



# GCOS

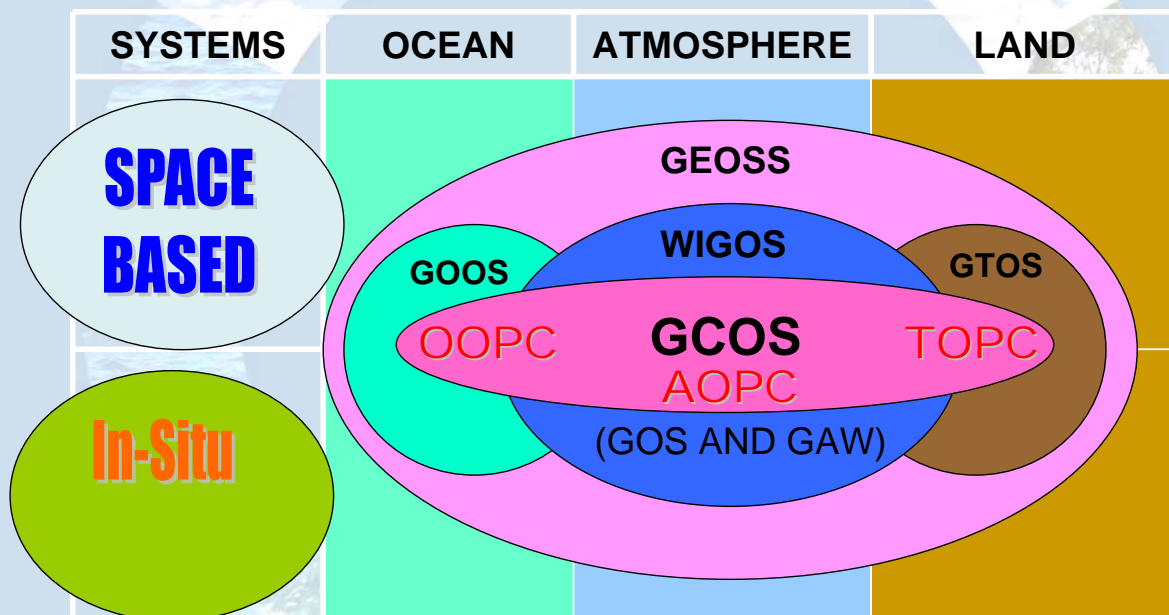
GLOBAL CLIMATE OBSERVING SYSTEM

## 5th GTN-H Coordination Panel Session

12-13 March 2011, University of Tokyo, Tokyo, Japan  
Kazutoshi Onogi, Member of the Steering Committee, Global Climate Observing System



### The Composition and Scope of the Main Global Observing Systems





# GCOS

GLOBAL CLIMATE OBSERVING SYSTEM

The goal of the Global Climate Observing System (GCOS) is to provide comprehensive information on the total climate system, involving a multidisciplinary range of physical, chemical and biological properties and atmospheric, oceanic, hydrologic, cryospheric and terrestrial processes.

(Annex A to 1992 and 1998 WMO-IOC-UNEP-ICSU MOU)



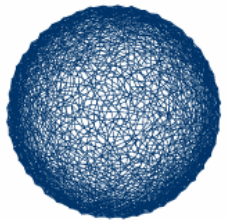
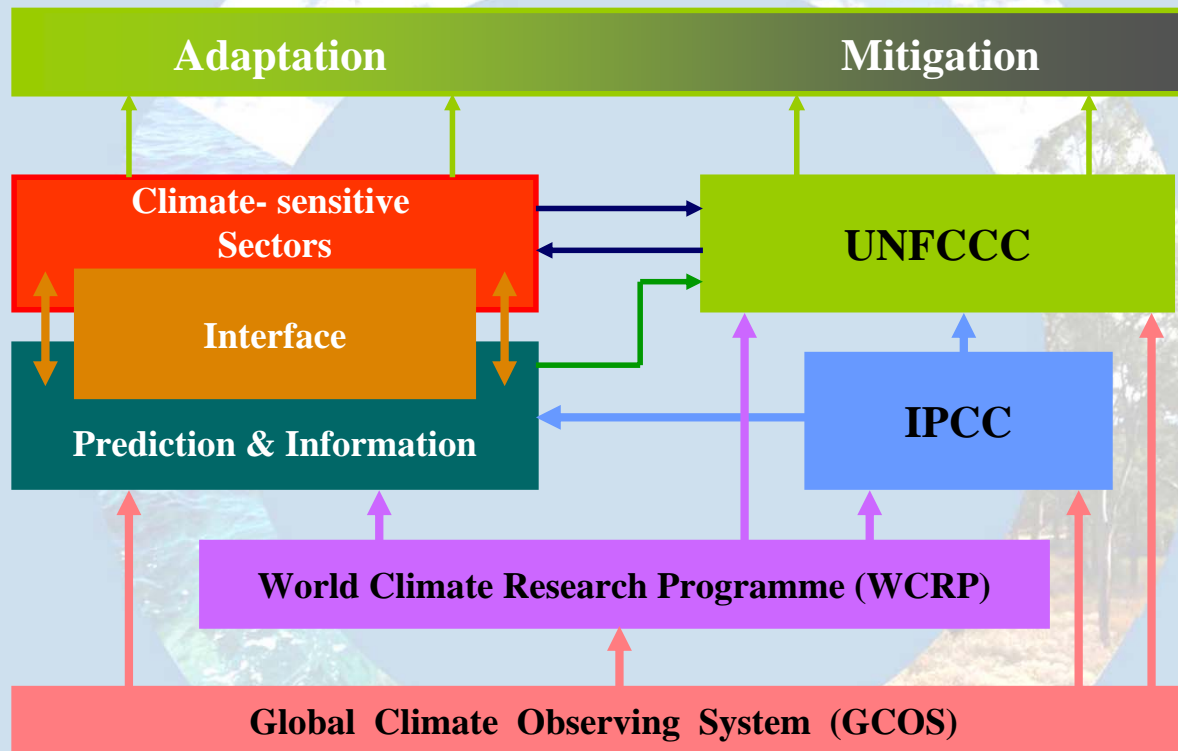
## The GCOS Mission

Observations made in the past have unequivocally demonstrated that the climate system is warming. Climate observation must be enhanced and continued into the future to enable users to:

- Detect further climate change and determine its causes
- Model and predict the climate system
- Assess impacts of climate variability and change
- Monitor the effectiveness of policies for mitigating climate change
- Support adaptation to climate change
- Develop climate information services
- Promote sustainable national economic development
- Meet other requirements of the United Nations Framework Convention on Climate Change (UNFCCC) and other international conventions and agreements



# GCOS as building block for a Global Framework for Climate Services



COP15  
COPENHAGEN  
UNITED NATIONS CLIMATE CHANGE CONFERENCE 2009

Report to COP 15,  
Copenhagen, Dec 2009



Decision on  
“Systematic Climate Observations”

COP16, Cancun, Dec 2010:  
Submission of the  
Updated GCOS Implementation Plan

Advance unedited version

## Draft decision -/CP.15

### Systematic climate observations

*The Conference of the Parties,*

*Recalling* Article 4, paragraph 1(g–h), and Article 5 of the Convention,

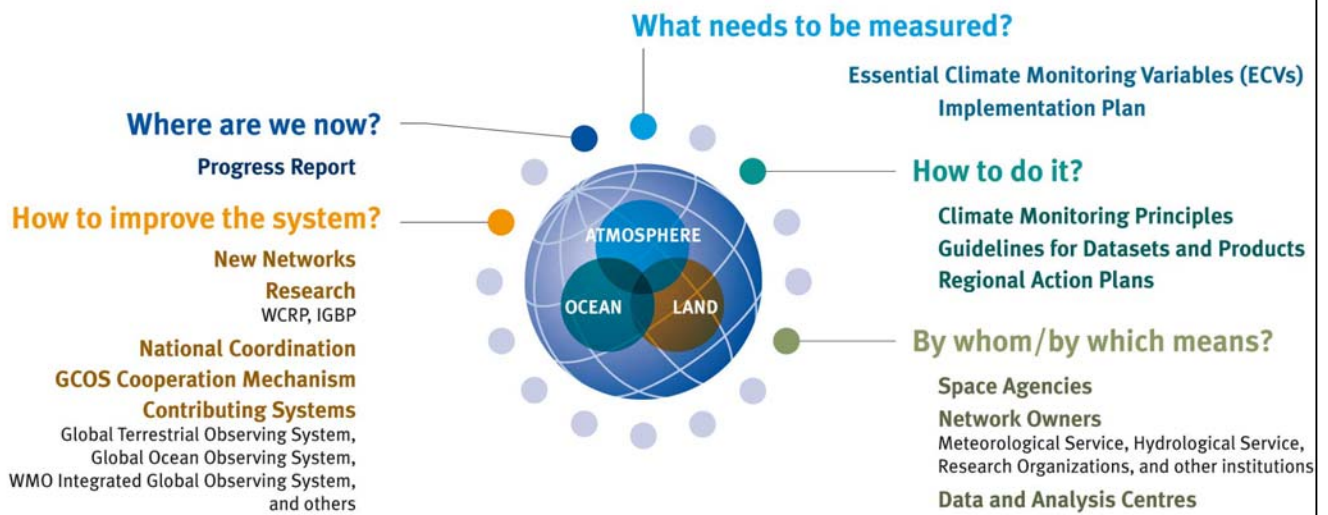
*Further recalling* decisions 8/CP.3, 14/CP.4, 5/CP.5, 11/CP.9, 5/CP.10 and 11/CP.13,

*Having considered* the conclusions of the Subsidiary Body for Scientific and Technological Advice at its thirtieth session,

*Noting* the important role of the Global Climate Observing System in meeting the need for climate observation under the Convention,

1. *Expresses its appreciation:*
  - (a) To the secretariat and sponsoring agencies of the Global Climate Observing System for preparing the report on progress with the *Implementation Plan for the Global Observing System for Climate in Support of the UNFCCC* (hereinafter referred to as the Global Climate Observing System implementation plan);
  - (b) To the secretariat and sponsoring agencies of the Global Terrestrial Observing System for developing a framework for the preparation of guidance materials, standards and reporting guidelines for terrestrial observing systems for climate;
  - (c) To the Committee on Earth Observation Satellites for its coordinated response, on behalf of Parties that support space agencies involved in global observations, to the needs expressed in the Global Climate Observing System implementation plan;
2. *Recognizes* the significant progress made during 2004–2008 in improving the observing systems for climate relevant to the Convention;
3. *Notes* that, despite the progress made, only limited advances have been made in achieving long-term continuity for several in situ observing systems and that there are still large areas, in Africa for example, for which in situ observations and measurements are not available;
4. *Also notes* that not all climate information needs under the Convention are being met;
5. *Urges* Parties to work towards addressing the priorities and gaps identified in the report on progress with the Global Climate Observing System implementation plan, in particular the implementation of the regional action plans that were developed during 2001–2006, and ensuring sustained long-term operation of essential in situ networks, especially for the oceanic and terrestrial domains, including through provision of the necessary resources;
6. *Invites* relevant United Nations agencies and international organizations to do the same;
7. *Encourages* Parties in a position to do so to support activities aimed at sustaining climate observations over the long term in developing countries, especially the least developed countries and small island developing States;
8. *Invites* the Global Climate Observing System secretariat, under the guidance of the Global Climate Observing System Steering Committee, to update, by the thirty-third session of the

# Continuous Improvement and Assessment Cycle GCOS – an all domain system



## What needs to be measured ?

### GCOS Essential Climate Variables (ECVs)

- Global observations feasible (practical, cost-effective)
- High impact on needs of UNFCCC, climate research (WCRP), climate change assessments (IPCC)



# What needs to be measured ?

## GCOS Essential Climate Variables (ECVs)

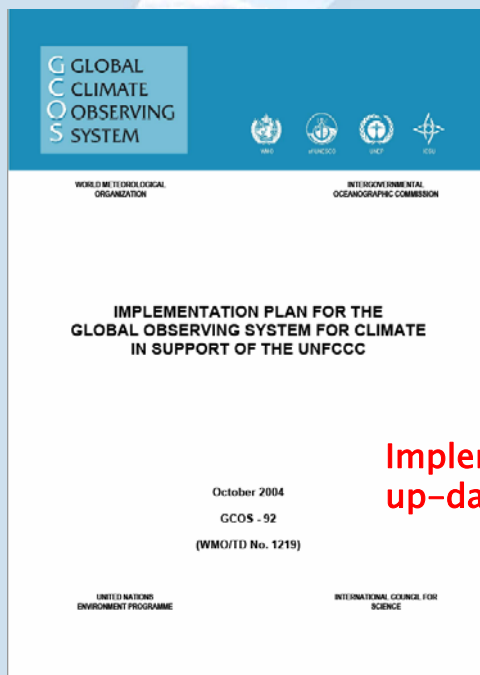
- **Atmospheric**
  - **Surface** – Air temperature, **Precipitation**, Pressure, Surface radiation budget, **Wind speed and direction**, Water vapour
  - **Upper Air** – Earth radiation budget (including solar irradiance), Temperature, Wind speed and direction, Water vapour, Cloud properties
  - **Composition** – Carbon dioxide, Methane and other long-lived greenhouse gases (N<sub>2</sub>O, CFCs, HCFCs, HFCs, SF<sub>6</sub> and PFCs), Ozone and Aerosol, **supported by their precursors** (NO<sub>2</sub>, SO<sub>2</sub>, HCHO and CO).
- **Oceanic**
  - **Surface** – Sea-surface temperature, Sea-surface salinity, Sea level, Sea state, Sea ice, **Surface Current**, Ocean colour, Carbon dioxide partial pressure, **Ocean acidity**, Phytoplankton.
  - **Sub-surface**: Temperature, Salinity, Current, Nutrients, Carbon dioxide partial pressure, **Ocean acidity**, **Oxygen**, Tracers.
- **Terrestrial**
  - River discharge, Water use, Ground water, **Lakes**, **Snow cover**, **Glaciers and ice caps**, **Ice sheets**, Permafrost and seasonally-frozen ground, **Albedo**, **Land cover (including vegetation type)**, **Fraction of absorbed photosynthetically active radiation (FAPAR)**, **Leaf area index (LAI)**, **Above ground biomass**, **Soil carbon**, Fire disturbance, **Soil moisture**.

**Blue/bold** = largely space-based **red** = new in 2010 plan

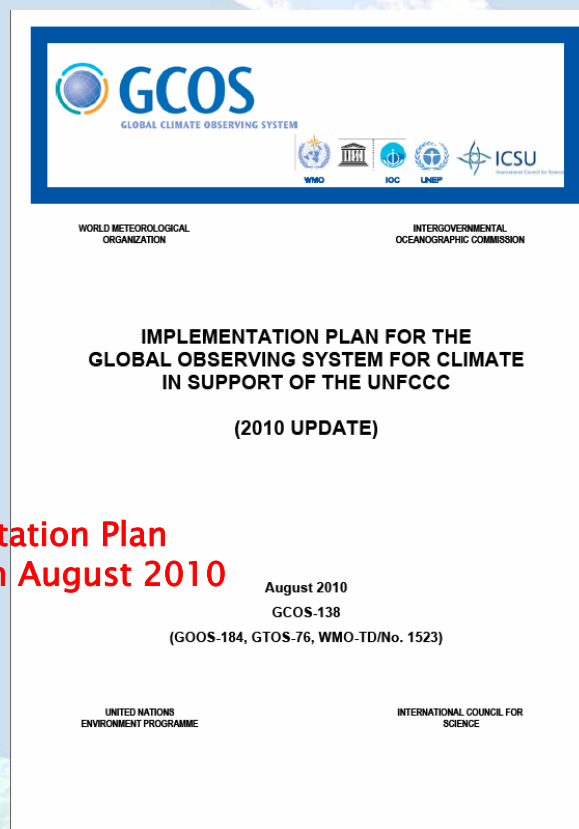


# What needs to be measured ?

## How to do it ?



**Implementation Plan  
up-date in August 2010**

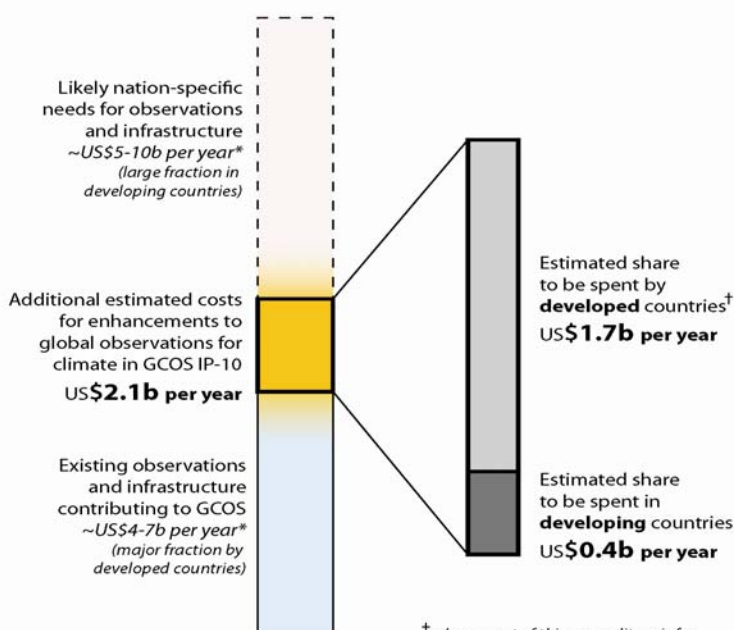


## Up-dated Implementation Plan: in brief:

- new ECVs, now 50 (before 44 )
- reflection on ecosystems (biodiversity)
- additional focus on reference and super site networks (measurements of several ECVs at one site for a more comprehensive understanding of the ecosystem)
- cost estimation (additional costs and costs for existing systems)



## 2010 Update of the GCOS Implementation Plan in Support of the UNFCCC



\* rough estimates, not addressed in this Plan, not necessarily secured

† a large part of this expenditure is for networks and systems in extra-territorial areas (e.g., satellite, open-ocean, polar observing systems) for the benefit of all countries

Estimated global cost in addition to already existing observation systems  
**US\$ 2.1 billion per year.**



## By whom / by which means ?

- “network owners”, i.e.,
- National Meteorological Services
- National Hydrological Services
- Research organizations
- Space agencies
- Marine / coastal agencies...

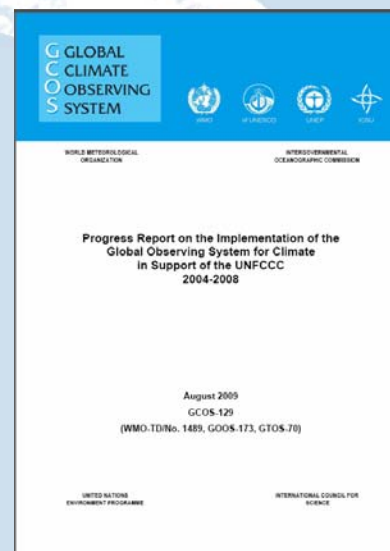
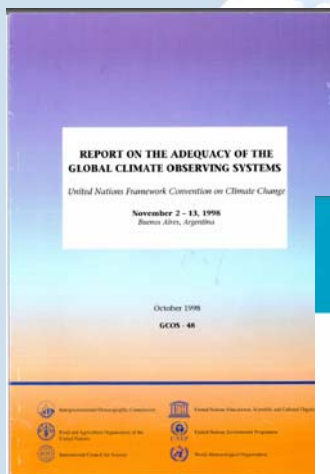


## How to improve the system ?

- Promote the actions in the GCOS Implementation Plan
- Operating a cooperation mechanism
- Develop Regional Action Plans
- Advocating national coordination



## Where are we now ?



**Progress Report 2004–2008**  
**Progress Report 2009–2013 (?)**

**Report on the Adequacy of the GCOS, 1998**  
**Second Report on the Adequacy of the GCOS, 2003**  
**Third Report on the Adequacy, (?) 2013–2015**



## GCOS Expectations addressing:

- **Operations:** Build resilience of observing systems for all ECVs;
  - GCOS invites the terrestrial community to send in proposals on how to improve the GTN in using the GCOS Cooperation Mechanism.
- **Science:** Close coordination with operations  
→ Research and Operations
- **Policy:** Invest in observational infrastructure, in particular in in-situ and space architecture;  
Improve data policies → free & unrestricted data;
- **Observing Systems:** Learn better to communicate with communities (decision makers, stake holders, science, operational services); Improve your networking and closer co-operate with your partners.



# GCOS

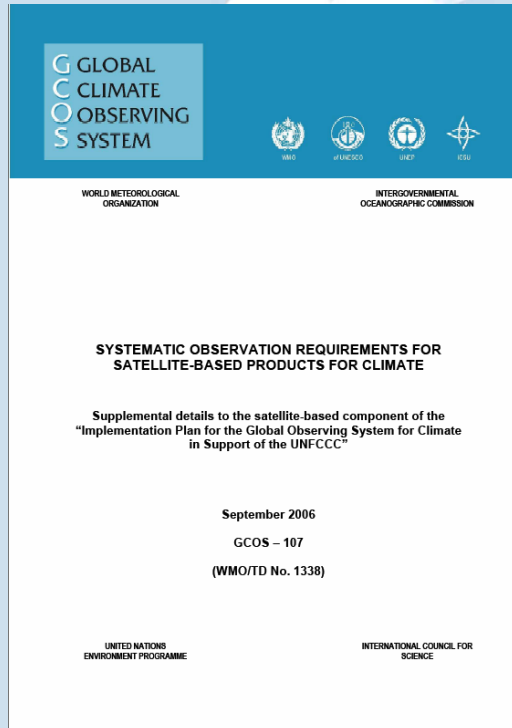
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# What needs to be measured ?

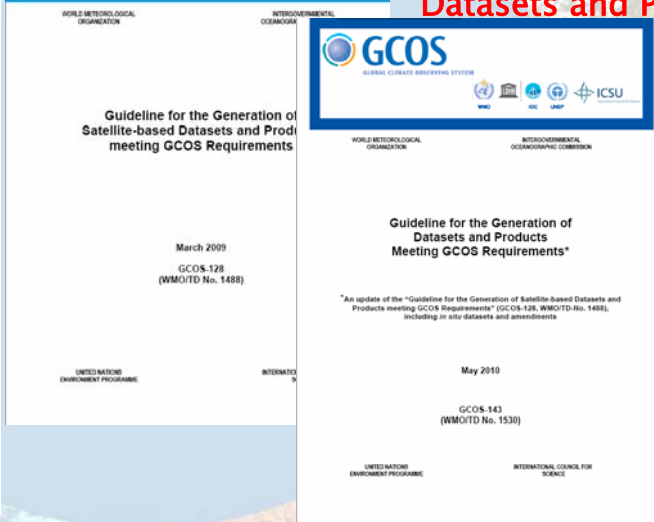
## How to do it ?



### Satellite Supplement up-date in January 2011



### Climate Monitoring Principles Guidelines for Datasets and Products



## Satellite Supplement – up-date in January 2011

Update 2006 Satellite Supplement to the GCOS IP (GCOS-107)

- Update detailed GCOS requirements for FCDRs and ECV products in terms of
  - accuracy,
  - stability,
  - temporal/spatial resolution,
  - calibration and validation needs and opportunities,
  - relevant international working groups.

for Atmosphere, Ocean, Land and Cross-Cutting actions.

- Expert Meeting, January 10 – 12, 2011, Geneva improvements on most of the ECVs, extra sections, e.g., GHGs, precursors, « pressure » emerges now also as space-based observed ECV.
- Open for public review, 28 March – 6 May 2011
- Finalising draft, 2<sup>nd</sup> Qrt 2011.

