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**C** CLIMATE  
**O** OBSERVING  
**S** SYSTEM



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**WORLD METEOROLOGICAL  
ORGANIZATION**

**INTERGOVERNMENTAL  
OCEANOGRAPHIC COMMISSION**

# **GCOS ANNUAL REPORT 2007-2008**

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Chairperson, Publications Board  
World Meteorological Organization (WMO)  
7 *bis*, avenue de la Paix  
P.O. Box No. 2300  
CH-1211 Geneva 2, Switzerland

Tel.: +41 (0)22 730 84 03  
Fax: +41 (0)22 730 80 40  
E-mail: [Publications@wmo.int](mailto:Publications@wmo.int)

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## Foreword

The Global Climate Observing System (GCOS) is a joint undertaking of the World Meteorological Organization (WMO), the Intergovernmental Oceanographic Commission (IOC) of UNESCO, the United Nations Environment Programme (UNEP), and the International Council for Science (ICSU). It is also supported by the Food and Agriculture Organization (FAO) through the climate component of the FAO-led Global Terrestrial Observing System (GTOS). GCOS aims at providing comprehensive information on the total climate system, involving a multi-disciplinary range of physical, chemical and biological properties, and atmospheric, oceanic, hydrologic, cryospheric, and terrestrial processes. It is designed to support all aspects of the World Climate Programme and climate-relevant aspects of other global programmes, including especially the work of the WMO-UNEP Intergovernmental Panel on Climate Change (IPCC) and the UN Framework Convention on Climate Change (UNFCCC). It provides the observational underpinning for the United Nations System Coordinated Action on Climate Change.

The WMO-IOC-UNEP-ICSU Memorandum of Understanding (MOU) on GCOS established the GCOS Steering Committee as the main scientific and technical body for formulating the overall concept and scope of GCOS and advising both the sponsoring and participating organizations on its further development. Paragraph 3.2 (h) of Annex B of the MOU requires the Chairman of the Steering Committee "To prepare annually, with the GCOS Secretariat, a report of GCOS planning and implementation activities, including the considerations and recommendations by the Steering Committee, and to present this report to the sponsoring organizations."

I am pleased, therefore, to present this report on GCOS planning and implementation activities during 2007-2008. The report covers the period from the opening of the Fifteenth Session of the GCOS Steering Committee on 16 October 2007 until the opening of the Sixteenth Session on 14 October 2008. It was reviewed and endorsed by the Steering Committee at its Sixteenth Session.

There is no doubt that the GCOS sponsoring and participating organizations are making great progress with the implementation of GCOS as the climate-focused global system of systems that will serve the needs of the user communities worldwide including the Climate Societal Benefit Area of the Global Earth Observation System of Systems (GEOSS). But, despite the progress of the last 16 years, much has still to be done to ensure the successful implementation of GCOS in support of its original objectives and to meet the needs of the United Nations System Coordinated Action on Climate Change.

On behalf of the Steering Committee, I urge the GCOS sponsoring and participating organizations and the international earth observation and climate communities to continue their strong support for the coordinated implementation of GCOS. It is our hope that the 2009 World Climate Conference 3 will provide a further reinforcement of the fundamental importance of GCOS and renewed international commitment to its accelerated implementation and sustained operation.

John W. Zillman  
(Chairman, GCOS Steering Committee)

December 2008

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## **Executive Summary**

There has been good progress with the implementation and further development of the Global Climate Observing System (GCOS) during 2007-08. Important milestones were achieved in the implementation of the main component observing systems on which it is built, the Global Ocean Observing System (GOOS), the Global Terrestrial Observing System (GTOS) and the WMO Integrated Global Observing Systems (WIGOS).

Work got underway on the preparation of a comprehensive report to the Subsidiary Body for Scientific and Technological Advice (SBSTA) of the UN Framework Convention on Climate Change (UNFCCC) on progress with the 155 Actions called for in the 2004 "Implementation Plan for the Global Climate Observing System in Support of the UNFCCC", for consideration by SBSTA at its 30<sup>th</sup> session in June 2009 and on Updating the 2004 Implementation Plan.

The GCOS Steering Committee and its Atmospheric, Ocean and Terrestrial Observing Panels continued with active planning and development of GCOS and maintained effective coordination with those responsible for the various component observing systems and user programmes of the GCOS.

Useful steps were taken during the year towards closer alignment of GCOS with the related activities of the Global Earth Observation System of Systems (GEOSS) and action was taken to enhance the visibility and effectiveness of GCOS through the World Climate Conference-3 in August-September 2009 and the publication of a new Strategic Plan for GCOS by the end of 2009. Advice was also prepared for the GCOS Sponsors (WMO, IOC, UNEP and ICSU) as a basis for updated governance arrangements for GCOS and on the need for strengthened support for the GCOS Steering Committee, Panels and Secretariat.

This report provides a summary account of GCOS planning and implementation activities from October 2007 to October 2008 and information on the current terms of reference and membership of the various GCOS planning and coordination mechanism and the Secretariat. It is provided for the information of the Sponsors and all those interested in recent progress with the implementation of GCOS and its component observing systems.

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# 1. Introduction

The Global Climate Observing System (GCOS) is an internationally coordinated system of observing networks and systems for meeting the full range of national and international needs for climate and climate-related observations. It is designed 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.

The GCOS emerged as a global imperative from the 1990 Second World Climate Conference (SWCC) and was formally established through an April 1992 Memorandum of Understanding between the World Meteorological Organization (WMO), the Intergovernmental Oceanographic Commission (IOC) of UNESCO, the United Nations Environment Programme (UNEP), and the International Council for Science (ICSU). It is built on the largely domain (ocean, atmosphere, land)-based operational and research observing systems of its sponsors and other international organizations, and its main components are, therefore, all the climate-relevant observing systems of the IOC-led Global Ocean Observing System (GOOS), the FAO (Food and Agriculture Organization)-led Global Terrestrial Observing System (GTOS), and the WMO Integrated Global Observing Systems (WIGOS).

The GCOS is not a separate observing system additional to WMO's global observing systems, the IOC-led Global Ocean Observing System (GOOS), and the FAO-led Global Terrestrial Observing System (GTOS). Rather it is the climate-focussed 'system-of-systems' framework, or interface, through which all the global observing systems of WMO and its UN and non-UN system partners work together to meet the totality of national and international needs for climate observations.

The objectives of the GCOS are to support all aspects of the World Climate Programme, the climate change assessment role of the WMO-UNEP Intergovernmental Panel on Climate Change (IPCC), and the international policy role of the United Nations Framework Convention on Climate Change (UNFCCC); and, in particular, to provide sustained, comprehensive, climate and climate-related observations to meet the needs for:

- (a) Climate system monitoring;
- (b) Climate change detection and attribution;
- (c) Research to improve understanding, modelling and prediction of the climate system;
- (d) Operational climate prediction on seasonal to interannual time scales;
- (e) Assessment of the impacts of, and vulnerability and adaptation to, natural climate variability and human-induced climate change;
- (f) Applications and services for sustainable economic development;
- (g) The climate change assessment role of the Intergovernmental Panel on Climate Change; and
- (h) The climate change policy role of the UNFCCC and other international conventions and agencies.

The GCOS MOU establishes the GCOS Steering Committee of up to sixteen scientific and technical experts, appointed jointly by the Executive Heads of the sponsoring organizations, to formulate the overall concept and scope of GCOS, and to provide scientific and technical guidance to sponsoring and participating organizations and agencies for the planning, implementation and future development of GCOS. The Steering Committee is supported by the GCOS Secretariat, which serves as the Joint Planning Office for GCOS, located in the WMO Headquarters in Geneva.

Over the 16 years since its formal establishment, the implementation of the GCOS has been proceeding within the overall framework of a 1995 GCOS Plan (GCOS-14 in the GCOS

Publication Series), a series of GCOS Regional Action Plans, and a 2004 'Implementation Plan for the Global Observing System for Climate in support of the UNFCCC' (GCOS-92) and its Satellite Supplement (GCOS-107). The Steering Committee has met annually for most of that period and, in recent years, has carried out much of its work through its standing domain-based Panels, co-sponsored with the World Climate Research Programme (WCRP) and the individual domain-based observing systems--the Atmospheric Observation Panel for Climate (AOPC), the Ocean Observations Panel for Climate (OOPC) and the Terrestrial Observation Panel for Climate (TOPC).

Under the terms of the GCOS MOU, the planning and coordination activities of the Steering Committee, Panels and Secretariat are supported through the GCOS Climate Observing System Fund (COSF). In 2000, a group of countries agreed to accelerate the pace of implementation, especially in developing countries, through the establishment of a GCOS Cooperation Mechanism (GCM) with a GCOS Cooperation Board and a GCOS Cooperation Fund. The GCOS Cooperation Fund is configured as a component of the COSF.

The Terms of Reference and October 2008 membership of the GCOS Steering Committee are at Appendix 1 and the Terms of Reference and membership of the Panels are at Appendix 2. The functions and staff of the GCOS Secretariat are at Appendix 3. The Terms of Reference of the GCOS Cooperation Mechanism are at Appendix 4.

## **2. Steering Committee Activities**

The GCOS Steering Committee held its Fifteenth Session (SC-XV) at the Headquarters of CNES (Centre Nationale d'Etudes Spatiales) in Paris on 16-19 October 2007 with the participation of 14 Committee members (including all three Panel Chairs), representatives of three of the four sponsors, eight partner and participating organizations, four invited experts, and four members of the GCOS Secretariat.

Following a general review of GCOS planning and implementation activities from the perspectives of the sponsors, the panels, the component observing systems, and the user community, the session addressed six major policy issues bearing on the further development of GCOS as follows:

- A strategic plan for the future development of GCOS;
- GCOS in the context of GEOSS (Global Earth Observation System of Systems);
- GCOS implementation issues at the national level;
- The role of GCOS relative to the IPCC and the UNFCCC;
- Information and communication; and
- Resourcing of GCOS.

The Steering Committee agreed on a list of 49 'Actions and Recommendations' from the Session (copy at Appendix 5) and a work programme until SC-XVI in October 2008 including:

- Report and advice to the GCOS sponsors;
- Guidance to the Panels;
- Guidance to the Secretariat;
- Priorities for the year (GCOS Plan and Brochure, 2009 Progress Report to the UNFCCC, the UNFCCC Nairobi Work Programme and strengthening GCOS activities at the national level); and
- Activities to be carried out by individual members of the Committee.

The report of the Session (GCOS-116) was distributed electronically to participants and key GCOS stakeholders and placed on the GCOS Web site on 21 December 2007. It was published and distributed in hard-copy form in March 2008.

The Steering Committee Chairman provided his formal annual report to the Executive Heads of the four sponsors on 25 March 2008 along with a copy of the SC-XV report and elaborative comment on the main actions and recommendations addressed to the sponsors.

In respect of the status of GCOS at the end of 2007, the SC Chairman reported, in summary:

- (a) Pleasing progress with several of the component systems of GCOS, especially the Argo program of the Global Ocean Observing System (GOOS) and the restoration of silent GSN and GUAN stations within the World Weather Watch Global Observing System (GOS);
- (b) Strong support from the Committee on Earth Observation Satellites (CEOS) for the climate missions of the various space agency satellite programs;
- (c) A generally supportive reaction to GCOS at the May 2007 World Meteorological Congress and June 2007 IOC Assembly;
- (d) The pro-active planning, coordination and facilitation of activities of the Atmosphere (AOPC), Ocean (OOPC) and Terrestrial (TOPC) Panels;
- (e) Fairly broad acceptance of the concept of GCOS as the climate observing component of GEOSS;
- (f) Good working relations between the GCOS Secretariat and those of its main component systems, especially the World Weather Watch GOS, the Global Atmosphere Watch (GAW), GOOS and the Global Terrestrial Observing System (GTOS); and
- (g) Strengthening collaboration with the various user communities encompassed by the various components of the World Climate Programme, the Intergovernmental Panel on Climate Change (IPCC) and the UN Framework Convention on Climate Change (UNFCCC).

In drawing the Executive Heads' attention to the key outcomes from SC-XV, the SC Chairman's letter of transmittal highlighted:

- (a) The desirability of FAO (Food and Agriculture Organization) co-sponsorship of GCOS (Action 4 of Appendix 5);
- (b) The need for a joint letter from the Sponsors to their national contacts concerning GCOS implementation coordination at the national level (Actions 6, 46 and 47);
- (c) A GCOS implementation strategy meeting for Central America and the Caribbean (Action 17);
- (d) A joint GCOS-WCRP (World Climate Research Programme) letter to the Chair of the Committee on Earth Observation Satellites (CEOS) (Actions 28-29);
- (e) The October 2007 Sydney GCOS-WCRP-IGBP Workshop on Lessons Learned from the IPCC Fourth Assessment Report (Action 41);
- (f) Support for UNFCCC activities (Action 42);
- (g) GCOS relations with GEO (Group on Earth Observations) and GEOSS (Actions 43 and 45);
- (h) The need for an updated Strategic Plan for GCOS (Action 44); and
- (i) The resourcing of GCOS (Action 49).

The Steering Committee was represented by Dr Alexander Zaitsev at the First Session of the WMO Executive Council Working Group on the WMO Integrated Global Observing Systems (WIGOS) and the WMO Information System (WIS) in Geneva on 4-7 December and by its Chairman at:

- The GEO Plenary and Ministerial Summit in Cape Town on 28-30 November 2007;
- Twenty-seventh session of the Subsidiary Body for Scientific and Technological Advice (SBSTA-27) in Bali on 3-12 December 2007;
- WMO Executive Council Working Group on Climate and Related Water and Environmental Matters, Geneva, 26-28 March 2008;

- Twenty-ninth session of the Joint Scientific Committee (JSC) of the World Climate Research Programme (WCRP), Arcachon, 31 March – 4 April 2008;
- Eleventh Session of the GOOS (Global Ocean Observing System) Scientific Steering Committee, Paris, 7-10 April 2008;
- Twenty-ninth Session of the Intergovernmental Panel on Climate Change (IPCC) in Geneva on 31 August – 4 September 2008; and
- The Sixth Meeting of the GEO Target Task Team in Geneva on 4-5 September 2008.

The Chairman also represented the Steering Committee at the Sixtieth Session of the WMO Executive Council in Geneva from 18-23 June 2008 and arrangements were put in place for his attendance, on behalf of GCOS, at the 29<sup>th</sup> General Assembly of ICSU in Maputo from 21-24 October 2008.

The GCOS Steering Committee also contributed during the year to the early planning for World Climate Conference No 3 (WCC-3), and especially to proposals for a climate observing session at the Conference, through Dr Stefan Roesner's membership of the WCC-3 Organising Committee.

Although the Steering Committee met only once during the year, its members were kept in touch with GCOS developments through the Secretariat and occasional progress reports from the Chairman. Most Committee members provided GCOS presentations and/or briefings at relevant scientific and policy fora during the year. The Panel Chairs and other Committee members represented the Steering Committee as well as their individual Panels in a range of other climate and related scientific and policy fora.

### **3. Panel Activities**

#### *Atmospheric Observation Panel for Climate (AOPC)*

The 14<sup>th</sup> session of the Atmospheric Observation Panel for Climate (AOPC), which is co-sponsored by GCOS and WCRP, was held from 21-25 April 2008 in Geneva under its Chairman Dr Adrian Simmons (For AOPC membership, see Appendix 2).<sup>1</sup> The AOPC discussed a variety of issues related to the implementation of atmospheric networks and systems for climate, including data availability, quality and use. For example, progress in the performance of the GCOS Surface and Upper-Air Networks was demonstrated by reports from the Monitoring Centres and dedicated CBS Lead Centres. It was noted that station operators often needed better guidance as to the level and format of metadata they are expected to provide to the international data centres, along with the observations themselves. Among many items, AOPC welcomed progress in planning for the GCOS Reference Upper Air Network (GRUAN) (see item below); noted progress in maintaining the archive of the Baseline Surface Radiation Network, now hosted by Alfred-Wegener Institute Bremerhaven, Germany; and discussed the efforts of space agencies to meet GCOS satellite-based requirements, such as through enhanced coordination by CEOS and the establishment of WMO Regional/Specialized Satellite Centres for Climate Monitoring.

Mainly through the work of the AOPC-sponsored working groups on surface pressure, on sea-surface temperature and sea ice, and on land surface/atmosphere issues, the session was informed of marine (e.g., the status of VOS and VOSCLIM) and terrestrial observational issues related to monitoring the atmosphere. Particular emphasis was placed at this session on atmospheric observations in the cryosphere, with two dedicated papers on the adequacy of observations to validate coupled atmospheric modelling results, and on the legacy of the International Polar Year 2007/2008 and the Global Cryosphere Watch concept, respectively. Furthermore, the session issued recommendations related to the use of observations in synthesized products and reanalyses. AOPC recognized the importance of regional

<sup>1</sup> The session report is available from <http://www.wmo.int/pages/prog/gcos/Publications/gcos-122.pdf>

observations for effective use in regional climate modelling for the assessment of climate change impacts and adaptation to these impacts, and the important contribution of climate indices and data rescue activities in this regard.

#### *Ocean Observations Panel for Climate (OOPC)*

The 13<sup>th</sup> session of the Ocean Observations Panel for Climate (OOPC) was held on 9-12 June 2008 in Buenos Aires under its Chairman Dr Ed Harrison (For OOPC membership, see Appendix 2). The Panel continued its work on planning for sustained observations in support of the climate requirements of its co-sponsors (GOOS, GCOS and WCRP), on using new information to evaluate and revise the plan for the initial observing system, and on providing advocacy and supporting coordination of the various marine communities involved in sustained observation.

The Panel's outreach to the ocean carbon, the Census of Marine Life, the ocean ecosystem and the ocean biogeochemistry communities involved significant effort; as did co-sponsorship of the Ocean Sensors 08 Workshop, continued work with the US NOAA Office of Climate Observation on the in-situ observing system, and the ocean contribution to the 2009 GCOS Report to the UNFCCC on progress with implementation of GCOS-92. The Panel also contributed to the planning for the GODAE Final Symposium on 11-15 November 2008 in Nice, France.

The Panel Chairman participated in a wide range of IOC, GOOS and JCOMM (Joint Technical Commission on Oceanography and Marine Meteorology) meetings, workshops and activities including the 11<sup>th</sup> session of the GOOS Scientific Steering Committee (GSSC) on 7-10 April 2008 in Paris. In addition to its work on promoting access to ocean information from global observations and its ongoing work with the JCOMM Management Committee through the JCOMM Observations, Data Management and Services Program Areas, with the WCRP and with the ocean forecasting community, the Panel put extra effort since SC-XV into planning for the OceanObs09 Conference to be held on 21-25 September 2009 in Venice, Italy. The primary sponsor of the Conference is ESA and support is also being provided by IOC/UNESCO, EUMETSAT, CLISAP, NASA, NOAA, CNES, NSF and ONR. More than 300 participants are expected and the Conference is expected to contribute substantially to the updating the GCOS-92 Implementation Plan.

#### *Terrestrial Observation Panel for Climate (TOPC)*

The Terrestrial Observation Panel for Climate (TOPC) is co-sponsored by GCOS and GTOS and recently, also, by the WCRP. It liaises with the relevant research and operational communities to identify measurable terrestrial properties and attributes that control the physical, biological and chemical processes affecting climate, are themselves affected by climate change or serve as indications of climate change.

TOPC was reconstituted in 2007 under its new Chairman Dr Han Dolman (For TOPC membership, see Appendix 2) and held its tenth session at FAO Headquarters in Rome in November 2007.<sup>2</sup> With the Panel strengthened in the areas of groundwater and permafrost, it was agreed that work on each of the terrestrial Essential Climate Variables (ECVs) will be coordinated by a Panel member on an active person outside the Panel. Each of these will coordinate the preparation of a report on standards for the relevant ECV.

During the year, the chairman represented TOPC in a range of meetings and teleconferences including the April 2008 session of AOPC, an IGRAC Groundwater Data Center Workshop in Utrecht and a June 2008 IEEE Teleconference on Standards. He also advised on the 2007 and 2008 GTOS submissions to the UNFCCC and on the GTOS booklet (GTOS-52) on the current status of terrestrial ECV observation capabilities.

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<sup>2</sup> The session report is available at [www.fao.org/gtos/doc/pub53.pdf](http://www.fao.org/gtos/doc/pub53.pdf).

Among the major issues addressed by TOPC at its 10<sup>th</sup> session and in the period up to SC-XVI where the state of hydrological networks (GTN-H/GTN-R) and the identification of a lead organization (IGRAC) for groundwater (GTN-W); also progress with GTN-G (glaciers) and GTN-P (permafrost) and the link-up with data collection efforts of the International Polar Year (IPY). The Panel was also heavily involved in providing input to the GTOS Secretariat documents for UNFCCC on a terrestrial framework mechanism and the assessment of standards for the terrestrial ECVs.

#### *WCRP Observation and Assimilation Panel (WOAP)*

The WCRP Observation and Assimilation Panel (WOAP), which is now co-sponsored by GCOS, coordinates cross cutting issues from a research perspective between WCRP and the GCOS panels. These issues include global observations, their analysis and assimilation, and the resulting products.

WOAP is complementary to the GCOS Panels, and it includes representatives from the WCRP/GCOS co-sponsored panels AOPC, OOPC, and TOPC who establish requirements of climate researchers for *in situ* as well as satellite observation networks and systems. The panels also serve the research community in the collection and reanalysis of climate observations in order to better describe the structure and variability of the climate system, as well as climate change. WCRP exploits observations and re-analyses in its input to the Intergovernmental Panel on Climate Change (IPCC) assessment reports and other wide-ranging policy advice.

WOAP also has representatives from WCRP modeling working groups, as models are essential to analyze observations and assimilation of observations provides fields for initializing climate predictions with models. It therefore also provides a forum for exploring modeling and prediction observational needs. WOAP includes representatives from WCRP projects, who typically lead in process studies but whose activities are necessarily set in a global context. WOAP further explores mechanisms for the management, stewardship, and access of data (WCRP's Data Management); and climate system data assimilation, synthesis, reprocessing and reanalysis of observations. Finally, WOAP interacts and represents WCRP on observational issues with the Global Earth Observation System of Systems (GEOSS).

The Third WOAP meeting, 29 Sept – 1 Oct 2008 in Boulder, USA, focused on progress achieved during the last two years in relation to space agencies, CEOS, interactions between GCOS and WCRP activities, and participation in GEOSS. A draft report of the meeting is available, and a considerable amount of material has been posted on the WOAP-III web site ([http://www.wmo.ch/pages/prog/wcrp/AP\\_WOAP3.html](http://www.wmo.ch/pages/prog/wcrp/AP_WOAP3.html)). Both background material and the presentations made at the meeting are also available. The main topics addressed at the meeting, in addition to the focus on progress achieved included, 1) the transition of WCRP projects and datasets beyond 2013, 2) assessment of the activities and results of the Task Group on Data Management and the Joint Working Group on Observational Data Sets for Reanalysis, 3) development of a report to the GCOS Steering Committee, 4) exploration of the role of WOAP in World Climate Conference 3, 31 Aug to 4 Sept 2009, and OceanObs09, 21-25 September 2009, and 5) development of contributions to the WCRP implementation plan, taking advantage of the outcome of the workshop on lessons learned from IPCC AR4.

## 4. Secretariat Activities

Some of the principal activities in which the GCOS Secretariat has been involved since the fourth quarter of 2007 (i.e., since the 15<sup>th</sup> session of the Steering Committee) include the following:

- Finalization of the report of the workshop, *Future Climate Change Research and Observations: GCOS, WCRP, and IGBP Learning from the IPCC Fourth Assessment Report*, held in Sydney, Australia in October 2007;
- Preparation for, and participation in, COP-13 in Bali, Indonesia, December 2007;
- Organization of the Fourth GCOS Cooperation Mechanism session, held in Bonn, Germany in June 2008;
- Organization of the GCOS–CCCC Implementation Strategy Meeting, held in Belize City, Belize, January 2008, and preparation of the final report of the meeting;
- Facilitation of the still evolving Climate for Development in Africa Programme (ClimDev Africa);
- Organization of the annual session of the Atmospheric Observations Panel for Climate (AOPC), held in April 2008 in Geneva;
- Preparation for the project *Climate Observations and Regional Modeling in Support of Climate Risk Management and Sustainable Development*, to be funded by the World Bank;
- Launching of work to prepare a progress report, to be delivered in 2009, on actions identified in the GCOS Implementation Plan and on an update of this plan;
- Organization of an implementation meeting to launch the GCOS Reference Upper Air Network (GRUAN) and follow-up activities;
- Collaboration with space agencies and their coordination bodies (CEOS, WMO Space Programme, Coordination Group on Meteorological Satellites (CGMS)) in helping them meet GCOS requirements for monitoring climate from space;
- Involvement in work to advance the implementation of the Global Terrestrial Network-Hydrology (GTN-H); and
- Assistance in organizing the WCRP Observations and Assimilation Panel (WOAP) meeting in Boulder, Colorado, USA, 29 September – 1 October 2008.

In addition, the table in Appendix 3 provides a list of the various tasks for which the staff of the GCOS Secretariat have been responsible during 2007-2008. This table shows not only the continuing activities in which the GCOS Secretariat is involved, but indicates who within the Secretariat during the last year has been responsible for which task and provides a rough estimation of which activities required the most time since the last Steering Committee meeting.

## 5. The GCOS Cooperation Mechanism

The Fourth Session of the GCOS Cooperation Board (GCB) was held on 12 June 2008 at the German Ministry of Transport, Building, and Urban Affairs in Bonn, Germany in conjunction with the 28<sup>th</sup> session of the UNFCCC Subsidiary Body for Scientific and Technological Advice (SBSTA). The goal of the session was to try to match donor priorities with observation needs and to illustrate how GCOS activities support climate across the board. Participants included mainly GCOS national coordinators from developed countries and representatives of other countries that have provided support to GCOS in the past. Mr Carlos Fuller of the Caribbean Community Climate Change Centre (CCCCC) provided a developing country perspective and reported on the successful Belize implementation strategy workshop discussed below.

The GCOS Secretariat reviewed the status of regional activities it has been facilitating, including the ClimDev Africa Programme, GCOS implementation in Central America and the

Caribbean, and the World Bank proposal (see below). The GCOS Implementation Project Manager spoke about the status of GSN and GUAN improvement activities and presented a list of candidate projects in need of support. Most other participants reported on the GCOS-related activities that are currently supported by their countries.

The annual GCB session is still conducted as an informal gathering of “friends of GCOS.” However, it is slowly evolving into a more formal annual meeting of representatives of countries that support improvements in climate observing systems in developing countries. It is not typically the case that commitments are made by specific donors to support specific projects at the GCB session. Nevertheless, the session is an important venue for the exchange of ideas between GCOS Secretariat staff and prospective donors, and some of these ideas ultimately lead to support for needed observing system improvements. A goal of the GCOS Secretariat is to try to expand the numbers of participants in the GCB meetings.

## **6. Planning, Coordination, and Implementation Activities**

### *Climate for Development in Africa*

The GCOS Secretariat helped to facilitate the initiation of what is now known as the Climate for Development in Africa Programme (ClimDev Africa) at an April 2006 meeting in Addis Ababa, Ethiopia. This programme was conceived as an integrated, multi-partner, Africa-led programme designed to mainstream climate information into development practices throughout Africa, thereby promoting sustainable development and helping to achieve the Millennium Development Goals (MDGs). ClimDev Africa addresses Africa-wide needs for climate information, packaging, and dissemination; analysis for decision support and management practice; and informed decision-making, awareness, and advocacy. The principal African partners, which make up the Chief Executive Board of the Joint Secretariat, are the African Union Commission (AUC), the UN Economic Commission for Africa (UNECA), and the African Development Bank (AfDB). It is planned that both WMO and GCOS will be represented on the ClimDev Africa Steering Committee.

ClimDev Africa has been slow to get underway, but concerted efforts on the part of the African partners and a consortium of likely donors, led by the UK’s Department for International Development (DFID), has resulted in the completion and approval of a Framework Programme Document at the end of October 2008. This document indicates that ClimDev Africa will be implemented by a new body, the Africa Climate Policy Center (ACPC), which will be housed in the UNECA in Addis Ababa. The next steps will be to seek funding for the Programme, and it is understood that a number of prospective donors are prepared to contribute to a new ClimDev Trust Fund to be managed by the AfDB. Some initial steps, once funding is secured, will be to establish the ACPC office at UNECA, recruit staff, and draft detailed project implementation documents and plans.

The WMO has expressed its strong commitment to the Programme and indicated its intention to assist in its further development, principally through its Climate and Water Department. The involvement of GCOS in the development of ClimDev Africa was seen by the European Union and others as an important contribution to its overall credibility. It is difficult to estimate with confidence when funds will become available and a programme director hired. Once the programme is underway, however, both WMO and the GCOS Secretariat could play important roles in helping to develop specific project proposals that could be implemented under the ClimDev Africa Programme. It is hoped that the other GCOS sponsors will also become involved.

## *GCOS–CCCC Implementation Strategy Meeting*

In January 2008, the GCOS Secretariat and the Caribbean Community Climate Change Centre (CCCC) collaborated to organize a strategy meeting in Belize to address implementation of projects contained in the May 2003 GCOS Regional Action Plan for Central America and the Caribbean (CAC). The meeting brought together representatives of regional climate organisations, funding agencies, and countries with a commitment to improved climate observations in the CAC region and Mexico. Participants learned of the climate-related activities of the Sistema de la Integración Centroamericana (SICA), Secretariat of the Caribbean Community (CARICOM), Caribbean Meteorological Organization (CMO), Caribbean Institute for Meteorology and Hydrology (CIMH), Water Centre for Humid Tropics of Latin America and Caribbean (CATHALAC), the Intergovernmental Oceanographic Commission Sub-Commission for the Caribbean (IOCARIBE), and the CCCC. Participants were also briefed on observation-related activities and priorities of a number of sponsor, donor, and partner organisations, including the WMO, Government of Canada, US National Oceanic and Atmospheric Administration (NOAA), Government of Italy, Organization of American States (OAS), Caribbean Development Bank; and the World Bank.

The meeting reviewed five updated project briefs, most of which were originally contained in the CAC RAP, that the region considered to be of especially high priority for implementation. These five project briefs were:

- The Provision of Additional and Better Upper Air Observations to Climatological Centers;
- Creating and Sustaining a Regional Technical Support Center;
- Improving Access to Climate Data in the Region;
- Adapting to Climate Change: Raising Awareness in Central America and the Caribbean; and
- An IOCARIBE-GOOS - GCOS Partnership to Support a Multi-Use Sea Level Observation Network for the Caribbean Region.

Several potential development partners indicated interest in one or more of the project briefs, although it was generally recognized that additional work would be needed to turn these briefs into the more detailed proposals that would eventually need to be considered for funding. It was also recognized that one or more regional champions would be needed to advance the project proposals. In addition to consideration of specific proposals, an important objective of the meeting was to facilitate the development of a road map for improved coordination and accelerated implementation of CAC-GCOS. The meeting agreed to undertake a number of actions designed to provide stronger leadership, enhanced coordination, and increased momentum for GCOS implementation in the region. These include establishment of a regional coordination committee, development of terms of reference for a regional GCOS coordinator, appointment of such a coordinator if a source of funding can be identified, and the holding of an annual implementation coordination meeting.

### *World Bank Project*

In late 2007, the GCOS Secretariat teamed with the Joint Planning Staff of the World Climate Research Programme (WCRP), the World Climate Programme Department (WCP) of WMO,<sup>3</sup> and the Nairobi-based IGAD Climate Prediction and Applications Center (ICPAC) to submit a proposal to the World Bank on “Climate Observations and Regional Modeling in Support of Climate Risk Management and Sustainable Development”. The World Bank provisionally approved this project for funding in July 2008. However, the start-up date will depend on the finalization of a grant agreement and subsequent receipt of project funds.

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<sup>3</sup> With the reorganization of WMO, the WCP Department merged with the Hydrology and Water Resources Department to become the Climate and Water Department (CLW). The Climate Prediction and Adaptation Branch (CLPA) is the branch of CLW that is involved in the project.

The project is based on the fact that reliable and detailed regional climate information, including current and future assessments of climate variability and change, is essential in the design of effective strategies for adaptation to climate change. Such information 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.

The project, which is intended to focus on the 10 countries of the Greater Horn of Africa (GHA), consists of a series of three linked workshops designed to demonstrate the key elements of an effective climate risk management strategy for the region. The originally defined objectives of the workshop programme were to help ensure that attention is given by countries in the region to observation and data needs, to demonstrate the use and value of regional models, to provide advice on model limitations, and to improve regional capabilities for using data records and model projections for adaptation planning.

Successful implementation of the three inter-linked workshops and related preparatory activities will result in a scientifically sound and user-focused framework for generating regional climate change information for adaptation planners. It will also result in improved expertise within the GHA countries to utilize observations and more detailed projections of future climate. If successfully implemented, the project will enable GHA countries to employ appropriate downscaling strategies, including state-of-art regional climate models, and to analyze, evaluate, interpret, and apply data for adaptation planning. It will also demonstrate the value to decision makers of adequate observations and well-informed use of regionalized climate products for climate change adaptation planning.

#### *Learning for the IPCC Fourth Assessment Report*

Held in Sydney, Australia in October 2007, the objective of this workshop (Future Climate Change Research and Observations: GCOS, WCRP and IGBP Learning from the IPCC Fourth Assessment Report), jointly organized by the Secretariats of GCOS, WCRP, and the International Geosphere-Biosphere Programme (IGBP), was to learn from the authors (in particular from Working Groups I and II) of the IPCC Fourth Assessment Report and its findings to help guide future strategies for climate change observations and research. The workshop report was published in January 2008 (GCOS-117), with subsequent publications in AGU EOS and BAMS (submitted).

Some 66 IPCC authors and other experts associated with the three international programmes discussed some fundamental climate change observation and research needs and challenges, based on gaps and uncertainties identified by IPCC Working Group I (The Physical Science Basis), and Working Group II (Impacts, Adaptation and Vulnerability) in their latest assessments. The starting point for this evaluation was the results of a survey of IPCC AR4 authors' and contributors' views on gaps and shortcomings identified in the most recent assessment.

In a sequence of plenary and break-out sessions, the workshop looked specifically at the gaps in observations and basic science raised by the IPCC, and at deficiencies in the way information about climate change can be used for estimation of impacts, design of adaptation measures, and assessment of vulnerability, particularly on the regional scale. Among numerous issues that limit our confidence in projections of climate change are our poor understanding of ice-sheet behaviour and its implications for sea-level rise, and gaps in knowledge about the hydrological and carbon cycles. Participants also agreed that vulnerability of regions and societies to climate change should be considered when framing future climate change research strategies and needs for additional observations.

The workshop also made suggestions on the research necessary to improve performance of regional climate change models. Better connections between global circulation models and regional models were identified as a major field of necessary action, as well as the need for enhanced cooperation between the climate modelling community and those involved in climate change impact assessment and response. In general, more rigorous validation of these models with observations of "Essential Climate Variables" (considered feasible for global observation and essential for IPCC and UNFCCC needs) is required. However, obtaining appropriate data to test regional models, including impact models, is a significant challenge, particularly for developing countries.

In the pre-workshop survey, IPCC AR4 WG I and II Coordinating Lead Authors and Lead Authors expressed their views as to the adequacy of climate observing systems and climate data records for the purposes of IPCC, and the adequacy of the list of Essential Climate Variables. This information, along with the workshop proceedings, will be used as input to the update of the GCOS-92 Implementation Plan planned for 2009 (see following).

#### *2009 Progress Report and GCOS-92 Update*

In November 2005, the Subsidiary Body for Scientific and Technological 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." In preparing for this report, the GCOS Steering Committee at its 15<sup>th</sup> session in 2007 decided that this report should (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, possibly including a revision of the list of Essential Climate Variables. The 2009 progress report will 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-27 in Bali. SBSTA-27 invited Parties to provide additional information on national activities related to the GCOS Implementation Plan, and a specific call for information has gone out to GCOS National Coordinators requesting input according to the revised guidelines by 15 September 2008. This input will provide much of the information needed for preparation of the progress report.

A kick-off meeting on the progress report with participation by GCOS panel chairs, the GCOS Steering Committee Chairman and Secretariat staff was held on 30 June-2 July 2008. Participants started drafting an outline of the report, as well as a collection of information on progress against each of the 131 actions identified in the GCOS Implementation Plan. The gathering of relevant information will continue through early 2009, involving a good number of 'agents for implementation'. A final draft report will be submitted to the UNFCCC SBSTA in April 2009, such that Parties have an opportunity to comment.

In conjunction with the 2009 progress report, planning has been started to update the Implementation Plan for the Global Climate Observing System in Support of UNFCCC (GCOS-92). Nearly five years after publication of the Implementation Plan, such an update is timely and urgently needed. This update will use information obtained from assessing progress against the Plan, from results of the 2007 Sydney workshop "Learning from the IPCC AR4", as well as from an expert meeting scheduled for 2-5 February 2009. It is planned to invite about 30 experts covering the atmospheric, oceanic and terrestrial domains who will undertake a critical review of existing requirements in the Implementation Plan, such as the GCOS networks and the list of Essential Climate Variables. The updated Plan is scheduled for publication in early 2010.

#### *GCOS Reference Upper-Air Network (GRUAN)*

Shortcomings in the design and implementation of the current upper-air measurement network greatly limit the accuracy and detail of observations needed to specify how climate

has varied and changed above the Earth's surface. The GCOS Reference Upper Air Network (GRUAN) has been designed to provide the foundation for long-term datasets that can be used reliably to monitor and detect emerging signals of global and regional climate change. Specifically, GRUAN has been identified by the climate community as being required to generate long-term high quality climate records, to constrain and calibrate data from more spatially-comprehensive global observing systems (including satellites and current radiosonde networks), and to fully characterize the properties of the atmospheric column.

In two workshops in Boulder and Seattle, the network requirements, architecture, and technological options were identified and summarized in the report "GCOS Reference Upper-Air Network: Justifications, Requirements, Siting, and Instrumentation Options" (GCOS-112, WMO/TD No. 1379). The Meteorological Observatory Lindenberg - Richard-Aßmann-Observatory (MOL-RAO) of the German Meteorological Service (DWD) was designated by WMO as a lead centre of the GRUAN network for a pilot phase of five years. Accordingly, the GRUAN Implementation Meeting, 26-28 February 2008, organized by the AOPC Working Group on Atmospheric Reference Observations (WG-ARO) was hosted by the DWD at the observatory in Lindenberg.

At its 60<sup>th</sup> Session in June 2008, the WMO Executive Council noted that GRUAN "would provide high-quality observing sites for the atmospheric profile, including surface and upper-air measurements, in support of climate application, validation of satellite products and climate research." It further requested WMO Members "to support the implementation of the GRUAN, using wherever possible existing infrastructure."

The "Report of the GRUAN Implementation Meeting" (GCOS-121) gives a first tentative list of twelve initial GRUAN candidate sites. Those sites have been recommended by meeting participants because of their significant expertise in observing the atmospheric column, their ability to share expertise and resources with other site operators, and their great potential to contribute to the development of a wider GRUAN. Wherever possible, the choice has been based on co-location with sites of existing global networks, such as GUAN, BSRN, and GAW, to ensure maximum synergy with these networks.

GRUAN stations will follow the data policy in WMO Resolution 40 Cg-XII by defining as 'essential' all data from the instrument systems that are specified in GCOS-112 or any agreed revision of GCOS-112 at all GRUAN sites, in order to ensure the free and unrestricted availability of these data. For the majority of GRUAN data, dissemination in (near) real time is considered essential for operational purposes and should, for example, involve the use of quality control procedures for operational monitoring of radiosondes. This will also improve the links between GRUAN and other global networks, such as the GCOS Upper Air Network (GUAN) and the WMO Regional Basic Climatological Networks (RBCN).

The full definition of procedures for quality control and quality assurance (QC/QA) will be established at a later stage, mainly based upon the lessons learned at each GRUAN site during a pilot phase, as well as using input from other experts and research institutions.

Following approval of the Atmospheric Observation Panel for Climate (AOPC) and the WMO Commission for Basic Systems (CBS) Management Group, invitation letters were sent to an initial set of stations to become GRUAN candidate sites.

#### *Collaboration with space agencies and their coordination bodies*

Collaboration between the GCOS Secretariat and space agencies and their coordination bodies (CEOS, WMO Space Programme, CGMS in particular) continued in 2007 and 2008. The main objective of this work is helping space agencies meet agreed requirements for monitoring climate from space, as set down in the Satellite Supplement to the Implementation Plan (GCOS-107). For example, nominated climate action teams in agencies are actively working against a priority set of the 59 actions set out in the 2006

CEOS response to GCOS-107, coordinated by the CEOS Climate Coordinator. Consultations with GCOS have been a regular part of this process. The GCOS Secretariat also provided comments on the CEOS report to UNFCCC SBSTA-29. The first steps toward implementing the Regional/Specialized Satellite Centres for Climate Monitoring are now being taken, directly addressing GCOS requirements mainly in the meteorological domain. GCOS representatives participated in R/SSC-CM planning meetings, and GCOS is represented on the R/SSC-CM Executive Panel. Development of a new vision for the WMO Global Observing System (GOS) for 2025 fully takes into account climate monitoring requirements for GCOS. The vision proposes a high-level architecture of the GOS that WMO Members should agree to maintain, ensuring its long-term continuity through voluntary commitments for contributions. Participation in relevant meetings of CEOS (Plenary, SIT), WMO Space Programme, and CGMS (mostly through the WMO Space Programme) has proven vital to foster links between GCOS bodies and space agency representatives.

### *Global Terrestrial Network – Hydrology*

There is a critical need for improved availability and access to global hydrological data, information and products for climate and hydrological research, and applications in order to quantify key environmental change processes, identify significant trends, assess variability, and develop response strategies. In response to this need, the Global Terrestrial Network – Hydrology (GTN-H) was established to link existing networks and systems for integrated observations of the global water cycle. The network is a joint effort of the GCOS Secretariat, the WMO Climate and Water Department (CLW), and the Secretariat of the Global Terrestrial Observing System (GTOS).

The main objective of GTN-H is to make available data from existing global hydrological observation networks and to enhance their value through integration. The aim of GTN-H is to create a global hydrological network of networks, to plan and implement projects that facilitate access to hydrological networks and observation data, to generate derived products, and to form an essential component for integrated global and regional hydrological products.

The Third GTN-H Coordination Panel Meeting was held from 17 to 19 September 2007 in Koblenz, Germany. The Panel reviewed key GTN-H projects, discussed new projects within the GTN-H framework, and agreed on measures to improve public visibility of the GTN-H in the international context. The Panel outlined the role of GTN-H as the observational arm of the Integrated Global Water Cycle Observations (IGWCO) within the Group on Earth Observations (GEO) and under the guidance of WMO/CLW and GCOS.

Selected achievements of the network so far are a prototype system for near-real-time data access to over 400 river gauge stations worldwide, access to first-guess global gridded precipitation product, first-time online access to a global water quality database, and a prototype definition of a hydrological metadata standard, based on the WMO core metadata standard.

The GCOS Secretariat assists actively in the further development of the network and has been instrumental in the creation of outreach material (flyer, website, Powerpoint presentation, etc.).

## 7. Coordination with the Implementation Mechanisms of Component Systems

The three main component systems of GCOS, viz:

- WIGOS for the atmospheric and closely related ocean and terrestrial variables;
- GOOS for the ocean; and
- GTOS for the terrestrial domain;

are each based on the aggregate of national observing systems coordinated through the relevant intergovernmental bodies set up by their sponsors for the purpose. Since it is these bodies, rather than the GCOS Steering Committee, Panels or Secretariat who carry formal responsibility for their implementation, it is especially important to maintain effective coordination between the GCOS planning process and the implementation agents for the component systems. Overall, the linkings and consultation worked effectively during 2007-08.

### *WMO Integrated Global Observing Systems (WIGOS)*

The newly established WMO Integrated Global Observing Systems (WIGOS) Framework is designed as a comprehensive, coordinated and sustainable system of observing systems. WIGOS is based on all the observational requirements of WMO Programmes, including, of course, on the WMO atmospheric, hydrologic, oceanographic and terrestrial observing systems contributing to GCOS. When fully operational, WIGOS will ensure the availability of required data and information and facilitate access to information through the WMO Information System (WIS) according to identified temporal, geographical and organizational requirements, including those for real, near-real time, and delayed modes. In doing so, WIGOS will respect data sharing policies and will help ensure high data quality standards. It will also benefit from archival and technological innovations. Through the integration of surface- and space-based observations, WIGOS is expected to lead to the improved monitoring of all sub-systems of the global climate system--atmosphere, hydrology, ocean, land surface, and cryosphere--that is essential in understanding global climate change.

The planning and implementation mechanisms for the four main components of WIGOS are:

- The Commission for Basic Systems (CBS) for the World Weather Watch Global Observing System (GOS);
- The Commission for Atmospheric Sciences (CAS) for the Global Atmosphere Watch (GAW);
- The WMO-IOC Joint Technical Commission for Oceanography and Marine Meteorology (JCOMM) for oceanographic components of the GOS; and
- The Commission for Hydrology for GTN-H and the World Hydrological Cycle Observing System (WHYCOS);

with their overall coordination now effected through a WMO EC Working Group on WIGOS and WIS. The GCOS planning link with the atmospheric components of WIGOS is maintained by the GCOS Atmospheric Observation Panel for Climate (AOPC) chaired by Dr Adrian Simmons.

In line with Resolution 11 (Global Climate Observing System) of the Fifteenth World Meteorological Congress, each of the WMO technical commissions is charged with leading the development and implementation of the networks for which they are responsible in the light of advice and guidance from the GCOS Steering Committee. The Congress also requested the Steering Committee and the technical commissions to continue their interaction and cooperation in the further development and implementation of GCOS.

Good cooperation and coordination were maintained during the year, especially via joint participation in a range of WIGOS and other planning meetings and by direct collaboration between the Chair of the SC and the individual Commission Presidents. By way of follow-up to SC-XV-expressed concern at the state of hydrological networks world-wide, liaison between the SC Chairman and the President of the Commission for Hydrology led to WMO Executive Council exhortation (EC-LX para 3.4.25) to Members to place the highest priority on strengthening their national hydrological networks for climate purposes as decided by the Commission for Hydrology. Effective coordination was also maintained, at Secretariat level, with all WMO-sponsored observing systems.

#### *Global Ocean Observing System (GOOS)*

The open ocean (climate) module of the IOC-WMO-UNEP-ICSU Global Ocean Observing System (GOOS) constitutes the ocean component of GCOS. GOOS planning and implementation resides with:

- The GOOS Scientific Steering Committee (GSSC) chaired by Professor John Field;
- The Intergovernmental Committee for GOOS (I-GOOS) chaired by Dr Francois Gerard; and
- The WMO-IOC Joint Technical Commission for Oceanography and Marine Meteorology (JCOMM) co-chaired by Dr Peter Dexter and Dr Jean-Louis Fellous

with Secretariat support provided by the GOOS Secretariat (headed by Dr Keith Alverson) located in IOC Headquarters in Paris.

As with WIGOS, effective coordination was maintained between GOOS and GCOS planning and implementation via cross-representation at Steering Committee and other sessions and especially via the active role of the jointly-sponsored Ocean Observation Panel for Climate (OOPC) whose Chairman, Dr Ed Harrison, participated actively in the planning meetings for both systems. The SC Chairman particularly, along with the OOPC Chairman in the April 2008 session of the GOOS Secretariat Steering Committee (GSSC).

#### *Global Terrestrial Observing System (GTOS)*

The FAO-WMO-UNEP-UNESCO-ICSU Global Terrestrial Observing System (GTOS) is designed to provide the climate related observations that together constitute the terrestrial component of GCOS. GTOS is guided by the co-sponsored GTOS Steering Committee chaired by Professor Berrien Moore and supported by the GTOS Secretariat headed by Dr John Latham and housed with FAO in Rome. The necessary scientific and technical coordination between GTOS and GCOS planning was maintained during 2007-08 through the work of the Terrestrial Observation Panel for Climate (TOPC) chaired by Dr Han Dolman.

One of the most important GTOS-GCOS coordination issues during 2007-08 related to the development of universal standards for terrestrial observations for climate. This was advanced substantially via a WMO-FAO agreement jointly with the International Standards Organization (ISO).

Also, a joint steering group under the auspices of ISO was proposed to implement an international framework for terrestrial climate-related observations. Members of this steering group would be FAO, UNEP, WMO and possibly other stakeholders. The GCOS Secretariat provided comments, suggesting that the Terrestrial Observation Panel for Climate (TOPC), co-sponsored by GTOS and GCOS, should be considered as a scientific advisory body within this mechanism. GTOS has been leading both the standard setting exercise and international framework development, with several status reports delivered to the UNFCCC, for example to SBSTA-27 in Bali in December 2007 (FCCC/SBSTA/2007/MISC.27).

## **8. Support for the World Climate Programme and Intergovernmental Panel on Climate Change (IPCC)**

The originally defined purpose of GCOS was to support all components of the World Climate Programme (WCP) and hence essentially all the activities at both national and international levels related to:

- Climate data availability and climate system monitoring;
- Climate research;
- Climate applications and services; and
- Climate impact assessment and response strategy development.

Over the past year, increased attention has been given, especially at the international programme level, to the role of GCOS in supporting the full range of WCP-related activities, including especially those related to climate information and prediction services. The GCOS Secretariat worked closely with the WMO Climate and Water Department to advance a number of opportunities for enhanced observational support for WCP activities.

During the GCOS-WCRP-IGBP workshop “Learning from the IPCC Fourth Assessment Report” in Sydney in October 2007, and in the pre-workshop survey among IPCC AR4 WG I and II Coordinating Lead Authors, many recommendations were made as to how climate research and climate observation can better support the work of IPCC scientists (see Section 6). In addition, many ideas were raised for consideration by the IPCC regarding its mode of operation for any possible future assessments. This call for suggestions was supported by the IPCC Secretariat. The workshop report (GCOS-117) provides a comprehensive account of the outcome of the conference.

## **9. GCOS and the UN Framework Convention on Climate Change (UNFCCC)**

Over the last decade, the UN Framework Convention on Climate Change (UNFCCC) bodies have established a strong interest in and commitment to GCOS. The GCOS Secretariat now reports regularly to the Conference of the Parties (COP) of the UNFCCC through its Subsidiary Body on Scientific and Technological Advice (SBSTA). This reporting has contributed to a substantial increase in the visibility of GCOS and has enabled the GCOS Secretariat to more effectively represent the concerns, interests, and needs of the climate observing community. “Research and Systematic Observation” has for some time been a regular agenda item at SBSTA sessions, and, as a result, a number of COP decisions and/or conclusions of the chairman of SBSTA have addressed climate observing concerns.

Notably, COP Decision 5/CP.5 in November 1999 invited the GCOS Secretariat to organize a programme of regional workshops to address priority capacity building needs related to systematic observation. This invitation led to the development of the GCOS Regional Workshop Programme, which was successfully completed in 2006. Likewise, SBSTA endorsed preparation of a second report on the adequacy of the global climate observing systems in 2001. When this report was completed, the COP requested the GCOS Secretariat, in its Decision 11/CP.9, to prepare an implementation plan to address the inadequacies highlighted in the second adequacy report. This resulted in the *Implementation Plan for the Global Observing System for Climate in Support of the UNFCCC* (GCOS-92), which the WMO Congress and a number of other international organizations have endorsed. This was followed by a satellite supplement to GCOS-92 in September 2006. This supplement (GCOS-107) assists Parties that support Earth observation from space to respond to the requirements of the Implementation Plan. In each of these cases, as well as many others, the relationship between the GCOS Secretariat and the COP of the UNFCCC has been a positive and productive one.

More recently, in September 2007, the GCOS Secretariat submitted a paper to SBSTA detailing its views on how it could contribute to the Nairobi Work Programme on Impacts, Vulnerability and Adaptation to Climate Change (NWP). The paper included a proposal for a focused program of regional workshops that would help ensure that attention is given by developing regions to observation and data needs, in particular for demonstrating the use and value of regional models. The workshops would also provide advice on model limitations and improve regional capabilities for using data records and model projections for adaptation planning. The World Bank project highlighted in section 6 above would implement this workshop programme in one region, the Greater Horn of Africa.

At COP 13 in Bali in December 2007 the UNFCCC adopted the revised reporting guidelines on global climate observing systems that had been developed by the GCOS Secretariat. These guidelines will be used for the preparation of detailed reports on systematic climate observations that Annex I Parties prepare in conjunction with their national communications. Also in Bali, SBSTA reiterated its request to the GCOS Secretariat to provide by June 2009 a comprehensive report on progress in implementing the GCOS Implementation Plan. Once this report is complete, the GCOS Secretariat will also prepare an updated version of GCOS-92. Both reports are discussed in more detail in section 6 above. Finally, in March 2008, the GCOS Secretariat participated in, and contributed to, a 2-part UNFCCC expert meeting in Mexico City, Mexico on Methods and Tools and on Data and Observations that was organized within the framework of the NWP. The Secretariat stressed the importance of climate observations for adaptation at this meeting. The recent SBSTA discussions relating to GCOS are appended at Appendix 8.

## **10. Contribution to the Global Earth Observation System of Systems (GEOSS)**

GCOS is effectively the climate observation component of the Global Earth Observing System of Systems (GEOSS). All implementation in support of GCOS, e.g., of actions as recommended in the Implementation Plan (GCOS-92), is equally supportive to GEOSS. As a participating organization of GEO, the GCOS Secretariat was identified as co-lead for two tasks of the 2007-2009 GEO Work Plan, namely CL-06-01 (*Sustained Reprocessing and Reanalysis Efforts*) and CL-06-02 (*Key Climate Data from Satellite Systems*). In the latter task, reporting to GEO Secretariat occurs on a regular basis (every three months). Further, the GCOS Secretariat has been recognized as a contributing organization to 11 tasks.

In the preparatory phase of the GEO Work Plan 2009-2011, the GCOS Secretariat introduced a new task for inclusion in the draft, on *Climate Information for Decision-making, Risk Management and Adaptation*. This task associated with the Climate SBA (CL-09-01), led by GCOS and WCRP, provides a platform for reporting to GEO on progress with both the ClimDev Africa Programme (Section 6) and the proposed World Bank project "Climate Observations and Regional Modelling in Support of Climate Risk Management and Sustainable Development" (Section 6). In August 2008, GCOS panels and secretariat provided a set of comments to the 2009-2011 GEO Work Plan v1.

The GCOS Steering Committee was represented by its Chairman at the Group on Earth Observations (GEO) Plenary and Ministerial Summit in Cape Town, South Africa on 28-30 November 2007. The GCOS Statement to the Ministerial Summit highlighted the vital role of the GCOS component systems in contributing to the Climate Societal Benefit Area of GEOSS. The Steering Committee Chairman also served during the year on a GEO Target Task Team charged with updating the overall ten-year targets for GEOSS.

## 11. GCOS Communication and Promotion

The purpose of GCOS communication is to keep the observing system providers and the GCOS user communities informed and involved in its further development. Promotion and the development of outreach material are seen as means to increase the external visibility of GCOS activities. In the long run, this will require a more formal 'communication policy' for regular internal communications within the GCOS community and GCOS national coordinators, and the development of external communication tools, possibly in cooperation with WCP and WCRP.

The 15<sup>th</sup> session of the Steering Committee requested the Secretariat to enhance its efforts on GCOS communications through "regular renewal of the website and preparation of a new brochure," as well as "preparation of a PowerPoint presentation on GCOS for inclusion on the website" (GCOS-116, Action 48).

The development of new outreach material started with the launch of the new GCOS website in June 2007. The Secretariat is regularly updating the site with new publications, conference venues and applications. Only recently a Google Earth application for the display of GSN and GUAN stations has been created. A link to the GCOS website has also been included on the "Gateway to the UN System's Work on Climate Change" site to reach a wider public, together with a paragraph about the work of GCOS (<http://www.un.org/climatechange/background/science.shtml>).

The Secretariat drafted an interim brochure about the general goals and objectives of GCOS, planning and implementation of the system of observing systems, component observing systems and baseline networks, regional and national level activities, system improvement programme, and cooperation mechanism. This was distributed, inter alia, at the GEO Ministerial Summit in Cape Town in November 2007 and at the WMO booth at the 27<sup>th</sup> session of SBSTA in Bali, Indonesia, December 2007.

To promote the work undertaken, a general PowerPoint presentation about GCOS has been developed, with a layout corresponding to the new brochure and information about the objectives and structure of GCOS. The brochure as well as the presentation can be downloaded at <http://www.wmo.int/pages/prog/gcos/index.php?name=publications>.

## 12. Climate Observing System Fund (COSF)

Under the terms of the WMO-IOC-UNEP-ICSU Memorandum of Understanding (its Annex C, Financial Arrangements), the planning and implementation activities for the GCOS are financed by the Sponsors, each from funds appropriated in their budgets for this purpose, and from extra budgetary resources. The funds are managed through the Climate Observing System Fund (COSF) which is administered by WMO in accordance with the WMO Financial Regulations and whose primary role is to support the activities of the GCOS Steering Committee, Panels and Secretariat.

The COSF also includes a separate component, known as GCOS Cooperation Fund (GCF), consisting of funds provided by donors to support GCOS implementation in developing countries. The GCF is administered by WMO as part of the COSF, under the guidance of the GCOS Cooperation Board (Section 5 and Appendix 4) and with the advice of the Steering Committee and Panels.

The COSF is administered on a calendar year basis with separate accounting for its core (Steering Committee, Panels and Secretariat) and GCF (System Improvement) components. As of November 2008, the status of the COSF can be summarized as follows (CHF):

<b>Balance (1 January 2008)</b>		<b>1,334,270</b>
<b>Income (rounded)</b>		
• Sponsors	87,695	
• Other contributions to core COSF	428,179	
• Contributions to GCF (System Improvement)	695,861	
<b>Total Income:</b>	<b>1,211,735</b>	<b>1,211,735</b>
<b>Expenditure (rounded)</b>		
• Secretariat salaries*	371,496	
• Steering Committee, Panel and Secretariat Activities*	244,112	
• Expenditure from GCF (System Improvement)	780,735	
<b>Total Expenditure:</b>	<b>1,396,343</b>	<b>1,396,343</b>
<b>Balance (November 2008)</b>		<b>1,149,662</b>

\*The Secretariat salaries and activities do not include the salaries of the Director of GCOS Secretariat and Administrative Assistant (Annual total approximately CHF 400,000) or the costs of general administrative services and office space which are met from the WMO Regular Budget. The bulk of the support for the OOPC and TOPC Panel activities is met from GOOS (IOC) and GTOS (FAO) sources.

In addition to the GCOS planning and implementation activities funded through COSF, considerable in kind support (including staff secondments and voluntary assistance) is also provided from a range of sources in support of the purposes of the COSF.

### 13. Sponsor Feedback and Guidance

Sponsor feedback and guidance for GCOS planning was provided, both formally and informally, from the Executive Heads (or their representatives) of all four sponsors and especially from the Sixtieth Session of the WMO Executive Council which, inter alia:

- Called on GCOS to continue providing coordination of data reprocessing and reanalysis efforts, and urged GCOS and its sponsors to continue their support for efforts spanning the full record of instrumental observation and for the climate system as a whole;
- Noted that GCOS was still far from fully implemented and that a major effort was needed in most parts of the world to strengthen and maintain essential climate observing networks and systems;
- Noted that GCOS, as an integrated cross-domain system broader than WIGOS, would contribute effectively to the achievement of Expected Results 2 (enhanced capabilities of Members to provide better climate predictions and assessments), 4 (integration of WMO observing systems), 5 (development and implementation of the new WMO Information System), 6 (enhanced capabilities of Members in multi-hazard early warning and disaster prevention and preparedness), 7 (enhanced capabilities of Members to provide and use weather, climate, water, and environmental applications and services), 8 (broader use of weather-, climate- and water-related outputs for decision-making and implementation by Members and partner organizations), and 9 (enhanced capabilities of NMHSs in developing countries, particularly east developed countries, to fulfil their mandates) of the WMO Strategic Plan;
- Noted that GCOS, including its WIGOS components, would optimally support the broader set of needs currently represented by the four components of the World Climate Programme, the Climate Agenda, IPCC, UNFCCC, and the full set of GEOSS societal benefit areas;

- Urged GCOS to identify current activities relevant to adaptation and gaps to be addressed for provision for the needs of key socio-economic sectors for climate information for climate-risk management, and to take steps to incorporate those in future priority setting and planning;
- Noted that the GCOS Reference Upper-air Network (GRUAN) would provide high-quality observing sites for the atmospheric profile, including surface and upper-air measurements, in support of climate applications, validation of satellite products, and climate research;
- Agreed that it was important that WMO Members provide comprehensive and timely input to the 2009 progress report on implementation of GCOS to the GCOS Secretariat and encouraged the Secretariat to complete this report in the shortest possible time in order to provide a framework for further work to improve climate observing systems; and
- Noted the difficulties faced by developing countries, especially concerning the availability of financial resources, to implement regional GCOS Action Plans, and requested the GCOS Secretariat and the GCOS Steering Committee to study the issue with a view to facilitating the necessary fundraising, including from the UNFCCC and its financial mechanism, to enable the effective implementation of the Action Plans.

## 14. The Current State of GCOS

As of October 2008, the Steering Committee is able to report to its sponsors, in summary:

- Continuing good progress with several of the component systems of GCOS, especially through the effective completion of the Argo float array of the Global Ocean Observing System (GOOS) and the restoration of several silent GSN and GUAN stations within the World Weather Watch Global Observing System (GOS);
- Strong support from the Committee on Earth Observation Satellites (CEOS) for the climate missions of the various space agency satellite programs;
- A generally supportive reaction to GCOS at the June 2008 Sixtieth Session of the Executive Council of the World Meteorological Organization;
- Pro-active planning, coordination, and facilitation activities of the Atmosphere (AOPC), Ocean (OOPC) and Terrestrial (TOPC) Panels, and the WCRP Observation and Assimilation Panel (WOAP);
- General acceptance of the concept of GCOS as the climate observing component of GEOSS, and increasingly close coordination between GCOS and GEOSS planning;
- Good working relations between the GCOS Secretariat and the Secretariats of its main component systems, especially the World Weather Watch GOS, the Global Atmosphere Watch (GAW), GOOS, and GTOS; and
- Strengthening collaboration with the various user communities encompassed by the various components of the World Climate Programme, the Intergovernmental Panel on Climate Change (IPCC) and the UN Framework Convention on Climate Change (UNFCCC).

Despite this progress, however, it should be noted that GCOS implementation still falls far short of the original GCOS Plan (GCOS-14), and many actions of the 2004 Implementation Plan (GCOS-92) are yet to be completed. It should also be noted that the GCOS Secretariat has been operating without a permanent Director since July 2008. The responsibilities and workloads of the Secretariat have increased greatly in recent years and can be expected to continue to increase. The Steering Committee believes that the Secretariat must be substantially strengthened to enable the GCOS sponsors to fulfil their critically important joint climate observing mission over the next decade.

## **15. Conclusion**

The past year (October 2007-October 2008) has witnessed significant achievements in the planning, implementation and further development of GCOS. There is, however, still a long way to go to realise the initial vision for GCOS and to meet the much more comprehensive and demanding expectations that have emerged over the past few years. The essential concept of GCOS as a jointly-sponsored 'system of climate observing systems' remains valid and extremely important but the challenge of implementation has significantly changed with the recent emergence of the new concepts of WIGOS (WMO Integrated Global Observing Systems) and GEOSS (Global Earth Observation System of Systems). The GCOS Steering Committee will be pleased to continue to advise the GCOS sponsoring and participating organizations on the further development of GCOS within the broader international framework of GEOSS.



**TERMS OF REFERENCE, STRUCTURE, FUNCTIONS, AND MEMBERSHIP  
OF THE GCOS STEERING COMMITTEE**

1. Terms of reference

1.1 The functions of the GCOS Steering Committee are to formulate the overall concept and scope of the GCOS, and to provide scientific and technical guidance to sponsoring and participating organizations, and agencies for the planning, implementation and further development of the GCOS.

1.2 Specifically, the Steering Committee will be called upon:

- (a) To identify observational requirements, define design objectives and recommend coordinated actions by sponsoring and participating organizations and agencies, in order to optimize the system's performance and coherence, taking cognizance of the responsibilities, working arrangements and recommendations of established scientific and technical bodies of such organizations and agencies;
- (b) To review and assess the development and implementation of the components of the GCOS, and report to the sponsoring organizations, and to the participating agencies as required;
- (c) To facilitate the exchanges of information among sponsoring and participating organizations and agencies, and in general make the objectives, resource requirements capabilities and outputs of GCOS known to relevant national and international bodies.

2. Membership

2.1 The Steering Committee shall be appointed jointly by the Executive Heads of the sponsoring organizations by mutual consent.

2.2 The Steering Committee shall consist of up to sixteen scientific and technical experts selected on the basis of their personal expertise. The Chairs of standing panels will be members *ex officio*.

2.3 The membership of the Steering Committee shall aim to include a balanced geographical representation of major operational and research observing programmes contributing to the GCOS, as well as an appropriate mix of disciplines in atmospheric, oceanic, hydrological, cryospheric and biospheric sciences. Experts in both *in situ* and remote sensing techniques will be included.

2.4 The members will be appointed for an initial term of appointment of two years. The membership shall be reviewed regularly by the Executive Heads of the sponsoring organizations, bearing in mind the need to ensure reasonable continuity and influx of new members. Members shall not normally serve more than six years.

3. Officers

3.1 The officers of the Steering Committee shall consist of a Chair, and First, Second, and Third Vice-Chairs selected by the Executive Heads of the sponsoring organizations and appointed for two-year terms.

3.2 The duties of the Chair of the Steering Committee shall be:

- (a) To preside over the sessions of the Committee and respond to its decisions;
- (b) To act on behalf of the Committee between meetings;
- (c) To guide the activities of the GCOS Secretariat, with respect to the fulfilment of GCOS plans and tasks;
- (d) To conduct, either directly or through appropriate sponsoring organizations, correspondence on matters related to the organization, planning and implementation of GCOS;
- (e) To carry out specific duties as prescribed by decisions taken in agreement by the sponsoring organizations;
- (f) To ensure that the activities and recommendations of the Steering Committee are in accordance with the joint objectives of the sponsoring organizations, as recorded in this Memorandum of Understanding;
- (g) To arrange for the views of the Steering Committee to be presented to the sponsoring organizations;
- (h) To prepare annually, with the GCOS Secretariat, a report of GCOS planning and implementation activities, including the considerations and recommendations by the Steering Committee, and to present this report to the sponsoring organizations.

3.3 The duties of the Vice-Chairs are to assist the Chair in his tasks and to substitute for him/her when necessary.

#### 4. Sessions

4.1 The Steering Committee shall meet at least annually, the venue and dates to be decided by the Chair of the Committee in consultation with the Secretary-General of WMO. Sessions shall normally be arranged so as to avoid scheduling conflicts with meetings of executive bodies of the sponsoring organizations.

4.2 The Director of the GCOS Secretariat, acting on behalf of the Chair of the Committee, shall inform the sponsoring and participating organizations and agencies, notify the members and make appropriate practical arrangements for the session.

4.3 Each sponsoring organization shall nominate one or two representatives to participate in the sessions of the Committee. The attendance of these representatives shall not be charged to the GCOS Fund.

4.4 Representatives of participating organizations and agencies and of the other observing systems, GOOS and GTOS, may be invited to attend the sessions, in the capacity as observers.

4.5 Individual experts may be invited to participate in the sessions upon decision of the Chair of the Committee. The sponsoring organizations shall be informed of such invitations.

4.6 The Secretary-General of WMO shall provide such interpretation facilities as may be required, within budgetary provisions. Documents will normally be distributed in the original language in which they were submitted.

5. Working Groups and Panels

5.1 The Steering Committee shall be authorized to establish and convene working groups, panels of scientific and technical experts, special study groups, etc. within its field of responsibility and within the budget approved by the sponsoring organizations, taking account of relevant scientific or technical groups established by the sponsoring organizations and their constituent bodies.

5.2 The membership, terms of reference and special requests addressed to working groups will be documented by the Director of the GCOS Secretariat on behalf of the Chair of the Committee.

6. Steering Committee Membership (as at October 2008):

The members of the Steering Committee as at October 2008 were:

**Prof. Abel Afouda**

Faculty of Agronomy  
University of Abomey-Calavi  
Abomey-Calavi  
Cotonou  
Benin  
PHONE:  
FAX:  
E-MAIL: [afoudabel@yahoo.fr](mailto:afoudabel@yahoo.fr)

**Dr Jack Kaye**

Research Division  
Office of Earth Science  
NASA Headquarters  
300 East St. SW  
WASHINGTON D.C. 20546  
United States of America  
PHONE: +1 202 358 2559  
FAX: +1 202 358 2770  
EMAIL: [Jack.A.Kaye@nasa.gov](mailto:Jack.A.Kaye@nasa.gov)

**Prof. Ed Hill**

National Oceanography Centre  
European Way  
Southampton  
SO14 3ZH  
United Kingdom  
PHONE: +44 23 80 59 5105  
FAX: +44 23 80 59 5107  
EMAIL: [ehill@noc.soton.ac.uk](mailto:ehill@noc.soton.ac.uk)

**Dr Dileep Kumar**

Chemical Oceanography Division  
National Institute of Oceanography  
Dona Paula, Goa 403 004  
India  
PHONE: +91 832 2450 450  
FAX: +91 832 2450 602/03  
EMAIL: [dileep@nio.org](mailto:dileep@nio.org)

**Prof. Lucka Kajfez-Bogataj**

University of Ljubljana  
Biotechnical Faculty  
Jamnikarjeva 101  
SL 1000 Ljubljana  
Slovenia  
PHONE: +386 4231161  
FAX: +386 4231088  
EMAIL: [lucka.kajfez.bogataj@bf.uni-lj.si](mailto:lucka.kajfez.bogataj@bf.uni-lj.si)

**Prof. Paul J. Mason**

Department of Meteorology  
Universities Weather Research Network  
University of Reading  
Earley Gate POB 243  
READING Berks. RG6 6BB  
United Kingdom of Great Britain and  
Northern Ireland  
PHONE: +44 118 378 8957  
FAX: +44 118 378 8791  
EMAIL: [p.j.mason@reading.ac.uk](mailto:p.j.mason@reading.ac.uk)

**Mr Stefan Roesner**

Deutscher Wetterdienst  
Keiserleistrasse 29/35  
63067 OFFENBACH AM MAIN  
Germany  
PHONE: +49 69 8062 4306  
FAX: +49 69 80624130  
EMAIL: [Stefan.roesner@dwd.de](mailto:Stefan.roesner@dwd.de)

**Prof. Ilana Wainer**

Dept. Oceanografia Física  
Universidade de São Paulo  
Praça do Oceanográfico 191  
05508-120 SAO PAULO SP  
Brazil  
PHONE: +55 11 3091 6581  
FAX: +55 11 3091 6610  
EMAIL: [wainer@usp.br](mailto:wainer@usp.br)

**Dr David Williams**

EUMETSAT  
Am Kavalleriesand 31  
D-64295 DARMSTADT  
Germany  
PHONE: +49 6151 807603/633  
FAX: +49 6151 807830  
EMAIL: [dwilliams@eumetsat.de](mailto:dwilliams@eumetsat.de)

**Mr Gregory W. Withee**

NOAA/NESDIS  
SSMC1 Room 8338  
1335 East-West Highway  
SILVER SPRING MD 20910  
United States of America  
PHONE: +1 301 7133578  
FAX: +1 301 7131249  
EMAIL: [greg.withee@noaa.gov](mailto:greg.withee@noaa.gov)

**Prof. John W. Zillman**

**Chair**, GCOS Steering Committee  
GPO Box 1289  
Melbourne  
Victoria 3001  
Australia  
PHONE: +61 3 9669 4250  
FAX: +613 9669 4169  
EMAIL: [J.Zillman@bom.gov.au](mailto:J.Zillman@bom.gov.au)

**Dr Alexandre Zaitsev**

Voeikov Main Geophysical Observatory  
7, Karbyshev Str.  
194021 St Petersburg  
Russian Federation  
PHONE: +7 812 247 4390  
FAX: 7 812 247 8661  
EMAIL: [a.zaitsev@main.mgo.rssi.ru](mailto:a.zaitsev@main.mgo.rssi.ru)

**Prof. Renhe Zhang**

Chinese Academy of Meteorological  
Sciences  
46 Zhong-Guna-Cun  
South Avenue, Beijing 100081  
China  
PHONE: +8610 68408142  
FAX: +861062175931  
EMAIL: [renhe@cma.cma.gov.cn](mailto:renhe@cma.cma.gov.cn)

**Ex-officio members:****Dr Adrian Simmons (Chairman, AOPC)**

ECMWF  
Shinfield Park  
Reading RG2 9AX  
United Kingdom  
PHONE: +44 118 949 9700  
FAX: +44 118 986 9450  
EMAIL: [Adrian.Simmons@ecmwf.int](mailto:Adrian.Simmons@ecmwf.int)

**Dr D.E. (Ed) Harrison (Chairman, OOPC)**

Pacific Marine Environmental Laboratory  
NOAA/PMEL/OCRD  
7600 Sand Point Way NE  
Seattle, WA 98115, USA  
PHONE: +1 206 526 6225  
FAX: +1 206 526 6744  
EMAIL: [d.e.harrison@noaa.gov](mailto:d.e.harrison@noaa.gov)

**Prof. Han Dolman (Chairman, TOPC)**

Faculteit der Aard-en-  
Levenswetenschappen  
Vrije Universiteit Amsterdam  
De Boelelaan 1085  
1081 HV Amsterdam, Netherlands  
PHONE: + 31 20 59 870 00  
FAX: + 31 20 646 24 57  
EMAIL: [han.dolman@falw.vu.nl](mailto:han.dolman@falw.vu.nl)

## TERMS OF REFERENCE AND MEMBERSHIP OF GCOS PANELS

### I. GCOS/WCRP ATMOSPHERIC OBSERVATION PANEL FOR CLIMATE (AOPC)

The Atmospheric Observation Panel for Climate (AOPC) was established by the GCOS Steering Committee (then the Joint Scientific and Technical Committee) in recognition of the need for specific scientific and technical input concerning atmospheric observations for climate. The Joint Scientific Committee of the World Climate Research Programme, recognizing the benefits of the AOPC, agreed in 1995 to co-sponsor the panel, which was therefore renamed as the GCOS/WCRP Atmospheric Observation Panel for Climate.

The goal of the AOPC is to plan and promote the atmospheric component of GCOS. Its specific Terms of Reference are as follows:

1. To liaise with relevant research, operational and end-user bodies in order to determine the requirements for data to monitor, understand and predict the dynamical, physical and chemical state of the atmosphere and its interfaces on seasonal to multi-decadal times scales.
2. To promote the establishment and maintenance of an overall system to provide long-term high-quality consistent data and information to meet those requirements.
3. To review the current state of the atmospheric component of the global observing system for climate
4. To identify gaps and inadequacies in the atmospheric component of the current global observing system for climate.
5. To propose and promote the establishment of new systems, or enhancements to current systems and practices, to eliminate deficiencies.
6. To promote the transfer, as appropriate, of research observing systems to operational networks.
7. To promote the rehabilitation of historical observational and proxy climate data sets.
8. To promote and review institutional arrangements to ensure that:
  - GCOS observations are of the highest quality and are collected in accordance with the highest standards of practice;
  - GCOS data products are relevant and of the highest quality;
  - GCOS data are archived and accessible to the user community.
9. To liaise with the other GCOS panels, WCRP steering groups and other relevant entities, such as WMO Commissions and CEOS, on atmospheric climate observing system issues.
10. To report regularly to the GCOS SC and the JSC for WCRP on issues related to the atmospheric component of GCOS.

The membership of AOPC as of October 2008 was as follows:

**Dr Adrian SIMMONS (Chairman)**

ECMWF  
Shinfield Park  
READING RG2 9AX  
United Kingdom  
Email: [Adrian.Simmons@ecmwf.int](mailto:Adrian.Simmons@ecmwf.int)

**Dr James Butler**

NOAA Earth System Research Laboratory  
325 Broadway R/GMD1  
BOULDER CO 80503 USA  
Email: [James.H.Butler@noaa.gov](mailto:James.H.Butler@noaa.gov)

**Dr Mitchell D. GOLDBERG**

Climate Research & Applications Division  
Office of Research & Applications  
NOAA/NESDIS  
E/RA1, Rm. 712-U, WWBG  
5200 Auth Road  
CAMP SPRINGS, MD 20746-4304 USA  
Email: [Mitch.Goldberg@noaa.gov](mailto:Mitch.Goldberg@noaa.gov)

**Dr D.E. HARRISON**

Pacific Marine Environmental Laboratory  
NOAA/PMEL/OCRD  
7600 Sand Point Way NE  
SEATTLE, WA 98115 USA  
Email: [d.e.harrison@noaa.gov](mailto:d.e.harrison@noaa.gov)

**Dr Raino HEINO (CCI representative)**

Climate Research  
Finnish Meteorological Institute  
Box 503  
SF-00101 HELSINKI Finland  
Email: [raino.heino@fmi.fi](mailto:raino.heino@fmi.fi)

**Dr Philip JONES**

Climatic Research Unit  
University of East Anglia  
University Plain  
NORWICH NR4 7TJ  
United Kingdom  
Email: [p.jones@uea.ac.uk](mailto:p.jones@uea.ac.uk)

**Mr Kazutoshi ONOGI**

Japan Meteorological Agency  
1-3-4, Otemachi  
Chiyoda-ku  
TOKYO 100-8122 Japan

**Mr David PARKER**

Hadley Centre  
Met Office Room H001  
London Road  
BRACKNELL RG12 2SY UK  
Email: [david.parker@metoffice.com](mailto:david.parker@metoffice.com)

**Dr Thomas C. PETERSON**

National Climatic Data Center  
Scientific Services Division  
151 Patton Avenue  
ASHEVILLE, NC 28801-5001 USA  
Email: [thomas.c.peterson@noaa.gov](mailto:thomas.c.peterson@noaa.gov)

**Dr Tobias FUCHS**

Global Precipitation Climatology Centre  
(GPCC)  
Deutscher Wetterdienst  
Department of Climate and Environment  
Kaiserleistrasse 44  
D - 63067 OFFENBACH AM MAIN  
Germany  
Email: [tobias.fuchs@dwd.de](mailto:tobias.fuchs@dwd.de)

**Dr. Matilde RUSTICUCCI**

Universidad de Buenos Aires – FCEN  
2do. Piso, Pab. 11  
Ciudad Universitaria  
1428 BUENOS AIRES Argentina  
Email: [mati@at.fcen.uba.ar](mailto:mati@at.fcen.uba.ar)

**Dr Johannes SCHMETZ**

Meteorological Division  
EUMETSAT  
Am Kavalleriesand 31  
D - 64295 DARMSTADT Germany  
Email: [schmetz@eumetsat.de](mailto:schmetz@eumetsat.de)

**Dr Michel VERSTRAETE**

Institute for Environment and Sustainability  
EC – Joint Research Centre  
Via Fermi  
1-21020 ISPRA Varese Italy  
Email: [michel.verstraete@jrc.it](mailto:michel.verstraete@jrc.it)

**Dr Fengsheng ZHAO**

National Satellite Meteorological Center  
China Meteorology Administration  
46 Zhongguancun Nandajie  
Haidian District  
BEIJING 100081 China  
Email: [fszhao@nsmc.cma.gov.cn](mailto:fszhao@nsmc.cma.gov.cn)

## II. OCEAN OBSERVATIONS PANEL FOR CLIMATE (OOPC)

Recognizing the need for scientific and technical advice and guidance for the common module of the Global Climate Observing System (GCOS) and the Global Ocean Observing System (GOOS), and the need for liaison and co-ordination between these operational observing systems (e.g., systematic, long-term, global climate observations) and those of climate research (e.g., limited-life, hypothesis-validating observations), the GOOS Scientific Steering (formerly J-GOOS), the GCOS Steering Committee (formerly JSTC) and the JSC for the WCRP have established an Ocean Observations Panel for Climate (OOPC) with the following terms of reference.

(i) To evaluate, modify and update, as necessary, the design of the observing system for the common module of GOOS and GCOS whose goals are:

- to monitor, describe and understand the physical and biogeochemical processes that determine ocean circulation and its influence on the carbon cycle as well as the effects of the ocean on seasonal to multi-decadal climate change,
- to provide the information needed for climate prediction.

(ii) To provide a procedural plan and prioritization for an integrated set of requirements consistent with the observing system design criteria and in a form that enables timely and effective implementation. This will entail drawing from findings of WOCE, TOGA, JGOFS, and CLIVAR, and particularly close interaction with the CLIVAR Upper Ocean Panel (UOP).

(iii) To liaise and provide advice, assessment and feedback to other panels in task groups of GCOS, COOS and WCRP, as requested, concerning ocean observing for climate in order to ensure that the designs and implementation schedules are consistent and mutually supportive.

(iv) To establish the necessary links with scientific and technical groups to ensure that they are cognizant of, and can take advantage of the recommended system, and that, in turn, the Panel can benefit from research and technical advances.

(v) To carry out agreed assignments from and to report regularly to the JSTC (GCOS SC), J-COOS (GSSC) and the JSC for the WCRP.

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An unofficially reformulated version of these Terms of Reference used for working purposes by OOPC is:

1. Develop recommendations for a sustained global ocean observing system, in support of WCRP, GOOS and GCOS climate objectives, including phased implementation.
2. Help develop a process for ongoing evaluation and evolution of system and recommendations.
3. Support global ocean observing activities by involved parties, via liaison and advocacy for agreed observing plans

The OOPC membership as of October 2008 was as follows:

**D. E. (Ed) Harrison** (Chair)

PMEL/NOAA/OCRD  
7600 Sand Point Way NE  
Seattle WA 98115, USA  
Tel: +1 206 526-6225  
Fax: +1 206 526-6744  
E-mail: [d.e.harrison@noaa.gov](mailto:d.e.harrison@noaa.gov)

**Johnny Johannessen**

Nansen Environmental and Remote  
Sensing Center  
Edvard Griegs vei 3a  
N-5059 Bergen, NORWAY  
Tel: +47 5520 5836  
Fax: +47 5520 5801  
E-mail: [johnny.johannessen@nersc.no](mailto:johnny.johannessen@nersc.no)

**Robert Keeley**

MEDS, Fisheries and Oceans Canada  
200 Kent Street  
Ottawa Ontario K1A 0E6, CANADA  
Tel: +1 613 990-0246  
Fax: +1 613 993-4658  
E-mail: [keeley@meds-sdmm.dfo-mpo.gc.ca](mailto:keeley@meds-sdmm.dfo-mpo.gc.ca)

**Alberto Piola**

Departamento Oceanografía  
Servicio de Hidrografía Naval  
Av. Montes de Oca 2124  
C1270ABV Buenos Aires, ARGENTINA  
Tel: +54 11 4301 2590  
Fax: +54 11 4303 2299  
E-mail: [apiola@hidro.gov.ar](mailto:apiola@hidro.gov.ar)

**Richard Reynolds**

NCDC/NESDIS/NOAA  
51 Patton Avenue  
Asheville NC 28801, USA  
Tel: +1 828 271-4302  
Fax: +1 828 271-4328  
E-mail: [Richard.W.Reynolds@noaa.gov](mailto:Richard.W.Reynolds@noaa.gov)

**Toshio Suga**

Department of Geophysics, Graduate  
School of Science  
Tohoku University  
Aoba-ku  
Sendai 980-8578, JAPAN  
Tel: +81-22-795-6527  
Fax: +81-22-795-6530  
E-mail: [suga@pol.geophys.tohoku.ac.jp](mailto:suga@pol.geophys.tohoku.ac.jp)

**Robert Weller**

Clark 204a MS29  
Woods Hole Oceanographic Institution  
Woods Hole MA 02543, USA  
Tel: +1 508 289-2508  
Fax: +1 508 457-2163  
E-mail: [rweller@whoi.edu](mailto:rweller@whoi.edu)

**Ex officio members**

[CLIVAR Atlantic Panel](#) representative  
[CLIVAR-GOOS Indian Panel](#)  
representative  
[CLIVAR Pacific Panel](#) representative  
[CLIVAR-CliC-SCAR Southern Ocean  
Panel](#) representative  
[CLIVAR Global Synthesis and  
Observations Panel](#) representative  
[International Ocean Carbon Coordination  
Project](#) representative

**Technical Secretariat**

**Albert Fischer**

IOC/UNESCO  
1 rue Miollis  
75732 Paris cedex 15 FRANCE  
Tel : +33 1 45 68 40 40  
Fax : +33 1 45 68 58 12  
E-mail : [a.fischer@unesco.org](mailto:a.fischer@unesco.org)

### III. TERRESTRIAL OBSERVATIONS PANEL FOR CLIMATE (TOPC)

Although climate change is now firmly established, there remains considerable uncertainty about the rate of change and its regional variability. Precise quantification of the rate of change remains important to determine whether feedback or amplification mechanisms are operating within the climate system. Unfortunately, the climate observing system in the terrestrial domain still remains the least well-developed component, whilst at the same time there is increasing significance being placed on terrestrial data for both climate understanding as well as impact and mitigation assessment.

Foundations exist for both the in situ observation networks and the space-based observing components of the terrestrial domain. Space Agencies and other organizations are generating new products, the Global Terrestrial Networks (GTNs) are being established and growing in effectiveness, and their associated international data centres are beginning to be populated with data.

TOPC has played an important role in establishing standards for the terrestrial climate variables within its overall mandate of improving the understanding of the terrestrial components of the climate system, the causes of change to this system and consequences in terms of impact and adaptation. Changes in the context of both the status of ECV's and the need for new ones required for impact and mitigation studies require some reestablishment of the focus of TOPC. These concern:

- Review and revise the terrestrial ECVs such as groundwater (recharge), soil moisture, biomass, fire (CO<sub>2</sub> emissions) needed to determine transient change, impact and mitigation.
- To identify key ECV's that play a role in feedbacks (amplification and impacts) within the climate system (snow, glaciers, lake level) and reassess whether current approaches to their measurement is adequate.
- Increased attention on coordination and long term maintenance of *in situ* networks to establish both independent bottom up data sets of ECV's and data sets required for calibration and validation of Earth Observation data.
- Investigate how a number of current research networks (e.g. Fluxnet, LTER's) can be effectively adopted (or endorsed) by GCOS/GTOS terrestrial networks.
- Promote the development of data integration and assimilation techniques for the terrestrial domain.
- Ensure that the five current Global Terrestrial Networks (hydrology, glaciers, permafrost, rivers, lakes) are fully implemented.
- Through GCOS and GTOS maintain strong links with SBSTA and UNFCCC and relevant international research programmes (e.g. WCRP, IGBP) in defining key requirements for observations of the terrestrial ECV's.
- Contribute to the 2009 GCOS progress report to the UNFCCC.
- Link with international opportunities to promote the need for continued observations such as the International Polar Year 2007-2008 ([www.ipy.org](http://www.ipy.org)), the International Year of Planet Earth 2007 - 2009 ([www.esfs.org](http://www.esfs.org)) and subsequent initiatives.
- Maintain engagement of CEOS to ensure delivery of required satellite observations as stated in the GCOS 107 report.
- Maintain engagement with efforts to establish international (continental) terrestrial observation networks.
- Liaise with GTOS wherever appropriate, e.g. in the establishment of guidelines and standards for the observation of terrestrial ECVs.
- Liaise with GCOS and GTOS science Panels on issues of common interest.

The TOPC membership as of October 2008 is:

**Prof. A.J. (Han) Dolman (Chairman)**

Faculteit der Aard- en  
Levenswetenschappen  
Vrije Universiteit Amsterdam  
De Boelelaan 1085  
1081 HV Amsterdam  
The Netherlands

**Prof. Shaun Quegan**

Centre for Terrestrial Carbon Dynamics  
Sheffield Centre for Earth Observation  
Science  
University of Sheffield, Hicks Building  
Hounsfield Road  
Sheffield S3 7RH  
UK

**Dr Jay Famiglietti**

Earth System Science  
3317 Croul Hall  
University of California, Irvine  
Irvine, CA 92697-3100  
USA

**Prof. Konrad Steffen**

CIRES  
University of Colorado, Boulder  
Boulder, CO 80309  
USA

**Prof. Wilfried Haeberli**

Department of Geography  
University of Zurich  
Winterthurerstrasse 190  
CH-8057 Zurich  
Switzerland

**Dr Michel Verstraete**

Institute for Environment and  
Sustainability  
European Commission, Joint Research  
Centre  
Via Enrico Fermi 1  
21020 Ispra, (Varese)  
Italy

**Mr Ulrich Looser**

Global Runoff Data Centre (GRDC)  
Federal Institute of Hydrology  
P.O. Box 200253  
56002 Koblenz  
Germany

**Mr Valery Vuglinsky**

State Hydrological Institute of  
Roshydromet  
23, Second Line  
199053 St. Petersburg  
Russian Federation

**Dr Jan Polcher**

Laboratoire de Météorologie Dynamique  
du CNRS  
4, pl. Jussieu  
75252 Paris Cedex 05  
France

## THE GCOS SECRETARIAT

1 The general functions of the GCOS Secretariat are to assist the Steering Committee in formulating the concept and in organizing the implementation of the GCOS, and any other organizational or technical task, as the Steering Committee may decide. In particular, the Secretariat, under the responsibility of its Director, shall take charge for:

- (a) Assisting the Steering Committee in preparing plans and other guidance material for the development and implementation of the GCOS;
- (b) Providing secretarial support to the Steering Committee;
- (c) Maintaining scientific and technical liaison with relevant departments and constituents bodies of the sponsoring organizations, and all other relevant institutions or agencies, as required for the development and implementation of GCOS;
- (d) Serving as the documentation and information centre for GCOS and preparing information or action documents pertaining to GCOS, as required by the sponsoring organizations;
- (e) Making arrangements for GCOS planning and coordination activities, in accordance with the provisions of Annex C on Financial Arrangements and following the guidelines provided by the Steering Committee.

2 The duties of the Director are:

- (a) To direct the work of the GCOS Secretariat;
- (b) To guide and support the activities of working groups set up by the Steering Committee;
- (c) To maintain liaison with the Chair and the members of the Steering Committee;
- (d) To serve as the channel for communication between the Steering Committee and the sponsoring and participating organizations and agencies;
- (e) To collaborate, as required, with the Executive Heads of the sponsoring organizations.

3 The Staffing of the Secretariat during 2007-2008 has consisted of:

Dr David Goodrich (Director) to July 2008  
Dr Alexander Karpov (Acting Director) from August 2008  
Dr William Westermeyer  
Dr Stephan Bojinski  
Mr Richard Thigpen  
Ms Stefanie Lorenz (though August 2008)  
Ms Anna Christina Kuhn (from October 2008)  
Mr Frederick Zietzschmann (from September 2008)  
Ms Imelda de Chavez

4 The allocation of responsibility within the Secretariat during 2007-08 has been as follows:

GCOS Secretariat Duties and Staff - 2008						
Task	Director	Westermeyer	Bojinski	Lorenz	Thigpen	deChavez
Overall management of Secretariat	<b>DIR</b>					
Budget management & approval	<b>DIR</b>					IdC
Fundraising	<b>DIR</b>	WW				
Steering Committee support		<b>WW</b>				IdC
AOPC support			<b>SB</b>			
Support to GSN and GUAN			<b>SB</b>	SL		IdC
System improvement					<b>DT</b>	
GRUAN			SB	<b>SL</b>		
TOPC support			SB			
UNFCCC	<b>DIR</b>	WW				
UNFCCC Nairobi Work Programme		<b>WW</b>				
ClimDev Africa		<b>WW</b>				
Regional Workshop Programme Followup		<b>WW</b>				
World Bank Project -- Adaptation		<b>WW</b>				
GTN-H			<b>SB</b>	<b>SL</b>		
GCOS website & IT			SB	SL		
GCOS outreach (flyers, etc.)				SL		
Satellite issues			<b>SB</b>			
WOAP				<b>SL</b>		
WCRP Joint Steering Committee	DIR					
WMO Commission support	DIR	WW	SB			
Comité de Direction	DIR					
Congress, EC preparation	DIR	WW	SB	SL		
Internal coordination (e.g., Secretariat Operating Plan)	DIR					IdC
Special task teams		WW	SB			
2009 Report			<b>SB</b>			
Conferences & other conventions	DIR	WW	SB			IdC
Dealing with other sponsors	DIR					
GEO meetings and tasks		WW	SB			
Implementation of GIP tasks			SB	SL		
GCOS Cooperation Mechanism	DIR	WW			DT	
Representing climate community with IPCC, UNEP, etc.	DIR	WW	SB			

**Bold = primary task**, Normal text = secondary task, **coloured** = tasks that are estimated to require 25 percent or more time

## **GCOS COOPERATION MECHANISM TERMS OF REFERENCE**

The GCOS (Global Climate Observing System) Cooperation Mechanism (GCM) is established through the common action of a number of donor countries with the endorsement of the GCOS Steering Committee and is implemented under the GCOS Memorandum of Understanding.

The purpose of this mechanism is to identify and make the most effective use of resources available for improving global observing systems for climate in developing countries, particularly in order “to enable them to collect, exchange, and utilize data on a continuing basis in pursuance of the UNFCCC.”<sup>1</sup>

This mechanism will address priority improvements in atmospheric, oceanic, and terrestrial observing systems for climate and is intended to complement and work in cooperation with other funding and implementation mechanisms, many of which deal with GCOS-related activities and, particularly, capacity building. The requirement for improved global observations for climate recognizes that capacity building is an essential component but that it does not address the full scope of needs for sustained observations. Accordingly, the GCOS Cooperation Mechanism is established specifically to ensure that this broad spectrum of needs, for system improvement and sustained operations as well as capacity building, in support of global observing systems for climate are addressed as effectively as possible.

The GCOS Cooperation Mechanism provides for a coordinated multi-governmental approach to address the high-priority needs for stable long-term funding for key elements of global observing systems for climate in support of the requirements of the UNFCCC and other GCOS clients, especially those needs in developing countries, taking into account the special needs and situations of least developed countries and small island developing States.

The mechanism is governed by a GCOS Cooperation Board as the primary means to establish and direct improvement projects resourced through voluntary contributions, both in-kind and financial, using a GCOS Cooperation Fund as a means for aggregating voluntary financial contributions from multiple donors into a common trust fund.

The mechanism provides the ability to develop, fund and implement crosscutting approaches relevant to all climate disciplines/regimes, including addressing data management and data exchange.

Participation in the mechanism is open to all donors that support, through financial or in-kind contributions, improvements in global observing systems for climate in developing countries. There is no requirement to move funds from existing mechanisms or to commit new funds through the GCOS Cooperation Fund.

### **GCOS Cooperation Board**

The GCOS Cooperation Board is established to facilitate the most effective use of voluntary contributions for the improvement of global observing systems for climate in developing countries. The Board will provide advice to potential donors on the high priority funding needs and will direct the operation of the GCOS Cooperation Fund, in light of existing international and national support activities and in accordance with the specific priorities of some donors. Features of the GCOS Cooperation Board include:

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<sup>1</sup> UNFCCC Decision 5/CP.5

- All donors are invited to be Board members, whether their contributions are financial or in-kind;
- Attendance at meetings is self-funded;
- The Board will operate by consensus;
- The Board will elect its Chairperson and convene as agreed, nominally on an annual basis;
- The GCOS Steering Committee, using the resources of the GCOS Science Panels (atmospheric, oceanic, terrestrial), will provide scientific advice to the Board;
- The GCOS Secretariat will provide appropriate secretariat support to the Board.

**The responsibilities of the Cooperation Board are to:**

Maintain and review a register of the activities supported by members with the express purpose of improving global observing systems for climate in developing countries;

Agree on the high priority funding needs for improvements in the global observing systems for climate (including data management elements) in developing countries based on scientific and programmatic advice from the GCOS Steering Committee;

Assess ways to address these needs through cooperative approaches, building upon existing national activities and the activities of regional and international funding mechanisms, including through the use of the GCOS Cooperation Fund;

Monitor the implementation of activities and the expenditures from the GCOS Cooperation Fund through a set of agreed guidelines;

Agree to and monitor appropriate procedures for cooperating with other funding and implementation mechanisms;

Provide an Annual Report for the GCOS Steering Committee and sponsoring agencies;

Review and modify, as appropriate, these TOR to match the common objectives of the Board.

**LIST OF ACTIONS AND RECOMMENDATIONS FROM SC-XV**

1. The SC noted Dr Goodrich's report and his decision to return to the USA in July 2008, and expressed its gratefulness to him for announcing this well ahead of time. It applauded the excellence of his contribution to GCOS as Director of the Secretariat and encouraged the GCOS sponsors, through WMO, to organize prompt recruitment of a comparably distinguished successor.
2. The SC affirmed that ICSU's sponsorship is an important asset for GCOS because of the broad base of ownership and support it provides from the nongovernmental scientific community. While ICSU sponsorship should not be seen as dependent on direct financial support, the SC requested the Chair to send a message to ICSU's Executive Director, mentioning that even a small financial contribution, would send a much more positive signal than no contribution. This message should be included in the letter to ICSU reporting on the main outcomes of the present session.
3. The SC requested the Secretariat to reflect, in future budget presentations, the wide range of in kind and other support that GCOS planning and coordination activities receive from sponsors, including support provided for the activities of the Panels.
4. The SC requested the Chairman to encourage the GCOS sponsors to contact FAO for potential cosponsorship, noting its present in kind contribution to GCOS and highlighting the potential benefits to all concerned from increased FAO involvement in climate-related observation activities.
5. The SC requested the Chairman, in his letter to the UNEP Executive Director reporting on the outcome of the present session, to highlight the importance of strong UNEP support to GCOS in the context of its increasing involvement in the Nairobi Work Programme, and impact and adaptation activities generally.
6. The SC requested the Secretariat, in consultation with the Chairman, to coordinate the preparation and distribution of a joint letter from the four sponsoring organizations, urging the appointment of GCOS National Coordinators and the establishment of cross agency GCOS National Committees or GCOS Offices. This letter should be distributed through their individual channels to countries. It should note that this need has been endorsed by SBSTA and reinforced by the 2007 WMO Congress Resolution. It could be linked to the UNFCCC call for additional information on national activities and the need for coordinated national input to the 2009 comprehensive GCOS report.
7. The SC welcomed the increased integration of WMO activities related to observations. Noting the 1998 Memorandum of Understanding between the GCOS cosponsors, and recognizing the multifaceted nature of the entirety of observing systems contributing to GCOS, the SC stressed that the success of GCOS relies on shared ownership and perceived balance between all cosponsors. It welcomed the WMO assurances that the restructuring of the WMO Secretariat would preserve this balance. It requested the Chairman to keep closely in touch with progress on the integration of WMO observing systems and to do everything possible to maintain the stability and balance of the cosponsorship arrangements for GCOS.
8. The SC welcomed the feedback from all GCOS cosponsors and thanked them for their advice and guidance. In the absence of a UNEP representative at the session, the SC agreed that the letter from the SC Chairman to the Executive Head of UNEP reporting on the outcome of the current session should place particular emphasis on the importance of UNEP support for the GCOS contribution to the Nairobi Work Program on impacts and adaptation.

9. The SC approved the “WMO/GAW Global Atmospheric Ozone Monitoring Network” as the ‘GCOS Global Baseline Total Ozone Monitoring Network’ and the ‘GCOS Global Baseline Ozone Profile Network’, in accordance with the terms and conditions set out in Annex II of Document 25 of AOPCXIII “GCOSGAW agreement.”
10. The SC commended on the effort of Dr Ellsworth Dutton to find a new host for the BSRN archives, and welcomed the offer of the Alfred Wegener Institute (AWI) in Bremerhaven (Germany). It requested the Secretariat to ensure that the organization in charge of the archive is duly informed of the terms of the GCOS/WCRP agreement on BSRN.
11. The SC reiterated its request, from its 14th session, that the Secretariat, in coordination with the World Climate Programme, arrange for preparation of a letter from the Secretary-General of WMO to all Permanent Representative, urging countries to submit as many historical subdaily atmospheric observations as possible to international data centres, recognizing that this would support the construction of long-term datasets, and thus help improve reanalyses and the analysis of extreme events.
12. The SC agreed that GCOS presentations and interventions in UNFCCC, GEO and other fora, should, whenever possible, highlight countries in which significant progress in the implementation of sustained ocean observations has been made, in order to encourage the development of agents of implementation in all countries. It would welcome GOOS Secretariat input to the GCOS Chair and Secretariat to assist with such communications.
13. The SC encouraged a broadening of the role of research agencies and institutions to include sustained ocean observations necessary for climate research on the predictability of decadal variability. This should complement continuing efforts to identify and empower agents of implementation with a mission for sustained ocean observations.
14. The SC endorsed the planned OceanObs/Info’09 meeting and agreed that GCOS Programmes should be a convening sponsor. OOPC may also consider representation from IGBP right from the preliminary planning stage of OceanObs 2009 meeting for better presentation of Ocean-IGBP plans during the meeting.
15. The SC endorsed the preparation of a joint recommendation by representatives of WMO and FAO, on a preferred option to progress action on guidelines and standards for terrestrial observations, recognizing TOPC as the relevant expert panel. This preferred option should then be referenced in statements to SBSTA by GCOS and GTOS representatives.
16. The SC invited TOPC to encourage cryospheric experts to prepare specific recommendations on the observation of the terrestrial cryosphere, to invite experts (e.g., Chairman of WCRP CliC, CoChairs of IPY) to its next session in November 2007, and to report at the next SC session.
17. The SC endorsed the proposal for an implementation strategy meeting for Central America and the Caribbean in Belize in January 2008. It also indicated its desire to explore the organization of other such meetings, and, in particular, to further explore the possibility of organizing a meeting for selected Asia Pacific countries in association with the Asian Development Bank. It agreed, however, that care must be taken to avoid stretching resources too thinly particularly in light of the fact that the ClimDev Africa program is still evolving.
18. The SC endorsed the document prepared by the GCOS Secretariat (with support from Professor Paul Mason) in response to the request by SBSTA for information on the role GCOS could play in the Nairobi Work Programme on Impacts, Vulnerability and Adaptation to Climate Change. Specifically, it endorsed the proposal contained in this

document for a joint GCOS, WCRP, WCP programme of regional workshops with, if possible, the support of SBSTA; 1) to address the adequacy of global and regional climate observations for determining regional climate trends and for adaptation planning, and 2) to evaluate the adequacy and reliability of regional climate models for adaptation needs. The SC expressed its gratitude to SC member Professor Lucka Kajfez Bogataj for volunteering to help push this forward.

19. The SC encouraged WMO to offer to take a lead in the development of the meteorological elements of ClimDev Africa. It urged the World Climate Programme Department, in cooperation with the GCOS Secretariat, to investigate the possibility of assisting in the preparation of the climate observation and climate services elements of the ClimDev Africa Programme proposal. It suggested that funds to help in Programme preparation might be sought from the African Development Bank or perhaps through the GCOS Secretariat itself. It encouraged the GCOS Secretariat and WCP Department Directors to follow up at WMO headquarters to further develop this idea and, as appropriate, communicate it to ClimDev Africa partners.
20. The SC applauded the progress being made in strengthening the GCM process, and particularly thanked Mr Howard Diamond for his leadership. It endorsed the regular convening of GCM meetings, with a view to the GCM becoming the equivalent of the WMO Voluntary Cooperation Programme (VCP), for climate. It further endorsed the proposal to organize the next meeting in June 2008, in conjunction with SBSTA, with the aim of the attendance of at least 20 countries.
21. The SC urged that as the GCM becomes better established and more active, it should also address terrestrial and ocean observation needs, along with atmospheric needs, in collaboration with other relevant technical cooperation mechanisms.
22. The SC requested the GCOS Secretariat to develop a framework to facilitate regular reporting on progress against the actions in the Implementation Plan (GCOS92), for example a spreadsheet template listing all actions and performance indicators, in close collaboration with the GCOS Panels. This reporting should serve as background information for the preparation of the 2009 comprehensive report to the UNFCCC.
23. The SC requested the GCOS Secretariat, in collaboration with the three GCOS panels, to develop guidelines for datasets and products meeting GCOS requirements, in response to the needs of the IPCC, space agencies and data providers or users.
24. The SC recalled the invitation from the UNFCCC (COP and SBSTA), to inform SBSTA, as required, on implementation of the Implementation Plan (GCOS92), and noted that this could be used as a platform to regularly raise issues of importance to the UNFCCC in relation to GCOS implementation.
25. The SC thanked the Commission for Basic Systems (CBS) and World Weather Watch Department of WMO for their fundamentally important role in implementation of GCOS and urged them to continue to give high priority to the climate observing functions of the WWW Global Observing System (GOS) in line with GCOS92 and Resolution 11 of the Fifteenth Congress.
26. The SC welcomed the positive response of the WMO Space Programme to GCOS92 and GCOS107, and encouraged continuing priority to GCOS implementation in collaboration with CGMS, CEOS and other relevant space agencies.
27. The SC encouraged close liaison between CEOS and GCOS panels to encourage the appropriate working groups (particularly CEOS WGCV) and data producers identified in GCOS107 to resolve intersatellite discrepancies between the climate products for which they are responsible, in order to demonstrate the need for sufficient overlap between

satellite instruments for maintaining a consistent climate record. They should also take into account the expected lifetimes of satellite systems to better assess the probability of inadequate overlap. A report on this issue is expected at the next session.

28. The SC requested its Chairman to send, desirably jointly with the WCRP Chair, a letter of appreciation to the CEOS Chair thanking her for CEOS cooperation with the climate community and for the CEOS response to GCOS107, and suggesting the maintenance of a close working relationship in assessing progress made in completing climate actions.
29. The SC agreed that the Chairman should send, desirably jointly with WCRP/JSC Chair, a letter to the CEOS Chair by January 2008, reiterating the high priority attached by the international climate observation and research community to maintaining the climate capabilities of US satellites.
30. The SC expressed its appreciation for the proactive JCOMM response to GCOS92 and urged continued JCOMM priority for implementation of GCOS ocean observations. It drew JCOMM attention to the importance of including climate-related applications in its development of marine services based on ocean observations.
31. The SC endorsed the establishment by JCOMM of an Observing Programs Support Centre (OPSC) with expanded functions.
32. The SC noted that, with increased emphasis on adaptation, impacts, and vulnerability, the impacts of climate in the coastal zone are receiving increasing attention. It requested the OOPC, in liaison with the GTOSGOOS Panel for the Integration of Coastal Observations (PICO) and JCOMM, to examine the observational requirements for assessment and understanding of climate impacts in the coastal ocean.
33. The SC urged a closer collaboration between the Secretariats of GCOS and GTOS in pursuing activities related to the UNFCCC, both through TOPC and directly between the Secretariats.
34. The SC requested the Chairman to inform the WMO Commission for Hydrology (CHy) of the SC's extreme concern over the dramatic decline in the availability of hydrological observations, and to urge CHy, in the strongest possible terms, to explore ways of remedying this situation, noting ongoing initiatives such as GTNH. It is stressed that action in this domain should be coordinated between WMO and its partner agencies involving especially UNESCO, UNEP, FAO, and ICSU/IAHS. CHy should be encouraged to explore the concept of a baseline network in line with the GCOS network structure defined in GCOS92.
35. The SC supported the IPY Committee in its consideration of its legacy programmes, and expressed a wish to be kept fully informed on planning for the evolution of cryosphere observing systems proposed by both IPY and WCRP. It supported the principle of a Global Cryosphere Watch.
36. The SC noted with appreciation the excellent working relationships established with WCP and recommended that they be maintained and further strengthened. It reiterated that the original and most fundamental objectives of GCOS are to support all aspects of the WCP.
37. The SC requested that the three GCOS panels re-examine the cryospheric issues in order to review the observation requirements in this domain (including a possible update of the cryosphere ECVs,) and that, subsequent to this, there be a cryosphere discussion at WOAP to bring conclusions from the separate groups together in discussion with CliC (Climate and Cryosphere Programme).

38. The SC confirmed its support for co-sponsorship of TOPC by WCRP, and requested that this be formalized by a joint letter from the GCOS and WCRP Secretariats to the GTOS Secretariat.
39. In view of the support of JSC/WCRP for GCOS SC co-sponsorship of WOAP, the SC agreed that financial support should be provided for participation by the GCOS Secretariat in the next WOAP meeting.
40. The SC welcomed the contribution of WCRP and its Projects in pioneering new observation capabilities. It reaffirmed that one of the objectives of GCOS is to meet the observation needs of WCRP research programmes, and that sustained research observations also represent an important contribution to GCOS. It welcomed the continuing collaboration with WCRP and co-sponsorship of panels.
41. The SC noted the summary of conclusions and recommendations from the Sydney workshop, and agreed that the relevant conclusions from the workshop be taken into account in the 2009 comprehensive report to the UNFCCC and possibly in the revision of the GCOS Plan. It requested that the Chairman consult with Panel chairs before the draft report is sent to all Sydney workshop participants. It requested that the Secretariat arrange for a discussion paper on observation needs in support of adaptation to be presented at its next session.
42. The SC requested the Secretariat to prepare with the Chairman, a GCOS statement for the SBSTA27 in Bali, including a recommendation on the revised GCOS guidelines and drawing attention to ocean observation mechanisms and the importance of hydrological and sea-ice observations. It endorsed GCOS participation in the March 2008 Mexico meeting on the Data and Observation theme of the Nairobi Work Programme.
43. The SC noted with appreciation Dr Achache's presentation, commended the GCOS Secretariat's contribution to the preparation for the Fourth Earth Observation Summit, and supported active participation of GCOS representatives, as appropriate, in GEOSS-related activities. It reaffirmed the concept of GCOS as the climate observation component of GEOSS.
44. The SC requested the Secretariat to continue the development of an update of the GCOS Plan, with the support of the panels and the key bodies responsible for both the GCOS component systems and user programs. The new Plan should involve a long-term vision for GCOS and should address the future role of GCOS in the area of impacts, adaptation and vulnerability to climate change. It should also reflect changes in the GCOS agenda and its overall framework since 1995, such as the emergence of GEOSS and the GCOS links with the UNFCCC.
45. The SC supported the contribution of the GCOS Secretariat to the GEO work plan at the present level and recommended that advantage be taken of the GEO framework to encourage the use of climate data sets by other disciplines and the cross-fertilization with other disciplines. It requested the Chairman to inform the Cape Town GEO Plenary and Ministerial Summit that the GCOS Steering Committee and sponsors support the development of GCOS as the climate observation component of GEOSS and look forward to GEO support for the investment needed to achieve full implementation of GCOS92 and GCOS107 and the effective overall implementation of GCOS.
46. The SC requested the Secretariat to update the terms of reference for GCOS National Committees and Coordinators in order to help countries address the new challenges related to adaptation in particular. It suggested mention of GCOS reporting guidelines as the best way to ensure a consistent picture. These updated terms of reference should be appended to the letter to be sent by the Executive Heads of the four GCOS sponsors to the respective national contact points.

47. The SC 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 GCOS92 and GCOS107 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.
48. The SC requested the Secretariat to enhance its efforts on GCOS communication through for example, regular renewal of the website and preparation of a new brochure, as well as the development of other communication tools, possibly in cooperation with WCP and WCRP. It suggested preparation of a Powerpoint presentation on GCOS for inclusion on the website, and requested the Secretariat and Chairman to ensure regular reporting to SC members and Panels.
49. The SC reiterated its 2006 request for a comprehensive GCOS resource mobilization strategy, including an encouragement to the Director of the Secretariat to continue his efforts in raising financial support from governments for the strengthening of the Secretariat operation. It specifically recommended that the Secretariat explore further the various channels of cooperation with the European Commission.

**SELECTED MEETINGS ATTENDED/SUPPORTED  
BY THE GCOS SECRETARIAT/REPRESENTATIVES BETWEEN SC-XV AND SC-XVI**

<u>Date Meeting</u>	<u>Location</u>	
<b>2007:</b>		
16-19 Oct.	GCOS Steering Committee – Fifteenth Session (GCOS SC-XV)	Paris, France
15-16 Nov.	10 <sup>th</sup> Meeting of the Terrestrial Observing Panel for Climate (TOPC)	Rome, Italy
28-30 Nov.	GEO Ministerial Summit South Africa	Cape Town,
3-14 Dec.	13 <sup>th</sup> Session of the Conference of Parties to the UNFCCC and the 27 <sup>th</sup> Session of the UNFCCC Subsidiary Body for Scientific and Technical Advice	Bali, Indonesia
<b>2008:</b>		
15-16 Jan.	8 <sup>th</sup> Session of the WMO Consultative Meetings on High-level Policy Matters on Satellite Matters	New Orleans, USA
20-24 Jan.	88 <sup>th</sup> AMS Annual Meeting	New Orleans, USA
28-30 Jan.	Implementation Strategy Meeting for Central America and the Caribbean	Belize City, Belize
25-28 Feb.	GRUAN Initiation Meeting	Lindenberg, Germany
4-7 March	UNFCCC Expert Meeting on Methods and Tools and on Data and Observation, under the Nairobi Work Programme on Impacts, Vulnerability and Adaptation to Climate Change	Mexico City, Mexico
18-19 March	1 <sup>st</sup> Meeting of ClimDev Africa Specialized Working Group	Addis Ababa, Ethiopia
26-28 March	1 <sup>st</sup> Meeting of the EC Working Group on Climate and Related Water and Environmental Matters (EC-WGCM)	Geneva, Switzerland
31 March- 4 April	29 <sup>th</sup> Session of the JSC/WCRP	Arcachon, France
7 April	GOOS GSSC-XI Meeting	Paris, France
15-16 April	RSSC-CM Planning Meeting	Darmstadt, Germany

11-13 June	28 <sup>th</sup> session of SBSTA/UNFCCC	Bonn, Germany
12 June	GCM Board Meeting	Bonn, Germany
18-19 June	EUMETSAT-Workshop on the African Participation to the RSSC-CM Initiative	Darmstadt, Germany
18-27 June	WMO Executive Council-LX	Geneva, Switzerland
30 June-2 July	Meeting on the Preparation of GCOS 2009 Progress Report	Geneva, Switzerland
1-4 Sept.	29 <sup>th</sup> Session of the IPCC	Geneva, Switzerland
15-17 Sept.	2 <sup>nd</sup> Meeting of CEOS SIT	Tokyo, Japan

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**GCOS PUBLICATIONS SINCE SC-XV**

- GCOS-116**  
(WMO/TD-No. 1415) Report of the Fifteenth Session of the WMO-IOC-UNEP-ICSU Steering Committee for GCOS (Paris, France, 16-19 October 2007)
- GCOS-117**  
(WMO/TD-No. 1418) Future Climate Change Research and Observations: GCOS, WCRP and IGBP Learning from the IPCC Fourth Assessment Report (4-6 October 2007)
- GCOS-118**  
(WMO/TD-No. 1421) Summary Report of the Tenth Session of the GTOS/GCOS Terrestrial Observation Panel for Climate (Rome, Italy, 15-16 November 2007)
- GCOS-119**  
(WMO/TD-No. 1424) Report of the Implementation Strategy Meeting for Central America and the Caribbean (Belize City, 28-30 January 2008)
- GCOS-120**  
(GOOS-No. ) Report on the Meeting of "IOC Group of Experts on the Global Sea Level Observing System (GLOSS), tenth session (Paris, France, 6-8 June 2007)
- GCOS-121**  
(WMO/TD-No. 1435) GCOS Reference Upper Air Network (GRUAN). Report of the GRUAN Implementation Meeting (Lindenberg, Germany, 26-28 February 2008)
- GCOS-122**  
(WCRP 9/2008)  
WMO/TD- No. 1436) Fourteenth Session of the GCOS/WCRP Atmospheric Observation Panel for Climate (AOPC-XIV) – Conclusions and Recommendations (Geneva, Switzerland, 21-25 April 2008)
- GCOS-123**  
(WMO/TD-No. 1444) Report of the Fourth Session of the GCOS Cooperation Board (Bonn, Germany, 12 June 2008)
- GCOS-124**  
(WMO/TD-No. 1463) Report of the Sixteenth Session of the WMO-IOC-UNEP-ICSU Steering Committee for GCOS (Geneva, Switzerland, 14-17 October 2008)
- GCOS-125**  
(WCRP) Report of the WOAP-III Meeting (Boulder, CO, USA, 29 September-1 October 2008)
- GCOS-126**  
(WMO/TD No. 1464) GCOS Annual Report 2007-2008



**GCOS-RELATED DECISIONS OF SBSTA-27****SUBSIDIARY BODY FOR SCIENTIFIC AND TECHNOLOGICAL ADVICE****Twenty-seventh session****Bali, 3–11 December 2007****Agenda item 6****Research and systematic observation****Research and Systematic Observation  
Draft Conclusions Proposed by the Chair**

1. The Subsidiary Body for Scientific and Technological Advice (SBSTA) noted with appreciation the oral statements by the Chair of the Steering Committee of the Global Climate Observing System (GCOS) and the Director of the Global Terrestrial Observing System (GTOS) secretariat.
2. The SBSTA expressed its gratitude to the GCOS secretariat for its updated proposal<sup>1</sup> for the possible revision of the “UNFCCC reporting guidelines on global climate change observing systems”.
3. Having considered the GCOS proposal, the SBSTA decided to recommend a draft decision containing revised UNFCCC reporting guidelines on global climate change observing systems for adoption by the Conference of the Parties (COP) at its thirteenth session (for the text of the decision, see FCCC/SBSTA/2007/L.14/Add.1).
4. The SBSTA recalled its request<sup>2</sup> to 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. It also recalled its invitation to Parties<sup>3</sup> to submit to the secretariat, by 15 September 2008, additional information on their national activities with respect to implementing the plan, and encouraged Parties to use the guidelines mentioned in paragraph 3 above when providing that information.
5. The SBSTA expressed concern that the regional action plans developed under the GCOS regional workshop programme remain largely unimplemented, and encouraged international organizations and development partners to provide further technical and financial support through existing bilateral and multilateral cooperation programmes in order to advance implementation of priority elements identified in the GCOS regional action plans.
6. The SBSTA encouraged the GCOS secretariat, when preparing the report mentioned in paragraph 4 above, to consider, as appropriate, information on progress in implementing the regional action plans.
7. The SBSTA welcomed the progress report on the assessment of the status of the development of standards for each of the essential climate variables in the terrestrial domain prepared by the GTOS secretariat in response to an invitation by the SBSTA at its twenty-third session.<sup>4</sup> The SBSTA encouraged the GTOS secretariat and the sponsoring agencies

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<sup>1</sup> FCCC/SBSTA/2007/MISC.26.

<sup>2</sup> FCCC/SBSTA/2005/10, paragraph 94.

<sup>3</sup> FCCC/SBSTA/2005/10, paragraph 95.

<sup>4</sup> As mandated, the GTOS secretariat provided a progress report on this matter to the SBSTA at its twenty-sixth session (FCCC/SBSTA/2007/MISC.6). It provided an update to this report prior to the twenty-seventh session of the SBSTA (FCCC/SBSTA/2007/MISC.27).

of GTOS to finalize the assessment and invited the GTOS secretariat to report to the SBSTA on progress at its twenty-ninth session (December 2008).

8. The SBSTA welcomed the efforts by the GTOS secretariat to develop a framework for the preparation of guidance materials, standards and reporting guidelines for terrestrial observing systems for climate, in response to decision 11/CP.9. The SBSTA welcomed the progress report by the GTOS secretariat on this matter and took note of the different options for such a framework presented therein.<sup>5</sup> The SBSTA encouraged the GTOS secretariat and the sponsoring agencies of GTOS to continue developing the framework in the way they consider most appropriate, making use of existing institutional bodies and processes, where appropriate, and taking into account that such a framework should meet the following criteria:

- (a) Standards should be developed on a scientifically sound basis;
- (b) The framework should provide for the involvement of governments in the development of standards and guidance materials and in their implementation;
- (c) Access to those standards and guidance materials should be free and unrestricted;
- (d) The process for developing the standards and guidance materials and the operation of the framework should be cost-effective and sustainable and take into account existing standards and guidance materials;
- (e) The framework should be flexible in view of future needs and developments in this area.

9. The SBSTA commended the Committee on Earth Observation Satellites (CEOS) and the Parties supporting space agencies on the progress made in 2007 in implementing actions in response to the GCOS implementation plan, and looks forward to continued progress during 2008. The SBSTA invited the CEOS to provide an updated progress report by its twenty-ninth session. The SBSTA noted the continued close working relationship between GCOS and the CEOS for linking space-based capabilities with global climate observing requirements.

10. The SBSTA welcomed the Draft Cape Town Declaration<sup>6</sup> adopted at the Group on Earth Observations Ministerial Summit, which recognizes the important contribution the Global Earth Observation System of Systems can make in response to the needs of the Convention and the growing need to further enhance such contributions. The SBSTA noted that such contributions will be made mainly through GCOS.

11. The SBSTA noted that systematic and continuous observations have significantly contributed to the key findings of the Fourth Assessment Report (AR4) of the Intergovernmental Panel on Climate Change (IPCC) and play an integral and increasingly important role in monitoring and assessing impacts of, and in supporting adaptation to, climate change, as well as in contributing to the reduction of uncertainties. The SBSTA noted the importance of robust scientific information derived from the state-of-the-art observing technologies as well as conventional observations for supporting scientific assessment to inform action to address climate change.

12. The SBSTA was informed of the workshop organized by GCOS, the World Climate Research Programme and the International Geosphere-Biosphere Programme,<sup>7</sup> held in Sydney, Australia, in October 2007 which examined, among other issues, requirements for future systematic observations resulting from the findings of the IPCC AR4. The workshop reinforced the importance of sustaining the long-term operation of the climate observing systems which provide the essential climate variables set down in the GCOS implementation plan and highlighted the need for Parties to share their data freely. The SBSTA noted that

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<sup>5</sup> See footnote 4.

<sup>6</sup> Available at <<http://earthobservations.org/>>.

<sup>7</sup> Workshop titled "Future climate change research and observations: GCOS, WCRP and IGBP learning from the IPCC Fourth Assessment Report."

such efforts are particularly urgent in developing countries; however, it was noted that a number of areas also need to be addressed in developed countries.

## **Addendum**

### **Recommendation of the Subsidiary Body for Scientific and Technological Advice**

The Subsidiary Body for Scientific and Technological Advice, at its twenty-seventh session, decided to recommend the following draft decision for adoption by the Conference of the Parties at its thirteenth session:

#### **Draft decision -/CP.13 Reporting on global observing systems for climate**

*The Conference of the Parties, Recalling* decisions 4/CP.5, 5/CP.5, 11/CP.9 and 5/CP.10, *Noting* the need to revise the “UNFCCC reporting guidelines on global climate change observing systems”<sup>8</sup> in order to reflect the priorities of the Global Climate Observing System implementation plan and incorporate the reporting on essential climate variables, *Recognizing* the proposals made by the secretariat of the Global Climate Observing System, *Having considered* the recommendations of the Subsidiary Body for Scientific and Technological Advice on this matter at its twenty-third, twenty-fifth and twenty-seventh sessions,<sup>9</sup>

1. *Adopts* the revised UNFCCC reporting guidelines on global climate change observing systems as contained in the annex to this decision;
2. *Decides* that these revised guidelines should take effect immediately for the preparation of detailed technical reports on systematic observations in accordance with the provisions of decisions 4/CP.5 and 5/CP.5;
3. *Requests* Parties included in Annex I to the Convention to continue providing such reports in conjunction with their national communications;
4. *Invites* Parties not included in Annex I to the Convention to provide such reports on a voluntary basis.

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<sup>8</sup> See decision 5/CP.5 and document FCCC/CP/1999/7, chapter III.

<sup>9</sup> FCCC/SBSTA/2005/10, paragraph 97; FCCC/SBSTA/2006/11, paragraph 95; and the draft conclusions to be adopted under agenda item 6 of the SBSTA.

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**GCOS Secretariat**  
Global Climate Observing System  
c/o World Meteorological Organization  
7 *bis*, Avenue de la Paix  
P.O. Box No. 2300  
CH-1211 Geneva 2, Switzerland  
Tel: +41 22 730 8275/8067  
Fax: +41 22 730 8052  
Email: [gcossjpo@wmo.int](mailto:gcossjpo@wmo.int)