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INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION
(of UNESCO)

INFORMATION DOCUMENT

**FUTURE DEVELOPMENT OF THE
WMO-IOC-UNEP-ICSU GLOBAL CLIMATE OBSERVING SYSTEM (GCOS)**

Summary. This document provides an overview of the links between GCOS and other IOC programmes, highlights issues and recommended actions from the 14th session of the GCOS Steering Committee, and offers some suggestions and recommendations to IOC Member States for consideration with respect to the further development of GCOS.

Background

The WMO-IOC-UNEP-ICSU Global Climate Observing System (GCOS) was established in 1992 to ensure that observations and information needed to address climate-related issues are obtained and made available to all potential users. It is intended to provide observations for climate system monitoring, climate change detection and monitoring the impacts of and the response to climate change, data for application to national economic development, and climate research needs. It covers the atmospheric, oceanic, and terrestrial domains (including hydrology and the cryosphere), and the ocean component of GCOS is the global climate module of GOOS.

The GCOS and GOOS Steering Committees receive scientific advice on the sustained ocean observing system for climate from an expert group, the Ocean Observations Panel for Climate (OOPC), which is co-sponsored by GCOS, GOOS and the WCRP,. The Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM) provides coordination of implementation and technical standards for the ocean component of GCOS.

The *Implementation Plan for the Global Observing System for Climate in Support of the UNFCCC* (IP) published in October 2004 was a milestone in planning for GCOS and GOOS, as the ocean section of this report is the implementation plan for the global climate module of GOOS. The IOC Assembly at its 23rd Session (Paris, June 2005) congratulated GCOS on the achievement of IP, instructed the Executive Secretary to set up a system of reporting from Member States on their contributions to the Climate Module of GOOS, and urged Member States to incorporate elements of the Implementation Plan into their own national plans. The Second Session of JCOMM (JCOMM-II, Halifax, September 2005), noted that the IP was designed for climate requirements but that marine services in general would be greatly improved by implementation of the system. It also recommended that its Observations Programme Area base its work plan on implementation of the ocean and relevant atmospheric actions in the IP.

Status

The JCOMM Observations Coordinator estimates implementation of the *in situ* ocean observing networks (serving the goals of GCOS, GOOS, the WCRP and JCOMM), at 58% in May 2007. Good progress has been made in many areas, but national commitments to completing the networks are needed. The IP identifies required actions not only in the implementation of observing networks, but in the development of data systems, products and information of policy and societal relevance, and in coordination activities.

Improved and more detailed recommendations for ocean satellite missions have been brought to the attention of the Committee on Earth Observation Satellites (CEOS) and the UN Framework Convention on Climate Change (UNFCCC). After publication of the IP, the UNFCCC asked CEOS for a report on how they planned to respond to the IP. CEOS asked for more detail on the requirements for satellite missions, and the two reports, a [supplement on systematic observation requirements for satellite-based products](http://ioc3.unesco.org/oopc/documents/background/gcos-107.pdf)¹ and the [CEOS response to the IP](http://ioc3.unesco.org/oopc/documents/background/CEOS%20Response%20to%20the%20GCOS%20IP.pdf)² were released in September 2006, recommending actions for satellite ocean observations of sea ice, sea level, SST, ocean colour, sea state, salinity, and in ocean reanalyses. The engagement from the satellite agencies has been most productive, and will need continued follow-up by the relevant Member States.

Research programs continue to provide most of the support for the ocean component of GCOS; only limited progress has been reported of national actions, outside the continued support of research, for sustained observations and/or operational analysis activities.

¹ <http://ioc3.unesco.org/oopc/documents/background/gcos-107.pdf>

² <http://ioc3.unesco.org/oopc/documents/background/CEOS%20Response%20to%20the%20GCOS%20IP.pdf>

The GCOS Steering Committee and Secretariat and the other sponsors of GCOS thank the IOC and its Member States for their continuing support for GCOS implementation.

Important Issues and Actions

The Fourteenth Session of the GCOS Steering Committee³ (SC-XIV, Geneva, 10-12 October 2006) agreed on a number of important actions which may be of interest to IOC Member States:

- GCOS as part of GEOSS (Action 26). The Steering Committee (SC) sees GCOS as the prototype 'system of observing systems' and thus its effective implementation in support of the 'climate' 'Societal Benefit Area' of the Global Earth Observation System of Systems (GEOSS) as essential to the ultimate success of both GCOS and GEOSS. It clearly outlines the importance of an ocean observing system for climate. It commended the strong support of the GCOS sponsors for this objective and approach.
- GCOS National Coordinators and National Committees (Action 29). SC-XIV considered that the lack of success, so far, in establishing active GCOS National Coordinator positions and GCOS National Committees in more than a very few countries is a major impediment to effective, coordinated GCOS implementation at the national level. The SC believes it would be a significant step forward if the Executive Heads of the four GCOS sponsoring organisations would agree to send a further joint letter (drafted by the GCOS Secretariat in collaboration with the individual sponsor Secretariats) to all countries, through their respective channels of communication, urging joint action at the national level to designate GCOS National Coordinators and appoint GCOS National Committees.
- Links to the UNFCCC (Actions 22-24 and 28). The links between the GCOS Steering Committee/Secretariat and the relevant bodies of the UN Framework Convention on Climate Change (UNFCCC) have greatly strengthened over recent years and a major report to the Subsidiary Body for Scientific and Technological Advice (SBSTA) is scheduled for 2009. While conscious that the four international sponsors of GCOS are WMO, IOC, UNEP and ICSU, the Steering Committee recognises the UNFCCC as a major client of GCOS and believes that the active engagement of SBSTA with climate observation matters and its support for GCOS are potentially very helpful to GCOS recognition at the national level. The SC has assumed that the IOC would wish it to continue to work closely with the UNFCCC bodies and foster that recognition and support.
- GCOS-WCRP-IGBP-IPCC Workshop (Action 21). The GCOS Steering Committee and Secretariat are working closely with their WCRP, IGBP and Intergovernmental Panel on Climate Change (IPCC) counterparts on the planning of a workshop, tentatively scheduled for 4-6 October 2007 in Sydney, to consider and analyse the implications from the IPCC's Fourth Assessment Report for the further development of both GCOS and the WCRP. The SC has assumed that the IOC, as sponsors also of the WCRP, would welcome this collaboration.

The GCOS SC was particularly grateful for Dr. Keith Alverson's participation at the session on behalf of GOOS and the IOC. The GCOS SC and Secretariat would be pleased to strengthen the international support for the joint objectives of GOOS and GCOS and would appreciate the IOC Member States' advice as to any new initiatives they might wish the SC to take on this front.

Other important GCOS issues and developments which did not flow directly from the report of SC-XIV are as follows:

- The GCOS MOU. This was most recently updated in 1998 and is formally required to be reviewed every four years by the sponsoring organisations.

³ The full meeting report is available at: <http://www.wmo.ch/pages/prog/gcos/Publications/gcos-109.pdf>

- The continuity of satellite observations for climate. Following informal advice of significant threats to the continuity of a number of key climate-related satellite missions, the Chair of the Joint Steering Committee for the World Climate Research Programme (Dr John Church) and the GCOS SC Chair wrote jointly in October 2006 to the Chair of the Committee on Earth Observation Satellites (CEOS) to draw attention to the concerns of the climate observation and research communities. The letter was well received and was regarded as helpful, but further effort may be needed from the sponsoring agencies on this matter.
- Integration of WMO observing systems. The Chair of the GCOS SC, represented the interest of GCOS and, to the extent appropriate, the interests of IOC, UNEP and ICSU, as its sponsors, at a 2006 meeting of a WMO Task Team to explore the scope for greater integration of the WMO Observing Systems. The WMO Congress recently endorsed a carefully phased approach to integration, but it is most important that this be done in a way that does not weaken the joint IOC-UNEP-ICSU-WMO ownership of GCOS, some of whose component systems will be heavily involved in the development of the more integrated approach within WMO. The GCOS SC and Secretariat will, in conjunction with the representatives of GOOS, be especially watchful on IOC interests in this respect and would welcome any guidance that the IOC Assembly could offer in this respect.
- GCOS Secretariat. The GCOS SC believes the GCOS Secretariat is doing an excellent job in carrying out the role assigned to it under the GCOS MOU but it is seriously under-resourced relative to the task involved in facilitating and supporting the overall implementation of GCOS. The Steering Committee would be grateful for anything the IOC Member States can do to muster greater funding support or secondment of professional staff to the GCOS Secretariat.

Finally, the Assembly may wish to consider some input from the OOPC on its activities that may be of direct interest to IOC Member States:

- The OOPC web site on the [state of the ocean](http://ioc.unesco.org/oopc/state_of_the_ocean/)⁴ is gaining visibility and will be used to display new ocean climate indices as they are developed. It was designed as a tool for basic evaluation of the capabilities of the observing system, by reporting key ocean climate indices and their uncertainty; and as a tool for advocacy about the capabilities of the global module of GOOS, the ocean component of GCOS. The need for interesting indices based on subsurface ocean variability remains high, and is the subject of ongoing dialogue with WCRP/CLIVAR groups.
- GODAE and the OOPC will be holding a workshop on Observing System Evaluations (OSE) and Observing System Simulation Experiments (OSSE) on 5-7 November 2007 in Paris. The workshop will focus on reviewing OSE and OSSE work, on identifying robust features, and on developing preliminary recommendations for the observing system. Some specific topics will be low/high resolution altimetry, Argo, tropical moorings, high resolution SST, and new observing techniques (e.g., gliders, salinity). The development of these tools, along with expert judgment, will inform evolution of the recommendations for the global system.
- The OOPC is in the process of scoping, along with the International Ocean Carbon Coordination Project (IOCCP) and other interested groups, the organizing a symposium on multi-disciplinary sensors and systems for autonomous observations of the global oceans, targeted for 2008 ("OceanSensors08"). The development, testing, and proliferation of new sensors will advance our ability to observe a larger number of biogeochemical and ecosystems variables on a global scale. The objectives of the symposium would be to foster the exchange of information, assess the technology needed to meet observing

⁴ http://ioc.unesco.org/oopc/state_of_the_ocean/

system goals, and providing valuable input into a proposed general ocean observations symposium.

OOPC recommendations can, in many cases, be traced back to the science and technology presented at the OceanObs99 conference in San Rafael (1999). The OOPC has considered, and has been encouraged by the GCOS SC and GOOS Scientific Steering Committee, to plan, with other interested groups, a new conference focused on global ocean observations, in about 2009, ten years after San Rafael. The goals of this conference would be to take stock in progress and in major advances in scientific knowledge from the observing system, and to focus on challenges and opportunities, including new technologies, and new opportunities for global measurements of biogeochemical and ecosystem variables. This meeting would also address some of the evolutions necessary in the recommendations for the global module of GOOS focused on the physics of the ocean. The OOPC calls the IOC Assembly to endorse this development and offer again the support of the IOC Secretariat in organizing the 10-year follow-up of OceanObs'99.