

Report of the Director, GCOS Secretariat

(Submitted by David Goodrich)

Summary and Purpose of Document

This document highlights activities of the past year and areas of future emphasis for the Secretariat. WMO Congress and Executive Council reaffirmed WMO's strong commitment to GCOS and its implementation. Actions in response to requests from the UN Framework Convention on Climate Change are a major part of the GCOS agenda, particularly in the preparation for a report to the UNFCCC in 2009 on progress with the GCOS Implementation Plan. As a lead-in to this report, GCOS held a joint meeting this fall with WCRP and IGBP on "Learning from the IPCC Fourth Assessment"; some implications for observing systems are summarized. Much of the climate policy emphasis is shifting towards adaptation, and GCOS is partnering in an effort to apply observations, models and services toward climate adaptation in East Africa. Progress continues on the development of an internationally supported programme on the use of climate information for development entitled "Climate for Development in Africa." Lastly, an initiation meeting for a GCOS Reference Upper Air Network was held at Lindenberg Observatory, and AOPC will be called on to consider initial site designation.

ACTION PROPOSED

The meeting is invited to note the information contained in this document for discussion under Agenda Item 3.

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0. Introduction

This document presents the report of the Director of the GCOS Secretariat to the Panel and complements the broad overview of AOPC issues provided by the Chair. Much of the meeting will be devoted to status reports on different GCOS networks; by contrast, this report will deal with recent and future activities of the GCOS Secretariat in support of the networks. The release of the GCOS Second Adequacy Report in 2003 and the Implementation Plan for the Global Observing System for Climate in Support of the UNFCCC in 2004 provided the blueprint for much of the present activity in the Secretariat. The Plan is the widely-agreed 5-10 year implementation document for the global observing system for climate. It cites 131 actions, which have been communicated broadly to the agents for action identified in the Plan. A major role of the GCOS Secretariat is in the execution of the Implementation Plan, using the range of linkages with the scientific, governmental and intergovernmental organizations already in place.

Major WMO meetings over the past year included the WMO Congress and Executive Council in May. Congress reaffirmed WMO's continuing strong commitment to the objectives of GCOS and support for its implementation in order to meet the full range of user needs. It provided a range of requests to Members, Technical Commissions, and Regional Associations in support of GCOS.

There has also been a significant reorganization of the WMO Secretariat, following the WMO Congress and Executive Council. Programmatic activities are under Departments of Observing and Information Systems Development; Research; Climate and Water; and Weather and Disaster Risk Reduction. GCOS falls under the Observations and Information Department, which has promoted closer ties with observational groups largely responsible for implementing GSN, GUAN and GRUAN. This Department is also responsible for implementing the WMO Integrate Global Observing System (WIGOS), a cross-cutting approach to the enhanced integration of all WMO observing systems.

Interactions with the UN Framework Convention on Climate Change (UNFCCC) have become a central part of the GCOS agenda. Ties with the climate policy community through the UNFCCC provide both motivation and support for GCOS. Major GCOS contributions to last year's UN Climate Change Conference in Bali included reports on updated Reporting Guidelines on Global Climate Observing Systems; and a report entitled *The Role of Observations in Support of Adaptation: The GCOS Contribution to the Nairobi Work Programme*. This strong interaction with UNFCCC is expected to continue.

It should also be noted that there will be a meeting of the GCOS Cooperation Mechanism Donor Board on Thursday, 12 June, in Bonn to benefit from the synergy with the UNFCCC Subsidiary Body for Scientific and Technological Advice.

1. GCOS 2009 Progress Report and Supplement

In November 2005 the Subsidiary Body for Scientific and Technical Advice (SBSTA) of the UNFCCC "requested the GCOS secretariat to provide, for consideration by the SBSTA at its thirtieth session (June 2009), a comprehensive report on progress with the GCOS implementation plan." This was reaffirmed at SBSTA in Bali in December 2007. In preparing for

this report, the GCOS Steering Committee at its 15th session (Paris, October 2007) decided that:

...in response to the request from UNFCCC for a 2009 comprehensive report, the Secretariat should prepare a Progress Report and Supplement that will (1) confirm ongoing requirements and report on progress against GCOS-92 and GCOS-107 and (2) focus on new actions and drivers such as the impacts, adaptation and vulnerability agenda, as well as regional climate needs. The report could canvass the need for new or revised ECVs. It should identify practical steps that can be taken by parties to advance the overall implementation of GCOS.

In addition to making use of the Sydney workshop, the 2009 report will also make use of information from national communications, GCOS monitoring and analysis centres, and GCOS panels and partner observing systems. National communications will use revised reporting guidelines adopted by SBSTA in Bali, and a specific information request has gone out to GCOS National Coordinators requesting input according to these guidelines by 15 September 2009.

2. Some Observing System Implications of the Sydney Workshop

In addition to the above inputs to the 2009 Progress Report and Supplement, the workshop "Learning from the IPCC Fourth Assessment," held in Sydney and co-sponsored with WCRP and IGBP, was planned as another central input to the 2009 report. The Sydney Workshop highlighted a number of major scientific issues revealed by IPCC AR4 participants, with some prominent implications for the evolution of the observing system. In Section 5 of this report, some of the ongoing and proposed activities of the Observing System Panels are described, with relation to these issues. The full report can be found at <http://www.wmo.int/pages/prog/qcos/Publications/qcos-117.pdf>. An overview of some of these issues is provided here:

Abrupt Climate Change, including Changes in Ice Sheets – Four types of abrupt change that stand out in the palaeoclimate record as being so rapid and large in their impact that if they were to occur, they would pose clear risks to society in terms of our ability to adapt. These are: (i) rapid change in ice sheets and hence sea level; (ii) widespread and sustained changes to the hydrological cycle (see below); (iii) abrupt change of the Atlantic meridional overturning circulation; and (iv) rapid release to the atmosphere of methane trapped in permafrost and on continental shelves. In particular, the issue of definition of ice sheet dynamics and its relation to sea level rise received particular attention.

Changes in the Hydrological Cycle, including Extremes – The hydrological cycle affects all aspects of climate and its forcing, including floods and droughts, radiative forcing, and forcing of ocean circulation. The immediate future (the next five years) holds a window of opportunity from new satellite observations in particular, to better understand the changing nature of the high frequency supply-side component of the hydrological cycle over land, the storage component of water over land, and the low-frequency supply-side component of the water balance over the oceans. Assembly of the following datasets was recommended:

- Precipitation probability distributions based on high-frequency observations;
- New observations of soil moisture (both remotely-sensed top-soil indicators, and deeper soil moisture profiles from *in situ* measurements);
- Continental-scale runoff from river gauge data;
- Changes in the large-scale hydrological cycle and its relation to ocean salinity.

Land Surface Processes, the Carbon Cycle and Biogeochemical Feedbacks – The terrestrial and ocean environments are the two key players in the Earth's carbon cycle. The oceans currently store 37% of the carbon dioxide emissions. There is concern that the oceans' capacity to store carbon is reducing. From an Earth system modeling point of view, the parameterization of land surface processes is a weakly modeled component of global climate models. Terrestrial environments host the bulk of the biosphere and most of the human population; radiation, energy, momentum, water and carbon cycles are intimately coupled through living processes (notably photosynthesis and respiration) in land-based ecosystems; and this is where much of the economic activities, most of the impacts of climate change, as well as all adaptation and mitigation measures take place. Better process modeling and understanding of feedbacks in the carbon cycle will require a denser and more evenly distributed network of sustained in situ observations of carbon on land, in the oceans and in the atmosphere.

Aerosol-Cloud Interactions and Radiative Forcing – In the AR4, several of the climate models did not have representation of the anthropogenic aerosol-cloud interactions and thus of the aerosol indirect forcing. Globally averaged, the net radiative effect of aerosols is negative (i.e., contributes to cooling at the surface) and is estimated to have a magnitude of about 75% of the forcing due to the CO₂ increase since pre-industrial times. About 60% of this is forcing via aerosol-cloud interactions, which is also the most uncertain of the anthropogenic forcings. There is a critical need to improve the understanding of the processes (e.g., aerosol transport, convective processes, cloud formation and dissipation) leading to this forcing, represent them reliably in climate models and thus simulate the interactions accurately to better quantify the anthropogenic influence on climate.

Building an Information Base for Adaptation – The climate will continue to change substantially from human activities over the next several decades, so that adaptation will be essential. An imperative and essential first step is to provide the scientific basis for a climate information system that informs decision-makers about what is happening and why, and what the immediate prospects are. The development of this climate information system potentially takes on, in a more operational framework, a key part of what is currently done as part of the IPCC assessment process. There are many research questions on how to develop such a system, and what such a system must include in order to be viable. GCOS and WCRP could play a major role in addressing these issues, noting that this would require adequate new funding.

Decadal forecasts/projection observational needs - Ocean initial conditions are essential for decadal forecasts and projections. It appears likely that observations through the full depth of the ocean, and not just to the depth of Argo profiling floats, will be necessary.

3. Information Needs for Adaptation to Climate Change

Concern on the needs for climate information for adaptation has led to considerable activity within the GCOS community. In considering the needs for information with which to design effective adaptation strategies, it is important to recognize that such strategies will necessarily vary locally, nationally, and regionally depending on how these regions are likely to be affected by climate change. To meet the observational needs for adaptation to climate change it will be essential to focus much more on regional, national and local networks than on the global-scale networks that have received most attention in GCOS planning so far. With adaptation in mind, it is becoming just as important to ensure that regional- and national-scale networks function effectively. Such networks are naturally denser than global networks and therefore, provide

much more local detail than do global networks. This greater detail is essential for understanding regional climate change, for example, in enabling the detection of regional climate trends and for use in regional models that provide some capability, currently limited, to project future regional climate changes. However, the accuracy and reliability of regional models depends greatly on the availability and quality of the observations that are used by the models. Looking more broadly, the primary challenge for GCOS in meeting the needs of the adaptation agenda will be to define and observe the major impact variables in the various sectors that will need to adapt.

Climate information for adaptation critically depends on the availability of good quality climate observations with sufficient spatial coverage over a long period of time, on the adequacy of models to depict current and future regional climate, and on a thorough understanding and appreciation of the uncertainties and constraints associated with the use of both data and regional and global models. To assist the developing and least developed countries of Eastern Africa to undertake and appropriately use climate projections in adaptation planning, GCOS, WCRP, the Climate Prediction and Adaptation Branch of the World Meteorological Organization, and the IGAD Climate Prediction and Applications Center (ICPAC) are collaborating, with the support of the World Bank, to develop and implement a programme of three linked workshops to demonstrate the key elements of an effective climate risk management strategy for the region.

4. GCOS Reference Upper Air Network (GRUAN)

A reliable record of water vapor in the upper troposphere/lower stratosphere is a major recommendation of the Sydney report and a major motivation behind GRUAN. The reference network will provide long-term high quality climate records to constrain and calibrate data from more spatially-comprehensive global observing systems, including satellites and current radiosonde networks. GRUAN has been endorsed by SPARC, among other bodies. The Implementation Meeting of the GRUAN, organized by the AOPC Working Group on Atmospheric Reference Observations, was held on 26-28 February 2008 at the Richard Aßmann Observatory in Lindenberg, Germany hosted by the Deutsche Wetterdienst (DWD). The observatory has recently been designated by WMO as the Lead Centre for the GRUAN network for a pilot phase. The meeting was held under the auspices of GCOS and focused upon necessary actions required to refine the cooperation with all partners, resolve scientific and technical issues from the report of the WG-ARO and define a work plan for the implementation of the network.

5. WCRP Joint Scientific Committee 29th Session, Arcachon

The World Climate Research Programme met in Arcachon, France, during the week of 31 March. GCOS was represented by the SC Chair and the Secretariat Director. While the JSC covered a wide range of topics, several are of particular interest to AOPC and the participants at this meeting:

- The JSC endorsed the role of the jointly sponsored observing system panels for climate (AOPC, TOPC and OOPC) and endorsed continuation of the WCRP Observations and Assimilation Panel.
- JSC expressed its appreciation to GCOS for cosponsoring the Sydney Workshop. It wanted to ensure that the Workshop report is comprehensively reviewed by the projects and JSC to identify potential gaps in the recommendations. The Workshop was seen as input but just the start of a process, not for decision-making on the research agenda.

- WCRP is having increased participation in UNFCCC activities. With regional adaptation to climate change high on the agenda of UNFCCC, there is a need to focus WCRP on achieving progress in producing meaningful regional climate projections, enabling further scientific support to regional adaptation measures.
- A major topic of discussion at the session was the idea of seamless weather-climate prediction, and a potential major role for an initiative of this type at the World Climate Conference - 3, currently scheduled for September 2009. While resolution was not reached at JSC, this will be a major topic for discussion at the World Modelling Summit for Climate Prediction, to be held at ECMWF on 6-9 May.
- A task group is being formed on regional climate modelling and downscaling, bringing in appropriate expertise and including users at the regional level.
- There was increased attention on sea level rise issues within WCRP, in particular on cryospheric factors, ocean thermal expansion issues, and water storage on land. Attention should be given to prediction of geographical distribution of sea level rise, leading to contributions to integrated assessments required by IOC. Corresponding observational requirements are to be considered as part of this activity.

6. Group on Earth Observations (GEO) Fourth Session, Cape Town

The GCOS Steering Committee Chair, John Zillman, represented GCOS at the Fourth Session of GEO on 28-29 November and the Fourth Earth Observation Summit on 30 November 2007. The only contentious issue was related to the scope of GEOSS, i.e. whether it is limited to observations or whether it extends to modelling, prediction, and service provision. The Cape Town Declaration can be found at http://earthobservations.org/05_Cape%20Town%20Declaration.pdf.

7. GCOS Interim Director

As many of the members of AOPC are aware, I will be leaving as Director of the GCOS Secretariat to return to NOAA in the US effective 2 July 2008. Until selection of a new Director, Dr Alexander Karpov will serve as Acting Director. Dr Karpov has had long experience with the World Weather Watch of WMO and with the implementation of the atmospheric component of GCOS. We could not ask for a better choice for this interim period.

I leave a remarkable group of public servants here at the GCOS Secretariat, and without exception I am honored to have served with them.