CGMS

CGMS-37 WMO-WP-16
v1, 25 September 2009
Prepared by WMO
Agenda Item: E.2
Discussed in Plenary

GCOS AND SATELLITE ACTIVITIES FOR CLIMATE MONITORING

This paper summarizes GCOS activities related to satellite activities in support of climate monitoring, namely on (i) the GCOS Progress Report 2004-2008, (ii) the update of the GCOS Implementation Plan and implications to satellite operators, (iii) recommendations by GCOS and World Climate Research Programme (WCRP) expert panels related to space agencies, (iv) update on the GCOS Reference Upper-Air Network (GRUAN).

Action/Recommendation proposed:

- CGMS members to provide reports to the next session of CGMS on climate-related activities and plans in support of GCOS needs. These reports should include comments on the maturity index for climate data records under development by NOAA, as well as on the *Guideline for the Generation of Satellite-based Datasets and Products Meeting GCOS Requirements* (GCOS-128).

- CGMS members to review the draft updated GCOS Implementation Plan (IP-09) during the open review period November 2009 – February 2010, and send their comments to the GCOS Secretariat.

GCOS AND SATELLITE ACTIVITIES FOR CLIMATE MONITORING

1 INTRODUCTION

The 37th meeting of the Coordination Group for Meteorological Satellites (CGMS) will be held in South Korea from 26 to 30 October 2009 (this is concurrent with GCOS XVIIth Steering Committee session in Paris, France). GCOS is represented at CGMS by the WMO Space Programme, as well as by Dr Johannes Schmetz (EUMETSAT), a member of the GCOS/WCRP Atmospheric Observation Panel for Climate.

2 GCOS ACTIVITIES IN RELATION TO SATELLITE-BASED CLIMATE MONITORING

2.1 GCOS Progress Report 2004-2008

In the *Progress Report on the Implementation of the Global Observing System for Climate in Support of the UNFCCC 2004-2008*[1]*,* responding to a request of the Subsidiary Body for Scientific and Technological Advice (SBSTA) of the UN Framework Convention on Climate Change (UNFCCC), an assessment has been made of progress in implementing and maintaining key observing systems in support of climate monitoring (as stated in the 2004 GCOS Implementation Plan), including satellites and satellite-related activities. This assessment was based on national reports on systematic observation, input from GCOS component observing systems and expert advice.

Among other results, it was found that space agencies have improved both mission continuity and observational capability, and are increasingly meeting the identified needs for data reprocessing, product generation, and access. Overall, there has been good commitment to the GCOS Climate Monitoring Principles (GCMPs) by many operators of networks and systems, including satellite agencies. However, overall, the extent of adherence to the GCMPs remains partial, mostly due to financial limitations. The space agencies have generally been very responsive to the GCOS Implementation Plan and they are advancing their own matching implementation plans (e.g., the 2006 CEOS Response[2] to the IP-04 and its Satellite Supplement[3]) detailing the coordinated response of individual satellite operators to the overall GCOS objectives. Improved instruments, international coordination, and reprocessing and exploitation of datasets have led to an increasingly important contribution of satellite systems to global climate monitoring.

2.2 Update to the GCOS Implementation Plan

The 2009 edition of the *Implementation Plan for the Global Observing System for Climate in Support of the UNFCCC* (IP-09) replaces the GCOS Implementation Plan (IP-04) which was

[1] GCOS (2009): *Progress Report on the Implementation of the Global Observing System for Climate in Support of the UNFCCC 2004-2008,* GCOS-129, WMO/TD-No. 1489, http://www.wmo.int/pages/prog/gcos/Publications/gcos-129.pdf

[2] CEOS (2006): *Satellite Observation of the Climate System* - The Committee on Earth Observation Satellites (CEOS) Response to the Implementation Plan for the Global Observing System for Climate in Support of the UNFCCC, October 2006, http://www.ceos.org/pages/CEOSResponse_1010A.pdf.

[3] GCOS (2006): *Systematic Observation Requirements for Satellite-based Products for Climate*, GCOS-107, WMO/TD-No. 1338, http://www.wmo.int/pages/prog/gcos/Publications/gcos-107.pdf.

published in 2004[4]. Its purpose is to provide an updated set of actions required to implement and maintain a comprehensive global observing system for climate that will fulfil the commitments of the Parties under Articles 4 and 5 of the UNFCCC and will meet the needs of Parties for climate observations in support of the objectives of the Convention. This revised Plan brings the Actions in the IP-04 up-to-date, given recent progress in science and technology, increased focus on adaptation, enhanced efforts to optimize mitigation measures, and the need for improved predictions of climate change.

The Plan includes over a hundred specific actions to be undertaken over the next 10 years, across the three domains (atmosphere, oceans, terrestrial), including needs for maintaining and improving observational capabilities, reprocessing of datasets, reanalysis, and adherence to the GCOS Climate Monitoring Principles. Continued and enhanced engagement by CGMS members is encouraged to address all the needs identified by GCOS, possibly through dedicated reports to the next session of CGMS on climate-relevant activities and plans.

For each recommended action, the IP-09 gives estimations for the costs incurred by carrying out the action. The estimated costs are annual incremental costs on top of existing, sustained networks/systems and associated infrastructure, which are needed to address climate needs. For example, GCOS would like to estimate the delta cost for making an operational satellite system "climate-worthy", e.g. full application of the GCOS Climate Monitoring Principles, as well as the additional (re-)processing cost needed to generate climate data records.

A preliminary draft of the IP-09 will be made available to the UNFCCC on 2 November 2009, for consideration at the COP 15 in Copenhagen in December. The space community is invited to provide comments during the open review of the Plan from 6 November 2009 to 1 February 2010, and send these comments to the GCOS Secretariat (gcosjpo@wmo.int). It may be noted that space agencies have been already invited to formally comment on the draft Plan in the framework of the Strategic Implementation Team of the Committee on Earth Observations (CEOS/SIT).

2.3 Outcome of GCOS/WCRP expert panels

Since the last session of CGMS, the GCOS/WCRP-sponsored Atmospheric Observation Panel for Climate (AOPC), the Terrestrial Observation Panel for Climate (TOPC) and the WCRP Observations and Assimilation Panel (WOAP) have met and made a number of recommendations to the attention of satellite operators:

- The development by NOAA of a maturity index concept for climate data records and products should be further pursued, in collaboration with the SCOPE-CM initiative; for this purpose all space agencies should be encouraged to comment on this concept (suggested recommendation to CGMS).

- GCOS (through GCOS/WCRP AOPC at its 15th session) supported the proposed establishment of an international working group on radio occultation under CGMS, to assess the needs for and ensure continuity of an RO climate observing system. It encouraged consistent processing of the data for climate purposes, and requested a comprehensive briefing on the use of GPS-RO data for monitoring of ECVs at the next session of AOPC.

[4] GCOS (2004): *Implementation Plan for the Global Observing System for Climate in Support of the UNFCCC*, GCOS-92, WMO/TD-No. 1219, http://www.wmo.int/pages/prog/gcos/Publications/gcos-92_GIP.pdf

- GCOS (through GCOS/WCRP AOPC at its 15th session) recognized that hyperspectral sounders and GPS-RO provide reference-quality observations from space which, together with the evolving GCOS Reference Upper Air Network and the planned benchmark measurement mission CLARREO, would provide independent pillars to ensure mutual consistency of datasets. The Panel encouraged the coordination of efforts between CEOS, CGMS and the WMO Space Programme in these areas; and it expressed its support for pilot studies on enhanced datasets using these reference-type measurements, including reanalyses.

- GCOS (through GCOS/WCRP AOPC at its 15th session) encouraged the regular reprocessing of satellite data records for the generation of FCDRs from all relevant instruments, preferably by space agencies as the operators of the instruments. This process should include regular feedback cycles by the scientific user community.

- In this connection, GCOS has published the *Guideline for the Generation of Satellite-based Datasets and Products Meeting GCOS Requirements*[5], assisting data and product suppliers to provide users with sufficient information to allow them to assess to what extent the datasets meet GCOS requirements, i.e. the climate-worthiness of the datasets. CGMS is invited to provide feedback to this guideline (suggested recommendation to CGMS).

- GCOS (through GCOS/GTOS TOPC at its 11th session) stressed the importance of continued operation of Landsat, Spot, and ASTER-type sensors for sustained monitoring of glaciers.

- WCRP and GCOS (through WOAP at its 3rd session) recognized the desirability of the transfer of the ISCCP processing system from NASA to NOAA in 2010 as a demonstration of the value and maturity of the ISCCP products, which were developed under the auspices of WCRP. The transfer of this system from research to operations is appropriate and could be a model for other data sets in the future. WOAP encourages the relevant agencies to ensure that the research community maintains a role in the scientific oversight and evaluation of ISCCP products after the transfer in 2010.

2.4 GCOS Reference Upper-Air Network (GRUAN)

The GCOS Reference Upper-Air Network (GRUAN) is being implemented with the objective to provide long-term high-quality climate records; to fully characterize the properties of the atmospheric column; and to constrain and calibrate data from more spatially-comprehensive global observing systems (including satellites and current radiosonde networks). GRUAN sites already are, or will be, equipped with highest-quality instrumentation to measure profiles of temperature and humidity. The recently-published GRUAN Implementation Plan[6] (GCOS-134) sets out a five-year roadmap for establishing this network. To date, 13 out of 14 initial GRUAN candidate sites have been officially confirmed: These are: Xilinhot, China; Sodankylä, Finland; Lindenberg, Germany; Potenza, Italy; Cabauw, the Netherlands; Payerne, Switzerland, Barrow, Alaska, USA, Beltsville, Maryland, USA, Boulder, CO, USA, Darwin, Australia, Lamont, Oklahoma, USA, Manus Island, Papua New Guinea and Republic of Nauru.

As noted in the GRUAN Implementation Plan, close collaboration with the satellite operators is being sought in the implementation of GRUAN, for example in relation to the best strategy

[5] GCOS (2009): *Guideline for the Generation of Satellite-based Datasets and Products Meeting GCOS Requirements*, GCOS-128, WMO/TD-No. 1488, http://www.wmo.int/pages/prog/gcos/Publications/gcos-128.pdf

[6] GCOS (2009): *GRUAN Implementation Plan 2009-2013*. GCOS-134, WMO/TD-No. 1506, July 2009 http://www.wmo.int/pages/prog/gcos/Publications/gcos-134.pdf

for collocating measurements, and the use of reference profile measurements for calibration and validation purposes. In turn, well-calibrated satellite instruments, such as IASI and AIRS, and the future CLARREO, can serve as travelling references for cross-comparison of profiles measured at GRUAN sites. There has been good collaboration with the GSICS programme in this regard.

At the first GRUAN Implementation – Coordination Meeting (ICM-1, 2-4 March 2009) details on the mode of operation for the network were discussed, including details of the observational strategy, data policy and data dissemination issues, and approaches to ensuring data quality. The second meeting of this kind (ICM-2) is scheduled for 2-4 March 2010 in Payerne, Switzerland, to further discuss these issues.

Within the WMO WIGOS initiative, a Pilot Project related to GRUAN has been established, focussing inter alia on the development of a GRUAN manual of operations, and on radiosonde intercomparisons in the framework of WMO CIMO.

3 CONCLUSIONS Suggested Recommendations:

- CGMS members to provide reports to the next session of CGMS on climate-related activities and plans in support of GCOS needs. These reports should include comments on the maturity index for climate data records under development by NOAA, as well as on the *Guideline for the Generation of Satellite-based Datasets and Products Meeting GCOS Requirements* (GCOS-128).

- CGMS members to review the draft updated GCOS Implementation Plan (IP-09) during the open review period November 2009 – February 2010 and send their comments to GCOS Secretariat.