Instruments and Methods of Observation Programme

Meteorological instruments and observations methods: a key component of the Global Earth Observing System of Systems (GEOSS)

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Instruments and Methods of Observation Programme - SUMMARY

1. **New structure** → OPAGs and ETs
2. **Future plans** → IMOP High Priority Issues
3. **GEOSS**

1. New CIMO Structure

CIMO MANAGEMENT GROUP
President
Vice-President
7 OPAG Co-cairs

- **OPAG**
  Surface Observation Technology
  2 Co-chairs
  - **ET on Surface Technology**
    Chair + 8 Members
    5 Representatives of other Bodies
  - **ET on Surface-Based Instrument Intercoparisons and Calibration Methods**
    Chair + 5 Members
    2 Representatives of other Bodies
  - **ET on Meteorological Radiation and Atnospheric Composition Measurements**
    Chair + 3 Members
    3 Representatives of other Bodies
- **OPAG**
  Upper Air Observation Technology
  3 Co-chairs
  - **ET on Upgrading the Global Radiosonde Network**
    Chair + 7 Members
    3 Representatives of other Bodies
  - **ET on Upper-Air Systems Intercomparisons**
    Chair + 5 Members
    1 Representative of other Body
  - **ET on Remote Sensing Upper-Air Technology and Techniques**
    Chair + 11 Members
    2 Representatives of other Bodies
- **OPAG**
  Capacity Building
  2 Co-chairs
  - **ET on Training Activities and Training Materials**
    Chair + 6 Members
  - **ET on RICs, QM Systems and Commercial Instrument Initiatives**
    Chair + 7 Members
  - **ET on CIMO Guide and Information Dissemination**
    Chair + 3 Members

2. Future Plans –
IMOP High Priority Issues

2. IMOP - Future Plans /GEOSS

High priority issues:

- Relation to GEOSS
- Develop performance measures to demonstrate continuous improvement in the quality of observations;
- Conduct instrument intercomparisons;
- Contribute to the review and update of WMO technical regulations, guides and other material related to quality management and standardization of observations;
- Evaluate existing RICs and review their terms of reference;
- Facilitate standardization of measurements of long-wave radiation;
- Automation of manual, visual and subjective observations;
- Strengthen links with relevant international organizations.

3. Global Earth Observation System of Systems (GEOSS)

3a. GEOSS Overview

- The World Summit on Sustainable Development, Johannesburg 2002 (WSSD) highlighted a need for coordinated observations relating to the state of the Earth.

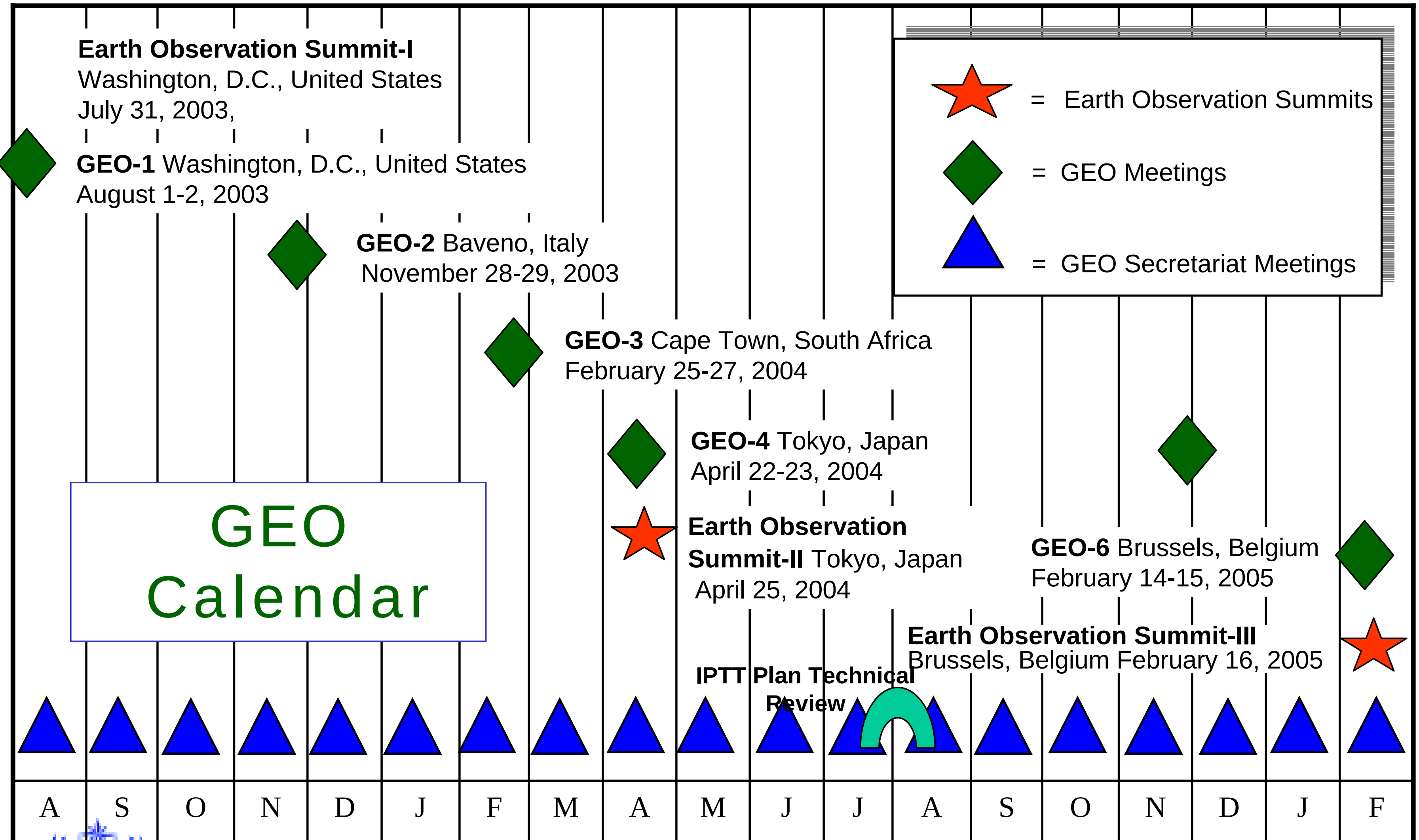
- First Earth Observation Summit convened in Washington July 2003 – established *ad hoc* Group on Earth Observations (GEO).

- GEO established sub-groups which lead to a Framework Document – negotiated at GEO-3 and adopted by the second Earth Observation Summit, Tokyo 2003.

- Production of GEO 204 – 10 - year Implementation Plan

GEO 204, February 2005

3a. GEOSS Overview Contd.

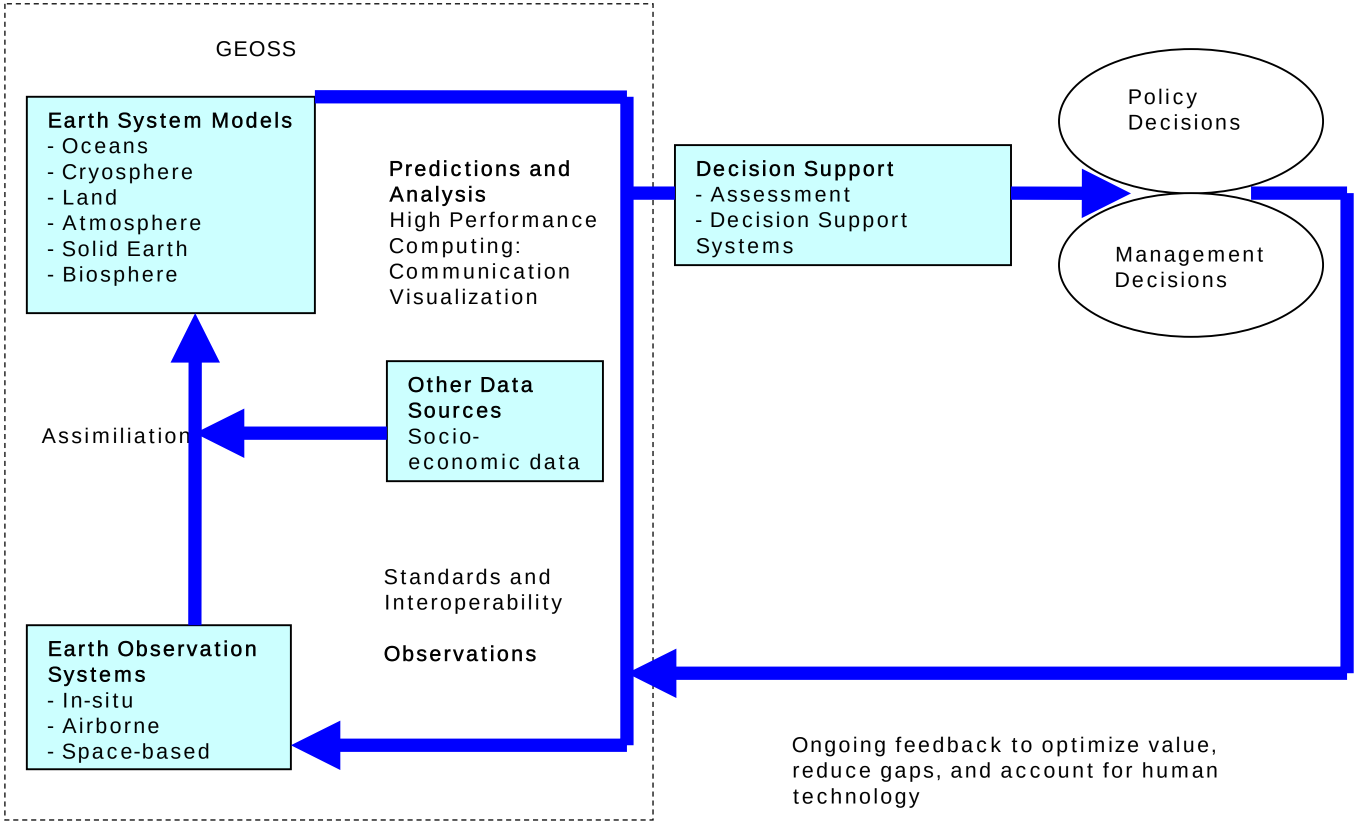


3a. GEOSS Overview Cont.

- GEOSS will be a "system of system" with components of existing and future Earth observation systems from primary observation to information production.
- GEOSS will attempt to identify gaps and unnecessary duplications, redirect or initiate activities to optimize the system, and ensure the necessary continuity in observations.
- GEOSS systems will abide by interface specifications for those portion of their data systems that they agree to share.
- This should allow linkages between systems allowing wider use of data across systems and within the wider community.

GEO 204, February 2005

3a. GEOSS Component Systems: scope and focus



The above demonstrates the end-to-end nature of data provision, the feedback loop from user requirements and the role of GEOSS in this process. The primary focus of GEOSS is on the left side of the diagram. **GEO 204, February 2005**

3a. GEOSS Components

The major components of the Earth Observation System comprise *in situ*, aircraft and space-based systems.

However, data from non-meteorological systems would able to be integrated with meteorological data.

Reliance on independent efforts has deficiencies as large parts of the globe are outside the territory of individual countries.

Deploying systems would be more feasible if undertaken as a cooperative action by many countries for the common good

GEO 204, February 2005

3a. GEOSS – meteorological perspective

“ *…GEOSS will contribute to improving weather information in three ways:*

1. ***Providing a timely, comprehensive and accurate initial state for forecast models;***

2. ***Provide comprehensive observations necessary to extend the range of useful products***

3. ***Will help GEO members and Participating Organisations to more effectively address the end-to-end weather information services needs, resulting in greater service for less cost…”***

GEO 204, February 2005

3b. GEOSS and Disaster Reduction

GEOSS will facilitate the sharing of Earth Observation data and information that are timely, of known quality, long-term and global in nature to better facilitate disaster reduction.

The global integration of data from various networks and systems will allow timely prediction, identification and verification of actual and potential disaster events

A common public warning systems with simple instructions for action would minimize the public confusion that occurs during emergencies, especially if the same system was in use for threats such as tsunamis, severe weather, fire and other threats.

3b. GEOSS and Disaster Reduction Contd.

23 June 2004

28 December 2004

QuickBird satellite images of the Banda Aceh shoreline in Indonesia before and after the tsunami

As an example, the undersea earthquake of Indonesia on Dec 26, 2004 was detected by the Global Seismographic Network, one of the systems participating in GEOSS. In a potential GEOSS global warnings for earthquake and potential tsunami could then be issued to affected areas. To confirm the quake had generated a tsunami, seismic data would be further refined and combined with data from coastal tide gauges and buoys. Hazard zonation maps showing areas vulnerable to tsunami run-up, areas of safety and evacuation routes could have been prepared.

3c. GEOSS – systems overview

- WMO WWW defines and coordinates the provision of observations through national agencies. Programme requirements cover the observing component (space and surface based) and data dissemination.

- Maintenance of the programme is through a rolling review process.

3c. GEOSS – systems overview

- *In situ* observations are primarily undertaken at a national level although significant developments in cooperation/cost sharing (e.g. EUMETNET, EUCOS)
- Rapid expansion in AMDAR data and ASAP which are evolving to meet user requirements. Central management provides efficiencies for NMHSs.
- ET-ODRRGOS (Observational Data Requirements and Redesign of the GOS) developed a plan for the GOS of 2015 for *in situ* systems and data management. The plan includes a prioritized list of critical atmospheric parameters that are not adequately measured by current or planned observing systems.
- Difficulty for emerging countries because of lack of communications mechanisms to receive and act on information. Additionally, a shortfall in education and training and a lack of resources to sustain development and use of existing capabilities.

3c. Observational Gaps

- Lack of complete global coverage of the atmosphere, land and oceans (e.g. inadequate resolution and quality) inhibits development and exploitation of extended range products.

- Expansion of capacity is needed to detect precursor environmental conditions to enable improvement to all weather and climate services (as called for by WMO WWW).

- Priority to filling gaps that limit data assimilation and predictive capabilities.

- Further emphasis is needed on open global sharing of data.

3c. Observational Gaps Contd.

- Data should be exploited through better research, data assimilation and predictive models, building telecommunications infrastructure capacity and transforming predictions into formats understandable to decision makers and the public.
- Satellites have a priority need for improved calibration of all data. Additionally:
  - There is a need for improved geostationary Imagers and Sounders.
  - There is a need to improve the timeliness and temporal coverage of data delivery
  - Improvement needed for sea-surface wind, altimetry and radiation
  - Research is required in Doppler technology, precipitation observation capability and radio occulation techniques

3c. Observational Gaps Contd.

- With *in situ* observations, there is a need for improved data distribution and coding, development of AMDAR and ground-based GPS. Additionally, there is a need to:
  - improve the network of observations in the oceans, polar areas and tropical land areas;
  - develop new observing technologies;
  - address the lack of atmospheric wind profiles in polar areas;

3c. Gaps in Modelling

- Scientific modelling techniques still limit the accuracy of forecasts and warnings and data are needed to validate the models.

- NMW models still have gaps in some data categories, e.g. ozone, moisture flux, that lead to increasing uncertainty and reduce model accuracy.

3c. Gaps in Information Technology

- Telecommunication and computer processing gaps limit observation exchange, scientific collaboration and dissemination of critical information to decision-makers and the general public.
- Lack of structure to facilitate transition of research technologies to operational use in all components of the end-to-end weather information services system.

3c. Gaps in Research, Education and Training

- Improvements in producing and delivering weather information requires parallel improvements in education and training processes to ensue full exploitation of these data.

- R&D in archiving, accessing and processing these data is necessary to ensure sustained weather information for the long-term

3d. Issues

- Cooperation
  - Balanced perspective for component systems
  - Need participation by developing countries
- Data policy
  - Free & unrestricted vs charged
  - Public good vs commercial boundaries
  - Data vs products vs services boundaries
- Security/control of data
- Governance arrangements are critical to the ownership, viability, effectiveness, success and sustainability of GEOSS
- Role of research-based systems
  - Integration pathway?

3e. Positive and Negatives

- + Increased access/coverage etc to data, products
  - Interoperability
  - Data types, parameters, resolution
  - Integrated products
- + Political visibility of global/regional observing issues
- - Data policy revision → possible charging for data?
- +/- Relationship to WMO WWW
- - Lack of world-wide high-resolution terrain models (difficult to map observations)