



# **Space Activities at WMO & Integration of satellite data in SWFDP**

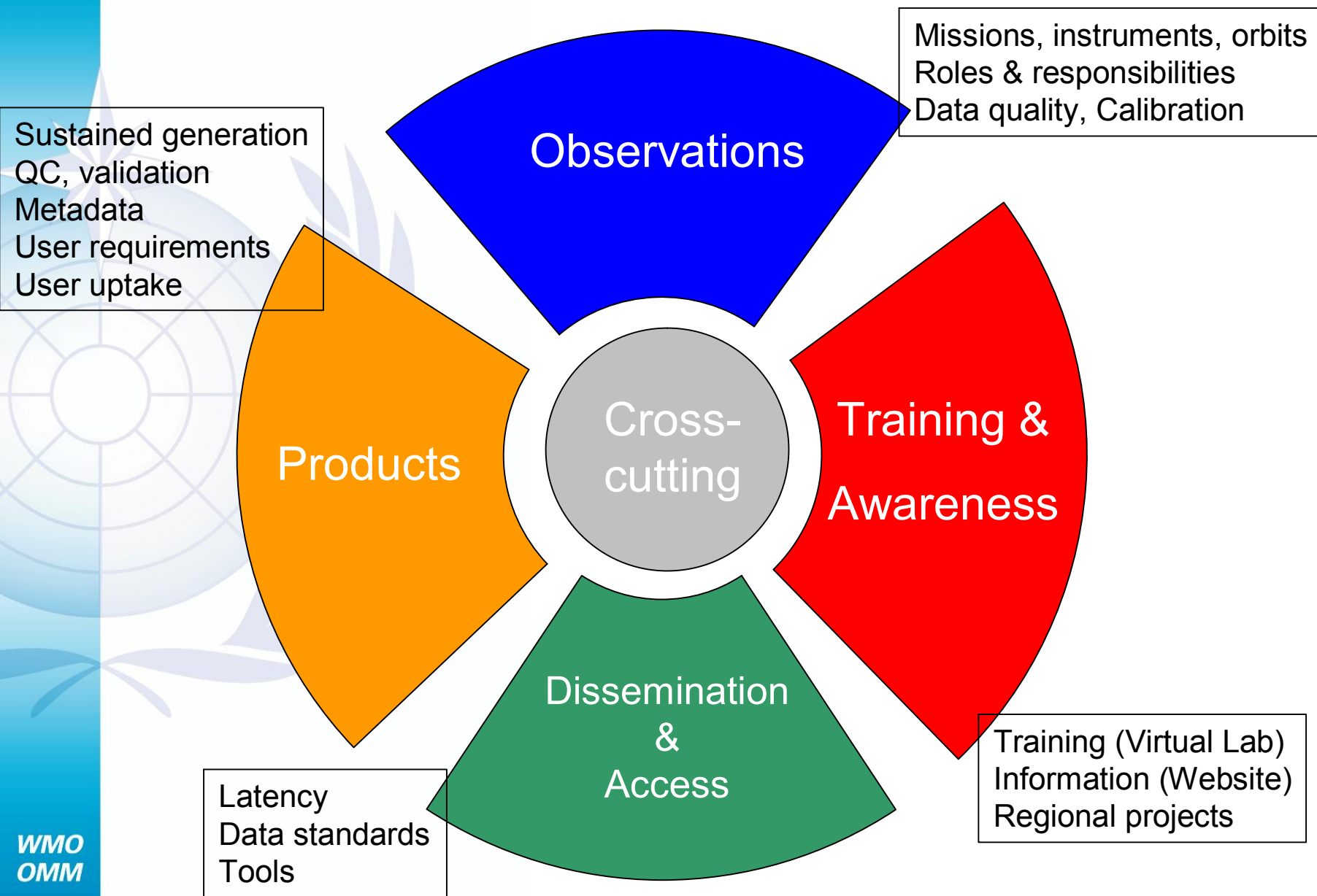
***SWFDP-SG-4***  
***29 February 2012***

**Stephan Bojinski**  
**Scientific Officer, WMO Space Programme**

# Space Programme in Support of SWFDP

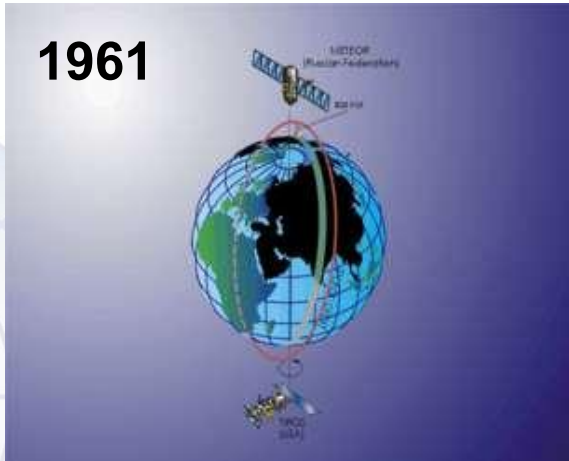
1. Solicit support by satellite operators to SWFDP, mainly through Coordination Group on Meteorological Satellites (CGMS)
2. Establish/maintain Regional Requirements for satellite data
3. Coordinate product development
4. Facilitate education and training

# Space Activities at WMO

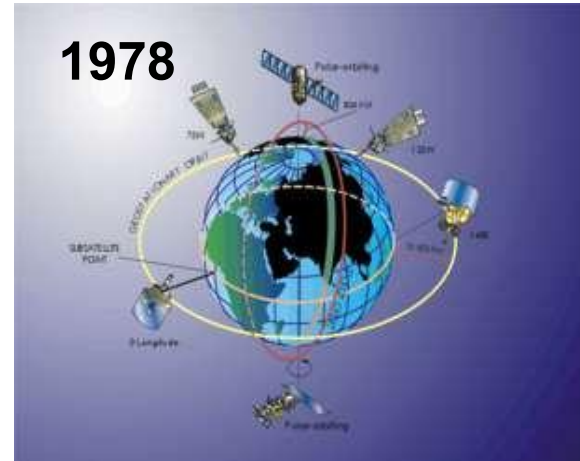


# Space-based Development of GOS

1961



1978



1990



2009



# Dialogue WMO - Satellite Operators through CGMS

- CGMS: since 1972, structured dialogue among WMO and 13 meteorological satellite operators
- 2011 Session:  
Substantial support to SWFDP  
Needs follow-up by WMO and SWFDP
- **Action 39.08:** CGMS Members to provide a contact point to WMO to coordinate their potential contributions to SWFDP. Deadline: Nov 2012
- **Recommendation 39.02:** CGMS Satellite Operators are invited to support the strategy for improving the use of satellite data in SWFDP regional subprojects.
- **Recommendation 39.29:** CGMS Satellite Operators are invited to advise on satellite products that could be made available in response to the needs of the SWFDP – Eastern Africa, to facilitate the timely provision of such satellite-related information, and to consider the SWFDP needs for the Lake Victoria Basin region in future product development activities.
- **Recommendation 38.02:** CGMS members to examine opportunities to incorporate Severe Weather Forecasting Demonstration Project (SWFDP) required data and products in their broadcast schemes.

# Dialogue WMO - Satellite Operators through CGMS

- NOAA NESDIS reported on progress in the development of a NearCasting system (Ralph Petersen, CIMSS)
- Uses multispectral infra-red geostationary satellite products to understand the detailed moisture and stability structure of the atmosphere 1-9 hours ahead of storm formation
- Lagrangian approach, extrapolation
- **Recommendation 39.28:** NOAA/CIMSS to report on additional case study results using NearCasting, and, if practical, to include collaboration with the Severe Weather Forecasting Demonstration Project (SWFDP) for the Lake Victoria region. Deadline Nov 2012



# Regional Satellite Data Requirements

- ✓ Regional approach to defining / maintaining satellite data user requirements
- ✓ For all WMO programmes
- ✓ Builds on positive experience:
  - ✓ RA I: Dissemination Expert Group
  - ✓ RA III/IV: Task Team
- ✓ Focus first on RA II, RA V
- ✓ CBS Expert Team on Satellite Utilization and Products
- ✓ SWFDP input essential

## 1. Establishes Regional Data Requirements Task Team (SG)

- Representative users
- Data providers
- WMO Secretariat



## 2. Gathering of needs and requirements for data/products

- Starting with inventory of available data/products
- Outcome of user surveys, questionnaires, etc
- Consultation of Centres of Excellence
- Personal experience



## 3. Assessment and prioritization of requirements

- Impact on applications and societal benefits
- Number/representativity of users
- Status of candidate products
- Quality/suitability of candidate data/products



## 4. Optimization of response to requirements

- Workshop with users and data providers
- Consideration of data distribution options and capabilities
- Guidance from CBS, WIS, IGDDS



## 5. Reporting on the outcome to CBS, RA, data providers

- Requirements for distribution of existing data
- Requests for modification and distribution of existing data/products
- Recommendations for development of new data/products
- Other recommendations (e.g training, user equipment)
- Proposals for further rolling review of data requirements

# Products: Precipitation Datasets using Satellites

- WMO/CGMS International Precipitation Working Group
- Compiled lists of publicly available, quasi-operational and quasi-global precipitation datasets
- Basic information on the dataset characteristics and data access, to facilitate comparison
- Validation datasets, Applications
- <http://www.isac.cnr.it/~ipwg/data/datasets.html>
- <http://www.isac.cnr.it/~ipwg/validation.html>
- Further investigation needed (IPWG-6 Oct 2012), e.g. on R2O, adequacy for purpose



# Products: Coordination of satellite products for nowcasting

- Sustained, Co-Ordinated Processing of Environmental Satellite Data for Nowcasting (SCOPE-NWC) initiative
- To establish a network of facilities for
  - Better coordination
  - Testing different models of coordination among satellite operators, including users
  - Enhanced and sustained provision of high-quality satellite products related to nowcasting
  - Facilitating the joint development of enhanced algorithms and methods
- Very early stages
- Pilot discussion papers under preparation (basic nowcasting, precipitation, ocean winds)



# Key points of the VLab strategy



- Virtual Laboratory for Education and Training in Satellite Meteorology
- Partnership between space agencies and training centres;
- Covering all WMO Regions and official languages;
- Sharing training resources: Virtual Resource Library, supported by Environmental Satellite Resource Center (UCAR COMET programme)
- Classroom, distance and Blended learning courses;
- Regional Focus Groups (RFG);
- Event Weeks: e.g., Aviation week Caribbean 30 April – 4 May 2012
- Common tools for distant learning and course management



# The VLab network



- Argentina (Buenos Aires and Cordoba)
- Australia (Melbourne)
- Barbados (Bridgetown)
- Brazil (Cachoeira Paulista)
- China (Beijing and Nanjing)
- Costa Rica (San Jose)
- Kenya (Nairobi)
- Niger (Niamey)
- Oman (Muscat)
- Republic of South Korea (Jincheon)
- Russian Federation (Moscow and St. Petersburg)
- South Africa (Pretoria)



VLAB LINKS BETWEEN COES AND THEIR SUPPORTING SATELLITE OPERATORS



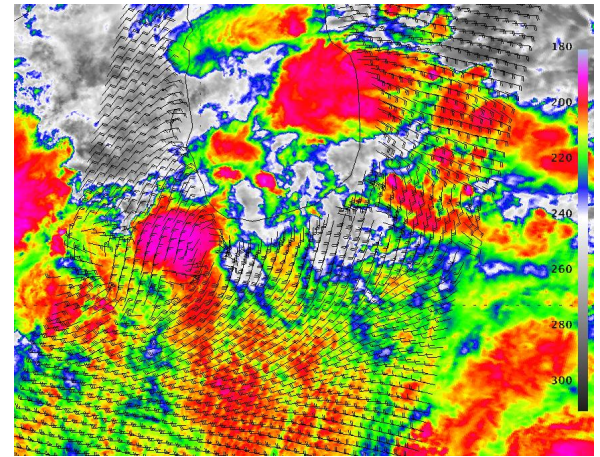


# VLab Facts 2011



- Monthly online “Regional Focus Group” meetings by VLab Centres of Excellence
- 65 courses in the year 2010/2011
- >2000 participants
- Involving all 6 WMO Regions and 7 languages: English, French, Spanish, Portuguese, Russian, Arabic and Chinese
- VLab web site: <http://vlab.wmo.int>
- Common calendar of training events
- Newsletter

# Summary I



Sri Lanka, ARB04, 25 Nov 2011

- Satellite imagery is a powerful tool to support very-short range forecasting, including nowcasting, through the provision of near-real time products to monitor and track convective development
- Satellites can also contribute to estimating rainfall rates, wind speed and direction over large water surfaces, significant wave heights, water levels, sea-surface temperature and many other parameters
- All users of global NWP forecasts indirectly benefit from satellite data

# Summary II

WMO Space Programme is responsive to SWFDP strategy for improving the use of satellite data, which foresees\*

- ✓ inviting relevant satellite operators to participate in the meetings of the Regional Subproject Management Teams to advise on relevant satellite data and products responding to their needs,
- ✓ identifying opportunities for tuning products, developing improved products and services,
- ✓ supporting the distribution of data and products for SWFDP regional subprojects.
- ✓ working with the WMO / CGMS Virtual Laboratory (VLab) in the development of the satellite aspects of the SWFDP Training programmes and in the delivery of the training.

\*CGMS-39\_WMO-WP-05

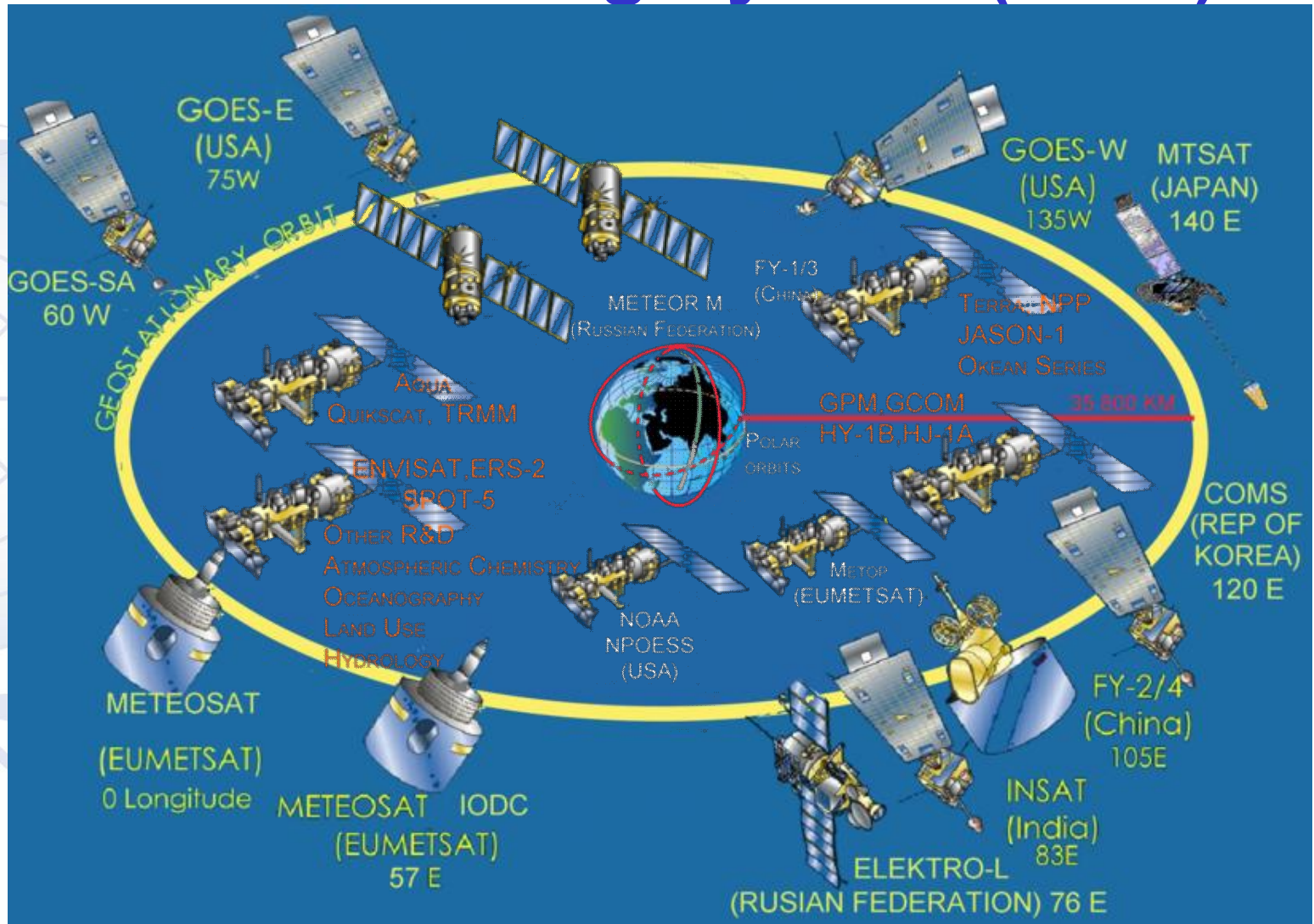


# Summary III

The Group may wish to consider:

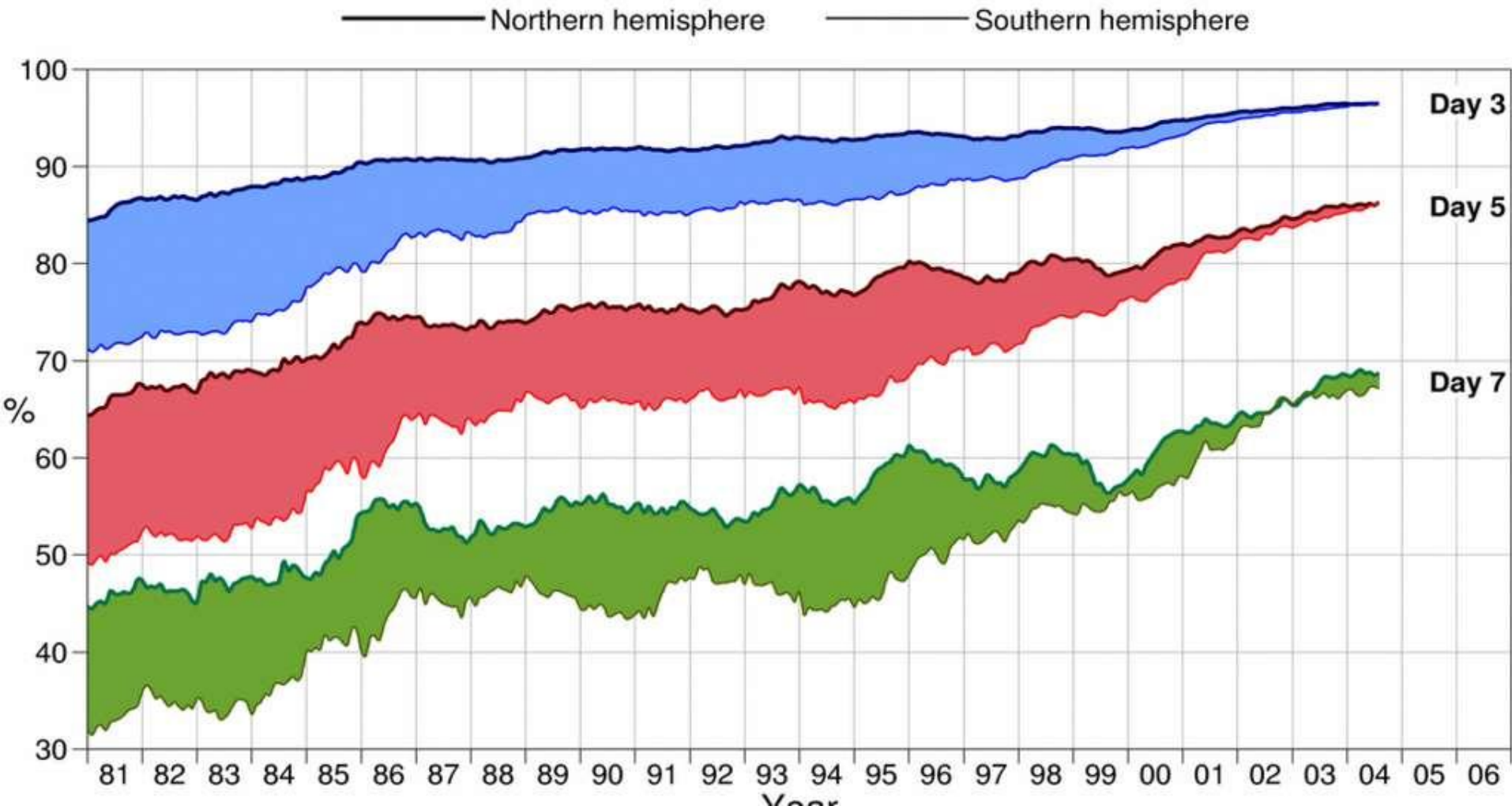
- Following up with satellite operators regarding their SWFDP commitment expressed at CGMS-39
- Engage in regional requirements definition process
- Consider any input / questions / feedback to Int'l Precipitation WG
- Further use the VLab as a training resource across SWFDP
- Identify any other areas where WMO Space Programme can be of assistance

# Space-based Component of WMO's Global Observing System (GOS)

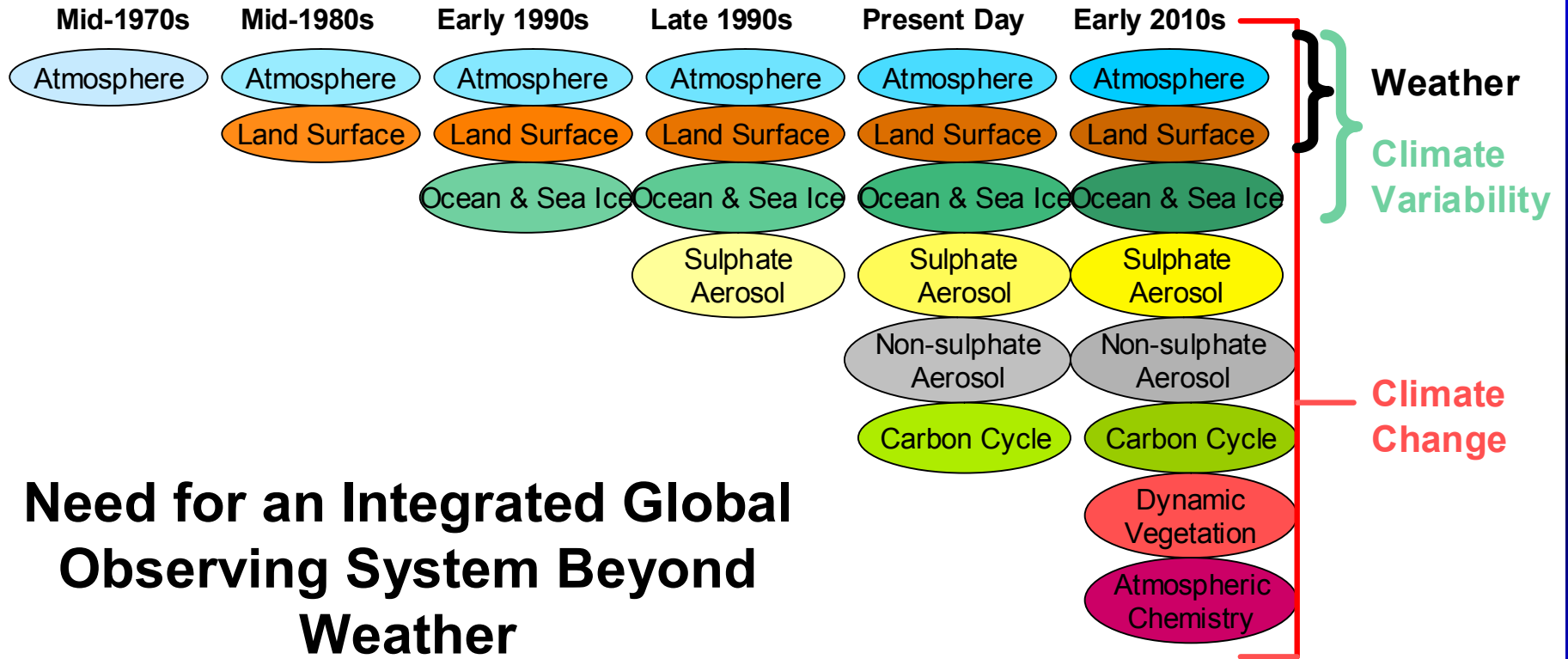


# Convergence of N. Hem and S. Hem Medium Range Forecast skill 1981 – 2004

Anomaly correlation of 500hPa height forecasts



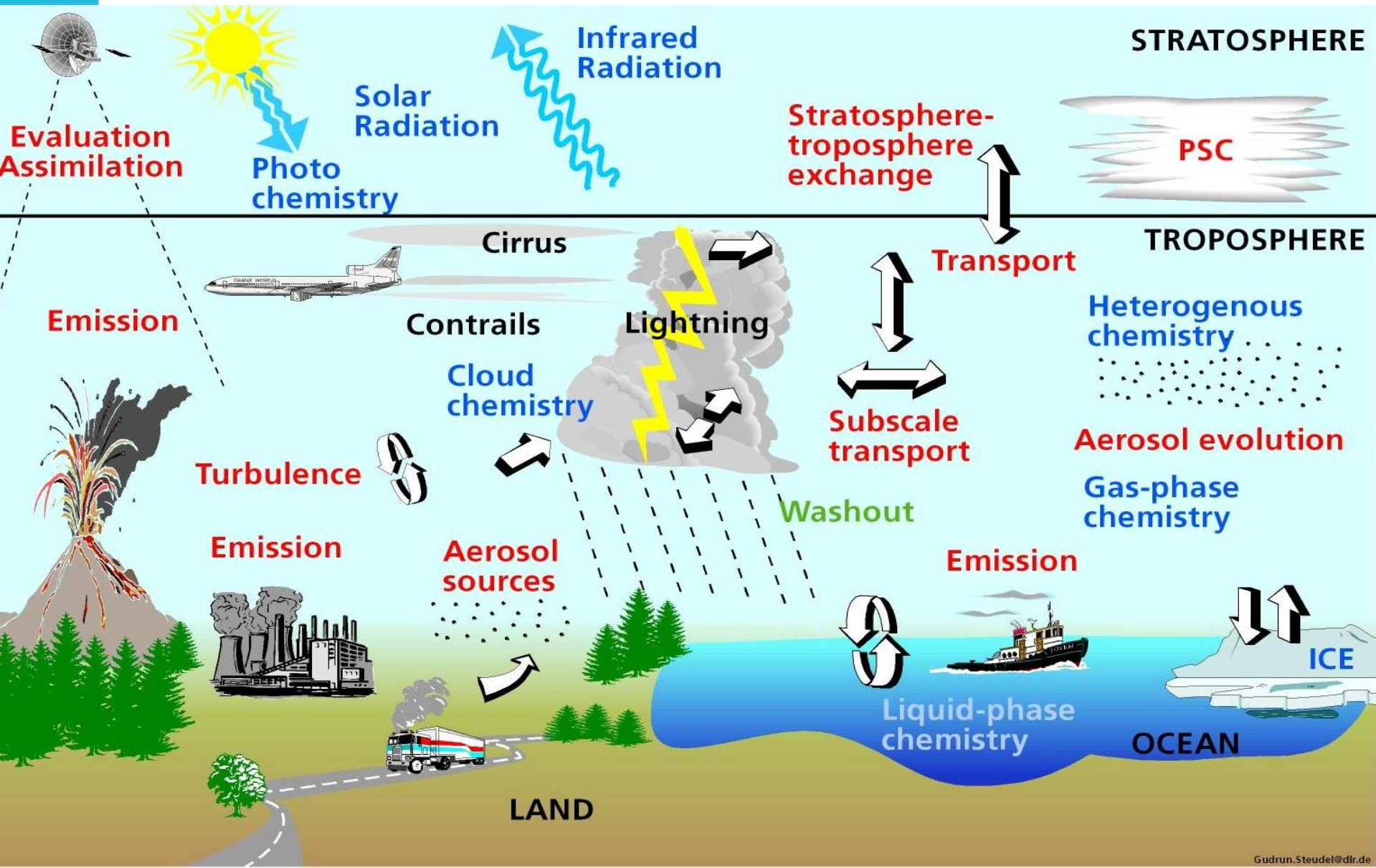
# Weather and Climate Models and the Required Observations



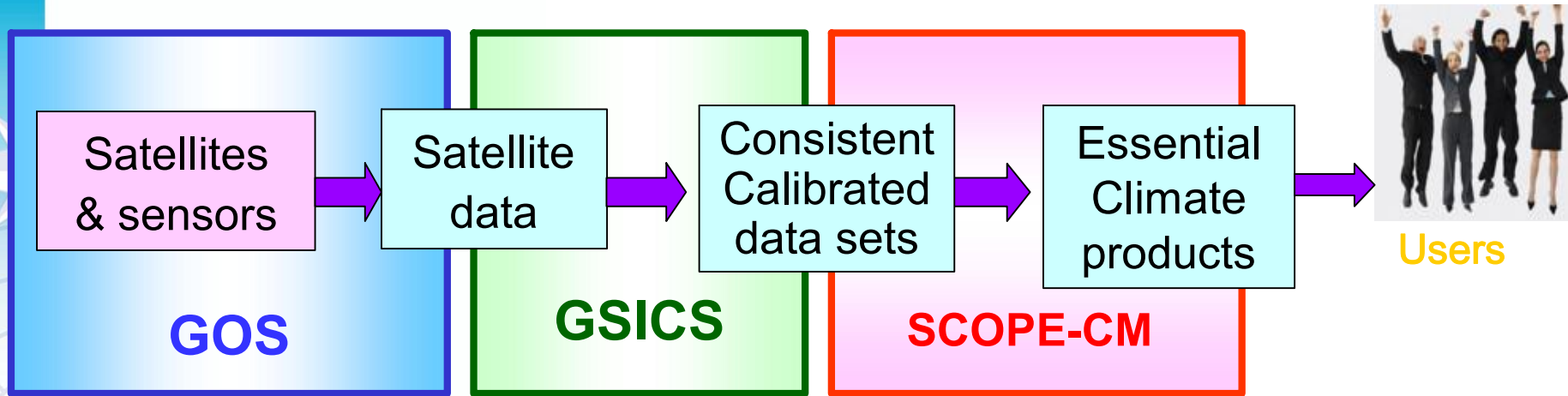
**Need for an Integrated Global Observing System Beyond Weather**



# A Complex Process Environment



# R20 Transition and Sustainability

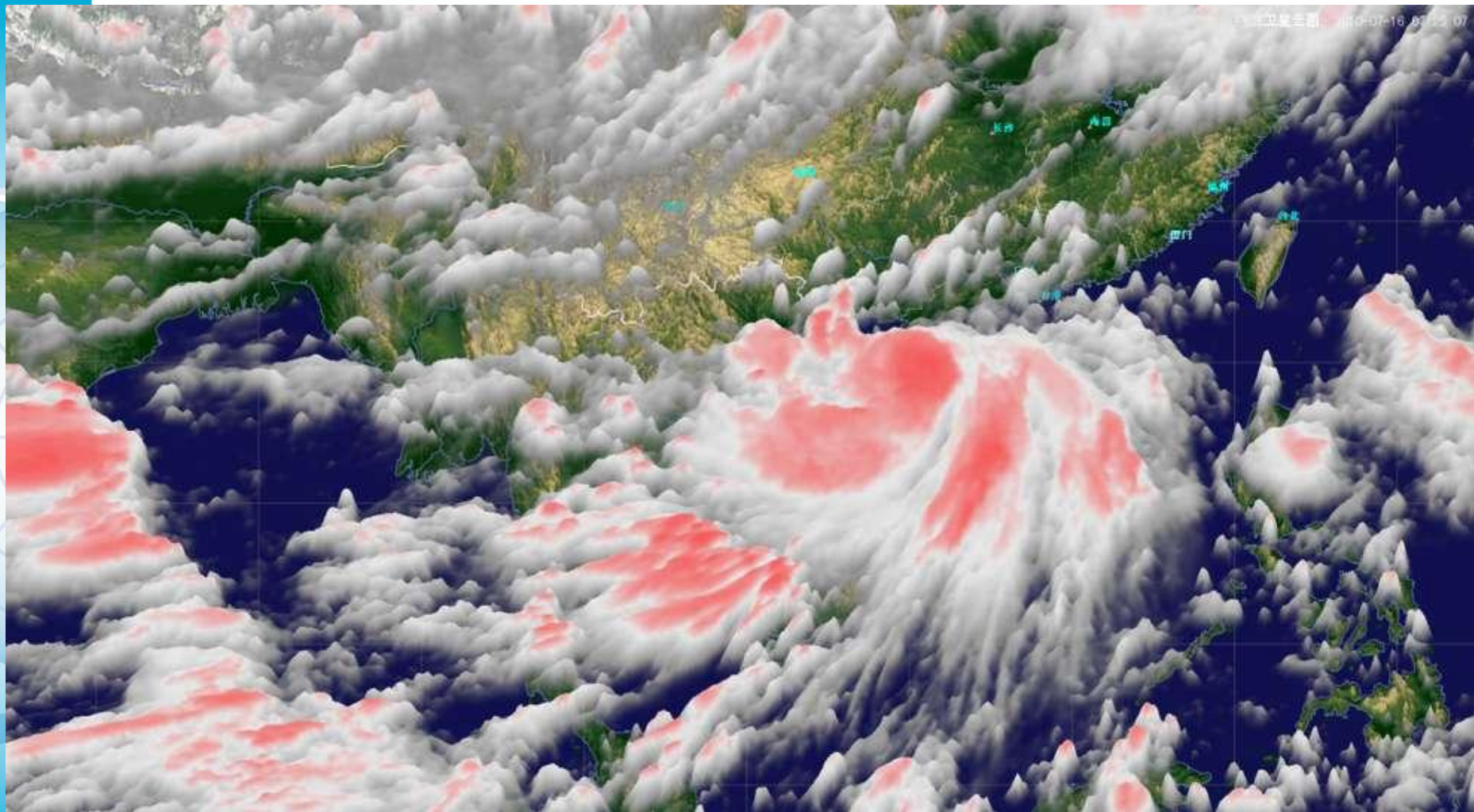


- **Sustained Coordinated Processing of Environmental satellite data for Climate Monitoring (SCOPE-CM)**
- **Participants to date:** EUMETSAT, JMA, NOAA, CMA, CEOS, GCOS, GSICS, WCRP, and WMO



# Summary

- **A challenge of integration**
- **Must build on existing capabilities**
- **Using climate change as a forcing function to deliver sustained observations for all the societal benefit areas**



Data from FY-2E Satellite

## 3D Cloud Image on 16 July 2010

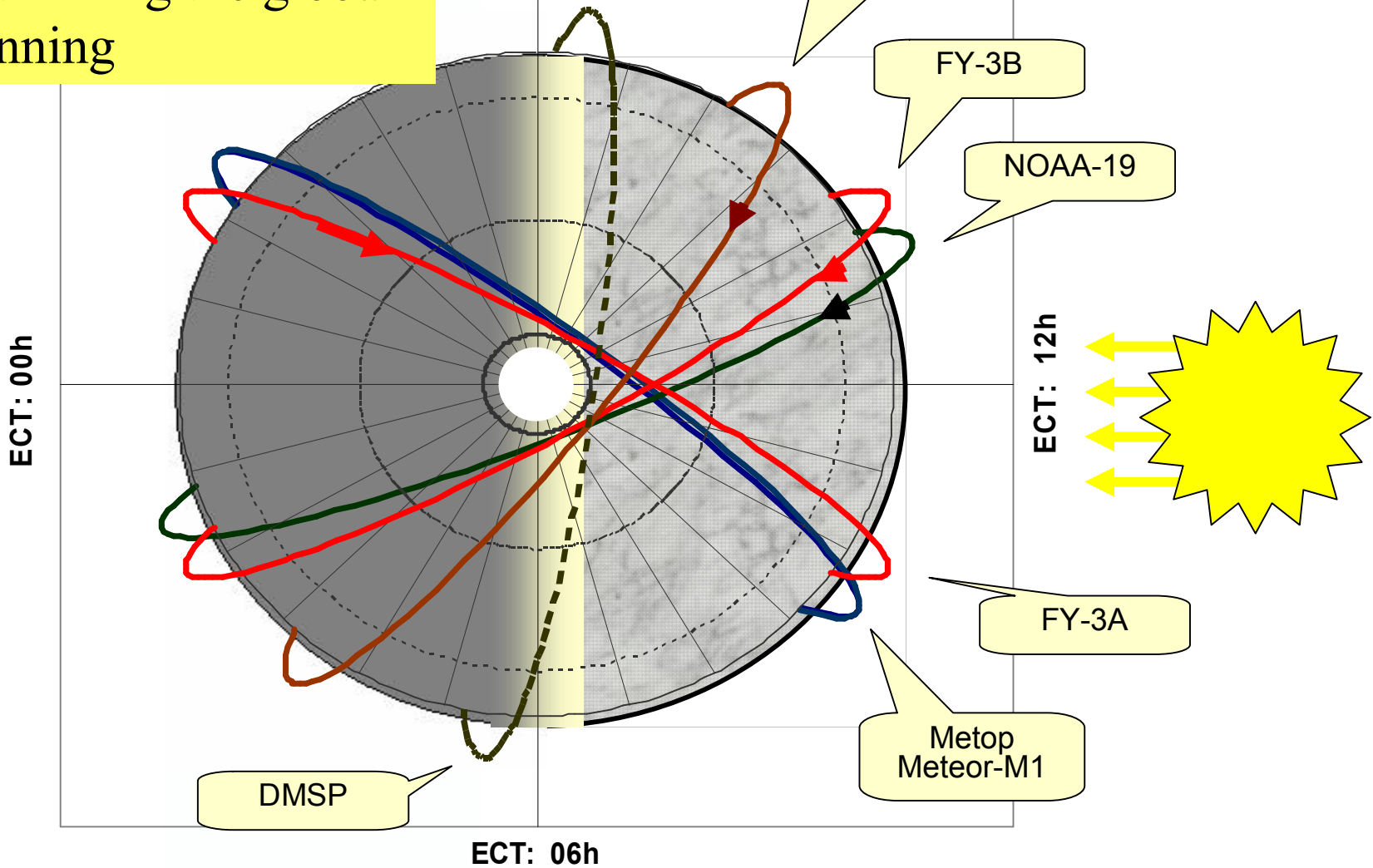


# Equatorial Crossing Times of planned polar orbiting missions in 2010/2011

ECT: 18h

North Pole view

Optimizing the global planning



DMSP

Meteor-M2

FY-3B

NOAA-19

ECT: 12h

FY-3A

Metop  
Meteor-M1

ECT: 06h

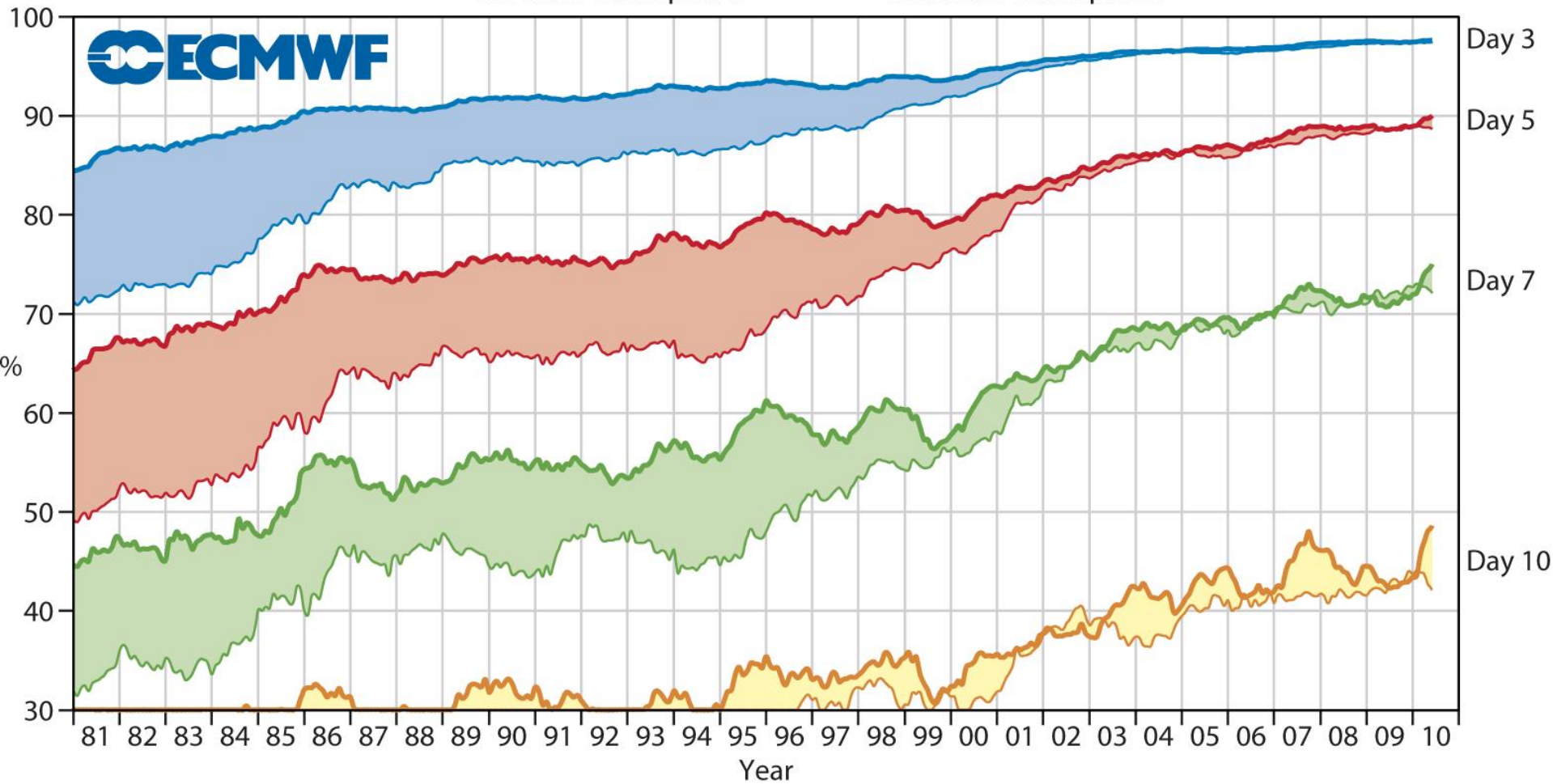
ECT: 00h




# Great Advances in Global and Regional Weather Forecasts

## Anomaly correlation of ECMWF 500 hPa height forecasts

— Northern hemisphere    — Southern hemisphere

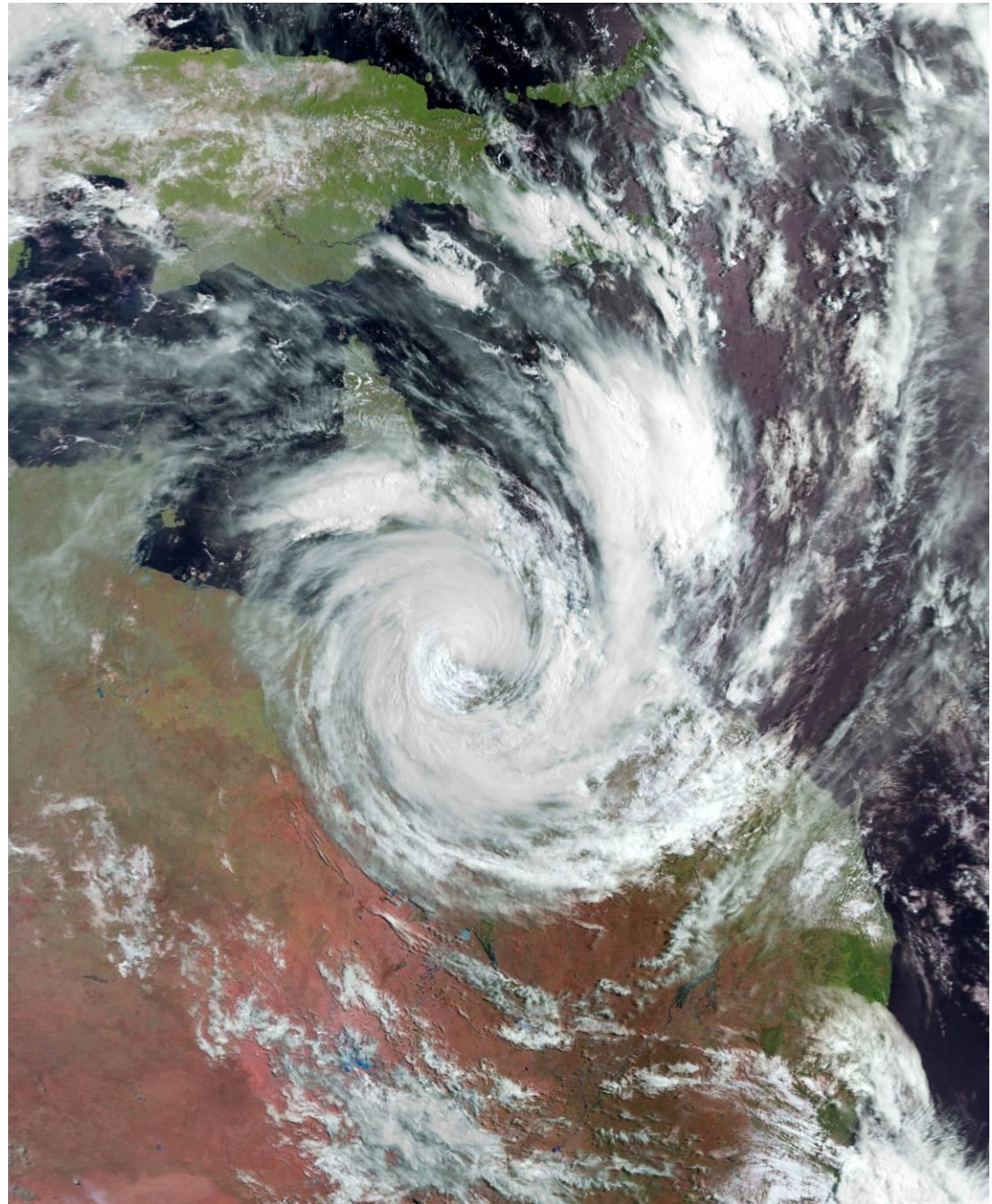


Courtesy of ECMWF. Adapted and extended from Simmons & Hollingsworth (2002)



Yasi, 3 février  
2011

Vu par Metop  
(EUMETSAT)



# Summary

- **A challenge of integration**
- **Must build on existing capabilities**
- **Using climate change as a forcing function to deliver sustained observations for all the societal benefit areas**