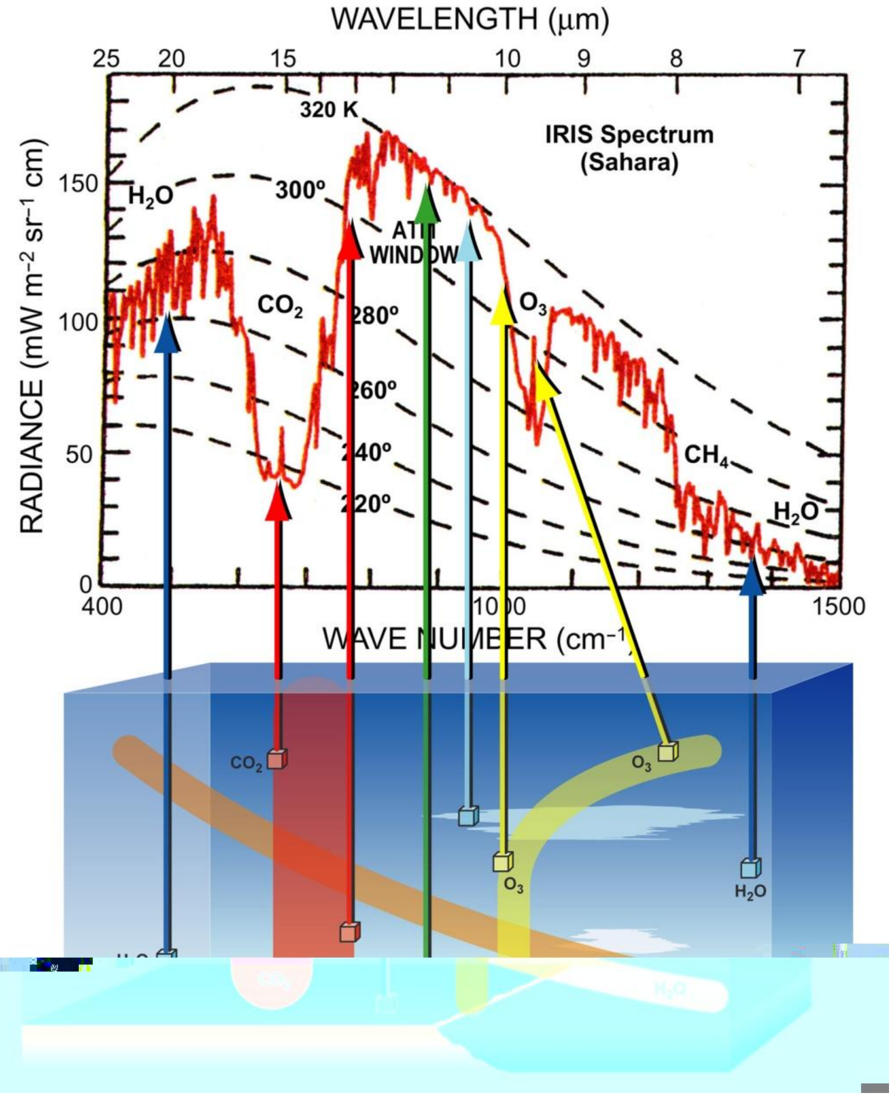
knowledge

information

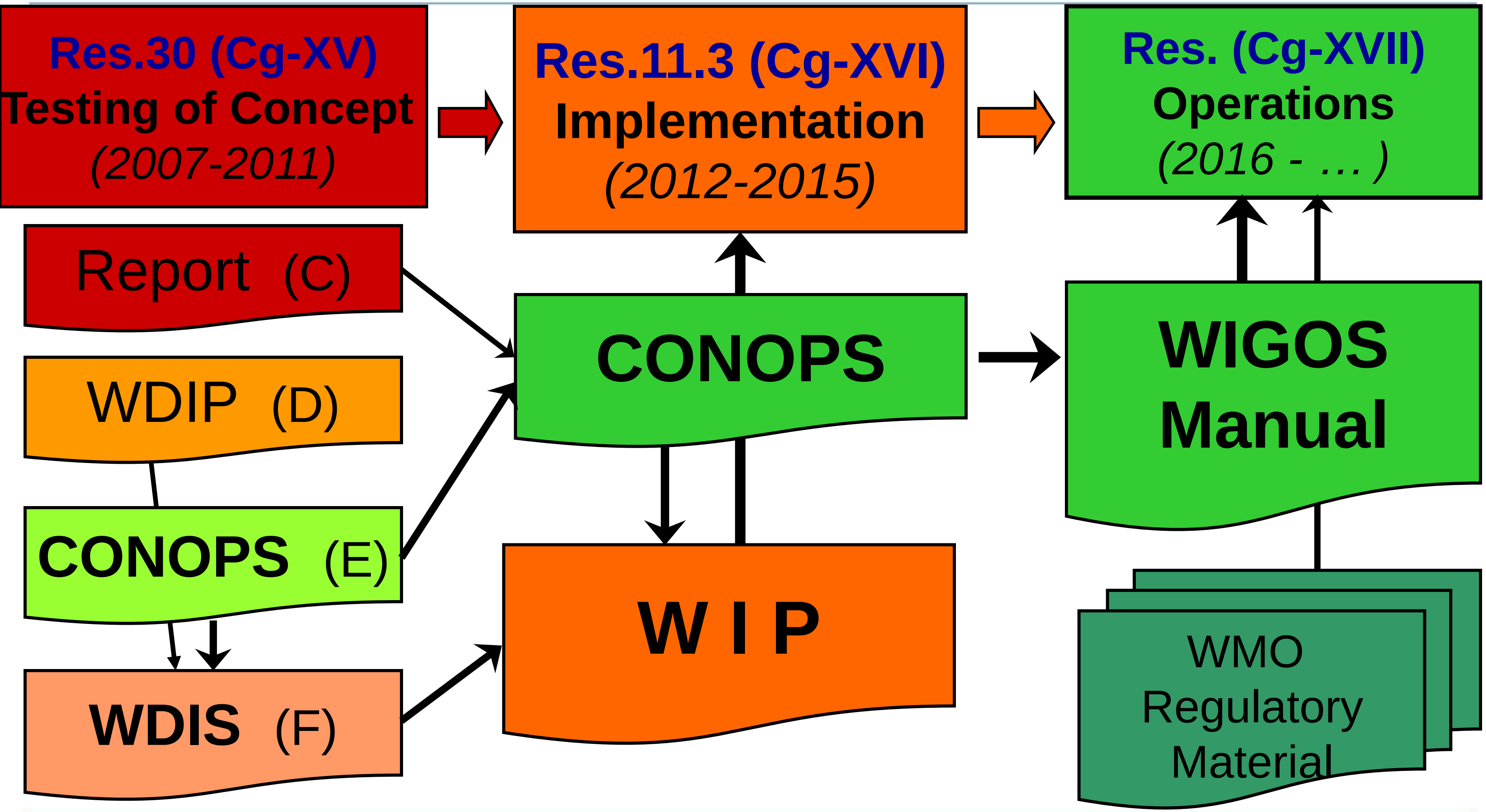
products

data

- **Great challenges:**
  - **Sciences**
  - **Technologies**
  - **Coordination**
  - **Collaboration**
  - **Cooperation**
  - **Resources**
  - **….**



WIGOS Phases



→ : ***Reference for***

Benefits of WIGOS

- ***Enhanced Members' ability*** to meet expanding national mandates and achieve higher ***national visibility of NMHSs*** with other environment related agencies;
- Framework for ***improved collaboration and coordination*** between NMHSs and relevant national and regional organizations;

WIGOS:
Meeting challenges of the future in an efficient and cost effective way

Thank you!

More information at: ***www.wmo.int/wigos***