

## IMPLEMENTATION ACTIVITIES OF THE GLOBAL CLIMATE OBSERVING SYSTEM

In response to recommendation R 38.03

This document gives an overview on the latest activities related to the objectives of the GCOS programme:

- Implementation Plan for the Global Observing System for Climate in support of the UNFCCC (2010 update) and its up-dated satellite supplement in 2011
- The evaluation of satellite-related global climate data sets
- The «GCOS Improvement and Assessment Cycle»
- System improvement – Support of in situ networks as ground truth for space based observations
- Facilitate regional and national implementation of the global observing system for climate

### Action/Recommendation proposed:

1. CGMS members to ensure the implementation of the tasks implied in the 2011 update of supplemental details to the satellite based component of the 2010 updated GCOS implementation plan.
2. CGMS members to support any follow-up on initiatives with regard to the evaluation of GCOS ECV data sets.
3. CGMS members to continue to closely cooperate with GCOS on future progress reports and on reviewing the adequacy of observing systems for climate.
4. Space agencies, NMHS and operational marine services to support the improvement of in situ networks through all domains (atmosphere, ocean and land), needed for validation and ground truth for space based observations.
5. CGMS members to take part in future regional workshops and assist in encouraging regional cooperation at those meetings.

## IMPLEMENTATION ACTIVITIES OF THE GLOBAL CLIMATE OBSERVING SYSTEM

### 1 INTRODUCTION

The Global Climate Observing System (GCOS) is an internationally coordinated network of observing systems and a programme of activities that support and improve the network. It is designed to meet evolving national and international requirements for climate observations. GCOS was established in 1992 as an outcome of the Second World Climate Conference.

The mission of GCOS is to give all users access to the climate observations, data records and information they require to address pressing climate-related concerns. GCOS users include individuals, national and international organizations, institutions and agencies. The role of GCOS is to work with partners to ensure the sustained provision of reliable physical, chemical and biological observations and data records for the total climate system – across the atmospheric, oceanic and terrestrial domains, including hydrological and carbon cycles and the cryosphere.

GCOS is sponsored by the World Meteorological Organization (WMO), the Intergovernmental Oceanographic Commission (IOC) of the United Nations Educational, Scientific and Cultural Organization (UNESCO), the United Nations Environment Programme (UNEP) and the International Council for Science (ICSU).

Many observing systems contribute to the GCOS network of global observing systems for climate. In many cases they also serve other functions, such as weather forecasting or air-quality monitoring. The contributing systems include the climate-observing components of the IOC-led Global Ocean Observation System (GOOS), the Global Terrestrial Observing System (GTOS), led by the United Nations Food and Agriculture Organization (FAO), and the WMO Global Observing System (GOS) and Global Atmosphere Watch (GAW). A number of other research and operational systems provide important contributions. The observations themselves may be ground-based, or from airborne or satellite systems. GCOS is both supported by and supports the international scientific community, and the World Climate Research Programme (WCRP) co-sponsors the expert panels set up by GCOS for the atmospheric, oceanic and terrestrial domains. The composite observing system designated as GCOS serves as the climate-observation component of the Global Earth Observation System of Systems (GEOSS).

In 2004, GCOS published the *Implementation Plan for the Global Observing System for Climate in Support of the UNFCCC* and in 2009 reported on its progress of implementation. The 2004 published GCOS implementation plan presented the set of specific actions required to implement and maintain a comprehensive global climate observing system that addressed the commitments and supported the needs of Parties under Articles 4 and 5 of the UNFCCC. The 2004 published GCOS implementation plan was prepared in response to a call by the UNFCCC Subsidiary Body on Scientific and Technological Advice (SBSTA). It was complemented by a supplement that specifically addressed requirements for observations from space.

The Progress Report concluded that implementation of the various observing systems in support of the UNFCCC had progressed significantly over the previous five years, but that it would be difficult to sustain funding for many important systems. There had been only limited progress towards filling the gaps in observing systems in developing countries, and there was still a long way to go before a fully implemented global observing system for climate could be achieved.

An update to the GCOS implementation plan was submitted to the UNFCCC Secretariat in August 2010 for consideration by Parties at the thirty-third session of the UNFCCC SBSTA, held in conjunction with the sixteenth Conference of the Parties (COP 16), from 29 November to 4 December 2010 in Cancún, Mexico.

The 2010 updated GCOS implementation plan takes into account recent developments in science and technology, the increasing focus on adaptation, the demand to optimize mitigation measures, and other evolving requirements for systematic observation of climate. The 2010 updated GCOS implementation plan provides provisional estimates of the costs for undertaking the recommended actions, including a breakdown into expenditure needed by developed countries and in developing countries.

The draft up-date of the supplemental details to the satellite-based component of the 2010 updated GCOS implementation plan was on public review from 9 May to 1 July 2011.

## 2 Implementation Activities

### 2.1 Implementation Plan for the Global Observing System for Climate in support of the UNFCCC (2010 update) and its up-dated satellite supplement in 2011

The thirty-third session of the SBSTA, at the COP 16, in December 2010, welcomed the Update to the Implementation Plan for the Global Observing System for Climate in Support of the UNFCCC (hereinafter referred to as the 2010 updated GCOS implementation plan), submitted by the secretariat of GCOS and prepared under the guidance of the GCOS Steering Committee (GCOS SC) in response to the invitation extended to the GCOS through the COP decision 9/CP.15.

Key changes in the 2010 updated GCOS implementation plan in comparison to the former implementation plan from 2004 are:

- the 2010 updated GCOS implementation plan is now identifying 50 Essential Climate Variables (ECVs), instead of 44,
- it is reflecting on ecosystems (biodiversity),
- there is an additional focus on reference and super-site networks (measurements of several ECVs at one site for a more comprehensive understanding of the Earth System),
- the 2010 updated GCOS implementation plan contains cost estimations for a climate observing system (additional costs and costs for existing systems).

In the light of the 2010 updated GCOS implementation plan, it was consequently necessary to also update the GCOS requirements for Fundamental Climate Data Records 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.

At its eighteenth session, the GCOS SC requested the GCOS Secretariat to prepare a satellite supplement to the 2010 updated GCOS implementation plan, based on updating the GCOS document GCOS-107, which is the satellite supplement published in 2006.

The GCOS Secretariat organised a workshop on the update of the supplement to the space-based component of the 2010 updated GCOS implementation plan from 10 to 12 January 2011, in Geneva, Switzerland. The workshop found that there are improvements on most of the ECVs. The experts also inserted for example extra sections on green-house gases, precursors, and found that «pressure» emerges now as an ECV observed from space.

The draft of the "Systematic Observation requirements for the satellite-based products for Climate (2011 Update)", which is the supplement to the satellite-based component of the 2010 updated GCOS implementation plan was open for public review, from 9 May to 1 July 2011. The GCOS Secretariat is planning to submit a final version latest at the end of the year 2011.

## 2.2 The evaluation of satellite-related global climate data sets

In a joint letter with the World Climate Research Programme (WCRP), dated 12 May 2010, the GCOS programme is calling for a systematical international approach to ensure

- transparency,
- traceability, and
- sound scientific judgement in the generation of climate data records.

In this letter, GCOS and WCRP were asking to carry out expert reviews of climate data records, to instigate groups who can perform such expert reviews and to promote awareness for the need of such a review.

Following up on this initiative, both programmes, supported by the WMO Space Programme, were organizing a workshop, led by the Chairman of the WCRP Observation and Assimilation Panel (WOAP), 18 - 20 April 2011, hosted by ESA/ESRIN, in Frascati, Italy.

The objectives of this workshop were the evaluation of satellite-related global climate data sets as a need to enhance international activities and to promote inter-comparison.

The ECVs to be considered at that workshop were for the:

- Atmospheric domain: Cloud properties, Surface radiation budget
- Ocean domain: Sea ice, Sea-surface temperature, Surface wind
- Terrestrial domain: Snow cover, Soil moisture, Fraction of absorbed photosynthetically active radiation (fAPAR)

Participants were experts in the generation of specified ECV products and representatives of the modeling, analysis, and diagnostic communities. The expected products and outcomes of this workshop were:

- A technical report on detailed assessments of existing datasets for key ECVs relative to the GCOS guideline for the generation of satellite-based datasets and products meeting GCOS requirements
- A framework for an inventory of all ECV datasets that includes indices of the maturity and uncertainties of each product
- The identification of best practices in evaluating and inter-comparing global climate datasets, especially where there are more than one dataset for a given parameter

## 2.3 The «GCOS Improvement and Assessment Cycle»

The thirty-third session of the SBSTA in December 2010 invited the GCOS Secretariat to report on progress made in the implementation of the 2010 updated GCOS implementation plan on a regular basis, at subsequent sessions of the SBSTA, as appropriate. In this regard it encouraged the GCOS to review, in broad consultation with relevant partners, the adequacy of observing systems for climate, such as by updating the *Second Report on the Adequacy of the Global Observing Systems for Climate in Support of the UNFCCC*. It noted the usefulness of updating the GCOS implementation plan on a regular basis, so as to take into consideration developments under the Convention and their related observational needs. The SBSTA agreed to consider, at its thirty-fifth session, issues related to the timing of GCOS contributions to the SBSTA.

#### **2.4.1 System improvement– Support of in situ networks as ground truth for space based observations**

The GCOS SC at its eighteenth session in September 2010 discussed a supplement to the 2010 updated GCOS implementation plan for in situ based products for climate, needed for validation and ground truth for space based observations. The GCOS SC requested that the idea should be developed of either an in situ supplement document or, alternatively a report which is focusing on observational needs on data requirement for adaption, to be published in 2012.

This view of preparing an in situ supplement is being strongly supported by the GCOS expert panels for climate observations which generate the scientific input of the GCOS programme and are the mechanism behind reviewing the list of ECVs.

Each ECV is observed by either based, ground based remote sensing, air borne and/or space based systems and is being discussed at the:

- Ocean Observations Panel for Climate – OOPC, led by IOC–UNESCO
- Terrestrial Observation Panel for Climate – TOPC, led by FAO
- Atmospheric Observation Panel for Climate – AOPC, led by WMO

#### **2.5 Facilitate regional and national implementation of the global observing system for climate**

The GCOS programme is starting to revise its regional action plans, which are closely linked to climate adaptation measures and socio-economic benefit discussions. Following a request by UNFCCC COP 5 in 1999, GCOS set up six regional workshops: Pacific Islands, 2000, Central America, 2002, East and South-East Asia, 2002, South-America, 2003, Eastern and Central Europe 2005 and Africa, 2006.

Currently, the GCOS Secretariat is working on revising the activities for the regional implementation of the global observing system for climate, focussing on South-America and Africa as the scope for improvement is particular large for those regions.

### **3 CONCLUSIONS**

3.1 It is recommended that CGMS members ensure the implementation of the tasks implied in the 2011 update of supplemental details to the satellite based component of the 2010 updated GCOS implementation plan.

3.2 It is recommended that CGMS members support any follow-up on initiatives with regard to the evaluation of GCOS ECV data sets. The support of this assessment process would be considered as a contribution to the «GCOS Improvement and Assessment Cycle».

3.3 It is recommended that CGMS members continue to closely cooperate with GCOS on future progress reports with regard to the actions of the 2010 updated GCOS implementation plan and on reviewing the adequacy of observing systems for climate.

3.4 It is recommended that space agencies, NMHS and operational marine services support the improvement of in situ networks through all domains (atmosphere, ocean and land), needed for validation and ground truth for space based observations, supporting also the concept of reference and super site networks discussed in the 2010 updated GCOS implementation plan. Those agencies should feed back their requirements for ground-truth observations to the GCOS expert panels.

3.5 It is recommended that CGMS members take part in future regional work shops and that they assist in encouraging regional cooperation at those meetings. Those representatives should support actions proposed in the updated GCOS regional action plans, specifically with regard to coordinating in-situ with space-based climate observations on a regional scale.