CGMS-XXXIV
WMO WP-22
Prepared by GCOS
Agenda item: E.2

GCOS AND RELATED CLIMATE MATTERS

(Submitted by WMO for the GCOS Secretariat)

Summary and Purpose of Document

This document presents a summary of recent developments in the Global Climate Observing System (GCOS) programme and related climate matters that are particularly relevant to CGMS.

Action Proposed

The session is invited to note the information presented for discussion under Agenda Item E.

DISCUSSION

1. Satellite Requirements for Climate Products

The document 'S*ystematic Observation Requirements for Satellite-based Products for Climate*'[1] (the 'Satellite Supplement') was recently completed under GCOS leadership. This document was developed in response to the need to provide more detail for many of the actions and products identified in the 'GCOS Implementation Plan'[2], in particular for those products heavily dependent on satellite observations. It was prepared by GCOS in collaboration the World Climate Research Programme, the WMO Space Programme and a number of invited experts, as well as with the wider climate community through a two-month period of open review on the GCOS Web site.

The report identifies nine cross-cutting needs related to the provision of "Fundamental Climate Data Records (FCDRs)" from satellites and defines 35 products derived from these FCDRs. These climate products are based on relevant Essential Climate Variables (ECVs) in the atmospheric, oceanic and terrestrial domains, as defined in the GCOS Implementation Plan. The report presents detailed requirements for accuracy, stability and resolution of data records and products for climate. It also highlights opportunities for reprocessing of historical datasets, identifies current and future gaps in satellite data records, and stresses the importance of *in situ* data for calibration and validation.

The Satellite Supplement has provided input needed by the Committee on Earth Observation Satellites (CEOS) in leading the preparation of a coordinated response by Parties to the UNFCCC with earth observation space agencies, to the requirements of the GCOS Implementation Plan. Such a response[3] was requested by the Conference of the Parties (COP) to the UNFCCC in December 2004 through its decision 5/CP.10 and is being submitted to COP in December 2006 through its Subsidiary Body for Scientific and Technological Advice (SBSTA) at the 25th session. The document is presented to CGMS for information under Agenda Item E.2.

2. GCOS/WCRP Atmospheric Observations Panel for Climate (AOPC) – Twelfth Session

The Twelfth Session of the GCOS/WCRP Atmospheric Observation Panel for Climate (AOPC-XII) was held in Geneva, Switzerland from 3-7 April 2006. J. Schmetz informed the session of the response of CGMS-XIII to the recommendations from AOPC-XI in April 2005. At AOPC-XII, the following CGMS-relevant conclusions and recommendations were agreed:

33. The AOPC welcomed the positive response of CGMS-XXXIII to the recommendations of AOPC-XI. It noted in particular the actions being taken by CGMS members to take steps needed to make their archived satellite data usable for climate studies, recognizing the benefits of the iterative process between reprocessing of the data and reanalyses.

34. The AOPC reiterated the desirability of developing globally-consistent fields of atmospheric motion vectors and welcomed the progress being made by Eumetsat and JMA toward this end.

35. The AOPC welcomed the Global Space-based Inter-Calibration System (GSICS) initiative being developed under the leadership of CGMS and the WMO Space Programme. The goal of GSICS is to achieve operational inter-calibration of the

1 "*Systematic Observation Requirements for Satellite-based Products for Climate* - Supplemental details to the satellite-based component of the *Implementation Plan for the Global Observing System for Climate in Support of the UNFCCC",* GCOS-107, September 2006.
2 "*Implementation Plan for the Global Observing System for Climate in Support of the UNFCCC"*, GCOS-92, October 2004.
3 "*Satellite Observation of the Climate System* - The Committee on Earth Observation Satellites (CEOS) Response to the Global Climate Observing System (GCOS) Implementation Plan*"*.

space component of the World Weather Watch's Global Observing System that addresses the climate, weather forecasting and other environmental needs of WMO Members. GSICS also includes requirements for reference sites to validate satellite observations. The Panel offered to cooperate in this effort and looked forward to an update on progress at its next session.

36. The AOPC recommended the continuation of international evaluation and benchmarking activities of existing geophysical products, notably surface albedo and the retrieval of cloud and aerosol properties.

37. The AOPC welcomed the pilot project carried out by Eumetsat to derive a spatially-consistent land-surface albedo product from five different geostationary satellites over a limited time period, with a view to subsequently inviting other satellite operators to share the load of carrying out the work needed to process the entire data record. It commended this as a model approach to developing the globally-consistent climate records needed for all parameters and encouraged its continuation.

38. Recognizing the benefits of hyperspectral IR sounders for generating climate data sets, the AOPC emphasized the desirability of ensuring the availability of sufficient instruments to allow the determination of diurnal variability in these products.

39. The AOPC commended the progress being made at the Eumetsat Climate Monitoring Satellite Application Facility (CM-SAF) and expressed its appreciation for the opportunity to interact closely with the SAF through participation in its regular user consultation workshops. The Panel noted in particular the product intercomparison activities being carried out through various workshops and working groups and strongly encouraged their continuation. It also welcomed the close interaction between the CM-SAF and other related SAFs in the SAF network.

40. The AOPC expressed its support for the objectives of the CM-SAF Continued Development and Operations Phase (CDOP) for 2007-2012. It welcomed especially the planned backward extensions in time and spatial extension to global scale for many of its products, in accordance with recommendations from the joint Eumetsat/GCOS/WMO workshops in 2004 and 2005.

3. GCOS Reference Upper-Air Network

Over the last two years, GCOS has collaborated with NOAA to pursue the issue of the possible establishment of a reference network for high-quality measurements of atmospheric upper-air parameters. The GCOS effort is being led by the AOPC Working Group on Atmospheric Reference Observations (WG-ARO) under the chairmanship of Peter Thorne. Such a network was called for in the GCOS Implementation Plan (GCOS-92, October 2004) and would aim to provide long-term, very high-quality observations from a limited number of sites to supplement measurements obtained from the GCOS Upper-Air Network and other observing systems. Early steps in this effort included a NOAA/GCOS workshop held in Boulder, USA, in February 2005 to 'Define Climate Requirements for Upper-air Observations'. This was followed in 2006 by a workshop on 'Reference Upper-Air Observations for the Global Climate Observing System: Potential Technologies and Networks', held in Seattle, USA from 22-24 May 2006. That workshop has led to the proposal for a GCOS Atmospheric Reference Observations Network (GARON) of 30-40 stations, the details of which are presented in the workshop report. The report is entitled 'GCOS Atmospheric Reference Observations Network: Justification, requirements, siting and instrumentation options' and was made available for open review to the broad atmospheric sciences community through mid-October. Review comments will have been collected and incorporated into final version and proposal by the time of CGMS-XXXIV. The summary of the report-for-review is included below, for the information of and potential comment by CGMS members.

"Shortcomings in the current upper-air measurement network design and implementation greatly limit the accuracy and detail with which it is possible to specify how climate has varied and changed above the surface. This lack of knowledge impacts our ability to predict climate change accurately and hence has potentially serious consequences for, amongst others, water resources, human health, energy management, communications, transportation, financial infrastructure, and economic growth. Foremost, an atmospheric reference observations network is required to make the observational networks "fit for purpose" and hence to provide long-term data sets that can be used reliably to monitor and detect emerging signals of global and regional climate change. Specifically, the network is required to: provide long-term high quality climate records; constrain and calibrate data from more spatially-comprehensive global observing systems (including satellites); and characterize the full properties of the atmospheric column. Two recent GCOS/NOAA workshops and associated activities have been undertaken to develop a set of proposals to take forward. These have led to a set of requirements, a clear siting rationale and a strawman observational implementation plan to meet the requirements in a step-wise manner. There is a pressing need to implement such a network as soon as possible. Moreover, more rational network design and operation may provide savings through elimination of redundant activities."

4. GCOS Steering Committee – Fourteenth Session

The Fourteenth Session of the GCOS Steering Committee (Geneva, Switzerland, 10-12 October 2006) will have been completed by the time of the CGMS-34 session. Results of the session relevant to CGMS will be provided in a subsequent addendum to this paper and/or presented at the session.

5. WCRP Issues

As part of its overall strategy, the World Climate Research Programme (WCRP) will continue to design, initiate and test new elements of observing systems as well as develop comprehensive models for predicting future climate. However, WCRP does not have the capability to maintain these systems on an ongoing basis from the short-term research projects and funds that comprise and underpin it. For these ongoing climate observing needs, WCRP depends on GCOS. WCRP collaborates closely with GCOS in order to ensure that its needs for long-term continuous observations are well taken into account, for example in the GCOS Implementation Plan and in supplemental documents such as the latest report on "*Systematic Observation Requirements for Satellite-based Products for Climate*" (see paragraph 1).

The Joint Scientific Committee of WCRP re-affirmed in 2006 the importance of WCRP-GCOS coordination and mutual support in responding to the needs of the UNFCCC/COP for information and support in respect of research and systematic observation. It agreed to the suggestion by GCOS to emphasize the need for close WCRP-GCOS co-operation in input to satellite operators and GEOSS bodies regarding climate observations for research. The prime body for this coordination is the recently established WCRP Observation and Assimilation Panel (WOAP), where GCOS is represented by its three panel chairs. At its most recent session (28-30 August 2006, Ispra, Italy), the WOAP made several recommendations that are relevant to this meeting. In particular, the Panel:

- considered the "CEOS response to GCOS IP" an important initiative, which may impact future GCOS and WCRP activities, and recommended that WCRP (through WOAP) should take part in any further consultation mechanism to be organized on this matter;
- decided to prepare a letter to space agencies to complement WCRP strategic views expressed last year through CEOS, including stressing the issue of the consequences of NPOESS de-scoping for climate observations;

- re-affirmed the importance for the scientific community of re-processing and improving fundamental climate data sets, and of developing an internationally coordinated programme of global reanalyses.

Three other items in WCRP's recent activities can be mentioned in the context of this meeting:

- WCRP supports under the "GEO" umbrella a number of actions with respect to the development of global data sets and reanalyses. This includes continued effort on global climate research data sets, participation in a recent workshop on atmospheric reanalysis (organized in June 2006 by ECMWF), the formation of a working group on the "development of improved observational data sets for reanalyses", and the proposed sponsoring of a Third International Reanalysis Conference" to be hosted by the Japan Meteorological Agency in Tokyo at the beginning of 2008.
- the UNFCCC and its SBSTA have become increasingly engaged with research requirements for climate change. At the request of SBSTA, WCRP prepared a statement on research gaps for SBSTA 24 (Bonn, May 2006), participated in the "official" side event on research gaps and held an additional side event on WCRP research. WCRP highlighted observational requirements as the first of its priorities as well as several other research gaps.
- in June 2006, WCRP organized a workshop on "Understanding Sea-Level Rise and Variability", hosted by IOC at UNESCO in Paris. A number of the research recommendations relate specifically to observing system requirements, including an open data policy, support in retrieving historical data, and adherence of satellite and in situ observing systems to the GCOS Climate Monitoring Principles.

5. Conclusions

GCOS welcomes the continuing cooperation with CGMS and its members in defining and establishing the satellite component of the GCOS baseline networks, including the observational infrastructure and the development of the integrated global climate products needed by its users. It looks forward to continuing and expanding this cooperation.

The session is invited to take note of the information contained in this report.