World Meteorological Organization

Working together in weather, climate and water

WMO

WMO Integrated Global Observing System

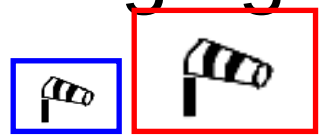
WIGOS

www.wmo.int

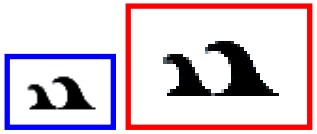
Global Societal Needs

- Improved protection of life, and property (related to impacts of hazardous weather, climate, water and other environmental events and increased safety of circulation and transport on land, at sea and in the air)
- Poverty alleviation, sustained livelihoods and economic growth (in connection with the Millennium Development Goals) including improved health and social well-being of citizens (related to weather, climate, water and environmental events and influence)
- Sustainable use of natural resources and improved environmental quality

Increasing Risks under a Changing Climate

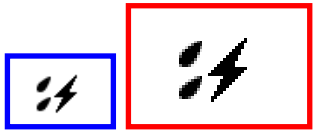


Strong Wind

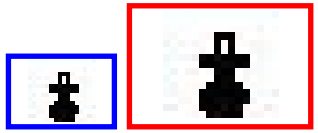


Coastal Marine Hazards

Tropical Cyclones

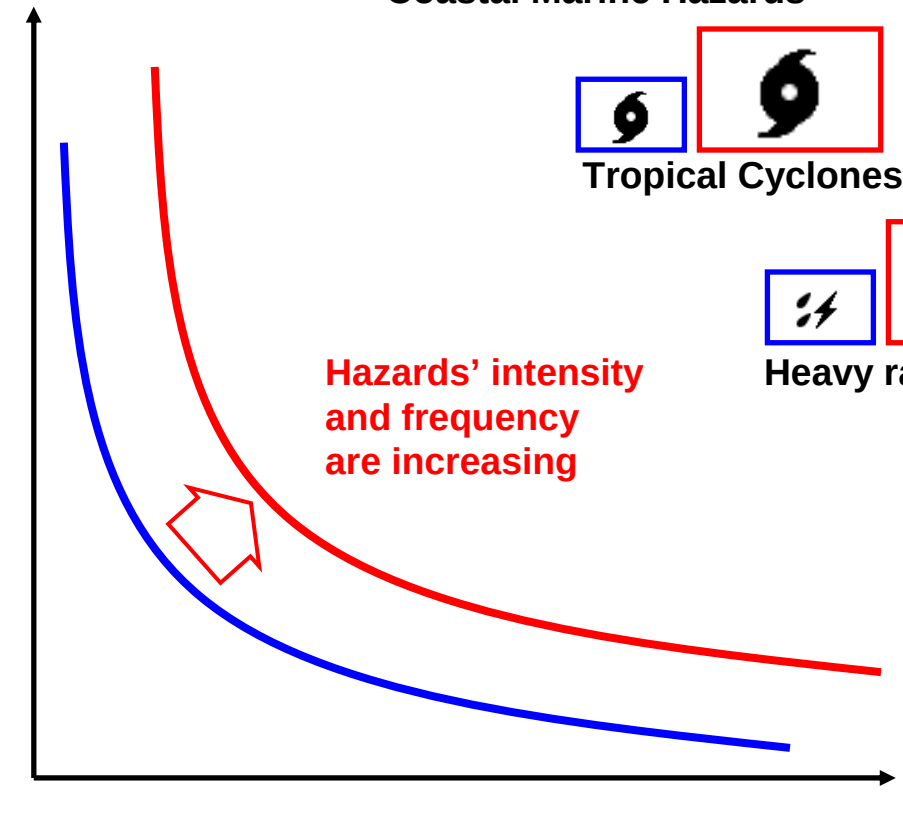


Heavy rainfall / Flood



Heatwaves

Exposure is increasing !

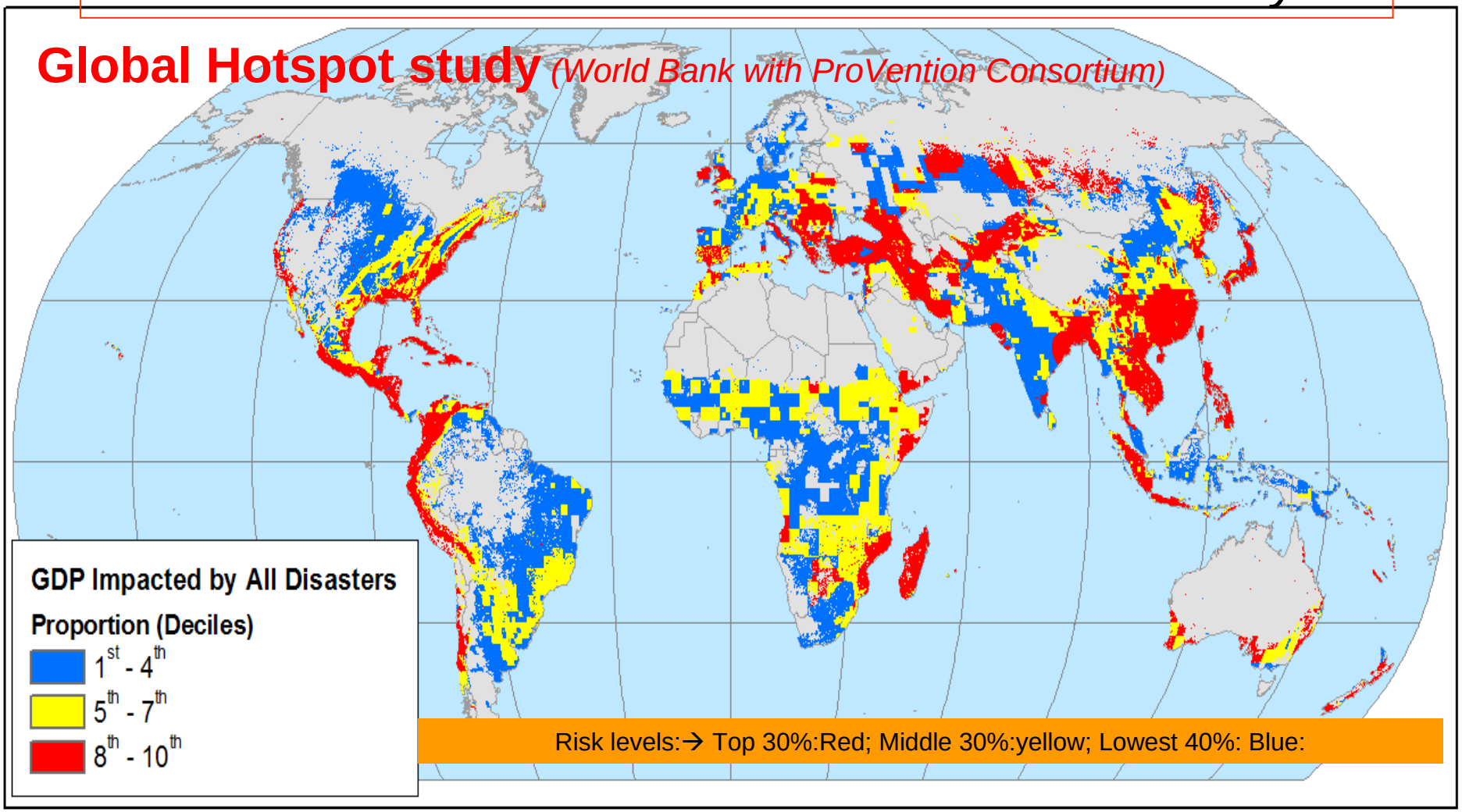


Hazards' intensity and frequency are increasing

Need for disaster risk management

Global Challenges

As society becomes more complex we become more sensitive to natural and human induced variability.

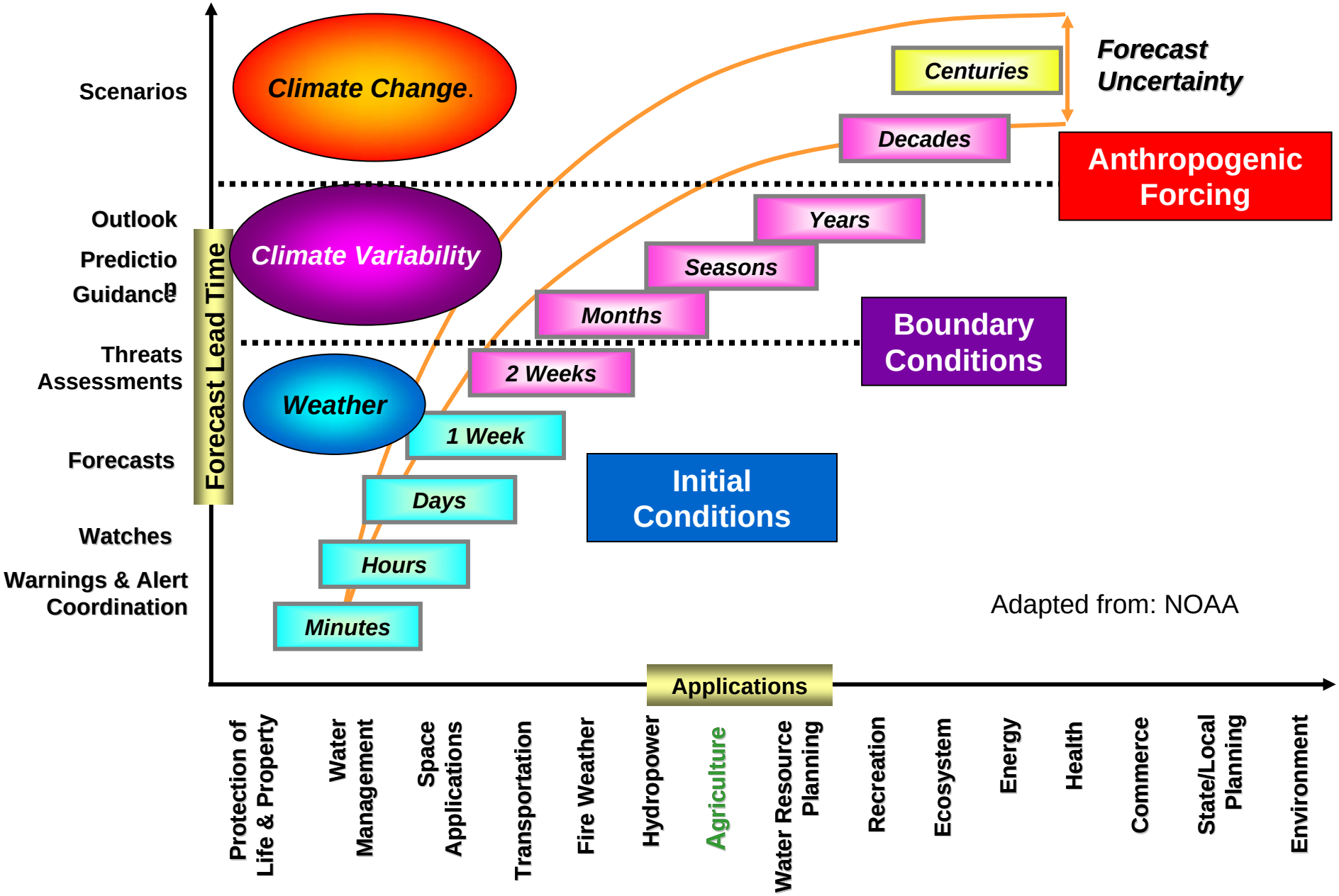


35 countries have more than 5% pop in areas at risk from three or more hazards
96 countries have more than 10% pop in areas at risk from two or more hazards
160 countries have more than 25% pop in areas at risk from one or more hazards

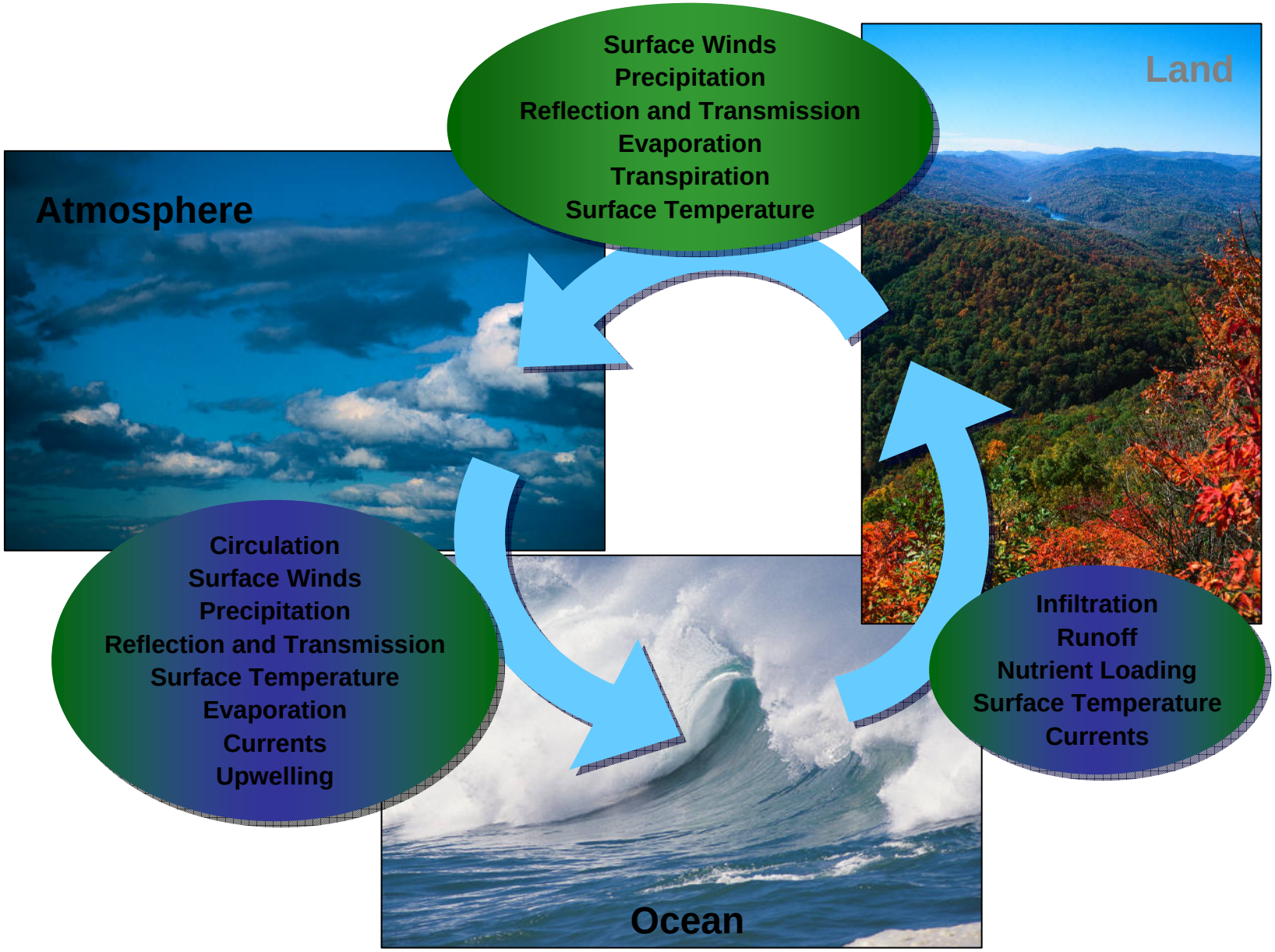
NMHS Operational service Pressing Requirements

- Current
  - Severe Weather DRR
  - Monthly to seasonal Prediction
  - …
- Future
  - Climate Services
  - Environmental Services
  - Water issues
  - Sustainable development
  - ……

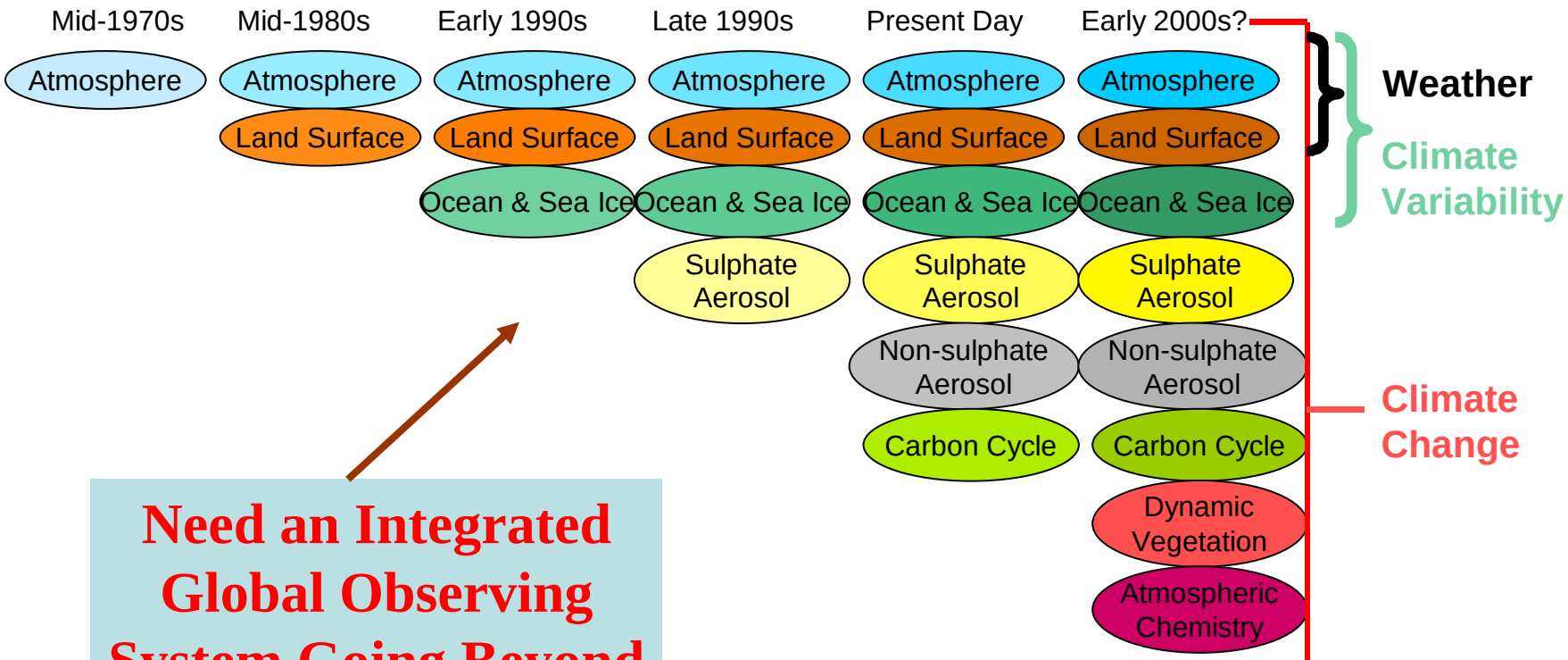
A Seamless Prediction Framework



Studying Earth as a Complex System



Overview of Weather and Climate Models and the Required Observations



Need an Integrated Global Observing System Going Beyond the WWW

To improve service delivery
Need more observations and data

- WIGOS will pave the way for better future observing systems development.
- What are the priorities
  - Atmosphere
  - Oceans
  - Land surfaces
  - Polars and Cryosphere
  - External and internal forces (Sun, GHGs, etc)
- Strategy
  - Steady increase of WMO Mandated observing capabilities in both Space and Surface components- GOS Vision 2025
  - Enhanced international partnerships

Some Key instruments

- Satellite Major Sounding and imaging instruments
- Weather Radars
- In situ Climate Observation instruments (Radiosonde for GRUAN, GAW, etc)
- In situ weather observing instruments (AWS, lightning, GPS, Profiler)

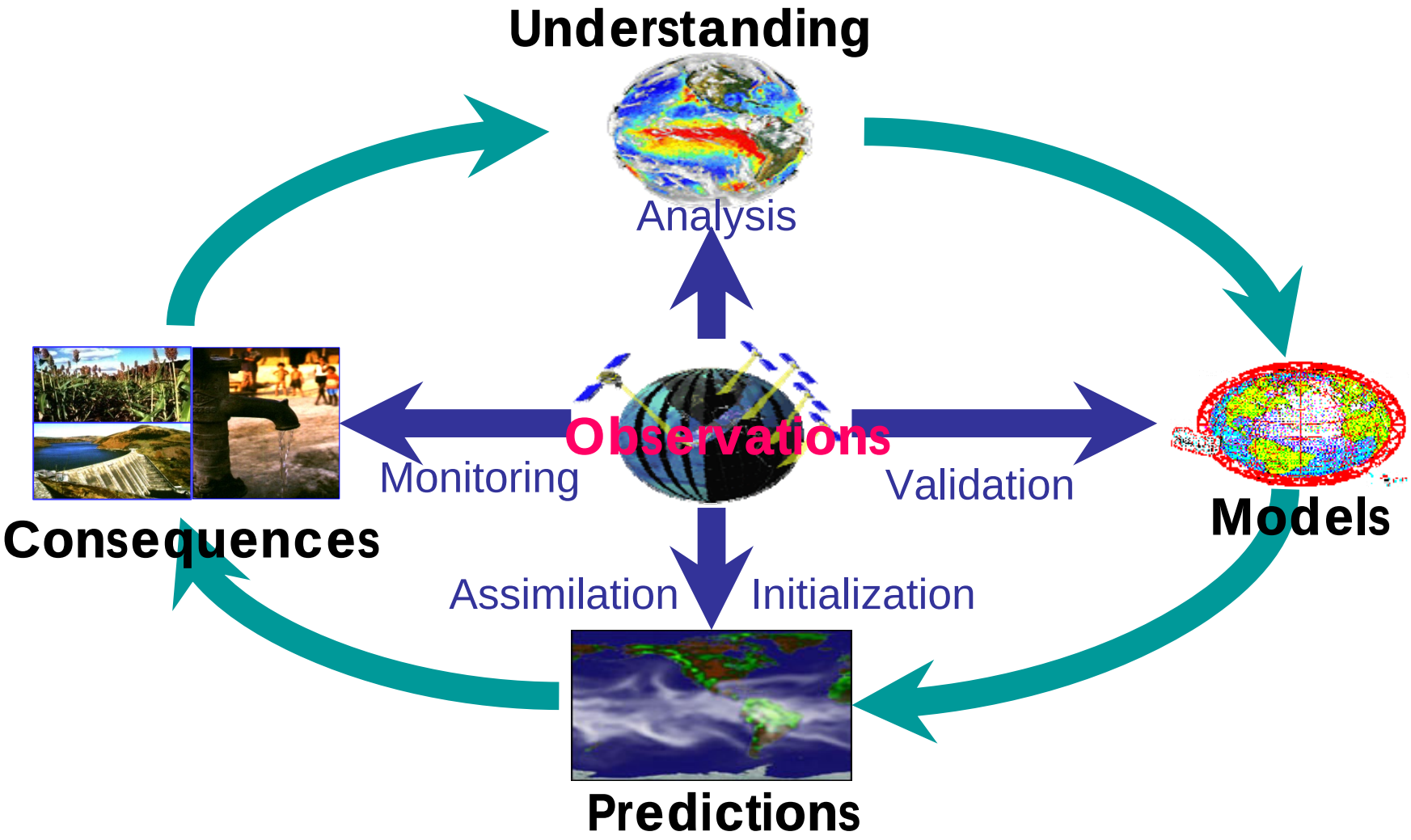
Cg-XV (2007)

- **Resolution 30 (Cg-XV) - Towards Enhanced Integration between the WMO Observing Systems:**

  Establishing a comprehensive, coordinated and sustainable system of observing systems, ensuring interoperability between its component systems:

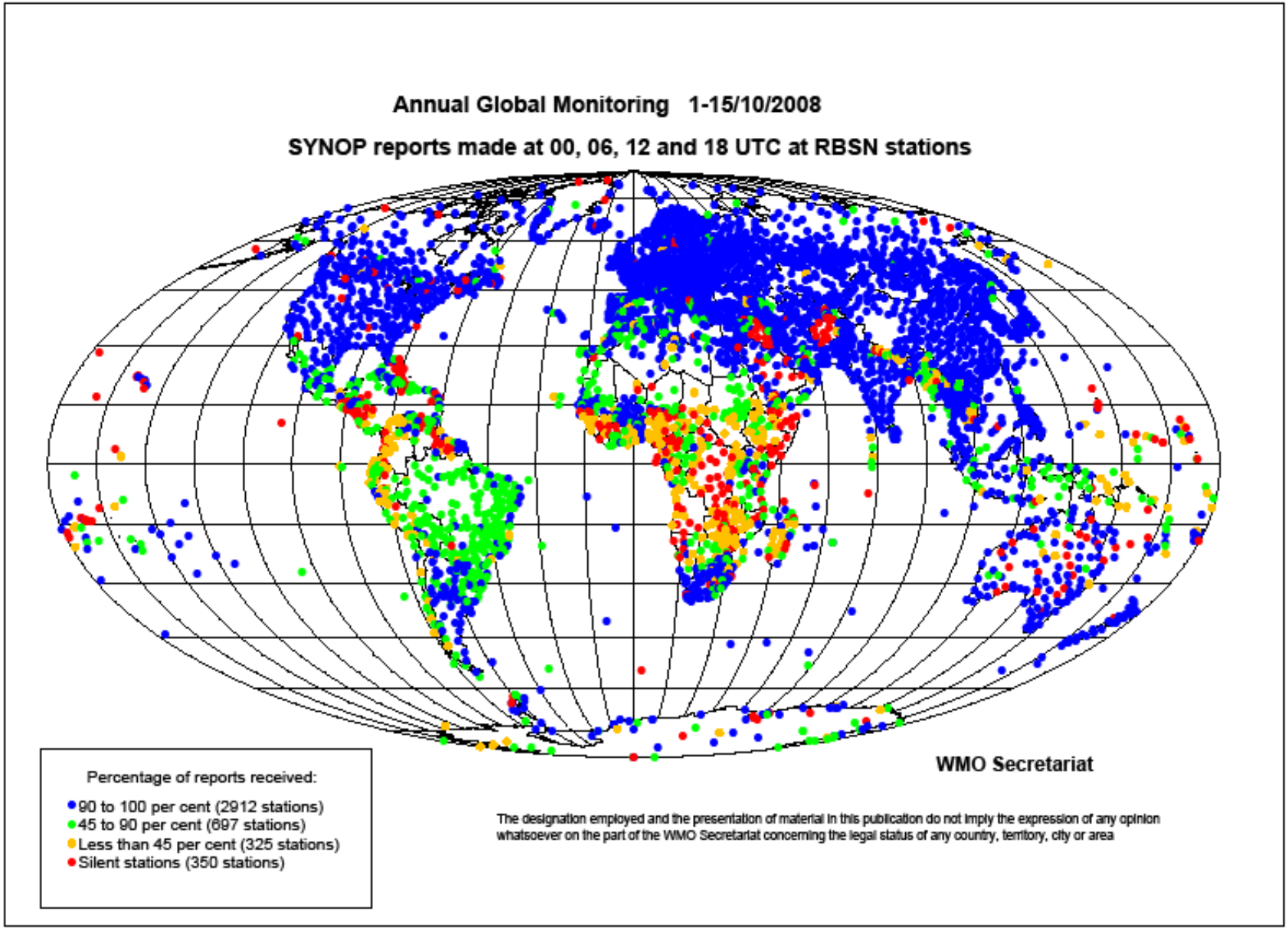
  WMO Integrated Global Observing System
  WIGOS

From Observations to Consequences

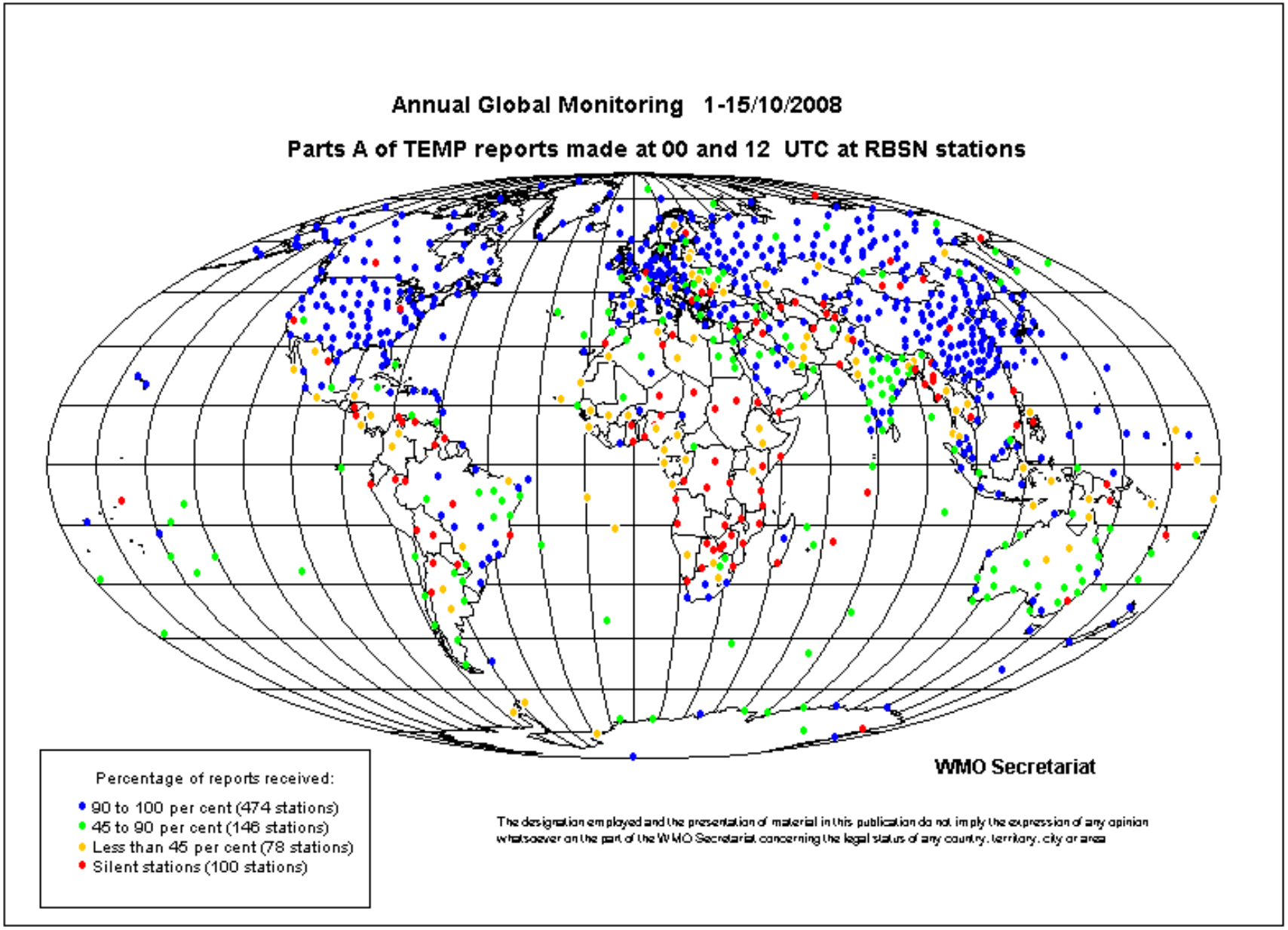


The availability of new observations strongly motivates advances in understanding, prediction, and application.

Surface observation network



Upper air observation network

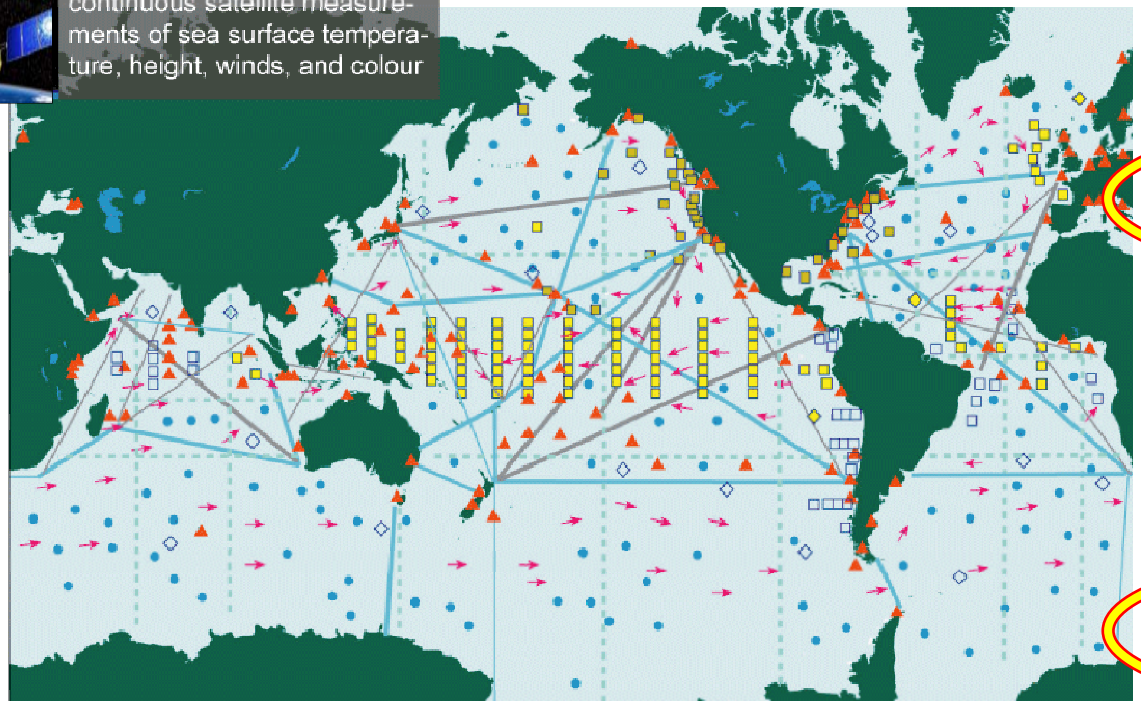


Initial Global Ocean Observing System for Climate

Status against the GCOS Implementation Plan and JCOMM targets

Total *in situ* networks **61%** March 2009

continuous satellite measurements of sea surface temperature, height, winds, and colour



87% **Surface measurements** from volunteer ships (VOSclim)

200 ships in pilot project

100% Global **drifting surface buoy** array

5° resolution array: 1250 floats

66% **Tide gauge** network (GCOS subset of GLOSS core network)

170 real-time reporting gauges

81% **XBT sub-surface temperature** section network

51 lines occupied

100% **Profiling float** network (Argo)

3° resolution array: 3000 floats

59% Repeat hydrography and carbon inventories

Full ocean

Reference time series 54%

58 sites

48% Global **reference mooring** network

29 moorings planned

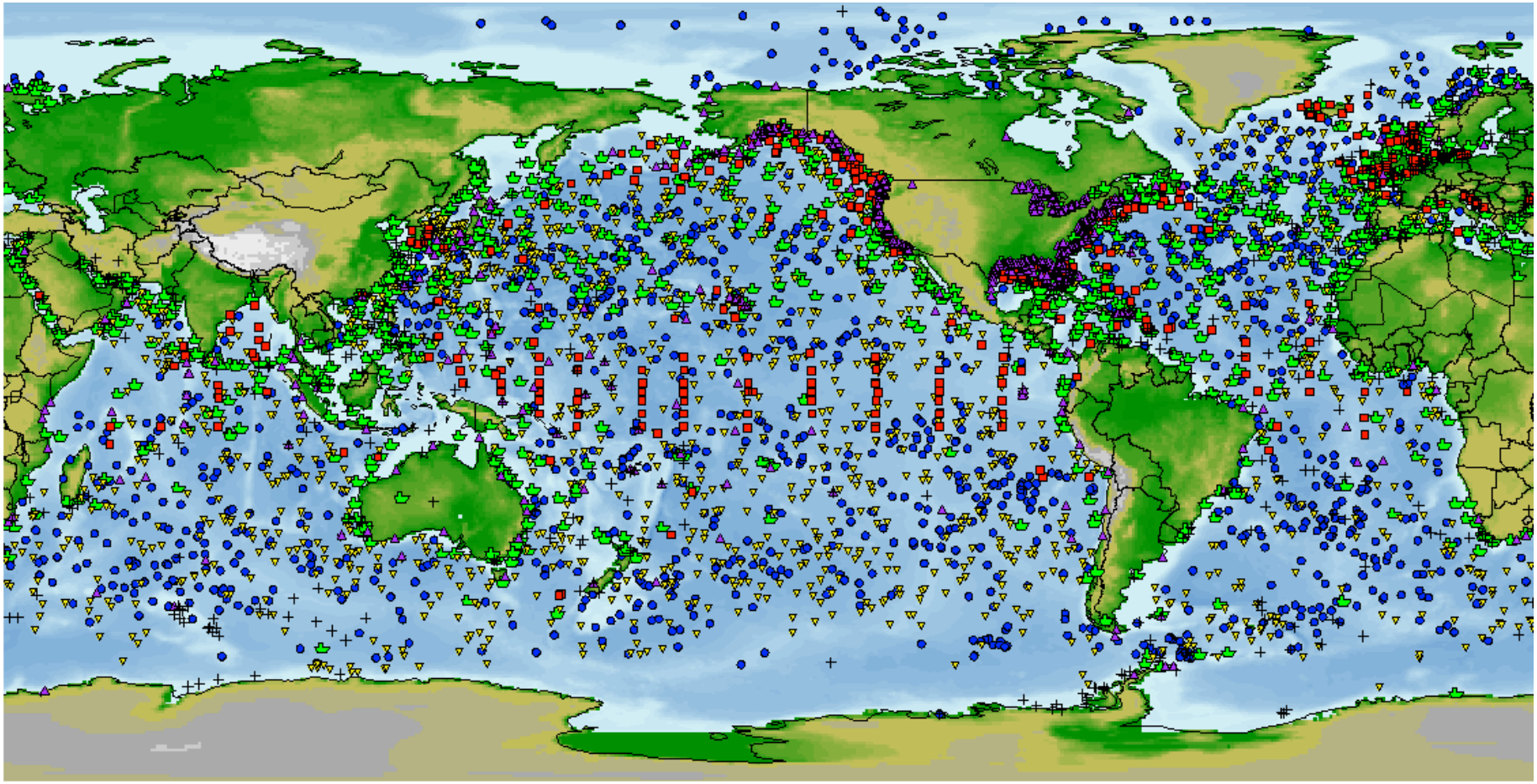
79% Global tropical **moored buoy** network

119 moorings planned

Milestones
Drifters 2005
Argo 2007

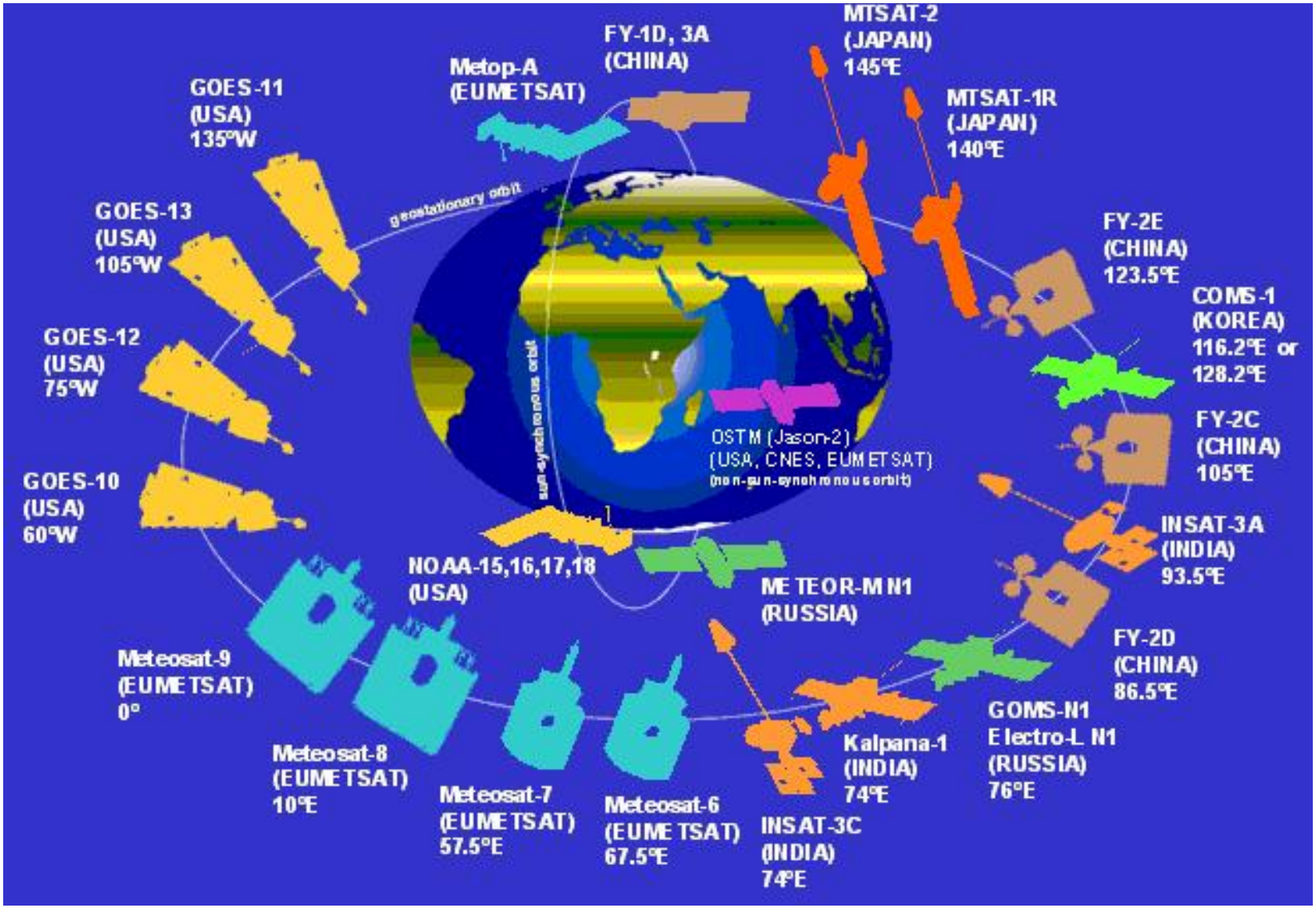
GCOS GOOS jcomm OCEANOGRAPHY & MARINE METEOROLOGY

Status of the System
8055 Platforms reporting in February



Suppressing ship observations for most recent 48 hours

Space-based observing system

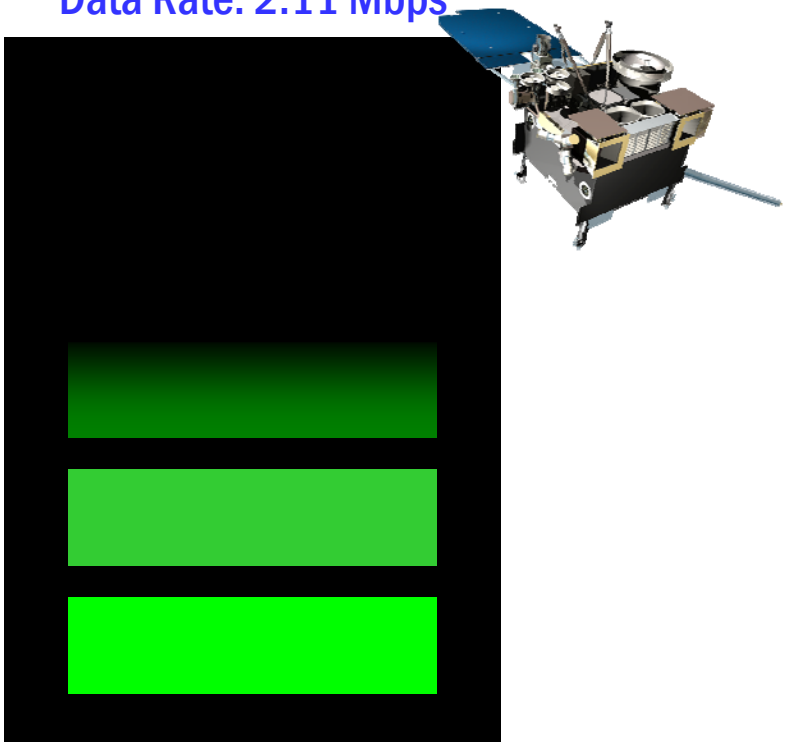


Future of Global Earth Observations

Technical Innovation

GOES-I/P Instruments

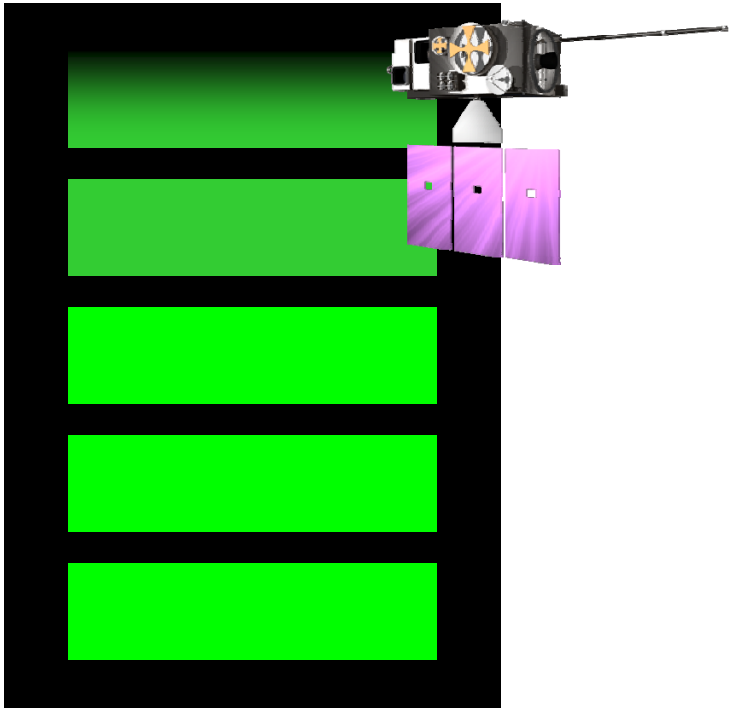
Data Rate: 2.11 Mbps



Daily Output: 181 Gb

GOES-R Baseline

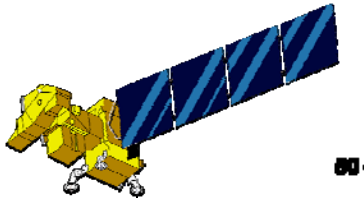
Daily Rate: 132.0 Mbps

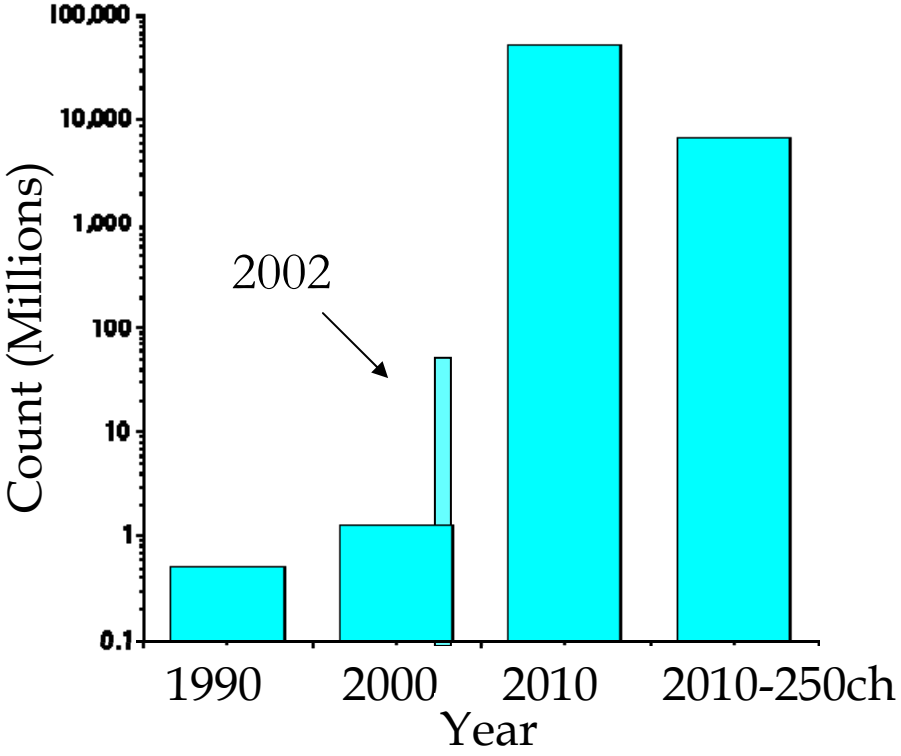


Daily Output: 16,000 Gb

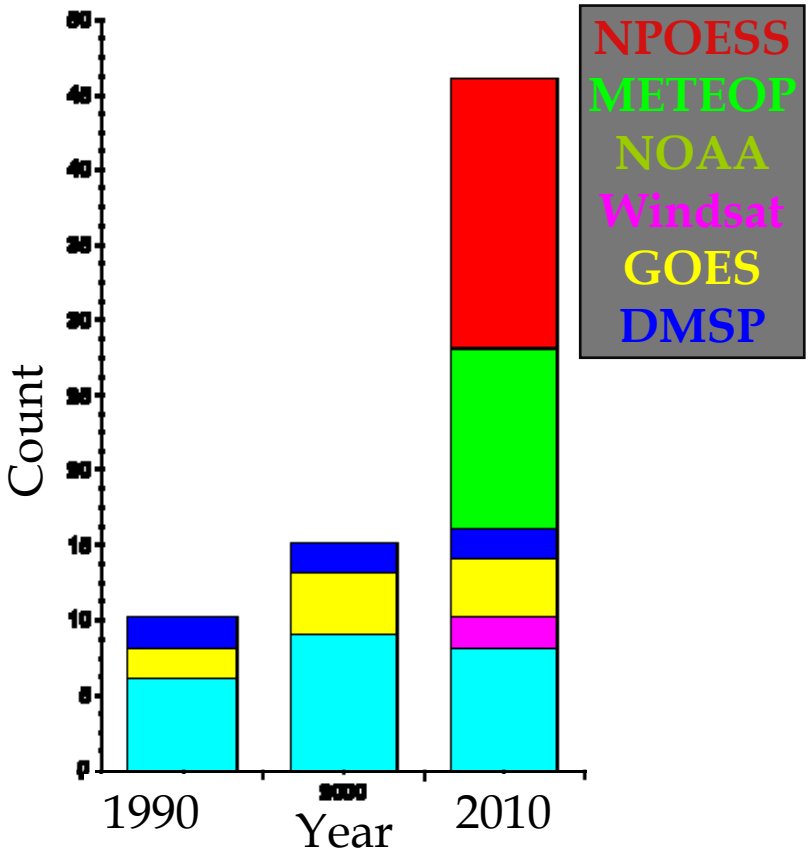
5-Order Magnitude Increase in Satellite Data Over 10 Years

Daily Upper Air Observation Count

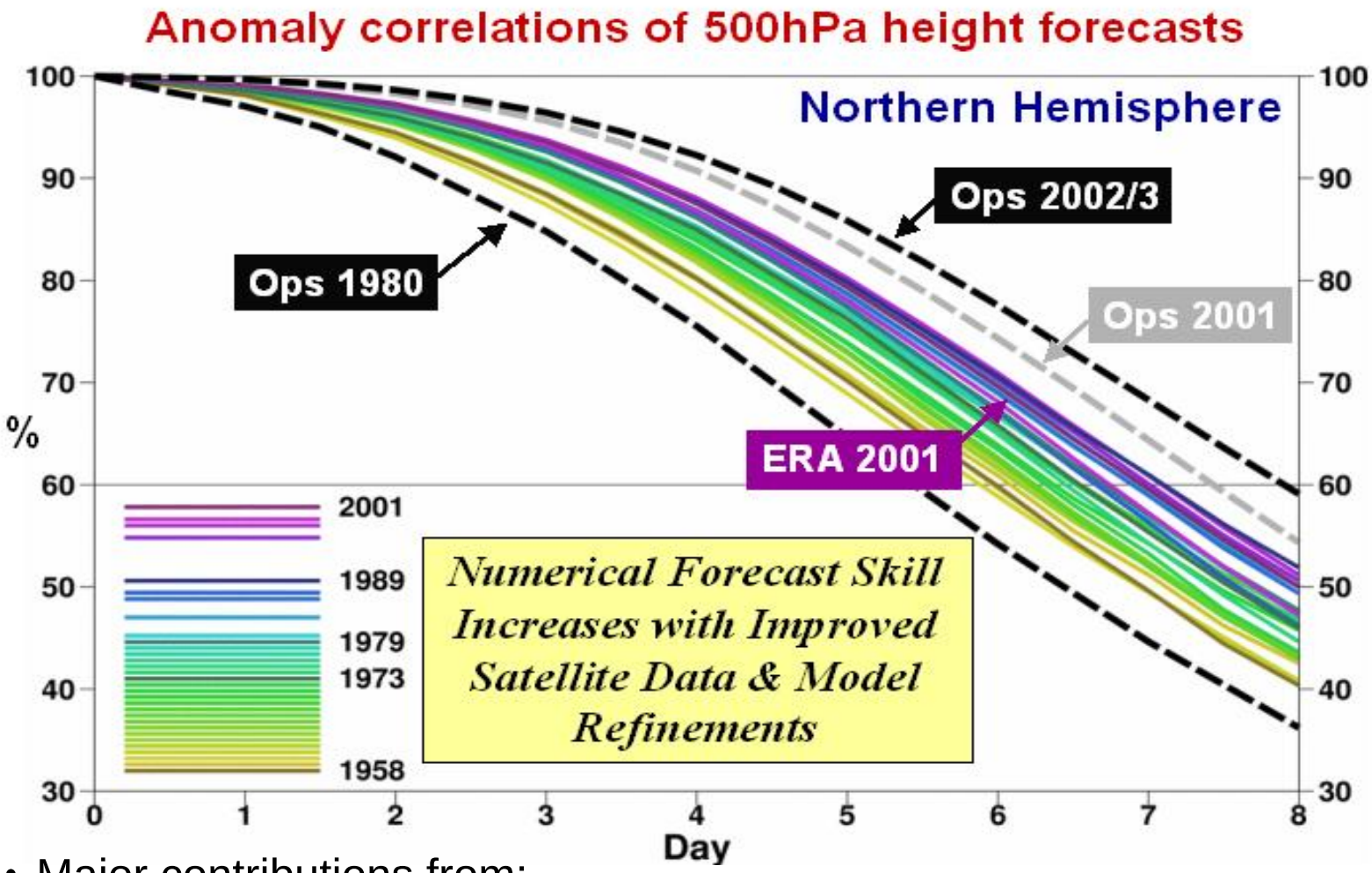




Satellite Instruments by Platform

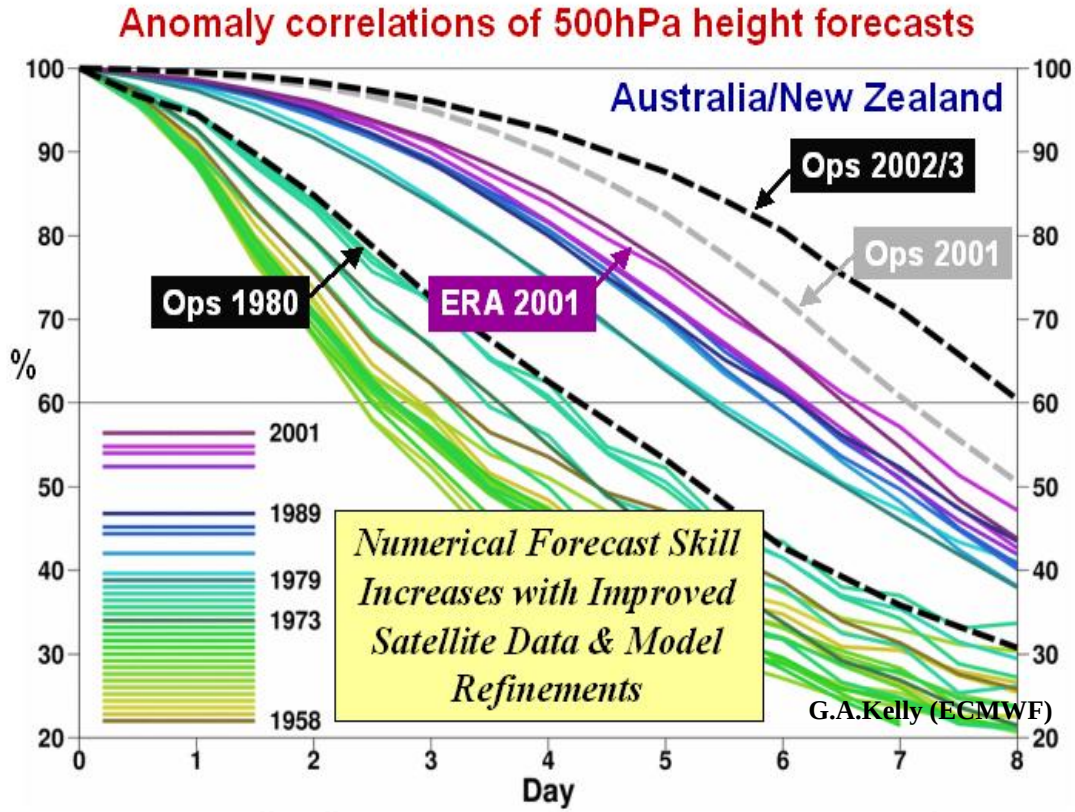


NWP continued improvement N. Hemisphere



- Major contributions from:
  - More observed data, especially satellite data
  - Improved physical processes
  - More powerful computers

NWP continued improvement



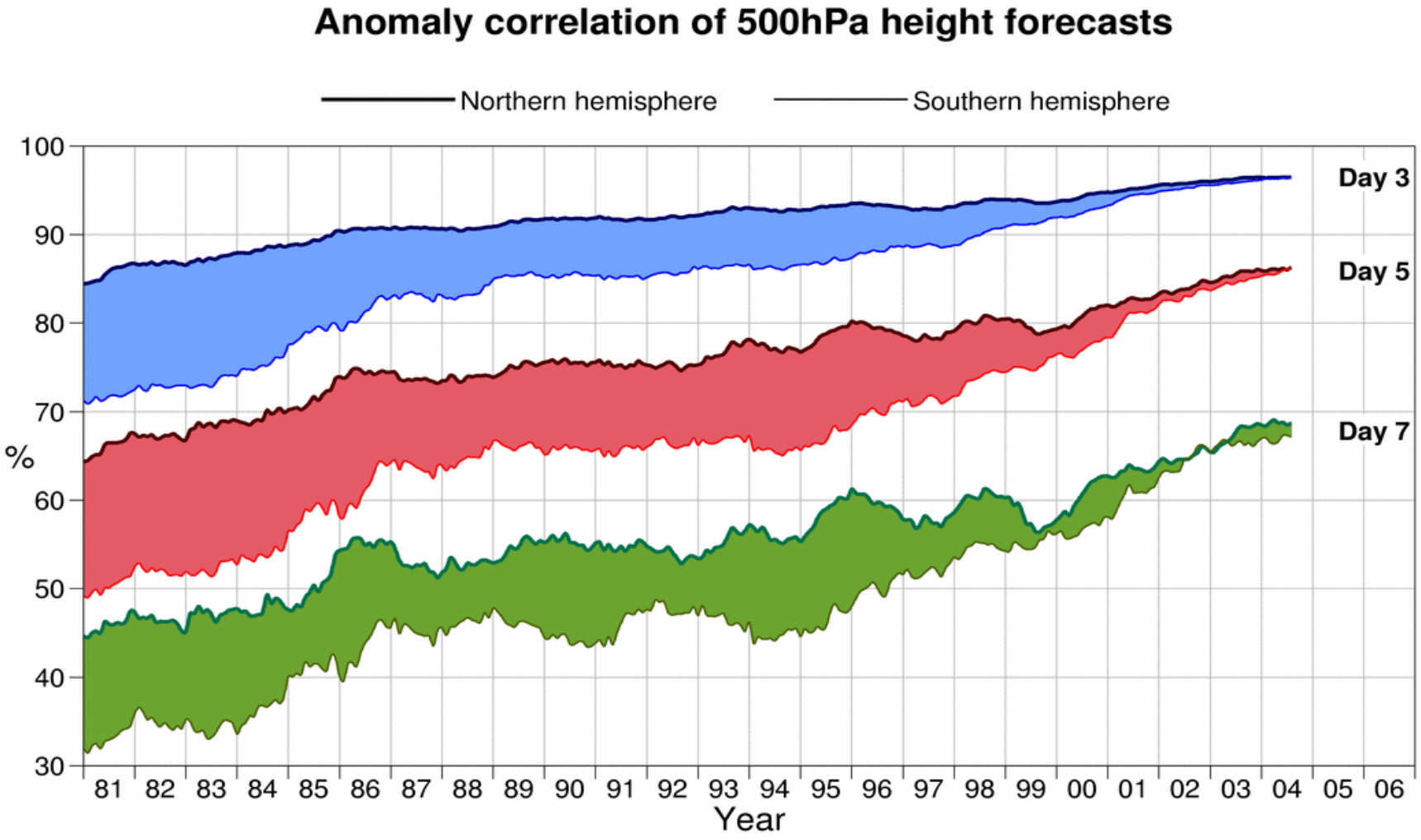
Southen Hemisphere

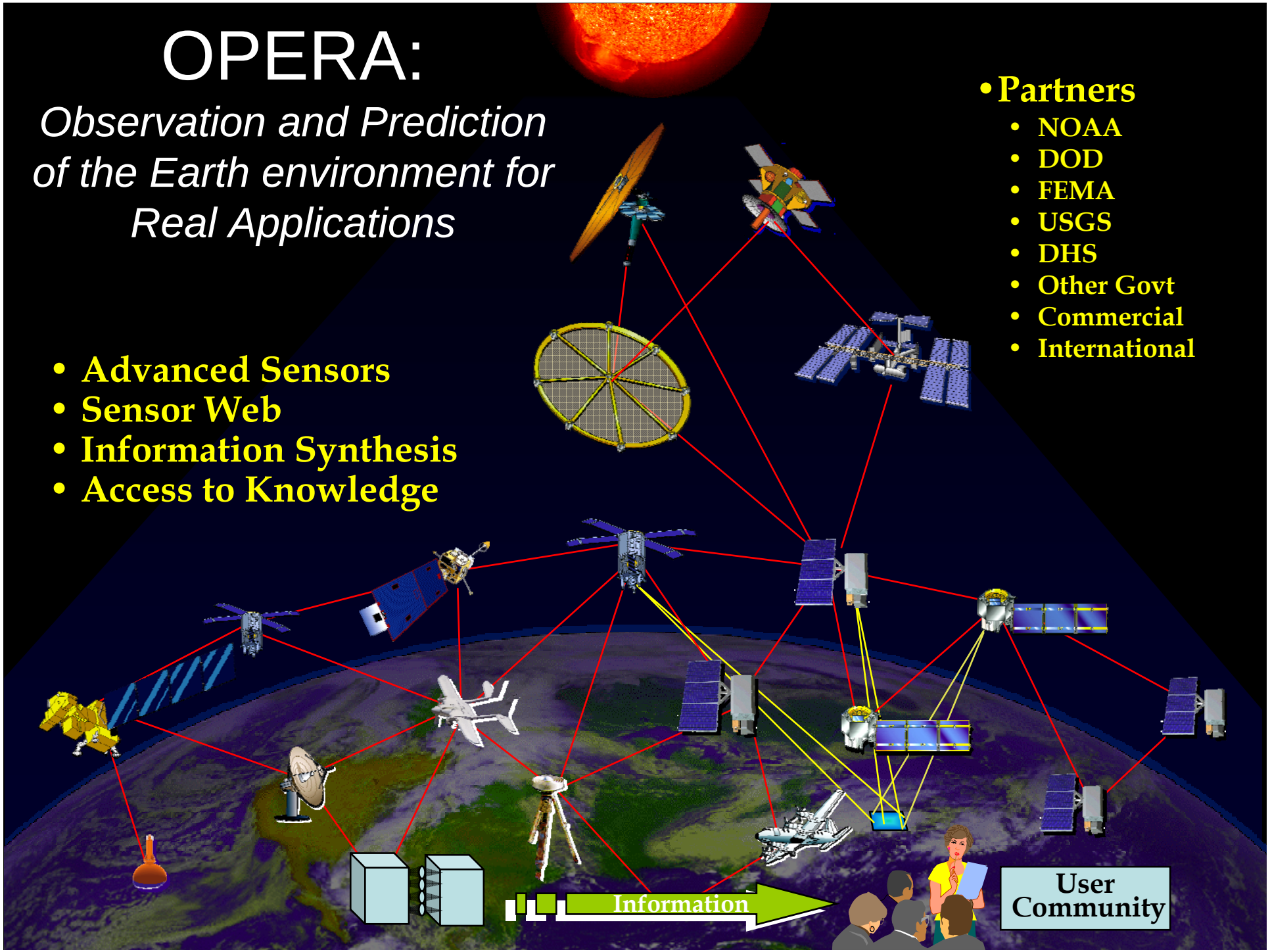
3. 5 days

From G.A.M. Kelly talk on ECMWF Forecast Improvements (September, 2003)

- Ops 1980 introduced satellites data, since then continuously improvement。

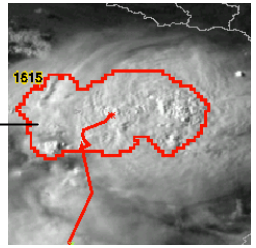
Convergence of N.Hem and S.Hem Medium Range Forecast skill 1981 – 2004



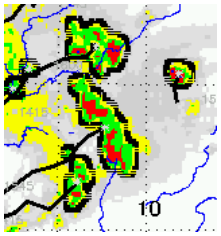

OPERA:
Observation and Prediction of the Earth environment for Real Applications
• Advanced Sensors
• Sensor Web
• Information Synthesis
• Access to Knowledge
• Partners
• NOAA
• DOD
• FEMA
• USGS
• DHS
• Other Govt
• Commercial
• International
Information
User Community

WxFUSION

Weather **F**orecast **U**ser-oriented **S**ystem **I**ncluding **O**bject **N**owcasting

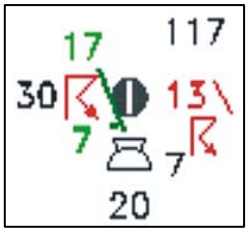


cloud tracker



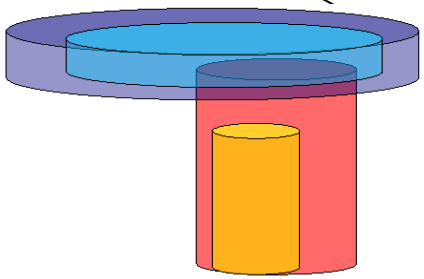
radar tracker

lightning



surface observations

POLDIRAD



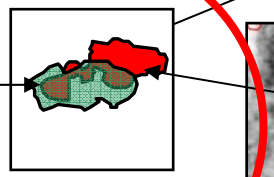
Fusion

TWO

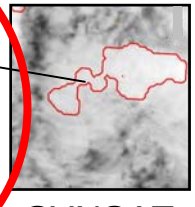
Tracking
Nowcast (0 -1 hrs)
Forecast (1 - 6 hrs)

forecast validation

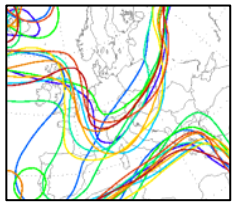
forecast validation



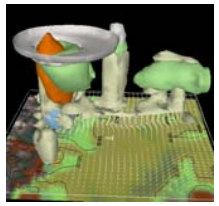
object comparison



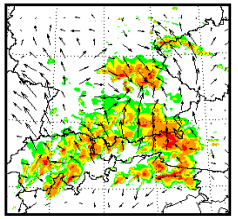
SYNSAT



ensemble forecast



local forecast



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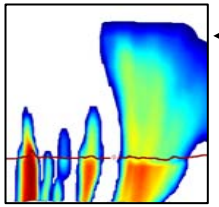

SYNPOLRAD

Setting the WMO Foundation : WIGOS in the Next Decade

- The extraordinary WMO foundation of global observations is at great challenge if it is not adequately prepared to meet society's rapidly evolving Earth information needs.
- **WIGOS will set the WMO Foundation in the Next Decade for sustained development.**