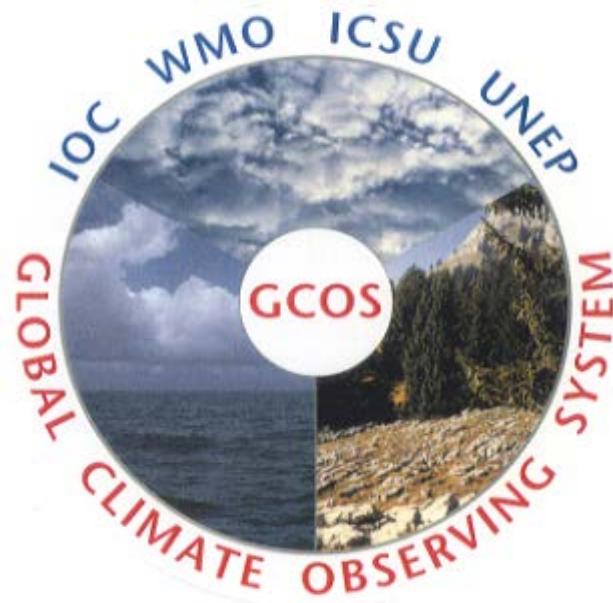


# Implementation Plan for the Global Observing System for Climate in Support of the UNFCCC



**NOAA/GCOS Workshop to Define Climate Requirements for Upper-Air Observations**

**Paul Mason – Chairman GCOS Steering Committee**

# GCOS Implementation Plan

- ◆ **Responds to the request in UNFCCC decision 11/CP.9 to develop a 5- to 10-year implementation plan that**
  - **Addresses the requirements in the ‘Second Adequacy Report’;**
  - **Draws on the expressed views of Parties with respect to that report;**
  - **Considers existing global, regional and national plans, programmes and initiatives, including that of the Group on Earth Observations;**
  - **Provides for an open review by a broad range of scientists and data users;**
  - **Includes indicators for measuring its implementation;**
  - **Identifies implementation priorities and resource requirements systems.**

# Observational Strategy

- Achieving an optimal balance of **satellite and in-situ data**
- Ensuring data are **stable** enough to allow reliable detection of climate change – GCOS climate monitoring principles
- Utilising (Making full use of) **all available** data to achieve an **cost-effective** global observing system for climate (and meeting needs at lowest cost)
  - Comprehensive networks of all relevant observations
  - Global Baseline networks
  - Reference networks

# Nature of “Implementation”

- Depends primarily on **National Efforts**
- Recognises role of **international bodies** and programmes for planning, facilitating cooperation and agreeing on common standards and practices.
- Needs the **sustained generation of priority climate quality products** (Recognises the nature of the operational requirements for sustained output of needed products)
  - International designation of contributing networks and systems
  - Institutional arrangements for
    - **Monitoring the continuity and performance of observations and products**
    - **Ensuring the existence of Data Centres and access to the data**
    - **Generating the full spectrum of required climate analyses and products**
    - **Evaluating quality (eg., errors) of climate data and products.**

# Characteristics of the Plan

- ◆ **[Satellites ~41% of Costs]** A major satellite component operated in a manner that ensures the long-term accuracy and homogeneity of the data”
- ◆ **[In situ networks ~38% of Costs]** Some ECVs will remain equally critically dependent on *in situ* observations for full measurement or for calibration and validation of satellite records.
- ◆ **[Capacity building ~5% of Costs]** Global participation is essential for global coverage of key in-situ networks
- ◆ **[Infrastructure ~10% of costs]** Improved data management and sustained product generation.
- ◆ **[Oversight of implementation ~4% of cost]** International oversight and coordination

# Characteristics of the Plan

- ◆ **Identified as the Climate component of the GEOSS of the Group on Earth Observations (GEO).**
- ◆ **Of wide value to many other area's of societal benefit, and a significant fraction of the total scope of the GEOSS proposed by the Group on Earth Observations**

# Priority Areas in Implementation Plan

- ◆ **Actions to implement essential Climate Variables (ECVs) globally**

**Priority actions to address the critical issues in the Second Adequacy Report:**

- **Generating integrated global analysis products**
- **Strengthening national and international infrastructure**
- **Enhancing of the full participation of least-developed countries and small island developing states**
- **Improving key satellite and *in situ* networks**
- **Improving access to high-quality global data for the essential climate variables (ECVs);**

# Actions with agents for implementation

- ◆ **Key Action 2:** Support for an **International Project Office** to provide overall coordination, to monitor performance, to report regularly on implementation, to initiate corrective action.
- ◆ **Key Action 3:** The *international and intergovernmental organizations* need to incorporate the relevant actions in this Plan within their own plans and actions.
- ◆ **Key Action 4:** Need to complete development and alignment of **Regional Action Plans** for observations in the context of this Plan.
- ◆ **Key Action 5:** National coordination and planning and production of **national plans** on their climate observing, archiving and analysis activities that address this Plan.
- ◆ **Key Action 6:** “*Parties*” are requested to **submit information** on their activities with respect to systematic observation of all ECVs as part of their national communications *to the UNFCCC*.



# **Global coverage and Participation by all Parties**

- ◆ **Key Action 7: Parties are requested to address the needs of least-developed countries, small island developing states and some countries with economies in transition for taking systematic climate observations by encouraging multilateral and bilateral technical cooperation programmes to support global observing systems for climate and by participating in the GCOS Cooperation Mechanism.**

**(Focus GUAN ( upper air), Surface, Water , Sea level.  
Also some Reference sites.)**

# Data suitable for Climate application

“Adherence by nations to the agreed policy of **free and unrestricted exchange** is urgently required for both *in situ* and satellite climate observations”

- ◆ **Key Action 8: Need to ensure that **International Data Centres** are established and/or strengthened for **all ECVs****  
“Ensure that observations and associated metadata for the **Essential Climate Variables**, including historical observations, are available at international data centers”
- ◆ **Key Action 9: The relevant intergovernmental organizations including WMO, FAO, UNEP, and ICSU need to create a mechanism for establishing **standards, regulatory material and guidelines for terrestrial observing systems.****
- ◆ **Key Action 10: Parties need to ensure that their climate-observing activities which contribute to GCOS adhere to the GCOS **Climate Monitoring Principles****
- ◆ **Key Action 11: International **standards for meta-data** for all ECVs need to be established and adopted by the Parties in the creation and archiving of climate data records**

# Key Actions - Atmosphere

## ◆ Key Action 12:

- (a) Ensure the implementation and full operation of the baseline networks and systems noted below and to ensure the exchange of these data with the international community, and to recover and exchange historical records;
- GCOS Surface Network (**GSN**).
  - Atmospheric component of the **composite surface ocean observation** system including sea-level pressure (see Key Oceanic Actions),
  - GCOS Upper-Air Network (**GUAN**),
  - Global Atmosphere Watch (GAW) **global CO<sub>2</sub>** network,
  - **MSU**-like radiance satellite observations,
  - Total solar irradiance and **Earth radiation budget** satellite observations
- (b) Establish a high-quality **reference network** of about 30 precision radiosonde stations and other collocated observations
- (c) Exploit emerging new technology including the use of **radio-occultation** techniques and ground-based Global Positioning System (GPS) sensing of the total water column.

# Key Actions - Atmosphere

## ◆ Key Action 13:

- (a) establish a **reference network of precipitation stations on key islands and moored buoys** around the globe and at high latitudes;
- (b) submit national precipitation data (preferably hourly data) to the International Data Centres;
- (c) support the further **refinement of satellite precipitation measurement techniques**.

## ◆ Key Action 14:

- (a) Support research to extend and improve current capabilities for **monitoring clouds** as a high priority.

## ◆ Key Action 15:

- (a) fully establish a **baseline network for key greenhouse gases**;
- (b) improve selected **satellite observations of atmospheric constituents**; and
- (c) extend existing networks to establish a **global baseline network for atmospheric optical depth**.

# Key Actions - Ocean

- ◆ **Key Action 17: Ensure climate quality and continuity for essential ocean satellite observations.**
  - (a) Sustained support for **vector-wind (scatterometer), sea-ice, sea-surface temperature (microwave and infra-red) and ocean-colour** measurements,
  - (b) Continuous coverage from **altimeters** to provide high-precision and high-resolution sea-level measurements (1 high-precision and 2 lower-precision altimeters).

# Key Actions - Ocean

- ◆ **Key Action 18: Global coverage of the surface network by implementing and sustaining:**
  - (a) the GCOS **baseline network of tide gauges**;
  - (b) an enhanced **drifting buoy array**;
  - (c) an enhanced **Tropical Moored Buoy network**;
  - (d) an enhanced **Voluntary Observing Ships Climatology (VOSCLim) network**; and
  - (e) a globally-distributed **reference mooring network**.
  
- ◆ **Key Action 19: Global coverage of the sub-surface network by implementing and sustaining:**
  - (a) the **Argo** profiling float array;
  - (b) the systematic sampling of the **global ocean full-depth water column**;
  - (c) the Ship-of-Opportunity Expendable Bathythermograph (**XBT trans-oceanic sections**); and
  - (d) the **Tropical Moored Buoy and reference mooring networks** referred to in Key Action 18 above.

# Key Actions - Terrestrial

- ◆ **Key Action 20: Support the operational continuation of the priority satellite-based products given below.**
  - Daily global **albedo** from geostationary and polar orbiting satellites,
  - **LAI** and **fAPAR** products to be made available as gridded products,
  - Gridded **fire and burnt area** products through a single International Data Centre,
  - **Snow** cover of both hemispheres,
  - Digital elevation maps of the **ice sheet surfaces and full glacier** inventory from current spaceborne cryosphere missions.
  - Specification and production of **land-cover** characterization data sets.
  
- ◆ **Key Action 21: A global network of at least 30 reference sites (collocated with atmospheric sites if possible) to monitor key biomes and to provide the observations required in the calibration and validation of satellite data.**
  
- ◆ **Key Action 22: Fill the identified gaps in the global networks for permafrost, glaciers, rivers and lakes**

# Key Actions - Climate Products

**The routine generation and ready availability of global climate products is a high and urgent priority.**

- **Key Action 23: An internationally-coordinated approach to the development of integrated global climate products and making them accessible to all “Parties”.**
- **Key Action 24: Establishing a sustained capacity for global climate reanalysis, to develop improved methods for such reanalysis, and to ensure coordination and collaboration among centres conducting reanalyses.**



# Upper Air :Radiosondes

- Action A15: Complete implementation of **GUAN**, including infrastructure and data
- Action A16: Specify and implement a **Reference Network** of high-altitude, high-quality radiosondes, including operational requirements and data management, archiving and
- Action A17: Improve implementation of the **WWW/GOS radiosonde network** compatible with the GCMs and in full compliance with coding
- Action A18: Submit **meta-data records and inter-comparisons** for radiosonde observations to International Data Centres

# Specific satellite measurements

- Action A19: Continue the system of satellites following the GCMPs to enable the continuation of **MSU-like radiance**
- Action A20: **GPS RO** measurements should be made available in real time, incorporated into operational data streams, and sustained over the long-term. Protocols need to be developed for exchange and distribution of Action A
- Action A21: Develop standards and protocols for exchange of data from the networks of **ground-based GPS** receivers.
- Action A22: Ensure continuation of a climate data record of **visible and infrared radiances**, e.g., from the International Satellite Cloud Climatology Project, and include additional data streams as they become available.
- Action A23 : Research to improve **cloud property** observations in three dimensions.
- Action A24: Ensure continuation of **Earth Radiation Budget**

# Analysis and reanalysis (engaging wider atmospheric measurements)

- **Action C11** : Prepare the, **data sets and meta-data** including historic data records, for climate analyses and reanalyses.
- **Action C12**: Establish sustainable systems for the **routine and regular analysis of the ECVs**, as appropriate and feasible, including measures of uncertainty.
- **Action C13**: Establish a sustained capacity for **global climate reanalysis** and ensure coordination and collaboration between reanalysis centres.

# Composition

- **Action A27: Establish the GCOS/GAW baseline network for CO<sub>2</sub> and CH<sub>4</sub>, and fill the gaps.**
- **Action A28: Develop plans for an Integrated Data Analysis Centre (WIDAC) for CO<sub>2</sub> and CH<sub>4</sub>**
- **Action A29: Complete an International Halocarbon Inter-comparison Study, linking measurement scales for CFCs of major networks as an initial step in an ongoing quality assurance programme.**
- **Action A30: Define and implement the Baseline Ozone Observing Network for balloon vertical profiles and total column ozone and initiate implementation.**
- **Action A31: Develop and implement a coordinated strategy to monitor and analyze the distribution of aerosols and aerosol properties.**
- **Action A32: Develop and implement a strategy to enable use of satellite data on atmospheric composition for climate by scientific users, regardless of source.**

# Elements of UNFCCC response

- **Encouraged Parties to incorporate actions in their national plans and invited them to report on their activities.**
- **Invited Parties supporting Earth observation satellites to provide a coordinated response.**
- **Welcomed the emphasis on enhancing the participation of developing countries and encouraged Parties to continue to implement priority elements of the “regional action plans”**
- **Welcomed the progress made by the ad hoc Group on Earth Observations (GEO) to develop a 10-year implementation plan for a Global Earth Observation System of Systems (GEOSS)**
- **Appreciated the collaboration between GCOS and GEO.**
- **Invited GEO to incorporate the actions in the implementation plan into the GEOSS 10-year implementation plan.**
- **Invited the GCOS and its sponsoring agencies to report on progress at subsequent sessions.**

**GCOS thanks the many contributors  
to the Implementation Plan**

**Implementation Plan available from  
<http://www.wmo.ch/web/gcos>**