



ICSU
International Council for Science

**Summary Report and Recommendations
from the
Eighteenth Session of the GCOS/WCRP
Atmospheric Observation Panel for Climate
(AOPC-XVIII)**

May 2013

**GCOS – 169
WCRP 7/2013**



© World Meteorological Organization, 2013

The right of publication in print, electronic and any other form and in any language is reserved by WMO. Short extracts from WMO publications may be reproduced without authorization, provided that the complete source is clearly indicated. Editorial correspondence and requests to publish, reproduce or translate this publication in part or in whole should be addressed to:

Chairperson, Publications Board
World Meteorological Organization (WMO)
7 bis, avenue de la Paix
P.O. Box 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

NOTE

The designations employed in WMO publications and the presentation of material in this publication do not imply the expression of any opinion whatsoever on the part of WMO concerning the legal status of any country, territory, city or area, or of its authorities, or concerning the delimitation of its frontiers or boundaries.

The mention of specific companies or products does not imply that they are endorsed or recommended by WMO in preference to others of a similar nature which are not mentioned or advertised.

The findings, interpretations and conclusions expressed in WMO publications with named authors are those of the authors alone and do not necessarily reflect those of WMO or its Members.

This publication has been issued without formal editing.

TABLE OF CONTENTS

1	Opening of the Meeting	1
2	Report from the AOPC Chair.....	1
3	Report of the GCOS Director and Secretariat.....	2
4	World Climate Research Programme Perspective.....	2
5	GSN, GUAN and RBCN.....	3
6	CCI Issues	5
7	Atmospheric Composition	6
8	Other Atmospheric Networks and Issues.....	8
9	Marine Issues	12
10	Terrestrial Issues	13
11	Cryospheric Issues.....	13
12	Satellite Issues, Data and Products	14
13	GCOS Developments.....	18
14	Reanalyses	19
	Next session	21
	Annex I	23
	Annex II	29
	Annex III	33
	Annex V	35

(Intentionally Blank)

AOPC-XVIII
2-5 April 2013

Summary Report and Recommendations

1 Opening of the Meeting

Chairman Prof. Adrian Simmons opened the Eighteenth Session of the GCOS/WCRP Atmospheric Observation Panel for Climate (AOPC) on 2 April 2013, 1.45 pm, at WMO Headquarters in Geneva. The participants were welcomed by Mr Jeremiah Lengoasa, Deputy Secretary-General of WMO, who stressed the need to provide a dialogue between communities as the distinction between “weather” and “climate” is increasingly diminishing, e.g. with regard to polar questions and the increasing skills of seasonal to decadal predictions. He highlighted the good cooperation of this panel with other communities and mentioned the recent GCOS workshop on observations for adaptation as leading in the right direction.

The Chairman then reviewed the proposed agenda, inviting any changes or additions. This report provides a summary and recommendations arising from the Panel’s discussions rather than a full record of the meeting. The list of participants is provided in Annex I and the final agenda for the session is given in Annex II.

2 Report from the AOPC Chair

Prof. Simmons continued to serve as AOPC Chairman, as well as Chairman of the GCOS Steering Committee (SC) during the past year. Referring to his supporting document, he particularly raised the integrating role of the World Climate Research Programme (WCRP) Data Advisory Council, where GCOS is represented by its Panel Chairs. Prof. Simmons mentioned the mismatch in how certain language is being used for example by the metrological community and in the context of numerical weather prediction (NWP). There is a need for clarification of terms such as “systematic error” if used in future GCOS documents. Prof. Simmons also mentioned the growing importance of Digital Object Identifiers (DOIs), which will also help to develop better referencing for different versions of data sets. Finally, he explained the plans for preparing a *‘Third Adequacy Report’* on the status of the global observing systems for climate in support of the United Nations Framework for Climate Change (UNFCCC) in 2014-15 to be followed by a new Implementation Plan in 2016.

2.1 Update of WMO Observing Requirements Database

Prof. Simmons opened the discussion on the role of the GCOS Panels in updating the WMO Observing Requirements Database as requested by the WMO Space Programme. The Rolling Review of Requirements (RRR) Database¹, which is managed by the WMO Space Programme, details user requirements for space-based or surface-based observations. The database has been supplemented by a ‘space-based capabilities’ module in 2012. Eventually, a surface-based observing capabilities module is also intended to be established.

Actions and recommendations:

1. AOPC recalled that the quantitative requirements for observations of atmospheric variables for climate purposes set out in the WMO Observing Requirements

¹ The RRR database is accessible online: <http://www.wmo.int/oscar>

Database had not been amended since 2007, and noted that recent discussions at the WCRP Data Advisory Council (WDAC) and the Terrestrial Observation Panel for Climate (TOPC) had questioned the value for climate purposes of the table of requirements, at least in its current form. For the areas covered by GCOS, the adequacy and progress reports, implementation plans and satellite supplements prepared by the programme provided the so-called Statements of Guidance. The Panel also noted that both the Global Atmosphere Watch (GAW) programme and GCOS set requirements for atmospheric composition variables in the database.

2. AOPC recognized that the Requirements Database was considered helpful by network managers and by space agencies for their initial mission planning. The Panel noted that the documents providing the Statements of Guidance would be renewed in the coming three years. It concluded that the AOPC requirements in the database could remain unchanged until documents were updated, and that the GCOS Secretariat and AOPC Chair should update qualifying text in the database to reflect this. In the meantime, opportunities should be explored for revising database entries to include a requirement for stability, and to relax the need to specify three levels of requirement, so entries could be mapped from the format used in the 2011 version of the Satellite Supplement to the GCOS Implementation Plan. Rationalisation of responsibilities for entries could also be considered, to avoid duplication and possible inconsistency.

3 Report of the GCOS Director and Secretariat

Dr Carolin Richter, Director of the GCOS Secretariat, introduced the new staff members of the GCOS Secretariat, namely Mr Tim Oakley of the UK Met Office, who was appointed as GCOS Implementation Manager after Mr Richard Thigpen retired at the end of 2012, and Ms Jessica Holterhof, who joined the Secretariat as Junior Professional Officer supported by Germany. Furthermore, Mr Dan Muller was seconded from the US National Oceanic and Atmospheric Administration (NOAA) Satellite and Information Service for two months. Another secondee, Mr Stefan Rösner of the German Meteorological Service, had just returned after spending six months at the GCOS Secretariat.

Dr Richter briefed the Panel on the Secretariat's activities during the intra-session period, in particular on the current review of the GCOS programme by its sponsors, which has just started and is expected to continue until the first quarter of 2014.

Actions and recommendations:

3. AOPC further discussed the merits of attendance of a GCOS representative at the Intergovernmental Panel on Climate Change (IPCC)'s final meeting for the Fifth Assessment Report of Working Group 1 in Stockholm. Noting the role played by the previous Steering Committee Chair in 2007, and the formal observer status now afforded to GCOS, attendance was considered appropriate.

4 World Climate Research Programme Perspective

Dr Michel Rixen from the WCRP Secretariat informed the Panel on recent and upcoming activities, presenting in particular the WCRP integrating themes. Key topics for the upcoming three to seven years are also the cross-cutting themes with foci on: regional climate information; sea-level rise and regional impacts; the cryosphere in a changing climate; changes in water availability; clouds, circulation and climate sensitivity; and science underpinning the prediction and attribution of extreme events. He announced the International Conference on Regional Climate - CORDEX 2013, taking place 4 – 7 November 2013 in Brussels, Belgium, and the next reanalysis conference, planned for the

2016-2017 timeframe. Underlining the trend for new observing requirements, he explained the need to evolve from climate models to Earth system models (including ocean, land, cryosphere, stratosphere, biosphere, etc.), from global climate models to regional climate models and towards models to address impacts, vulnerability, adaptation and mitigation plans. To this end, increased resolution, consistency, and data quality are essential. Dr Rixen summarized that as observations are indispensable in climate research and prediction, sustained support and collaboration by GCOS and its Panels is needed to maintain and improve existing networks, to add new measurements for improvement of climate predictions, and to promote open and unrestricted access to observations for research.

Actions and recommendations:

4. AOPC stressed the importance of dataset assessment and intercomparison, and welcomed the WCRP Data Advisory Council's attention to this issue, in particular for the establishment of best practices. The Panel nevertheless recognized that alternative datasets often had different strengths, weaknesses and applicabilities, and cautioned against assigning overall rankings of datasets that could be misinterpreted by either end-users or the funders of dataset production. In particular funders should be reminded of the fundamental scientific value of having several complementary sustained dataset efforts for different ECVs and observing techniques.

5 GSN, GUAN and RBCN

5.1 Monitoring of network performance and report from the Analysis and Archive Centre

Dr Bruno Rudolf from the German Meteorological Service, Deutscher Wetterdienst (DWD), who attended on behalf of Dr Andreas Becker, Mr Nozomu Ohkawara from the Japan Meteorological Agency (JMA), and Dr Peter Thorne of the Cooperative Institute for Climate and Satellites, North Carolina, USA, who attended on behalf of Dr Matt Menne, reported on performance monitoring of the GCOS Surface Network (GSN), the GCOS Upper-Air Network (GUAN), as well as the WMO Regional Basic Climatological Network (RBCN).

Actions and recommendations:

5. AOPC expressed its gratitude to DWD and JMA for their continued monitoring of the receipt and quality of CLIMAT messages, and for their coordinated reporting of results. The Panel encouraged the Monitoring Centres to extend their activities to include monitoring of CLIMATs in BUFR format, as well as from RBCN stations. It also expressed interest in seeing multi-year time series of quality-control information, to supplement the time series showing amounts of data. AOPC recommended that when messages were corrected for apparent common errors, the original message should be retained in addition to the corrected message.
6. AOPC noted that annual GSN CLIMAT data receipts from the Global Telecommunication System (GTS) have been about the same for the last few years, and that the number of GUAN stations meeting minimum performance requirements had increased slightly. AOPC also noted that there were several bilateral and international agreements for large national contributions of daily data that include automated mechanisms for updates and periodic "refreshing" of historic data. The Panel encouraged establishment of more of these agreements.
7. AOPC was pleased to be informed that the forthcoming version 2 of the Integrated Global Radiosonde Archive (IGRA) would contain substantially more data than held in version 1 of IGRA.

8. Noting that the GCOS SC had asked AOPC to keep under review the question of the need for a global surface reference network, the Panel was interested to learn that an article on the US Climate Reference Network was published in the April 2013 issue of the Bulletin of the American Meteorological Society².

5.2 CBS Lead Centres Activities

Meeting participants were updated by the GCOS Implementation Manager Mr Tim Oakley on issues concerning the Commission for Basic Systems (CBS) Lead Centres for GCOS and related climatological data. The forth bi-annual coordination workshop of the CBS Lead Centres will take place from 8-10 October 2013, hosted by the Lead Centre for South America in Chile.

Actions and recommendations:

9. AOPC was disappointed to learn that few annual reports had been received to date from the CBS Lead Centres for GCOS. The Panel decided to discuss the working of the lead-centre system at its next session. This would take into account input from the Implementation Manager, following his attendance at the upcoming meeting of Lead Centres, to be hosted by Chile.

5.3 CIMO Activities

Dr Isabel Ruedi from the WMO Observing and Information Systems Department briefed the Panel on current activities under the auspices of the Commission for Instruments and Methods of Observation (CIMO). These were in particular the newly introduced CIMO site-classification scheme and plans for “sustained performance classification” of observations, taking into account the status of instruments and their maintenance. She further reported on the Solid Precipitation Intercomparison Experiment (SPICE) measurement campaign.

Actions and recommendations:

10. AOPC expressed its appreciation for the presentation on CIMO activities of particular relevance to AOPC and voiced its support for these activities. The Panel highlighted the importance of metadata in general, and in particular reiterated its 2012 recommendation to encourage National Meteorological and Hydrological Services (NMHSs) to implement the CIMO classification at their sites, especially for GSN stations.
11. Following discussions arising from the information provided on the SPICE campaign, AOPC concluded that instrument intercomparisons in general should focus not only on the performance of new, improved types of instrument, but should, where practical, compare also with types of instrument used in the past, so that information may be gathered to assist in the homogenization of data records. A small supply of appropriate consumables should be retained for use in later intercomparisons.

5.4 Report from AGG

Prof. Phil Jones presented the results from the discussions of the Advisory Group on GSN and GUAN (AGG). The AGG had met in the morning of 2 April 2013, prior to the AOPC session. Its report is attached as Annex III.

Actions and recommendations:

12. AOPC endorsed in general the conclusions of the AGG. In particular, it supported the sending of a one-off letter to all operators of GSN and GUAN sites. The letter would remind operators of their commitments, promote implementation of the CIMO siting

² Diamond et al., 2013 <http://dx.doi.org/10.1175/BAMS-D-12-00170.1>

classification and call for the submission of all historic data, including from any parallel operations, to the Archive Centre.

13. AGG had recalled that the GSN and GUAN were designed in the mid-1990s. AOPC concurred with AGG that the purposes and functioning of these networks should be reviewed, and discussed arrangements for holding an expanded meeting on network issues immediately prior to next year's full session of the Panel. Conclusions and proposals could then be embodied in the subsequent new Adequacy Report and Implementation Plan.
14. AOPC was informed in the context of its discussion of the design of the GSN and GUAN that the WMO Integrated Observing System (WIGOS) is re-designing WMO networks, and that GCOS was welcome to nominate experts to participate in respective WIGOS task team. Representation of GCOS in this work was strongly supported by AOPC.
15. AGG had discussed how communication issues were often the cause of poor data receipt, but that it could be difficult to locate the bottleneck. AOPC agreed that it is important to determine whether communications is the issue before approaching apparently non-reporting sites. In view also of a recent decoding issue, the European Centre for Medium-Range Weather Forecast (ECMWF)'s reporting of GUAN sonde receipts should be checked routinely against the receipts of another centre, as is accomplished for the GSN by having two monitoring centres, DWD and JMA.

5.5 GSN and GUAN System Improvement Activities

Being new in his position as Implementation Manager, Tim Oakley delivered a presentation on projects to revitalize upper-air and surface network stations undertaken through the GCOS Cooperation Mechanism (GCM) in the past, and raised the questions of prioritization and giving higher attention to sustainability of observations on the long-term when funding projects.

Actions and recommendations:

16. AOPC noted the argument that support programmes, such as that under the GCOS Cooperation Mechanism, should plan for a much longer term of support, including calibration, spare parts etc., perhaps for a minimum period as long as ten years; it could be better to fund only a fraction of stations, but ensure that they operate for a considerable time. This would be considered as part of a wider re-evaluation (see item 5.4) of the purposes and operation of the GSN and GUAN, and of their technical support.

6 CCI Issues

6.1 Report from CCI Representative

Prof Manola Brunet, co-Chair of the Commission for Climatology (CCI) Open Panel of Experts on Climate Monitoring and Assessments (OPACE2), presented issues related to CCI, with inputs from Mr William Wright, co-Chair of the Open Panel of CCI Experts on Climate Data Management (OPACE 1). Topics of relevance to AOPC were best-practices for climate data management, climate normals, status and progress of the Task Team on National Climate Monitoring Products, outcomes from the Task Team on Definitions of Extreme Weather and Climate Events and conclusions from the Rapporteurs on World Weather and Climate Extreme Records.

Actions and recommendations:

17. AOPC thanked Prof. Brunet for her comprehensive and interesting account of a number of important CCI activities. In welcoming the work of the task team on

national climate monitoring products, the Panel urged that, wherever possible, the observations utilized in the formation of the products should be made available as well as the products themselves. The Panel also queried whether 1981-2010 would be a better base period than 1971-2000 for these products, in view of the availability of better satellite data and more reanalysis products for the later period. It was informed however that the time lag in assembling digital records from observations for recent years could make this difficult for some countries.

6.2 WCDMP Activities

Dr Omar Baddour of the WMO Observing and Information Systems Department briefed meeting participants on activities of the World Climate Data and Monitoring Programme (WCDMP).

Actions and recommendations:

18. AOPC thanked Dr Baddour for his report discussing the six focus areas of the World Climate Data and Monitoring Programme (WCDMP). The Panel was pleased to learn of the progress being made in data recovery, particularly for Africa, and interested to hear the summary of the climate data management meeting held recently in Nanjing, China. AOPC had previously endorsed initiatives for earlier supply of World Weather Records (WWRs), so welcomed the issue of a letter by the Secretary-General of WMO calling for records for 2011 and 2012, as well as the decadal records for 2001-2010, and gap-filling for the decade before that. The Panel also expressed its appreciation for the production of the annual WMO statement on the status of the global climate.

6.3 Daily CLIMAT Messages

On behalf of Dr Jay Lawrimore from the Analysis and Archive Centre at NCDC and responsible person for the CBS Lead Centre for North and Central America, the Caribbean and Hawaii, Dr Peter Thorne reported on progress made in developing new BUFR templates for CLIMAT messages to accommodate daily information. This information is needed as monthly CLIMAT data are insufficient for many measures of climate extremes, and daily summaries provided via SYNOP messages are also problematic due to different reporting intervals.

Actions and recommendations:

19. AOPC was pleased to see arrangements for reporting of daily climate observations moving forward quickly, following the recommendation made to CBS through its Implementation/Coordination Team on Integrated Observing Systems (ICT-IOS) agreed by the Panel during its 2012 session. The Panel was grateful for the efforts of NCDC in working with partners to develop this via BUFR-formatted messages. It encouraged approval by CCI, recognizing that tools and support for implementation would be needed. GCOS should promote implementation by the operators of GSN stations in particular.

7 Atmospheric Composition

7.1 Contribution by GAW

Dr Oksana Tarasova briefed the meeting participants about the WMO Global Atmosphere Watch (GAW) Programme's activities related to data acquisition regarding the GCOS Essential Climate Variables (ECVs) for atmospheric composition. In particular, she reported on ozone profiles, greenhouse gases and aerosols, as well as progress of the GCOS

baseline and comprehensive networks for Ozone, CO₂-CH₄ and N₂O. Dr Tarasova stressed that in the current difficult context of reduced or diminishing funding to support observing systems, applying science for services is most important.

Actions and recommendations:

20. AOPC thanked Dr Tarasova for her presentation on the progress made by WMO/GAW and the international community regarding global greenhouse gas, aerosol and ozone observations for climate. The Panel was interested to learn of the emerging proposal for an Integrated Greenhouse Gas Information System (IGIS). In noting the proposed engagement of bodies from the global international community, the Panel also stressed the need to engage with regional activities such as developed under Europe's Copernicus Programme and other European initiatives. It looked forward to a future update on the development of IGIS.
21. AOPC appreciated the continuing work towards a proposal for formal recognition by GCOS of a surface network for aerosol optical properties and a vertical profile network based on the composite GAW Aerosol Lidar Observing Network (GALION). The Panel also welcomed the work undertaken towards establishment of an international network of ceilometers, which can provide measurements for detecting aerosols in general and especially for volcanic ash layers, in addition to measurements of cloud base height.
22. AOPC acknowledged the paramount importance of GAW activities on QA/QC and training, performed through the GAW central facilities that ensure the stability of the calibration scales for the whole network and through the world calibration centres that ensure traceability of measurements to the primary scale. These activities are a direct application of the GCOS Monitoring Principles.
23. AOPC stressed the need to strengthen links between those developing products on atmospheric composition from satellite data and those undertaking the *in situ* and ground-based remote-sensing measurement and analysis activities, highlighting the importance of integrated products. The Panel also encouraged the partnering of GRUAN with GAW for aerosol properties, in particular with regard to traceability.
24. AOPC expressed regret at the discontinuation of greenhouse gas measurements from NOAA ship transects and ten land-based sites worldwide, but was pleased to learn about six newly accepted GAW stations performing continuous *in situ* measurements. The Panel was also pleased to be informed that some threats to ozone measurement that had caused concern at its last meeting have been averted.

7.2 Report from the World Data Centre for Greenhouse Gases

Mr Nozomu Ohkawara reported on the World Data Centre for Greenhouse Gases (WDCGG), which is hosted by JMA and one of the seven GAW World Data Centres.

Actions and recommendations:

25. AOPC thanked Mr Ohkawara for his interesting presentation. The Panel was impressed by the growth of data submissions from both fixed and mobile platforms. It welcomed the statistics presented on data downloads, which showed a substantial growth over time, and the emerging use of the WMO Information System (WIS). AOPC was concerned by the dearth of ship measurements over the Indian Ocean in the WDCGG, and looked forward to clarification from the Ocean Observations Panel for Climate (OOPC) as to whether this represented a lack of observation or a lack of submission of data that had been taken.

7.3 WCRP SPARC Perspectives (including Data Initiative)

Prof. Johannes Staehlin, representative from the Stratospheric Processes and their Role in Climate (SPARC) initiative, presented recent developments within this WCRP core-

programme. He explained the slightly shifted mandate of SPARC, which has been expanded also for tropospheric research to look at the interface between stratosphere and troposphere. Currently, the SPARC initiative comprises eleven activities, with the focus on key variables and their long-term trends.

Actions and recommendations:

26. AOPC appreciated the update on SPARC activities. The Panel noted that conclusions from the recent SPARC workshop on data requirements should feed into the wider GCOS assessment of requirements and implementation planning to be undertaken over the next three years. It welcomed engagement of the UK Met Office and reanalysis experts in the activities of the SPARC Temperature Trends group aimed at resolving discrepancies between Met Office and NOAA processings of the Stratospheric Sounding Unit (SSU) data record.
27. AOPC was pleased to learn of the new assessment of stratospheric water vapour. The Panel noted the presentation's conclusion concerning the gap in vertically resolved water vapour observations in the upper troposphere and stratosphere expected for the coming decade, and repeated its previously-voiced concern over the lack of provision for future limb-sounding satellite missions suitable for sensing water vapour and other important trace gases.
28. AOPC was interested in being updated on progress with the SPARC Data Initiative, which had demonstrated reasonable consistency among satellite datasets on water vapour and good consistency among the satellite datasets concerning the vertical profile of ozone. It noted the challenge of estimating trends in the ozone profile, and was pleased to see progress in the merging of satellite records and the homogenization of ozonesonde data.

8 Other Atmospheric Networks and Issues

8.1 Report from GPCC

Dr Bruno Rudolf from the Global Precipitation Climatology Centre (GPCC) at DWD delivered a presentation on activities of the GPCC.

Actions and recommendations:

29. AOPC was pleased to see two peer-reviewed publications on the work of the GPCC, and welcomed the assignment of DOIs to individual datasets, a practice that GCOS encouraged dataset producers in general to follow. The Panel looked forward to seeing results from the HOMogenized PReipitation Analysis (HOMPRA). AOPC was also interested by the start in 2012 of acquisition, processing and trial analysis of daily precipitation data. It enquired whether the analysis would ensure that the daily values would be constrained to sum to give the same monthly values as one of the existing GPCC products.
30. AOPC acknowledged the important need for continuing efforts to increase GPCC's holdings of observational data, notwithstanding the progress that was being made. The Panel urged the WMO Secretariat to continue the support efforts for GPCC data acquisition in cases of problematic communication between GPCC and WMO Members. Activities under the WIGOS and WIS should also support improvement of the climatological precipitation record by addressing the important issues of availability of appropriate metadata and the transmission of data on the GTS, for which there was recognized to still be room for improvement despite the progress made over the years.
31. AOPC supported efforts by GPCC to find alternative ways of acquiring daily data, noting that GPCC is teaming up with activities within the Severe Weather Forecast

Demonstration Project (SWFDP) of WMO in order to facilitate data acquisition and rescue in African and Asian regions prone to extreme weather, and that other opportunities may arise through GPCC's participation in the forthcoming ERA-CLIM2 project.

8.2 Report on GRUAN

Dr Peter Thorne, in his capacity as co-Chair of the Working Group on the GCOS Reference Upper-air Network (GRUAN) provided an overview on progress in the establishment of this network.

Actions and recommendations:

32. AOPC was impressed by the continued good progress towards full establishment of the GRUAN, and thanked Dr Thorne and his WG-GRUAN and Lead-Centre colleagues for their hard work. The Panel was pleased to see the production of a new Implementation Plan and completion of the Manual and Guide. It gave its approval to publishing the latter as a joint GCOS/WIGOS document, and also agreed that the report of the fifth Implementation and Coordination Meeting (ICM-5) should be published as a GCOS document.
33. AOPC welcomed the ICM-5 discussion on the better formalization of the benefits of the GRUAN to the GUAN and GOS, and noted the ways identified in which GUAN sites could be helped by GRUAN developments and experience so as to be of greater value for climate purposes and more distinct from the radiosonde network at large. The Panel looked forward to any further discussion on this that might result from ICM-6 and that might inform the discussions to be had on the purposes and functioning of the baseline network.
34. AOPC regretted the loss of Nauru as a GRUAN site due to withdrawal of the US Department of Energy's Atmospheric Radiation Measurement (ARM) programme, but was pleased that Ny Ålesund had joined the network as the first certified contributing site, and that there were other potential new sites.
35. The possibility of a launch event at the 2014 session of the WMO Executive Council was raised. AOPC suggested that consideration be given to the alternative of holding an event at the 2015 session of WMO Congress. Also worthy of consideration in this regard was the World Weather WWRP Open Science Conference to be held in Montreal in August 2014 and the next session of CIMO.
36. AOPC considered the question of the viability, membership and suitable co-Chairs of a GRUAN metadata task team brought up in the presentation. It noted that the Inter-Commission Coordination Group on WIGOS (ICG-WIGOS) had set up a task team for metadata. It recommended that the GCOS Secretariat liaise within the OBS Department of WMO to ensure that GRUAN needs are taken into consideration in the WIGOS task team's work. The need and arrangements for any additional GRUAN task team on metadata could be reconsidered once the extent of the WIGOS task team's activities was known.
37. AOPC recalled its earlier concern at the size of WG-GRUAN, and noted that this had been discussed by the WG, which had recognized the issue, but felt that it was working well, with very few truly silent members. The WG would, nevertheless, revisit the issue periodically. AOPC also recalled that the meeting on GRUAN governance held in January 2012 agreed that relevant Technical Commissions of WMO should be represented on the WG-GRUAN. AOPC was thus disappointed to learn that neither CBS nor the Commission for Atmospheric Sciences (CAS) had been represented at the two subsequent GRUAN Implementation-Coordination Meetings (ICMs). The Panel asked the GCOS Secretariat to remind these commissions of the governance arrangements.

8.3 GNSS-PW Measurements for Climate

Dr Junhong Wang provided a scientific lecture on the development in Global Navigation Satellite System (GNSS) observations of precipitable water (PW) and its application for climate monitoring and research.

Actions and recommendations:

38. AOPC thanked Dr Wang for her presentation, and took note with interest of the role that GNSS-PW data can play in the validation of humidity data from radiosondes and reanalyses, and the use of the data for studying long-term variations. The Panel also appreciated being informed of the contribution of GNSS-PW data to the GRUAN and of the activities of the GRUAN task team devoted to this type of measurement. It expressed its support for these activities.
39. AOPC discussed the question raised in both the GRUAN and GNSS-PW presentations of how to formalize the proposed role of the Geoforschungszentrum Potsdam (GFZ), Germany, as the centralized processing centre for GRUAN GNSS-PW data, noting that several new GRUAN data streams and processing centres were envisaged over coming years. A direct agreement between GCOS and GFZ was not considered appropriate. Rather, an agreement should be sought between the Lead Centre for the GRUAN and GFZ. GCOS should provide a letter of support for the arrangement from an international perspective if required.

8.4 Earth Radiation Budget and BSRN

Dr Martin Wild, who is a member of the Baseline Surface Radiation Network (BSRN) working group, informed the meeting on recent scientific findings with respect to the Earth Radiation Budget, as well as on the status of the BSRN. Special attention was given to the future perspective of individual sites, where the funding situation is unsecure.

Actions and recommendations:

40. AOPC thanked Dr Wild both for the technical information he provided on the status of the BSRN and for the excellent scientific overview he provided on the results derived from the measurements and the lessons learnt for atmospheric modeling. The Panel expressed its sadness at the passing away in October 2012 of Ellsworth Dutton, who had been project manager for the BSRN for twenty years and whose memory was well served by the success of the BSRN made evident in Dr Wild's presentation. The Panel recalled earlier contributions of Dr Dutton to its work, and offered its best wishes to Dr Joseph Michalsky who was currently serving as interim project manager.
41. AOPC was pleased to see a continued increase in the number of stations in the network, and appreciated the continuation of archiving activities by the Alfred Wegener Institute, which had been designated as a Data Collecting and Production Centre (DCPC) of the WIS. The Panel noted however that some stations had been lost or were at risk. Its discussions centered on three sites:
Chesapeake Lighthouse: BSRN observations had ceased due to renovation of the lighthouse, and it was not clear whether they would be resumed, moved to a nearby site or terminated completely. GCOS should provide a letter of support for continued observation, should one be needed once the situation becomes clearer.
Nauru: The ARM programme would cease operations at the site in September 2013, but much infrastructure would remain. The GCOS Secretariat should liaise with the acting project manager and current site scientist Chuck Long to determine the situation and the potential for the BSRN station to be run for the long term under other arrangements or whether it was feasible to move the station to a nearby site. Depending on the outcome, support from the GCM could be considered.

Ilorin: It was reported to last year's session of AOPC that this site in Nigeria had been a candidate for support from the GCM using funds provided by Germany for a solar power system. The GCOS Secretariat should clarify the current situation and inform AOPC accordingly.

42. AOPC also noted and queried the cause of the 6 Wm^{-2} multi-model mean bias, and more than 20 Wm^{-2} inter-model spread, in the surface downward long-wave radiation of the CMIP5 models when compared with data from 41 BSRN sites.

8.5 International Surface Temperature Initiative

Dr Peter Thorne, in his second capacity as Chair of the International Surface Temperature Initiative (ISTI) updated AOPC Members on progress of this initiative.

Actions and recommendations:

43. AOPC thanked Dr Thorne for his presentation. The Panel was very interested to see the progress that had been made. It noted the substantial increase in the amount of data that has been made available for analysis, and appreciated being shown early results from such analysis. Although this indicated little change to estimates of global trends, significant local changes were emerging.
44. AOPC also welcomed the new project to build a database of the parallel measurements needed to study daily inhomogeneities under the leadership of Dr. Victor Venema.
45. Noting that support had been given by CCI and WCRP, as well as GCOS when the ISTI had been launched, and that it was desirable for there to be renewed national contacts for local verification of the merged database and to find new data sources, AOPC requested the GCOS Secretariat, in liaison with its CCI and WCRP counterparts and with Dr Thorne, prepare a letter to Permanent Representatives (PRs), with copy to be sent to national focal points. In addition to requesting feedback on the merged database and any additional observational data that could be found, the letter should explain how the initiative was now beginning to make data and information available to the countries in return. It should also draw attention to the new activity collecting parallel measurements, and call for any national data holdings that would contribute to this project to be made available.

8.6 Capacity Building and Twinning for Climate Observing Systems

Dr Gabriela Seiz, Swiss National GCOS Coordinator and Head of the International Affairs Division at MeteoSwiss, introduced the Capacity Building and Twinning for Climate Observing Systems (CATCOS) project. MeteoSwiss, in cooperation with the Swiss Agency for Development and Cooperation (SDC) and under the umbrella of the UNFCCC Fast-Start Financing mechanism, has developed this concept to establish partnerships between observing stations.

Actions and recommendations:

46. AOPC appreciated learning of this Swiss national initiative supporting observation of aerosols and greenhouse gases and glacier monitoring in partner countries, and thanked Dr Seiz for her presentation. The Panel noted that an emphasis had been placed on training, and the linking of the atmospheric measurement sites with the GAW programme and the terrestrial activities with the World Glacier Monitoring Service (WGMS). This plus the MoUs negotiated prior to the provision of support were seen as ways of promoting sustained operations beyond the lifetimes of the development projects.
47. AOPC recognized the value that is provided by bi-lateral funding initiatives such as reported by Dr Seiz, and her conclusion that there were also future opportunities for improving observing systems through climate finance mechanisms. Some discussion

of the need for a more coordinated approach to this followed. It was recalled that the GCOS Steering Committee had also discussed this topic at its 2012 session and suggested that the Global Framework for Climate Services (GFCS) Office could play a role in improving coordination of funding for capacity development for climate observation and monitoring.

48. AOPC discussed the possibility of setting up a standard MoU with operators of GSN and GRUAN stations, and decided to consider this further as part of its general discussions concerning the future of these networks.
49. AOPC was shown a video entitled "GCOS Switzerland: Local observations - for global understanding" prepared by MeteoSwiss and available from its website³. The video was considered to be an excellent promotion of climate observation for the atmospheric and terrestrial domains, and the Panel suggested that the GCOS Secretariat provide a link to it from the GCOS website.

9 Marine Issues

9.1 OOPC

Dr Marc Bourassa, co-Chair of the re-established OOPC joined the meeting via teleconference. He delivered a presentation on the new mandate and planned activities of the Ocean Panel, stressing the intention to better connecting with the other Panels. Dr Bourassa also updated AOPC members on the status of implementing the Global Ocean Observing System (GOOS).

Actions and recommendations:

50. AOPC congratulated Dr Bourassa on his recent appointment as a co-Chair of OOPC, and thanked him for his presentation. It took note of the new arrangements for ocean panels under GOOS and the move of secretariat support from the Intergovernmental Oceanographic Commission (IOC) to WMO.
51. AOPC recalled that the GCOS Steering Committee had queried at its 2012 session the status of the drifting buoy network, as the number of observations had been dropping. The Panel was pleased to learn that new deployments were being undertaken to remedy the problem, which had arisen because of a reduction in buoy longevity following an attempt to save costs. The Panel was, however, concerned by the extent of non-reporting from the TAO moorings; here the problem was the cost of ship-time for servicing the network.
52. The Panel also noted the problems associated with US funding for the International Comprehensive Ocean-Atmosphere Data Set (ICOADS) and recalled its earlier discussion of the loss of NOAA ocean transects and land stations making greenhouse gas measurements.
53. AOPC recognized the importance of diversifying funding for components of the climate observing system that were of substantial global benefit. The importance of either continuity of observation or of appropriate overlaps in the case of change was stressed again. However, it would inevitably take time for a changed distribution of the funding burden to occur. In the meantime, AOPC urged that every effort be made to minimize the detrimental impact of current budgetary pressures on long-term programmes of climate observation.
54. AOPC welcomed the plan for an OOPC-sponsored workshop on the future of the tropical ocean observing system. It was informed that the envisaged timing was late this year or in the first half of next year. This would enable conclusions to be reflected in the GCOS' forthcoming Adequacy Report and Implementation Plan.

³ www.gcos.ch

55. AOPC appreciated Dr Bourassa's identification of areas of future work for OOPC that included links with AOPC. The Panel looked forward to future interaction with OOPC on these matters, in particular on reducing uncertainties in estimates of air-sea fluxes. It expressed interest in hearing the views of new members of OOPC on this topic once the reconstituted panel had met for the first time.

9.2 Marine Science Update

Dr D.E. Harrison provided a scientific lecture on his El Niño/La Niña–Southern Oscillation (ENSO) research.

Actions and recommendations:

56. AOPC thanked Dr Harrison for his interesting contribution on ENSO. The Panel noted his main conclusions as to the importance of multi-decadal variability and that trend estimates over limited periods can be highly misleading concerning long-term behaviour, based on analysis of multi-decadal variability and trends in the ~150-year Darwin sea-level-pressure index. It also noted that ENSO-linked anomalies in the Outgoing Longwave Radiation (OLR) were key indicators of atmospheric heating anomalies that brought about remote responses in temperature and precipitation.

10 Terrestrial Issues

10.1 TOPC

Dr Michel Vestraete, who is a member of AOPC as well as of the TOPC, provided a summary presentation on terrestrial domain issues on behalf of TOPC Chairman Prof. Konrad Steffen.

Actions and recommendations:

57. AOPC thanked Dr Verstraete for his brief presentation of matters discussed at the recent session of TOPC. The Panel noted that a number of the issues considered by TOPC had been or would be considered also at this session of the AOPC under other agenda items. Noting the general encouragement by GCOS for the use of DOIs, the Panel suggested that the GCOS Secretariat give the DOI paper presented to TOPC high visibility on the GCOS website.

11 Cryospheric Issues

11.1 EC-PORS & GCW

Dr Barry Goodison from the WMO Observing and Information Systems Department updated participants on activities of the WMO Executive Council EC Panel of Experts on Polar Observations, Research and Services (EC-PORS) and on the progress in establishing a Global Cryosphere Watch (GCW).

Actions and recommendations:

58. AOPC thanked Dr Goodison for the information provided in his presentation. Aside from the SPICE, which the Panel had considered earlier in the session, many of the developments reported related to variables that formally lay within the responsibilities of the terrestrial and oceanic panels, but were nevertheless of interest to AOPC both from a general climatic viewpoint and more particularly because of the sensitivity of atmospheric variables to the state of the underlying surface. Temperature observations from high-latitude and high-altitude cryospheric regions were a specific

interest of AOPC, and the Panel would look for improvement as a result of implementation of the GCW.

59. AOPC noted the invitation to review and comment on the Implementation Plan for the GCW, which was scheduled for finalization by the end of 2013, before the Panel's next session. Any comments members may have on the plan should be sent to the AOPC Chair for consolidation. AOPC also noted Dr Goodison's conclusion that updates were required for cryospheric matters identified in the Second Adequacy Report, and appreciated his comment that members of GCW bodies would be well placed to contribute to new report and implementation plan to be prepared by GCOS.
60. AOPC expressed some concern that nomenclature was being used in different ways by different communities, and that this could confuse potential funders. General agreement should be sought as to the characteristics of what is referred to as a baseline or a reference site. The Panel viewed this to be a topic that WIGOS should consider addressing.

12 Satellite Issues, Data and Products

12.1 Report from the GCOS Space Rapporteur

Dr Jean-Louis Fellous informed the Panel on relevant activities of space agencies and space coordination groups such as the CEOS Working Group on Climate.

Actions and recommendations:

61. AOPC thanked Dr Fellous for his presentation and work to ensure effective liaison between GCOS and the Space agencies on climate observation.
62. AOPC took note of the good progress made as a result of the CEOS Virtual Constellations Initiative. The achieved coordination and integration of space missions into a global observing system was seen as a good complement to the established coordination of operational meteorological satellites within the Coordination Group for Meteorological Satellites (CGMS). AOPC also noted that there are already good examples beyond coordination, such as the exchange of instruments between NOAA and EUMETSAT for their respective satellites, and the successive complementary altimetry missions (Jason 2 and 3, SARAL, CryoSat-2, FY-2, in the future Sentinel-3 and Jason-CS) contributed in collaboration by various space agencies and providing continuity in coverage and accuracy. Another current and promising example was the initiative to have a Chinese polar orbiter in the early morning orbit. Taking note of these successful examples, AOPC was encouraged to recommend to space agencies, as an aspirational activity, to consider working toward a coordinated and complementary planning of future satellite missions in the framework of the architecture for space-based climate monitoring.

12.2 Update on Progress of the ESA CCI

An update on progress of the Climate Change Initiative (CCI) of the European Space Agency (ESA) was presented by Dr Jean-Louis Fellous on behalf of Dr Roger Saunders.

Actions and recommendations:

63. AOPC thanked Pascal Lecomte and Roger Saunders for preparing a presentation on the CCI, and Dr Fellous for making the presentation. It looked forward to future updates as the CCI moved into its second phase.
64. AOPC stressed the great importance of preservation of the fundamental data records that underlie the CCI products and are the basis for other climatic applications of data from ESA satellites. The Panel urged ESA to continue to work towards long-term preservation and open access to all its Earth Observation data.

65. Widening its discussion, AOPC noted that expertise in satellite data and reanalysis production was under-represented in the author lists for parts of IPCC's Fifth Assessment Report, and recommended that GCOS use its observer status to advocate better representation from these communities in future IPCC assessments noting that the records and their scientific maturity were both increasing.

12.3 GEWEX Water Vapour Assessment

Dr Jörg Schulz, co-Chair of the WCRP Global Energy and Water Cycle Experiment (GEWEX) Data and Assessments Panel (GDAP), briefed participants on the assessment of water-vapour data products, which is proposed to be implemented through the use of metrics and indicators of maturity.

Actions and recommendations:

66. AOPC thanked Dr Schultz for his presentation. The Panel appreciated the efforts on assessment that had been made over the years by both the GEWEX and, as discussed earlier, the SPARC WCRP projects. It noted the substantial amount of time and effort needed to carry out the GEWEX Water Vapour Assessment, and a number of specific conclusions listed in the presentation. AOPC welcomed the continuing attention that was paid to assessment in general by the WCRP Data Advisory Council. The importance of adequate funding of the activity was re-stated.
67. In the light of its earlier conclusions under agenda item 4, AOPC was pleased to learn that the GEWEX Water Vapour Assessment placed emphasis on the strengths and weaknesses of particular products rather than a simple categorization of them. The Panel agreed that it is important to include producers as well as independent experts in such assessments, but that care had to be taken to ensure that conclusions provided information suitable for potential users of the data products, guarding against over-emphasis of producer-centric views of the details expected to be fixed in future products.
68. AOPC noted that GEWEX planned finalization of the report and peer-reviewed publication for late 2015, and that the principal results would be available sufficiently far ahead of this time for them to be taken into account in the planned GCOS report on progress and adequacy of the global observing system for climate.

12.4 Report from "Space week" meetings

Reports from the second two of the three meetings related to climate observation from space that were held at WMO during the week 18-22 February 2013 were covered earlier in the session in the report of the GCOS Space Rapporteur (item 12.1). In addition, Dr Simmons reported on developments related to inventory of climate datasets discussed during the first of the three space-week meetings. He noted that the GCOS Steering Committee and the WCRP Data Advisory Council had both previously endorsed a joint inventory project between GCOS and NCDC, following discussions between the former Chair of the WCRP Observations and Assimilation Panel (WOAP) and NCDC. Both had, however, also noted the need to link with the CEOS/CGMS/WMO questionnaire to space agencies related to ECV datasets. Progress with the latter was seen at the February meeting to have been substantial, and the responses formed a first version of the inventory for satellite-based datasets. Noting that the CEOS/CGMS/WMO activity seemed to provide the best resourced opportunity, the meeting had discussed the actions needed to establish the feasibility and implement the CEOS/CGMS/WMO infrastructure/database for *in-situ* as well as satellite-based datasets.

Actions and recommendations:

69. AOPC noted that there was a potential for multiple interfaces to the database and that GCOS and WMO would be responsible for soliciting contributions from *in situ*

dataset providers, with GCOS/WCRP panels such as AOPC playing a role in the overall assessment of the activity. The AOPC Chair had since been informed that wording of the CEOS/CGMS/WMO questionnaire was being reworked to cater for *in situ* datasets, and that NCDC's Global Observing Systems Information Center (GOSIC) now offered a metadata creation tool that enabled a user to enter information in plain text from which a metadata record compliant with ISO 19115-2 would be created.

70. AOPC noted the information provided and supported the development of a single inventory database, notwithstanding the expression of a few points and concerns. It looked forward to following developments and assessing progress at future sessions.

12.5 CEOS Response to the Satellite Supplement

Dr Mitchell Goldberg, who joined the session by teleconference, informed the Panel on the CEOS' Response to the 2010 Update of the GCOS Implementation Plan and the 2011 Satellite Supplement. He further briefed the Panel on the Joint Polar Satellite System (JPSS).

Actions and recommendations:

71. AOPC thanked Dr Goldberg for his presentation on behalf of himself and Mark Dowell of the CEOS Response. The Panel was grateful for the care and thoroughness that had gone into the Response, and noted that the authors expected it to help space agencies to plan their climate data programmes and the CEOS Working Group on Climate to define priorities.
72. AOPC noted that Dr Goldberg had called on AOPC to raise with CEOS any concerns it might have on the Response. Members should send any individual concerns to the AOPC Chair for consolidation.
73. AOPC was pleased to be informed that the CEOS Response is viewed to be a living document, to be updated periodically. As would be discussed later in the session, GCOS was considering streamlining the preparation of its new Implementation Plan scheduled for 2016 so that it included satellite (and *in situ*) product requirements in the plan itself, not in later supplements. Responding to the 2016 Plan would be less burdensome for CEOS if the current response was treated as a living document as the requirements for satellite data products were not likely to change considerably from those identified in the 2011 Supplement.
74. AOPC were grateful for the update on the status of the JPSS provided by Dr Goldberg. AOPC were pleased to learn of the good performance characteristics of the ATMS and CrIS sounding instruments and the environmental products from the VIIRS imager on Suomi NPP. The Panel was particularly grateful for Dr Goldberg's explanation of the risks to continuity of observation due to instrument- or platform-failure prior to launch of JPSS-1, which categorized the chance of a gap for at least one key instrument to be at the 30-40 % level. AOPC nevertheless stressed the importance of planning for mission overlap, as identified in the GCOS Climate Monitoring Principles and recommended by the 40th CGMS meeting (item 12.7). It regretted that the formal plan for NOAA's Polar (Primary) Operational Satellite Programs as of December 2012 showed a gap between operation of Suomi NPP and operation of JPSS-1.

12.6 EUMETSAT Climate Activities

Dr Jörg Schulz informed the Panel on climate-related activities of the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT).

Actions and recommendations:

75. AOPC thanked Dr Schultz for his update on the climate-related activities of EUMETSAT. The Panel welcomed the updating of EUMETSAT's Climate Monitoring Implementation Plan, and appreciated both EUMETSAT's own efforts on construction of fundamental climate data records and the work on the provision of products undertaken with its Member States through the Satellite Application Facility (SAF) mechanism, several examples of which were presented. The Panel also appreciated the support for reanalysis provided by EUMETSAT within the ERA-CLIM project, and looked forward to being updated at future sessions on the outcomes of EUMETSAT's continuing work within the ERA-CLIM2 and CORE-CLIMAX projects. It also acknowledged the role played by EUMETSAT in providing the Secretariat for the Sustained Coordinated Processing of Environmental Satellite Data for Climate Monitoring (SCOPE-CM) initiative.

12.7 Report on CGMS

Dr Johannes Schmetz reported on the 40th meeting of the Coordination Group for Meteorological Satellites (CGMS).

Actions and recommendations:

76. AOPC thanked Dr Schmetz for his report, which had covered many topics of relevance to AOPC.
77. AOPC welcomed the initiative to convene a CGMS tiger team to coordinate the technical evaluation of the global and regional impact of flying a FY-3 satellite in early morning orbit, in order to support the China Meteorological Administration (CMA) in the assessment process. The Panel underlined the importance of this activity for a sustained and robust space-based observing system for monitoring climate, in addition to supporting weather prediction.
78. AOPC offered support for the creation of a CGMS/CEOS climate working group to coordinate climate-related activities with CEOS in line with the work done for the preparation of the Architecture for Climate Monitoring from Space
79. AOPC noted that CGMS Members plan to set up the archives of historical data necessary for the generation of Climate Data Records (CDR), together with the relevant algorithm versions for products, and other metadata (e.g. spectral response functions) derived by operational and quasi-operational satellite algorithms. This should include the preservation of pre-1979 records. Access mechanisms needed to enable CDR generation by users would be provided and all archived records should be registered in the ECV inventory. AOPC strongly welcomed these activities and requested that it be kept updated on progress.
80. AOPC encouraged the planned enhancement of the operational derivation of winds from feature tracking in images from polar orbiting satellites. The sustained creation of such data sets will benefit future re-analyses. AOPC was pleased to note that NOAA was a partner in the SCOPE-CM project for deriving wind and clear-sky radiance products from historical satellites, in particular because re-derivation of winds from GOES satellites had yet to be undertaken. This was in contrast to the situation for European and Japanese satellites, from which reprocessed products were used in reanalysis.
81. AOPC gave its full support for reprocessing of radio occultation data to maximize their utility in anchoring climate reanalyses and encouraged completion as a matter of priority because of their potential to derive short-term climate trends of tropopause and lower to middle stratospheric temperatures with a high degree of accuracy.
82. AOPC acknowledged that for the Global Space-Based Inter-Calibration System (GSICS) to be fully operational, it was important that its activities be recognized by satellite operators as an integral part of their operational tasks. The Panel viewed

GSICS as one element of the integration of observing systems under WIGOS, and of particular relevance for climate monitoring.

13 GCOS Developments

13.1 Plans for Future Adequacy Report and Implementation Plan

83. AOPC agreed in general terms with ideas expressed for preparation of the new report on progress and adequacy and subsequent new implementation plan as set out in document 13.1.

13.2 ECV Publications

Dr Michel Verstraete presented a proposed outline for a paper on GCOS ECVs to be published as peer-reviewed article.

Actions and recommendations:

84. AOPC thanked Dr Verstraete for his presentation on this topic, and appreciated his personal commitment to it, in particular to his leading role in starting an overview paper on ECVs. The Panel endorsed plans for this paper, and suggested upper tropospheric humidity as one possible variable from the atmospheric domain to be used for illustrative purposes. It also noted that an article on the recent Observations for Adaptation workshop was under consideration.
85. AOPC also recommended that a journal paper or papers be produced following development of the next report on progress and adequacy.

13.3 Adaptation Workshop

Mr Daniel Muller presented the main conclusions from the Workshop on Observations for Adaptation to Climate Variability and Change, which was organized by GCOS in partnership with IOC and the UN Environment Programme (UNEP) and hosted by DWD at its headquarters in Offenbach, Germany, from 26-28 February 2013. The workshop had identified the following key needs to present existing information in forms of relevance to users:

- to develop information and products in close consultation with users;
- to invest in the ground-based network of primary hydro-meteorological observations;
- to establish and improve mechanisms to provide data access and data descriptions.

Common themes regarding observational requirements were the needs:

- for higher spatial and temporal resolution;
- to focus on regions where climate change will have significant effects on key sectors and where there are vulnerable populations;
- to develop infrastructure and governance to support sustained data rescue;
- to support research initiatives such as PROVIA and Future Earth.

Actions and recommendations:

86. AOPC thanked Mr Muller for his presentation and took note of the conclusions summarized above. The Panel was in agreement with workshop participants in recognizing that it would be appropriate to organize follow up workshops in cooperation with GFCS on specific requirements for some sectors.
87. AOPC took note of experience reported from UK national experience of the user interface. Users required daily or sub-daily historic weather data and projected data for the future. The latter were provided to them in the form of possible sequences of

future weather, which were used to drive impact models. Left to their own devices, users might express a wish for one definitive view of the future. The question that should be asked of them was not what you want but rather what are you using at present and what use you can make of what is available now, or potentially available.

88. AOPC also noted that countries could benefit from simply bringing their design codes and practices up to current or expected near-future conditions; as such design codes and practices may well be based today on climatological conditions as they existed several decades ago.

13.4 Update on WIGOS

Dr Wenjian Zhang, Director of the WMO Observing and Information Systems Department, updated the meeting on the implementation of WIGOS.

Actions and recommendations:

89. AOPC took note of the significant role played by aircraft data in today's composite atmospheric observing system. The Panel looked forward to an update on humidity measurements from commercial aircraft at a future session.
90. More generally, AOPC recognized the importance of good interaction with WIGOS activities, noting that network design, the consistency of observational requirements expressed in the OSCAR database and GRUAN interaction with the WIGOS metadata task team were considered under other agenda items. GCOS engagement with the work of the Inter-Commission Coordination Group on WIGOS (ICG-WIGOS) was considered important; it was noted that this had been one of the topics raised in the previous week's meeting of the sponsors' Review Board for GCOS.

14 Reanalyses

14.1 European Regional Reanalyses

Dr Albert Klein-Tank presented the progress within the European Reanalysis and Observations for Monitoring (EURO4M) project.

Actions and recommendations:

91. AOPC thanked Dr Klein-Tank for his presentation and was very pleased to see the progress of the EURO4M project, which was an integrating activity bringing together different elements of the climate observation and analysis community, and which in particular was enabling the development of regional reanalysis for Europe.
92. AOPC encouraged the regional reanalysis teams involved in EURO4M and successor projects to consider making their products, when sufficiently mature, available through the Earth System Grid portal to facilitate comparison with models, as was being done for global reanalyses.
93. AOPC also appreciated the additional information given by Dr Klein-Tank concerning activities on regional *in situ* data sets and data portals under the auspices of the Expert Team on Climate Change Detection and Indices (ETCCDI).
94. AOPC was interested to learn of the setting up of regional climate assessment databases similar to the European (ECA&D) one utilised and improved in EURO4M. This was considered an important activity, especially as it included provision of many application-relevant indices useful for climate services. It should motivate sustainability of observation, recovery of data and an increasing focus on daily rather than monthly data for climate applications. It should also increase the flow of data to international centres. AOPC looked forward to learning of further development of the activity, which could take place under the GFCS.

14.2a Global Reanalyses - General Status and ERA

Dr Adrian Simmons presented a summary of US activities on global reanalysis and some general aspects related to reanalysis, based on a presentation given one month earlier by Dr Michael Bosilovich, NASA/GMAO, to the second session of the WDAC. He then outlined the ERA-CLIM project and presented some results from ERA-20CM, a recently completed ensemble of AMIP-style model runs from 1900 onwards, and ERA-20C, a corresponding reanalysis assimilating surface pressure and wind observations, which was in mid-production. ERA-CLIM also included work to prepare an ERA-SAT reanalysis, which would in due course replace ERA-Interim. Dr Simmons also reported on diagnosis of global-mean temperatures from ERA-Interim, which included comparison with the MERRA reanalysis and study of the fits of ERA-Interim to assimilated bias-adjusted radiosonde and radiance data. His presentation concluded with the plans for ERA-CLIM2, a project that was under negotiation for EU FP7 funding. It would include production of an ensemble of 20th-century reanalyses at moderate spatial resolution, using a coupled atmosphere-ocean model, with additional provision of products on the carbon cycle, together with commencement of a comprehensive coupled reanalysis for the satellite era.

Actions and recommendations:

95. AOPC thanked Dr Simmons for his update on ongoing activities and presentation of plans for both US and European reanalyses. The Panel noted Dr Simmons' assertion that the lower to middle stratospheric temperature trends inferred from ERA-Interim and MERRA fitted radiosonde data and several types of satellite radiance data within reasonable limits and were much more compatible with the Met Office than the NOAA processing of the SSU record, notwithstanding a continuing degree of uncertainty in trends. The Panel looked forward to resolution of this issue following further engagement with the SPARC temperature trends group.

14.2b Global Reanalyses - JRA-55

Mr Nozomu Ohkawara reported on progress in the development of the new JRA-55 reanalysis.

Actions and recommendations:

96. AOPC applauded JMA for recently completing JRA-55, a new-generation comprehensive reanalysis covering more than 50 years, which had been shown in Mr Ohkawara's presentation to be a substantial step forward in terms of simulation skill, resolution, and temporal continuity of temperature in the upper stratosphere. The Panel looked forward to the planned public release of the data in a few months' time.
97. AOPC were pleased to note the evidence of improvement over time in the observing system, including the benefits of reprocessing of satellite, and the consequent improvements in reanalysis products.
98. AOPC noted that the JRA-55 "family" of products would include an AMIP run for the full (1958-2012) period of the reanalysis, and a version of the reanalysis from 1972 onwards that did not assimilate satellite data. The Panel welcomed this and the diversity of products being prepared by ECMWF and envisaged in US activities, which should provide the basis for a better understanding of product quality and applicability

14.3 Monitoring Near-surface Temperatures: Comparisons with reanalyses

Prof. Phil Jones provided a scientific lecture on monitoring of near-surface temperatures and showed results from the comparison with reanalyses.

Actions and recommendations:

99. AOPC thanked Prof Jones for his scientific presentation. The Panel was interested to learn of the studies comparing absolute temperatures from CRU and ERA-Interim, and the comparisons of ERA-Interim with station data from Antarctica, especially as the latter region poses particular challenges for reanalysis. The comparison of temperatures from the 20CR reanalysis (which assimilated no surface air temperature data) with CRUTEM4 and other analyses of the surface air temperature record was of particular interest. It was noted that the corresponding ERA-20C reanalysis also did not analyse surface air temperature data, and the Panel looked forward to seeing whether or not the spells in which there was disagreement between the 20CR reanalysis and the observational record would be reproduced by ERA-20C.
100. AOPC also appreciated Prof Jones' discussion of the trends in ETCCDI indices relating to percentages of warm and cold maximum and minimum temperatures, which compared values deduced directly from European station data with values from corresponding gridded station data and from ERA-Interim. The Panel noted Prof Jones' conclusion concerning the promise of reanalysis for monitoring extremes in (at least) data dense regions, notwithstanding rather poorer ERA results for minimum than maximum temperatures.

Next session

AOPC agreed a one-off change of format for its next meeting. The first two days of the week would be devoted to networks and their management, including general discussion on their purpose and possibly new design criteria. This would not necessarily involve all Panel members. AOPC as a whole would meet for the following three days, and after reviewing the outcome of the network meeting, the full meeting would be structured ECV by ECV, discussing status for each ECV in the atmospheric domain, other cross-cutting ECVs, and potential new ECVs. This would contribute to the new progress and adequacy report and implementation plan. The Panel agreed provisionally to hold its next session from 7 – 11 April 2014 at the Joint Research Centre in Ispra, Italy.

(Intentionally Blank)

Annex I

LIST OF PARTICIPANTS

Members:	
Prof. Adrian SIMMONS (Chairman) ECMWF Shinfield Park READING RG2 9AX United Kingdom	Tel: +44 118 949 9700 Fax: +44 118 986 9450 E-mail: Adrian.Simmons@ecmwf.int
Dr Mitchell D. GOLDBERG (from remote) Satellite Meteorology and Climatology Division Office of Research and Applications NOAA/NESDIS E/RA1, Rm. 712-U, WWBG 5200 Auth Road CAMP SPRINGS, MF 20746-4304 USA	Tel: +1 301 763 8078 (ext. 125) Fax: +1 301 763 8580 E-mail: Mitch.Goldberg@noaa.gov
Prof. Philip JONES Climatic Research Unit, University of East Anglia NORWICH NR4 7TJ United Kingdom	Tel: +44 1 603 592 090 Fax: +44 1 603 591327 E-mail: p.jones@uea.ac.uk
Dr Albert KLEIN-TANK KNMI P.O. Box 201 3730 AE De Bilt The Netherlands	Tel.: +31 30 2206 872 Fax: +31 30 2210 407 E-mail: albert.klein.tank@knmi.nl
Mr Nozomu OHKAWARA Atmospheric Environment Division Global Environment and Marine Department Japan Meteorological Agency 1-3-4 Otemachi, Chiyoda-ku TOKYO 100-8122 Japan	Tel.: + 81 3 3212 8341 Fax: + 81 29 851 5765 E-mail: ohkawara@met.kishou.go.jp

<p>Dr Johannes SCHMETZ Chief Scientist EUMETSAT Eumetsat Allee 1 D-64295 DARMSTADT Germany</p>	<p>Tel.: +49 6151 807 5900 / 6310 Fax: +49 6151 807 8380 E-mail: Johannes.Schmetz@eumetsat.int</p>
<p>Dr Gabriela SEIZ Federal Office of Meteorology and Climatology MeteoSwiss Kraehbuehlstrasse 58 CH-8044 ZURICH Switzerland</p>	<p>Tel.: +41 44 256 95 39 Fax: +41 44 256 9278 E-mail: gabriela.seiz@meteoschweiz.ch</p>
<p>Dr Michel VERSTRAETE European Commission, DG Joint Research Centre Institute for Environment and Sustainability (IES) Climate Risk Management (CRM) Unit; TP 272 Via Enrico Fermi, 2749 I-21027 ISPRA (VA) Italy</p>	<p>Tel: +39 03 32 78 5507 Fax: +39 03 32 78 9034 E-mail: michel.verstraete@jrc.ec.europa.eu</p>
<p>Members unable to attend:</p>	
<p>Dr Andreas BECKER Head of GPCC Deutscher Wetterdienst Frankfurter Str. 135 D-63067 OFFENBACH Germany</p>	<p>Tel.: Fax: E-mail: andreas.becker@dwd.de</p>
<p>Dr James BUTLER NOAA Global Monitoring Division, R/GMD 325 Broadway BOULDER, CO 80305 USA</p>	<p>Tel: +1 303 497 6898 Fax: +1 303 492 6975 E-mail: James.H.Butler@noaa.gov</p>
<p>Dr Matthew MENNE NCDC/NOAA 151 Patton Avenue ASHEVILLE, NC 28801 USA</p>	<p>Tel.: +1 828-271-4449 E-mail: matthew.menne@noaa.gov</p>
<p>Dr Roger SAUNDERS Met Office D2, Met Office HQ Fitz Roy Road Exeter EX1 3PB UK</p>	<p>Tel.: +44 1392 886295 Fax: +44 1392 885681 E-mail: roger.saunders@metoffice.gov.uk</p>

Ex-Officio Members:	
<p>Dr Mark A. BOURASSA (from remote) (Co-chairman, OOPC) Department of Earth, Ocean and Atmospheric Science College of Arts and Sciences The Florida State University TALLAHASSEE, FL 32306-4520 USA</p>	<p>Tel.: +01 850 645-4788 Fax: +01 850 644-4841 E-mail: mbourassa@fsu.edu</p>
<p>Unable to attend:</p> <p>Dr Toshio SUGA (Co-chairman, OOPC) Department of Geophysics, Graduate School of Science Tohoku University Aoba-ku Sendai 980-8578 JAPAN</p>	<p>Tel.: +81-22-795-6527 Fax: +81-22-795-6530 E-mail: suga@pol.geophys.tohoku.ac.jp</p>
<p>Prof. Manola BRUNET (CCI Representative) Centre for Climate Change (C3), Director University Rovira i Virgili Dept. of Geography Av. Catalunya, 35 43071 - TARRAGONA Spain</p>	<p>Tel.: +34 977559583 Fax: +34 977559597 E-mail: manola.brunet@urv.cat</p>
Other Experts:	
<p>Mr Steve COLWELL British Antarctic Survey Madingley Road CB3 0ETCambridge United Kingdom</p>	<p>Tel.: Fax: E-mail: src@bas.ac.uk</p>
<p>Dr Bruno RUDOLF Global Precipitation Climatology Centre (GPCC) Deutscher Wetterdienst Frankfurter Str. 135 D-63067 OFFENBACH Germany</p>	<p>Tel.: +49 - 69 - 8062 2765 Fax: +49 - 69 - 8062 3987 E-mail: bruno.rudolf@dwd.de</p>
<p>Prof. Dr Johannes STAEHELIN ETH Zürich Institut für Atmosphäre und Klima Universitätstrasse 16 8092 ZÜRICH Switzerland</p>	<p>Tel.: +41 44 633 27 48 E-mail: johannes.staehelin@env.ethz.ch</p>

<p>Dr Jörg SCHULZ Climate Product Manager EUMETSAT Eumetsat-Allee 1 64295 DARMSTADT Germany</p>	<p>Tel.: +49 6151 8074660 Fax: +49 6151 8073040 Mobile: +49 170 2263528 E-mail: Joerg.schulz@eumetsat.int</p>
<p>Dr Peter THORNE Cooperative Institute for Climate and Satellites - NC NCSU / NOAA's National Climatic Data Center 151 Patton Avenue, ASHEVILLE, NC, 28801 USA</p>	<p>Tel.: +1-828-257-3025 E-mail: peter.thorne@noaa.gov</p>
<p>Dr Junhong WANG Research Associate Professor Department of Atmospheric and Environmental Sciences University of Albany, SUNY 1400 Washington Ave., Albany, NY 12222 USA</p>	<p>Tel.: 518-442-3478 Fax: 518-442-5825 E-mail: junhong@ucar.edu</p>
<p>Dr Martin WILD Institute for Atmospheric and Climate Science ETH Zurich Universitätsstr. 16 CH-8092 ZURICH Switzerland</p>	<p>Tel. +41 44 632 82 78 Fax: +41 44 632 13 11 E-mail: martin.wild@env.ethz.ch</p>
<p>Dr D.E. (Ed) HARRISON Pacific Marine Environmental Laboratory NOAA/PMEL/OCRD 7600 Sand Point Way NE SEATTLE, WA 98115 USA</p>	<p>Tel: +1 206 526 6225 Fax: +1 206 526 6744 E-mail: d.e.harrison@noaa.gov</p>
<p>WMO Secretariat:</p>	
<p>Mr Mohan ABAYASEKARA Observing and Information Systems Department WMO, P.O. Box 2300 1211 GENEVA 2 Switzerland</p>	<p>Tel.: +41 22 730 8244 Fax: +41 22 730 8021 E-mail mabayasekara@wmo.int</p>
<p>Dr Stephan BOJINSKI Space-based Observing Division Observing and Information Systems Department</p>	<p>Tel.: +41 22 730 8319 Fax: +41 22 730 8021 E-mail: SBojinski@wmo.int</p>

WMO, P.O. Box 2300 1211 GENEVA 2 Switzerland	
Dr Omar BADDOUR Chief, Data Management Applications Division Observing and Information Systems Department WMO, P.O. Box 2300 1211 GENEVA 2 Switzerland	Tel: +41 22 730 8268 Fax: +41 22 730 8021 E-mail: OBaddour@wmo.int
Mr Jerome LAFEUILLE Chief, Space-based Observing Division Observing and Information Systems Department WMO, P.O. Box 2300 1211 GENEVA 2 Switzerland	Tel.: +41 22 730 8228 Fax: + E-mail: Jlafeuille@wmo.int
Dr Michel RIXEN World Climate Research Programme (WCRP) World Meteorological Organization P.O. Box 2300 1211 GENEVA 2 Switzerland	Tel.: +41 22 730 8528 Fax: +41 22 730 8036 E-mail: MRixen@wmo.int
Dr Oksana TARASOVA Scientific Officer, RES/ARE World Meteorological Organization P.O. Box 2300 1211 GENEVA 2 Switzerland	Tel.: +41 22 730 8169 Fax: +41 22 730 8049 Email: OTarasova@wmo.int
GCOS Secretariat:	
Dr Carolin RICHTER Director, GCOS Secretariat c/o WMO, P.O. Box 2300 1211 GENEVA 2, Switzerland	Tel: +41 22 730 8275 Fax: +41 22 730 8052 E-mail: CRichter@wmo.int
Mr Tim OAKLEY Implementation Manager GCOS Secretariat	Tel: +41 22 730 8482 Fax: +41 22 730 8052 E-mail: TOakley@wmo.int
Dr Jean-Louis FELLOUS GCOS Space Rapporteur COSPAR c/o CNES 2 place Maurice- Quentin 75039 PARIS Cedex 01	Tel.: +33 6 85 31 50 11 Fax: +33 1 44 76 74 37 E-mail: Jfellous@noos.fr

France	
Dr Katy HILL GCOS Secretariat	Tel: +41 22 730 8083 Fax: +41 22 730 8052 E-mail: KHill@wmo.int
Ms Anna Christina MIKALSEN GCOS Secretariat	Tel.: +41 22 730 8272 Fax: +41 22 730 8052 E-mail: AMikalsen@wmo.int
Mr Daniel MULLER GCOS Secretariat	Tel.: +41 22 730 8 Fax: +41 22 730 8052 E-mail: DMuller@wmo.int
Ms Jessica HOLTERHOF GCOS Secretariat	Tel.: +41 22 730 8218 Fax: +41 22 730 8052 E-mail: JHolterhof@wmo.int

Annex II

MEETING AGENDA

Item	Doc. No.	Presenter(s) (time slots include discussion)
Tuesday 2 April		
13.45 – 18.30		
1. Opening of the Meeting (30')		
1.1 Welcome and introductions		Simmons, Lengoasa
1.2 Adoption of Agenda	1	Simmons
1.3 Conduct of the Meeting		Secretariat
2. Report from the AOPC Chair - Issues and objectives for the meeting - Review of activities since AOPC-XVII, - GCOS review		
	2.1	Simmons (20')
3. Report of GCOS Director and Secretariat - Overview of Secretariat activities - Introduction of new Implementation Manager		
	3	Richter (15')
4. World Climate Research Programme Perspective - Report from 2 nd WCRP Data Council meeting - ECV Inventories		
	4	Asrar / Rixen (30')
15.30 – 16.00 Coffee Break		
2.1 Update of Rolling Review of Requirements (RRR) Database	2.2	All (20')
5. GSN, GUAN and RBCN		
5.1a GSN Monitoring Centres Report (DWD and JMA) 5.1b Report from NCDC Analysis/Archive Centre	5.1a 5.1b	Rudolf for Becker / Ohkawara (30') Thorne for Menne (20')
5.2 CBS Lead Centre Activities	5.2	Oakley (20')
5.3 CIMO site certification; plans for "sustained performance Classification"; Update on SPICE	5.3	Ruedi (30')
18.00 End of day 1		
Wednesday 3 April		
09.00 – 12.30		
5.5 GSN and GUAN System Improvement Activities	5.5	Oakley (30')
5.4 Report from AGG	5.4	Jones (30')
13.4 Update on WIGOS	13.5	Zhang (15')

10.15 – 10.30 Coffee Break		
6. WMO CCI Issues		
6.1 Report from CCI Representative	6.1	Brunet (40')
6.2 Update from the World Climate Data and Monitoring Programme (WCDMP)	6.2	Badour (15')
6.3 Daily CLIMAT Messages	6.3	Thorne for Lawrimore (15')
12.25 – 14.00 LUNCH		
7. Atmospheric forcing		
7.1 Contribution by GAW - Progress of Ozone, CO ₂ -CH ₄ and N ₂ O Baseline Networks - Status of Aerosol Networks - Private sector engagement in GHG observation - Status of data exchange in GAW and non-GAW atmospheric composition networks	7.1	Tarasova / Butler (30'+15')
7.2 Report from the World Data Centre for Greenhouse Gases (WDCGG)	7.2	Ohkawara (20')
7.3 WCRP SPARC Perspectives (including Data Initiative)	7.3	Stähelin (30')
8. Other Atmospheric Networks and Issues		
8.1 Report from the Global Precipitation Climatology Centre (GPCC)	8.1	Rudolf for Becker (20')
8.2 Report on GRUAN - Report from ICM-5 - Update of GRUAN Implementation Plan	8.2a 8.2b	Thorne (40')
15.50 – 16.20 Coffee Break		
8.3 GNSS Measurements for Climate	8.3	Wang (30')
8.4 Update on Earth Radiation Budget and BSRN	8.4	Wild (30')
8.5 Global Surface Temperature Dataset Initiative	8.5	Thorne (20')
8.6 CATCOS (Capacity Building and Twinning for Climate Observing Systems) Project	8.6	Seiz (20')
18.00 End of day 2		
19.30 Group Dinner		
Thursday 4 April		
9.00 – 12.30		
10. Terrestrial Issues		
10.1 Report from TOPC	10.1	Verstraete for Steffen (30')
11. Cryospheric Issues		
11.1 Update on PORS and GCW	11.1	Goodison (20')

12. Satellite issues, data and products		
12.1 Report from the GCOS Space Rapporteur	12.1	Fellous (30')
12.2 Update on ESA CCI	12.3	Fellous for Saunders (30')
10.20 – 10.50 Coffee Break		
12.3 GEWEX Water Vapour Assessment	12.3	Schulz (30')
12.4 Report from Space Week (CGMS, scope-cm, CEOS WG on Climate)	12.4	Simmons / Fellous (30')
12.5 CEOS Response to the 2011 Satellite Supplement	12.5	Goldberg (from remote) (30')
12.20 – 13.45 LUNCH		
13.45 – 18.30		
12.6 Report on EUMETSAT Climate Activities	12.6	Schulz (20')
12.7 Report on CGMS	12.7	Schmetz (20')
9. Marine Issues		
9.2 Marine science update	9.2	Harrison (30')
9.1 Report from OOPC	9.1	Bourassa (from remote) (30')
15.40 – 16.10 Coffee Break		
2.1 RRR Database update – to be continued	2.2	All (20')
13. GCOS developments		
13.1 Plans for future Adequacy Report	13.1	All (30')
13.2 ECV publications	13.2	Verstraete / all (30')
13.3 Outcomes from the Adaptation Workshop	13.3	Muller / GCOS Sec (30')
18.30 End of day 3		
Friday 5 April		
9.00 – 12.30		
14. Reanalyses		
14.1 European Regional Reanalyses	14.1	Klein-Tank (20')
14.2 Global Reanalysis - ERA and general status - JRA-55	14.2 a 14.2 b	Simmons (20') Ohkawara (20')
14.3 Monitoring Near-surface Temperatures: Comparisons with ERA-Interim	14.3	Jones (30')
10.30 – 11.00 Coffee Break		
15. Upcoming meetings relevant to AOPC		
16. Summary of decisions and actions		
17. Closure (10')		

17.1 AOB, Next session
17.2 Adjourn
12.30 End of meeting

Report from the Advisory Group on GSN and GUAN (AGG) Meeting 2 April 2013

AGG Members attending: Phil Jones (Chairman), Mohan Abayasekera, Steve Colwell (from remote), Albert Klein Tank

Also attending: Adrian Simmons, Carolin Richter, Tim Oakley (GCOS Implementation Manager), Anna Mikalsen, Bruno Rudolf, Peter Thorne, Junhong Wang and Manola Brunet (CCI representative)

Discussion:

The meeting began with introductions, followed by a brief report (from Anna Mikalsen) on network changes to the GSN and GUAN made in January 2013.

Tim Oakley then gave three presentations following his first month in post on the current and pending GCOS projects where equipment, new instruments and telecommunication upgrades have been planned or are ongoing. The important point made here is that many have not yet led to an improvement in data receipt at the GSN and GUAN monitoring centres. This aspect needs to be incorporated into current and all future projects to ensure the funding leads to measurable improvements in terms of data receipts at monitoring centres.

A large number of points were then discussed during the meeting, the most important of which was a possible redesign of the GSN and GUAN. Before this can begin, there needs to be a full reassessment of the purpose of the two networks today (2013), likely near-term (~2020) expectations contrasting this to the rationale for their design in the mid-1990s.

The following is a summary of the discussion points, that weren't formulated as recommendations:

- Communication issues are often the cause of poor data receipt, but it is often difficult to locate the bottleneck. Important to determine if this is the issue, before going back to non-reporting sites. Important to check ECMWF reporting of sonde receipts versus another centre for the GUAN. For the GSN this is accomplished by the two monitoring centres (DWD and JMA).
- Switzerland 'twins' its GUAN site at Payerne with that from Nairobi, Kenya. Is this practice to be encouraged? See Gabriela Seiz' report for more examples of this.
- The next CBS Lead Centre's meeting (Chile, autumn, 2013) is important for the GCOS Implementation Manager to attend. Some are working well, but others are not.
- Antarctic CLIMAT stations are delayed as about a third are being calculated and submitted by the British Antarctic Service (the Antarctic CBS Lead Centre, Steve Colwell). They still make the 20th month deadline though.
- Useful to follow up on any scanning project (e.g. scanning colonial era data for developing countries) then the current one of Omani data in the UK may prove to be an exemplar. Issue here though is that the scanned data will not be made readily available for all to use, so GCOS needs to bear this in mind with any other project of this kind.

Recommendations to AOPC

- A number of NMHSs produce parallel measurements when AWSs are installed. Useful if ISTI could gain access to these. Initially see if NZ and Canada would make these measurements available.
- All projects funded through GCOS need to be followed up to check data are being sent over and to the various networks. Monitor through the centres and also from those doing the installing. Most recent projects have not led to increase in data receipt from upgraded sites.
- Balloon sizes potentially restrict the heights sondes can reach. Is there a need to ensure that greater heights reached?
- GRUAN discussions could provide a list of the important GUAN sites
- Determine the more important GSN sites – those furthest from others?
- Tim to monitor both these lists? Will provide criteria to be used if stations are removed from the lists. Reporting rates are just one factor, data quality is another factor. Does AOPC/AGG need more metrics to more easily remove non-reporting sites from both networks?
- The GUAN and GSN were designed in the mid-1990s. Since then tweaks have been made to the networks, which have increased reporting. Real issue is whether the networks are fit for purpose in the 2013-2020 period?
- Need to determine the modern purposes of both networks, as these are probably quite different now.
- Need to consider the long-term funding of both networks, given the Adequacy Report which is due in 2016.
- The Observations Requirement Document (from Stephan Rösner) forms a good start, but this needs expanding and strengthening
- A one-off letter was suggested to be sent to all operators of GUAN and GSN sites reminding them of their commitments. Use this as a way of asking for the historic data for all sites, reminding them of the CIMO site characteristic information needs

Annex V

List of Acronyms

AOPC	ATMOSPHERE OBSERVATION PANEL FOR CLIMATE
AGG	AOPC ADVISORY GROUP ON GSN AND GUAN
AIRS	ATMOSPHERIC INFRARED SOUNDER (NASA)
ARM	ATMOSPHERIC RADIATION MEASUREMENT PROGRAMME
AWS	AUTOMATED WEATHER STATION
BUFR	BINARY UNIVERSAL FORM FOR THE REPRESENTATION OF METEOROLOGICAL DATA (code)
BSRN	BASELINE SURFACE RADIATION NETWORK
CAS	COMMISSION FOR ATMOSPHERIC SCIENCES (WMO)
CBS	COMMISSION FOR BASIC SYSTEMS (WMO)
CCI	CLIMATE CHANGE INITIATIVE (ESA)
CCL	COMMISSION FOR CLIMATOLOGY (WMO)
CEOS	COMMITTEE ON EARTH OBSERVATION SATELLITES
CGMS	COORDINATION GROUP FOR METEOROLOGICAL SATELLITES
CIMO	COMMISSION FOR INSTRUMENTS AND METHODS OF OBSERVATION (WMO)
CMA	CHINA METEOROLOGICAL ADMINISTRATION
DWD	DEUTSCHER WETTERDIENST (GERMANY)
DOI	DIGITAL OBJECT IDENTIFIER
ECMWF	EUROPEAN CENTRE FOR MEDIUM-RANGE WEATHER FORECASTS
EC-PORS	EXECUTIVE COUNCIL PANEL OF EXPERT ON POLAR OBSERVATIONS, RESEARCH AND SERVICES (WMO)
ECV	ESSENTIAL CLIMATE VARIABLE
ENSO	EL NINO/LA NINA–SOUTHERN OSCILLATION
ESA	EUROPEAN SPACE AGENCY
ETCCDI	EXPERT TEAM ON CLIMATE CHANGE DETECTION AND INDICES
EUMETSAT	EUROPEAN ORGANISATION FOR THE EXPLOITATION OF METEOROLOGICAL SATELLITES
EURO4M	EUROPEAN REANALYSIS AND OBSERVATIONS FOR MONITORING
GALION	GAW AEROSOL LIDAR OBSERVING NETWORK
GAW	GLOBAL ATMOSPHERE WATCH (WMO)
GCM	GCOS COOPERATION MECHANISM
GCW	GLOBAL CRYOSPHERE WATCH
GDAP	DATA AND ASSESSMENTS PANEL (GEWEX)
GEWEX	GLOBAL ENERGY AND WATER CYCLE EXPERIMENT (WCRP)
GFCS	GLOBAL FRAMEWORK FOR CLIMATE SERVICES
GFZ	GEOFORSCHUNGSZENTRUM POTSDAM
GNSS	GLOBAL NAVIGATION SATELLITE SYSTEM
GOOS	GLOBAL OCEAN OBSERVING SYSTEM
GPCC	GLOBAL PRECIPITATION CLIMATOLOGY CENTRE
GRUAN	GCOS REFERENCE UPPER-AIR NETWORK
GSICS	GLOBAL SPACE-BASED INTERCALIBRATION SYSTEM
GSN	GCOS SURFACE NETWORK
GTOS	GLOBAL TERRESTRIAL OBSERVING SYSTEM
GUAN	GCOS UPPER-AIR NETWORK
HOMPRA	HOMOGENIZED PRECIPITATION ANALYSIS
IASI	INFRARED ATMOSPHERIC SOUNDING INTERFEROMETER
ICM	IMPLEMENTATION AND COORDINATION MEETING (GRUAN)

ICODS	INTERNATIONAL COMPREHENSIVE OCEAN- ATMOSPHERE DATA SET
ICT-IOS	IMPLEMENTATION/COORDINATION TEAM ON INTEGRATED OBSERVING SYSTEMS (CBS)
IGRA	INTEGRATED GLOBAL RADIOSONDE ARCHIVE
IOC	INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION (UNESCO)
IPCC	INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE
ISTI	INTERNATIONAL SURFACE TEMPERATURE INITIATIVE
JMA	JAPAN METEOROLOGICAL AGENCY
JPSS	JOINT POLAR SATELLITE SYSTEM
MSU	MICROWAVE SOUNDING UNIT
NASA	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (USA)
NMHS	NATIONAL METEOROLOGICAL AND HYDROLOGICAL SERVICE
NCDC	NATIONAL CLIMATIC DATA CENTER (USA)
NMS	NATIONAL METEOROLOGICAL SERVICE
NPP	NET PRIMARY PRODUCTION
NWP	NUMERICAL WEATHER PREDICTION
NOAA	NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (USA)
OLR	OUTGOING LONGWAVE RADIATION
OOPC	OCEAN OBSERVATIONS PANEL FOR CLIMATE
OPAG	OPEN PROGRAMME AREA GROUP
OPACE	OPEN PANEL OF CCL EXPERTS
RBCN	REGIONAL BASIC CLIMATOLOGICAL NETWORKS (WMO)
PW	PRECIPITABLE WATER
RRR	ROLLING REQUIREMENTS REVIEW (WMO)
SAF	SATELLITE APPLICATION FACILITY
SBSTA	SUBSIDIARY BODY FOR SCIENTIFIC AND TECHNOLOGICAL ADVICE (UNFCCC)
SCOPE-CM	SUSTAINED COORDINATED PROCESSING OF ENVIRONMENTAL SATELLITE DATA FOR CLIMATE MONITORING
SPARC	STRATOSPHERIC PROCESSES AND THEIR ROLE IN CLIMATE (WCRP)
SPICE	SOLID PRECIPITATION INTERCOMPARISON EXPERIMENT (WMO CIMO)
SSU	STRATOSPHERIC SOUNDING UNIT
SWFDP	SEVERE WEATHER FORECAST DEMONSTRATION PROJECT (WMO)
TOPC	TERRESTRIAL OBSERVATION PANEL FOR CLIMATE
UNESCO	UNITED NATIONS EDUCATIONAL, SCIENTIFIC AND CULTURAL ORGANIZATION
UNFCCC	UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE
WCDMP	WORLD CLIMATE DATA AND MONITORING PROGRAMME (WMO)
WCRP	WORLD CLIMATE RESEARCH PROGRAMME
WDCGG	WORLD DATA CENTRE FOR GREENHOUSE GASES
WGMS	WORLD GLACIER MONITORING SERVICE
WIGOS	WMO INTEGRATED GLOBAL OBSERVING SYSTEM
WDAC	WCRP DATA ADVISORY COUNCIL
WMO	WORLD METEOROLOGICAL ORGANIZATION
WOAP	WCRP OBSERVATIONS AND ASSIMILATION PANEL
WWR	WORLD WEATHER RECORD

(Intentionally Blank)

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: gcosjpo@wmo.int