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

June 2014

**GCOS – 183
WCRP 4/2014**



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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

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AOPC-XVIII
9-11 April 2014

Summary Report and Recommendations

1 Opening of the Meeting

The Nineteenth Session of the GCOS/WCRP Atmospheric Observation Panel for Climate (AOPC) was opened by its Chairman, Prof. Adrian Simmons, on 9 April 2014, 9.00 am at the Joint Research Centre of the European Commission (EC) in Ispra, Italy. Dr Alan Belward, Head of the Land Resource Management Unit of the Institute for Environment and Sustainability, warmly welcomed participants on behalf of the local host, Dr Elisabetta Vignati, Head of the Air and Climate Unit. Dr Belward explained that climate change, has been, and continues to be, one of the main topics for the European Commission. Thus, it is one of the focus areas for the JRC, which forms the Commission's in-house research organization, with Ispra being its biggest of several research centres.

Prof. Simmons thanked the JRC representatives for their excellent hospitality, recalling that after the Terrestrial Observation Panel, this was the second GCOS Panel meeting to be held at JRC within just a few weeks. The Chairman then invited a tour-de-table and 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. Update on programme activities

2.1 GCOS Update

Prof. Simmons, who had served as both AOPC Chairman and Chairman of the GCOS Steering Committee (SC) during the past four years, explained that GCOS was now entering a new phase of assessment and reporting, in particular to the UN Framework Convention on Climate Change (UNFCCC). Therefore, the review of Essential Climate Variables (ECVs) was foreseen to take most of the time for this meeting. The preparation of the progress report will be led by Adrian Simmons over the coming one and a half years.

Dr Carolin Richter, Director of the GCOS Secretariat, thanked Adrian Simmons for his outstanding engagement in GCOS, having chaired the AOPC for the last eight years. She announced that Dr Stephen Briggs (European Space Agency, ESA) had accepted to chair the GCOS SC with effect from 1 March 2014. Dr. Kenneth Holmlund (EUMETSAT), who unfortunately could not attend the meeting in person, will succeed Prof. Simmons as AOPC Chairman and Dr Klein-Tank (Royal Netherlands Meteorological Institute, KNMI) will become the Vice-Chair.

Dr Richter then continued with a report from the GCOS Secretariat, outlining upcoming important meetings of the sponsors' governing bodies and space planning activities. She explained that the situation of the Global Terrestrial Observing System (GTOS) remains unresolved, with no functioning Secretariat in place at the moment. She briefed the Panel on the status and outcomes of the GCOS programme review, undertaken by the sponsors and led by Mr Wolfgang Kusch, former Permanent Representative (PR) of Germany. The review report, which is currently undergoing the final layout and editing process, confirms that if there was no GCOS programme, it would have to be invented, and also suggests slight changes in governance, strengthening the engagement of sponsors, and broadening the

programme to take on adaptation issues. Dr Richter also detailed the upcoming reporting process. GCOS has reported to the UNFCCC Subsidiary Body for Scientific and Technological Advice (SBSTA) since the fifth Conference of the Parties (COP-5). At the next SBSTA meeting in Bonn in June, the GCOS Cooperation Mechanism (GCM) board will meet again and the progress report is to be presented in 2015 in Paris, France, when a post-Kyoto protocol will be on the agenda. Four workshops will be scheduled in 2015 for preparation of the progress report and starting the Implementation Plan, and two in 2016 to shape the draft Implementation Plan. This should also include statements of specific guidance on product requirements, although it has not yet been decided whether to treat these as combined or as separate supplements for products based on satellite and *in-situ* data.

2.2 Outcomes of the AOPC / AGG Network Meeting

Preceding the Panel Session, a two day meeting was held to review the requirements of the GCOS Surface and Upper-air Networks (GSN and GUAN) 20 years after their establishment, in the light of changes in both technology and data needs. The meeting included experts for specific operational networks, monitoring and archive centres, and data users. Prof. Phil Jones, Chairman of the Advisory Group on GSN and GUAN (AGG), who had chaired the network meeting, summarized the discussions on the design, scientific principles, performance and use of data from the GSN and GUAN, and their roles in relation to the comprehensive surface and upper-air networks.

Actions and recommendations:

1. AOPC supported the proposed strengthening of the GSN and GUAN requirements to make 'membership' and data of these dedicated networks more meaningful and distinct from the wider Global Observing System (GOS). This would include, among others, coordinated assessment of change management, active performance and quality monitoring, fulfilling of requirements as stated in Guide to the GSN) and GUAN¹ and the OSCAR database. (For more details, see the report from the Review of the GSN and GUAN and related atmospheric networks, GCOS-182²).
2. All current GUAN sites should become de facto candidate sites, but need to be 'certified' within a transition period of 5 years.
3. The GCOS Secretariat is requested to take the steps necessary to get such changes reflected in the WMO regulatory material, specifically the Manual on the GOS, to be brought to Congress in 2015.
4. The panel supported the proposal of the Commission for Climatology (CCI) to set up an International Data Rescue Portal as a means of coordinating the many data rescue activities underway globally. It requested the CCI to provide the GCOS Secretariat with an overview of the project, outlining its benefits, and an indicative costing, following the first meeting of the new CCI Expert Team on Data Rescue (ET-DARE), which will be held in September or October of this year.
5. Recognizing that the network level definitions (reference, baseline, comprehensive) as currently used in many GCOS and other documents are potentially misleading and are used in different manners in different application areas yielding the potential for significant confusion amongst practitioners and stakeholders, the panel invited further discussion of the tiered network definitions in consultation with TOPC, OOPC, the GCOS Steering Committee, but also WMO commissions and programmes such as WIGOS. A draft version of definitions is given in Annex III.

¹ Guide to the GCOS Surface Network (GSN) and GCOS Upper-Air Network (GUAN) (2010 Update of GCOS-73), GCOS-144: http://www.wmo.int/pages/prog/qcos/Publications/GCOS-144_en.pdf

² Workshop on the Review of the GCOS Surface Network (GSN), GCOS Upper-Air Network (GUAN) and related atmospheric networks, GCOS-182: <http://www.wmo.int/pages/prog/qcos/Publications/GCOS-182.pdf>

2.3 GCOS Cooperation Mechanism

Tim Oakley briefed participants on his activities as GCOS Implementation Manager to revitalize upper-air and surface network stations undertaken through the GCOS Cooperation Mechanism (GCM), as well as on network performance.

Actions and recommendations:

6. The panel thanked the UK Department of Energy and Climate Change (DECC) and the UK Met Office for their support of the GCOS Implementation Manager and thanked the Implementation Manager for his status update.
7. It was pleased to learn that there were only six truly silent GUAN stations in 2013 and that India was making better quality soundings at a subset of its stations. If sustained for a couple of years, a few stations in India could be included to the GUAN.
8. AOPC supported the suggestion from the Implementation Manager to discuss dedicated network issues over a whole day at future AGG/AOPC Sessions.
9. Support for GUAN stations should in the first instance look to address substantial capability and spatial coverage gaps. Gaps should be assessed in the context of all aspects of the upper-air capabilities of the GOS (including satellites and aircraft) and not from radiosonde capabilities in isolation. Gaps should be quantitatively assessed using inter-alia outcomes of the WMO Inter Programme Expert Team on the Observing System Design and Evolution (IPET-OSDE) and expert solicitation via, e.g., reanalysis and NWP centres.
10. Regarding assessment of reporting from GSN stations it was noted that in many cases of CLIMAT-message non-compliance, the data were in fact available, but received after the 21-day cut-off date, the panel supported reporting of a second set of receipts, 3, 6 or 12 months later to get a better estimation of which surface stations were genuinely silent, rather than those that were merely late, or who had sent messages that became stuck in bottlenecks somewhere in the Global Telecommunication System (GTS).
11. The GCOS Implementation Manager was asked to liaise with the National Climatic Data Centre (NCDC), the German Meteorological Service Deutscher Wetterdienst, (DWD) and the Japan Meteorological Agency (JMA) about producing the extra information on GSN reporting.

2.4 World Climate Research Programme

Dr Michel Rixen from the World Climate Research Programme (WCRP) joint planning staff delivered a presentation on WCRP objectives and new initiatives.

Actions and recommendations:

12. Whilst pleased that the WCRP Data Advisory Council (WDAC), which replaced the functions of the former joint GCOS-WCRP Observations and Assimilation Panel (WOAP), was including all GCOS Panel Chairs and also representatives from the Committee on Earth Observation Satellites (CEOS), the Coordination Group for Meteorological Satellites (CGMS) and the International Geosphere-Biosphere Programme (IGBP), the panel noted that annual two-day meetings do not seem sufficient to cover the range of activities required, keeping in mind how WOAP had operated.
13. AOPC was interested in learning more about the obs4Mips and ana4Mips initiatives, and invited WCRP to provide a short paper and presentation on this at the next panel session.

3. Ocean and Land

3.1 Ocean Observations Panel for Climate

Dr Mark Bourassa, Co-Chair of the Ocean Observations Panel for Climate (OOPC) presented plans to work with the newly established Global Ocean Observing System (GOOS) panels on biogeochemistry and on biology, and gave a summary of the problem and plans towards a solution for the severe degradation of the Tropical Atmosphere Ocean (TAO) /Triangle Trans-Ocean Buoy Network (TRITON) array.

Actions and recommendations:

14. AOPC was very concerned to see the decline in the TAO/TRITON array, in view of its impact on atmosphere/ocean prediction capabilities, for example of El Nino events. It hoped that NOAA would soon bring observations back to the ~80% data return it had announced. The Panel welcomed OOPC's efforts towards a long-term solution by joining forces with the biogeochemistry observation community. These OOPC efforts provided a good example of bringing communities together for mutual benefit.
15. Regarding the AOPC/OOPC working group on surface pressure, the AOPC Chairman and OOPC Co-Chairs were requested to discuss with working group co-Chairs whether this group was still considered to provide a useful mechanism to support recovery of historic data and report back at the next session of AOPC.

3.2 Terrestrial Observation Panel for Climate

Dr Michel Vestraete, who is a member of the 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:

16. The panel thanked Michel Verstrate for his presentation and welcomed the proposal to hold the next AOPC session back to back with the terrestrial panel to foster a more holistic view and better integration between different ECVs and cross-cutting processes.
17. In the view of the panel, designated groups world-wide should be in charge for individual variables of the OSCAR database of requirements and there needs to be full traceability as to where the information came from. The difficulty was noted that values would largely depend on the scales of interest, which is not addressed in the current set-up of the database. AOPC recommended instigating an inter-panel working group to discuss the issue further, with Michel Verstraete volunteering to participate for TOPC and Jörg Schulz for AOPC.

4. Composition ECVs

Dr James Butler, Director of the Global Monitoring Division of the NOAA Earth System Research Laboratory, provided an overview on Aerosol networks and specifically recommendations for interpretation of "Black Carbon" measurements from the GAW Scientific Advisory Group (SAG) on Aerosol. As he pointed out, no current method combines all five essential characteristics of Black Carbon (Composition, Morphology, Volatility, Solubility, and Light absorption), consequently, no current method can justifiably claim to provide a quantitative measurement of Black Carbon.

Actions and recommendations:

18. AOPC thanked Dr Butler for his overview on atmospheric composition networks for aerosol and specifically black carbon, noting with concern that the number of

observations has gone down due to funding issues. The Panel stressed that data integration between domains was needed in support of mitigation efforts.

19. The Panel agreed with the SAG Aerosols' view that a more detailed specification of the "Aerosol" ECV was required in the forthcoming GCOS Implementation Plan.

5. GCOS Surface Network, GCOS Upper-air Network and Global Precipitation Climatology Centre

5.1 Report from GSN Monitoring Centres

Dr Andreas Becker presented the findings of the annual report from the GSN Monitoring Centre.

Actions and recommendations:

20. The Panel welcomed the progress in developing a new BUFR template for reporting daily values in addition to the normal CLIMAT message, to be sent via the GTS at the end of each month. It encouraged collaboration with CBS bodies, particularly the Inter-Programme Expert Team on Data Representation Maintenance and Monitoring (IPET-DRMM) and encouraged GCOS and WMO Secretariats to pursue this matter further. CCI recognition of the need for such daily CLIMAT information would greatly help raise the acceptance of this forthcoming new message and support its implementation by WMO Members.
21. AOPC reiterated its recommendation from the previous year to extend monitoring and reporting on CLIMAT messages by Lead Centres and Monitoring Centres to include Regional Basic Climatological Network (RBCN) stations. The AOPC encouraged RBCN stations to submit the forthcoming daily CLIMAT message.
22. The Panel noted that the increase in reception rate of CLIMAT messages from Regional Basic Climatological Network (RBCN) stations to about one third of the reception rate for SYNOPS was quite a success, and shows that the GSN network is not degrading, though its coverage is by no means perfect. Regions were becoming more similar in terms of data transmission. The Implementation Manager was asked to investigate the reason for the surprisingly high amount of data missing the quality check for RA III and whether this indicates the presence of a common error. Similarly, the high error rate for min/max temperature and precipitation values in RA VI needs checking.
23. As there seems to be little improvement in the number of stations sending higher resolution locations, the meeting asked for a report from the WMO Observations and Information Systems Department (WMO/OBS) on this topic for the next year. Any known problems with station information in the WMO database (Volume A) should be collected by the Implementation Manager, who will report this back to WMO/OBS.

5.2 Report from NCDC Analysis/Archive Centre

Dr Mathew Menne from the Analysis and Archive Centre at NCDC, which also hosts the Commission for Basic Systems (CBS) Lead Centre for North and Central America, the Caribbean and Hawaii, provided an update on activities conducted in support of GCOS.

Actions and recommendations:

24. The panel was pleased to learn that the International Surface Temperature Initiative (ISTI) databank effort was going to be continued and it thanked NCDC for providing the necessary ongoing staff support.
25. In the light of many countries establishing so-called surface reference networks with very different concepts and purposes, the panel did not wish to encourage Members to set up further reference stations at the moment, but wanted to take advantage of

the experience of existing ones with a view to developing guidelines for the longer term, in consultation with partners (the Commission for Instruments and Methods of Observation (CIMO), CBS, CCI, and others). It was noted that CCI plans to set up a respective task team under the Open Panel of Experts on Climate Monitoring and Assessments for Climate Data Management (OPACE 1).

5.3 Report from Global Precipitation Climatology Centre

Dr Andreas Becker, Head of the Global Precipitation Climatology Centre (GPCC) at the German Meteorological Service, Deutscher Wetterdienst (DWD), presented information on the status of the GPCC data base and product generation, with special focus on the extension of its portfolio of Digital Object Identifier (DOI)-referenced products, the daily data collection and analyses, and approaches to make use of new technologies in data collection and product dissemination through OGC-compliant data standards and web services.

Actions and recommendations:

26. AOPC congratulated the GPCC for its 25 years of work on this very important subject, and thanked the DWD for its support of this substantial contribution to climate data records. It highly welcomed the new Joint GPCC and EUMETSAT CM-SAF satellite-gauge product and the operational GPCC drought index.
27. AOPC recommended support from the GCOS and WMO Secretariats (the World Climate Programme) for data acquisition in cases where GPCC faced communication problems with WMO Members.
28. The Panel also supported alternative ways for joint acquisition of daily data, for example in cooperation with scientific projects and with activities of the Group on Earth Observation (GEO) community. In particular, the inclusion of Open Geospatial Consortium (OGC) compliant XML standards should be considered due to their potential for data mobilization. Reliable metadata are key for systematic error correction and correct station association. The latter is challenging for WMO Member countries that have to re-assign station Identifiers (ID's) from closed stations too quickly for WMO catalogue maintenance. Action from the WMO World Weather Watch (WWW) might be needed in this context, e.g. to provide for an additional block of station ID's. Furthermore, consideration of web-services for data and product dissemination should become an appropriate priority for the WMO Secretariat. DWD and GPCC offer to assist in the exchange of requirements and plans.

6. Surface Radiation Budget

6.1 Report from BSRN World Radiation Monitoring Center and WMO World Radiation Data Centre

Mr Nozomu Ohkawara from JMA briefed participants on the status of the Baseline Surface Radiation Network (BSRN) World Radiation Monitoring Center (WRMC) and the corresponding WMO World Radiation Data Centre (WRDC).

Actions and recommendations:

29. The Panel was pleased to see the amount of archived data at both data centres steadily increasing, with the data being widely used to improve scientific knowledge on radiative budget of the Earth and to verify calculated radiative budget in climate models. The GCOS Implementation Manager and Mr Ohkawara were requested to liaise with the BSRN project manager regarding the status of comparability of BSRN observations.

7. GCOS Reference Upper-air Network

Dr Peter Thorne, Co-Chair of the Working Group on the GCOS Reference Upper-air Network (GRUAN) provided an overview on progress and recent activities.

Actions and recommendations:

30. AOPC thanked Dr Thorne, the WG-GRUAN and the GRUAN Lead Centre for their continuous hard work in establishing the GRUAN. It approved publishing the report of the Sixth Implementation and Coordination Meeting (ICM-6) as a GCOS document, allowing panel members three weeks time for additional comments.
31. Following the regrettable withdrawal of Atmospheric Radiation Measurement Programme (ARM) from their sites in the Tropical Pacific, AOPC encouraged WMO Members to help fill this gap. In particular, it was hoped that the Australian Bureau of Meteorology could help securing the GRUAN site at Darwin and the New Zealand Met Service might help with sites in the Pacific. The proposed paired set of French stations, the national experimental facility (Site Instrumental de Recherche par Télé-détection Atmosphérique; SIRTa), located in Palaiseau, and the “l’observatoire atmosphérique du Maïdo” on La Réunion Island were welcomed. In future, support from WIGOS in reaching out to Africa and South America would also be very helpful.
32. AOPC welcomed the joint GRUAN-GSICS-WIGOS workshop that would provide a case study for collaboration of WMO Observing Systems and the satellite community to address user benefits.
33. The adoption of revised membership and terms of reference for both the WG-GRUAN and the various underlying task teams as called for in the ICM-6 report was agreed to be dealt with inter-sessionally by the incoming Chair and Vice-Chair. AOPC encouraged consideration of Ozone and Southern Hemisphere experts in the WG-GRUAN membership considerations.
34. The panel welcomed the plan for a side event at WMO congress in 2015 and asked the GCOS Director to liaise on this matter with the GRUAN Co-Chairs and Jim Butler as AOPC representative.
35. The panel took the view that the question of whether to establish a GRUAN data users group that would meet every 2 to 4 years should be considered in the context of its scientific review of GRUAN in 2015, recognizing that such a forum will be needed in the long-term.
36. With regard to the last CIMO intercomparison campaign, AOPC encouraged CIMO to make the data available and accessible to the extent possible. It was noted that preparation of a peer reviewed article would be a valuable outcome of this significant effort on the part of CIMO and GRUAN.

8. Global Atmosphere Watch

Dr Oksana Tarasova informed meeting participants of recent and planned activities of the WMO Global Atmosphere Watch (GAW) Programme regarding the development of the atmospheric composition ECVs for ozone profiles, Greenhouse Gases (GHGs) and aerosols.

Actions and recommendations:

37. The panel thanked Oksana Tarasova for her contribution from a GAW perspective and particularly for her input to updating the ECV tables that would inform the progress report and future GCOS Implementation Plan. As several GAW networks have been recognized as GCOS baseline and comprehensive networks, the need for clarification of language was clearly articulated, with the aim to achieve coherence with the terminology used by the atmospheric composition community.

38. With respect to network status and the danger of losing the necessary global coverage of ozone networks, it was proposed that GAW provide a map of closed and endangered stations. The panel was concerned that current coverage of the Dobson total ozone network was not adequate to cover ozone changes in the Arctic.
39. On the positive side, the Swiss capacity building efforts were acknowledged. In the frame of the Capacity Building and Twinning for Climate Observations (CATCOS) programme, twinning of stations for GHGs and aerosol observations is being supported. The AOPC thanked Dr Gabriela Seiz, Head of the Meteo Swiss International Affairs Division, and her colleagues for this very important, successful contribution to GCOS.

9. Space-based Observations

9.1 ESA Climate Change Initiative

Dr Roger Saunders provided an update on the ESA Climate Change Initiative (CCI), now into its second phase, as well as an analysis how satellite observations of how well satellite observations are able to contribute to the monitoring of individual ECVs.

Actions and recommendations:

40. The analysis of satellite data contributing to ECVs should be updated by the CEOS Working Group on Climate to find out which ECVs are not covered by satellite data records for updating the satellite section in the next GCOS Implementation Plan.
41. When showing tables intended for informing funding agencies about upcoming gaps, AOPC Members stressed that the satellite community should highlight the need for ground-truth data and avoid giving the impression that satellites could replace all ground-based observations.
42. When planning satellite missions, a procedure to ensure regular validation activities, not only once within the instrument's lifetime, should be established. Especially towards the end of the instrument lifecycle, a cal/val activity would be helpful for climate monitoring.

9.2 CEOS – CGMS

Dr Jörg Schulz reported on recent CEOS–CGMS activities, followed by a brief presentation on behalf of Mitch Goldberg on monitoring the performance of the Cris and IASI instruments.

Actions and recommendations:

43. The Panel looked forward to the outcome of CEOS-CGMS WG Climate ECV inventory and gap analysis that should inform the GCOS progress report and new Implementation Plan. Participants noted that the WMO Information System (WIS) discoverability metadata was set up to help users find particular data sets and collaboration with WIS would be useful to this end.
44. It noted with pleasure that the production of ECV Climate Data Records and uptake had been enhanced, in particular through the Satellite Application Facility for Climate Monitoring (CM-SAF). CORE-CLIMAX results on production processes are also being taken up well by the international satellite community. Though extensions to *in-situ* data products and reanalysis seem feasible, this would require work beyond the current CORE-CLIMAX project.
45. A system-maturity approach could be useful for assessing sustainability of GCOS ECV production activities, but there is still a need to assess and report compatibility with GCOS Climate Monitoring Principles and guidelines.
46. The panel further underlined that comparing satellite-based remote sensing with airborne or ground-based remote-sensing observations alone is not sufficient, but comparability to traceable measurements is required. AOPC also recommended

revising the Guideline for the Generation of Datasets and Products Meeting GCOS Requirements (GCOS-143) as an annex to the forthcoming GCOS Implementation Plan.

47. AOPC thanked both speakers for their very informative talks showing that good progress was made in this area. The dependence of this activity on “soft money” from the European Commission science funding is undesirable, but operational climate services could provide long-term funding in the future.

10. General discussion on ECVs

The Panel discussed the atmospheric ECVs and related matters in general in preparation for the next GCOS progress report and Implementation Plan update. To gather detailed information on ECV progress, the ECVs were distributed among responsible panel members as listed below.

Actions and recommendations:

48. Prof. Arian Simmons will contact each responsible person and send them the most recent ECV table.

10.1 Distribution of work for updating ECV progress report

Composition ECVs

Responsible persons: **Jim Butler** to look after GHGs and Aerosol for climate;
Adrian Simmons to look after Aerosol with regard to air pollution, ozone and precursors

Surface ECVs

Temperature: **Phil Jones** and **Matt Menne**
Wind: **Adrian Simmons** and **Mark Bourassa**
Humidity: **Peter Thorne**, in liaison with Kate Willett
Pressure: **Adrian Simmons** and **Phil Jones**, in liaison with Gil Compo and Rob Allan
Precipitation: **Andreas Becker** and **Jörg Schulz**

Upper-air ECVs

Temperature: **Peter Thorne**, **Roger Saunders**, **Tim Oakley**
Wind: **Jörg Schulz** and **Adrian Simmons**, in liaison with **Leo Haimberger**
Water vapour: **Roger Saunders** for the satellite part; **Peter Thorne** and **Tim Oakley** for conventional radiosondes
Cloud properties: **Jörg Schulz** to liaise with Rainer Hollman, Claudia Stubenrauch and the CGMS WG on clouds
Earth radiation budget: **Roger Saunders**

11. Next session

AOPC agreed to hold a joint session together with the TOPC at the Swiss Federal Institute for Forest, Snow and Landscape Research, Eidgenössische Forschungsanstalt für Wald, Schnee und Landschaft (WSL), in Zürich Switzerland from 16-20 March 2015.

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Annex I

LIST OF PARTICIPANTS

Members:	
Prof. Adrian SIMMONS (outgoing Chair) ECMWF Shinfield Park READING RG2 9AX United Kingdom	Tel: +44 134 477 3721 Fax: +44 118 986 9450 E-mail: Adrian.Simmons@ecmwf.int
Dr Andreas BECKER Global Precipitation Climatology Centre (GPCC) Deutscher Wetterdienst Frankfurter Str. 135 D-63067 OFFENBACH Germany	Tel.: +49 69 8062 2900 Fax: +49 69 8062 3987 E-mail: andreas.becker@dwd.de
Dr James BUTLER NOAA Global Monitoring Division, R/GMD 325 Broadway BOULDER, CO 80305 USA	Tel: +1 303 497 6898 Fax: +1 303 492 6975 E-mail: James.H.Butler@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 (incoming Vice-Chair) KNMI P.O. Box 201 3730 AE De Bilt The Netherlands	Tel.: +31 30 2206 872 Fax: +31 30 2210 407 E-mail: kleintan@knmi.nl
Dr Matthew MENNE NCDC/NOAA 151 Patton Avenue ASHEVILLE, NC 28801 USA	Tel.: +1 828-271-4449 Fax: E-mail: matthew.menne@noaa.gov
Mr Nozomu OHKAWARA Atmospheric Environment Division Global Environment and Marine Department Japan Meteorological Agency 1-3-4 Otemachi, Chiyoda-ku	Tel.: + 81 3 3212 8341 Mobile + 81 90 4934 6291 E-mail: nzmohkawara08@gmail.com

TOKYO 100-8122 Japan	
Dr Roger SAUNDERS Met Office D2, Met Office HQ FitzRoy Road Exeter EX1 3PB UK	Tel.: +44 1392 886295 Fax: +44 1392 885681 E-mail: roger.saunders@metoffice.gov.uk
Dr Michel VERSTRAETE SANSA Earth Observation Enterprise Building Mark Shuttleworth Street Innovation Hub Pretoria 0087 PO Box 484, Silverton, 0127 South Africa	Tel: +27 12 844 0425 Fax: +27 12 844 0396 E-mail: mverstraete@sansa.org.za
Unable to attend:	
Mr Kenneth Holmlund (incoming Chair) Head of the Remote Sensing and Products Division EUMETSAT EUMETSAT-Allee 1 D-64295 Darmstadt Germany	Tel.: +49 6151 807599 Fax: E-mail: kenneth.holmlund@eumetsat.int
Dr Gabriela SEIZ Federal Office of Meteorology and Climatology MeteoSwiss Kraehbuehlstrasse 58 CH-8044 ZURICH Switzerland	Tel.: +41 44 256 95 39 Fax: +41 44 256 9278 E-mail: gabriela.seiz@meteoswiss.ch
Dr Mitchell D. GOLDBERG 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

Ex-Officio Members:	
<p>Dr Mark A. BOURASSA (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>CCI Representative:</p> <p>Dr William WRIGHT c/o Climate and Water Division Bureau of Meteorology 700 Collins St., MELBOURNE 3008 Australia</p>	<p>Tel.: +61 3 9669 4457 Fax: +61 3 9669 4760 E-mail: w.wright@bom.gov.au</p>
Other Experts:	
<p>Ms Rosey GRANT British Antarctic Survey Madingley Road CB3 0ETCambridge United Kingdom</p>	<p>Tel.: Fax: E-mail: src@bas.ac.uk</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>Dr Peter THORNE Nansen Environmental and Remote Sensing Center Bergen Norway</p>	<p>Tel.: +47 45232961 Fax: E-mail: peter.thorne@nersc.no</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>
WMO Secretariat:	
<p>Dr Michel RIXEN World Climate Research Programme (WCRP)</p>	<p>Tel.: +41 22 730 8528 Fax: +41 22 730 8036</p>

World Meteorological Organization P.O. Box 2300 1211 GENEVA 2 Switzerland	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
Ms Anna Christina MIKALSEN Project Officer GCOS Secretariat	Tel.: +41 22 730 8272 Fax: +41 22 730 8052 E-mail: AMikalsen@wmo.int
Mr Tim OAKLEY Implementation Manager GCOS Secretariat	Tel: +41 22 730 8482 Fax: +41 22 730 8052 E-mail: TOakley@wmo.int

Annex II

MEETING AGENDA

Item	Item. No.	Presenter(s) (including discussion)	Supporting documents/ additional information
Wednesday, 9th April 2014			
9.00 – 9.15			
1. Opening of the Meeting			
Welcome and introductions	1.1	Richter/Simmons (5')	
Adoption of Agenda	1.2	Simmons (5')	
Conduct of the Meeting	1.3	Simmons (5')	
9.15 – 10.45			
2. Update on programme activities			
GCOS Update	2.1	Richter/Simmons (30')	<i>Review main events of past year, including outcome of Sponsors' Review; what is needed from atmospheric observation community for the next GCOS Progress Report and Implementation Plan.</i>
Outcomes of the AOPC/AGG Network Meeting	2.2	Oakley/Jones (30')	<i>Main outcomes from the AOPC/AGG Network Meeting (7-8 April 2014).</i>
GCOS Cooperation Mechanism (GCM)	2.3	Oakley (15')	<i>Update on GCM; Potential input from/benefit for AOPC.</i>
WCRP Update	2.4	Rixen (15')	
10.45 – 11.00 Coffee Break			
11.00 – 12.30			
3. Ocean and land			
Update on OOPC	3.1	Bourassa (45')	<i>Update on OOPC and thoughts on cross-cutting AOPC/OOPC activities</i>
Update on TOPC	3.2	Verstraete (45')	<i>Update on TOPC and thoughts on cross-cutting AOPC/TOPC activities</i>
12.30 – 14.15 Lunch (including visit to JRC tower)			
14.15 – 16.15			
DISCUSSION – ECV-BASED EVALUATION OF THE OVERALL ATMOSPHERIC OBSERVING			

SYSTEM			
4. Composition ECVs			
Carbon dioxide	4.1	All (30')	
Methane	4.2	All (30')	
Other long-lived greenhouse gases	4.3	All (30')	
Ozone	4.4	All (30')	
16.15 – 16.30 Coffee			
16.30 – 17.30			
DISCUSSION – ECV-BASED EVALUATION OF THE OVERALL ATMOSPHERIC OBSERVING SYSTEM – (Composition, continued)			
Aerosol	4.5	All (30')	
Precursor species	4.6	All (30')	
17.30 – 18.30			
5. GSN, GUAN and GPCC			
Report from GSN Monitoring Centres	5.1	Becker or Ohkawara (20')	Joint report of DWD and JMA
Report from NCDC Analysis/Archive Centre	5.2	Menne (20')	
Report from Global Precipitation Climatology Centre	5.3	Becker (20')	
18.30 End of Day 1			
19.30 Group Dinner			
Thursday, 10th April 2014			
9.00 – 10.30			
DISCUSSION – ECV-BASED EVALUATION OF THE OVERALL ATMOSPHERIC OBSERVING SYSTEM			
6. Surface ECVs			
Air temperature	6.1	All (30')	
Wind speed and direction	6.2	All (30')	
Water vapour	6.3	All (30')	
10.30 – 10.45 Coffee			
10.45 – 12.15			
DISCUSSION – ECV-BASED EVALUATION OF THE OVERALL ATMOSPHERIC OBSERVING			

SYSTEM – (Surface, continued)			
Pressure	6.4	All (30')	
Precipitation	6.5	All (30')	
ECV Surface Radiation Budget	6.6	All (30')	
12.15 – 12.45			
7. GRUAN			
Report on status of GRUAN	7.1	Thorne (30')	
12.45 – 13.45 Lunch			
13.45 – 15.45			
DISCUSSION – ECV-BASED EVALUATION OF THE OVERALL ATMOSPHERIC OBSERVING SYSTEM			
8. Upper-Air ECVs			
Temperature	8.1	All (30')	
Wind speed and direction	8.2	All (30')	
Water vapour	8.3	All (30')	
Cloud properties	8.4	All (30')	
15.45 – 16.00 Coffee Break			
16.00 – 16.30			
DISCUSSION – ECV-BASED EVALUATION OF THE OVERALL ATMOSPHERIC OBSERVING SYSTEM (Upper-air, continued)			
Earth radiation budget (incl. solar irradiance)	8.5	All (30')	
16.30 – 18.00			
9. General discussion of ECVs and related matters	Discussion of current list of ECVs. Should all remain? Should any be renamed? Do we make precursor species an additional ECV? Do we wish to designate any others? Should we have a separate list of variables important for impacts and adaptation? What about fluxes?		
ECV list	9.1	All (45')	Discussion of current list of ECVs. Should all remain? Should any be renamed? Do we make precursor species an additional ECV? Do we wish to designate any others?
Other important variables	9.2	All (45')	Should we have a separate list of variables important for impacts and adaptation? If so, which ones? What about fluxes?
18.00 End of Day 2			

Friday, 11th April 2014			
9.00 – 9.25			
10. Data management			
General discussion and review of IP-10 data-centre table	10.1	All (25')	
9.25 – 10.00			
11. GAW			
Report on status of GAW	11.1	Tarasova (35')	
10.00 – 11.00			
12. Review of cross-cutting actions from IP-10	12.1	All (60')	
11.00 – 11.30 Coffee Break			
11.30 – 12.30			
13. Space-based Observations			
Reports on activities related to space-based observation	13.1	Saunders/Schulz (40')	
Review of cross-cutting actions from 2011 Satellite Supplement	13.2	All (20')	
12.30 – 13.30 Lunch			
13.30 – 14.45			
14. Future activities of AOPC			
AOPC Terms of Reference	14.1	All (30')	<i>Review of AOPC ToRs, including a discussion on defining the future AOPC role and its key connections.</i>
Report on activities related to space-based observation	13.1	Goldberg from remote (15')	
AOPC Work Plan 2015-2018	14.2	All (30')	<i>Key AOPC activities to progress within the next four years; discussion on timeline.</i>
14.45 – 15.00			
15. Closure			
AOB	15.1	(10')	
Next session	15.2	(5')	
Adjourn	15.3		

The GCOS Programme has to report on progress and develop a new Implementation Plan, and a short report on initial scoping discussions has recently been circulated. As agreed at AOPC-XVIII,

the 2014 session of AOPC is devoted mainly to these activities, in particular to an ECV-by-ECV review. A document including ECV tables, cross-cutting actions from IP-10 and other material to guide discussions will be circulated. Please prepare for this session of AOPC by reading this document and giving thought to issues in your area of expertise. A few regular reporting items have been interspersed in the agenda. If you have other items to report or raise, please do so in the discussion of the relevant ECV or cross-cutting action; you may volunteer 2-3 slides for such items, but do please try to be brief.

Insofar as we have the required expertise around the table, we will discuss the various items in the ECV tables and make initial entries or notes where we can. The exercise is both for information gathering and a forward-looking discussion with the 2016 Implementation Plan in mind. We also need to agree follow-up actions and responsibilities, so that the material is in place for the writing the Progress Report to start towards the end of this year, and the writing of the Implementation Plan to start in 2015. The scoping discussion has called for a workshop early in 2015 as part of the preparation of the Implementation Plan. The 2015 session of AOPC should consider the draft of the Progress Report prior to its release for public review, and will be able also to consider the outcomes of the workshop on the Implementation Plan.

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Annex III

Preliminary definitions of tiered networks

Global Reference observing networks: provide metrologically traceable observations with quantified uncertainty at a limited number of locations. (SI units, recognized standards, redundancy, metadata, active management)

Global Baseline observing networks: involve a subset of the comprehensive network at selected locations that is globally representative and provide long-term data records of sufficiently high quality to characterise global to regional variability and change. (metadata, meets the RRR, active management)

Comprehensive observing networks: include regional and national networks and, where appropriate, satellite data. The comprehensive networks provide observations at the detailed space and time scales required to fully describe the nature, variability and change of a specific climate variable.

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Annex IV

List of Acronyms

AOPC	ATMOSPHERE OBSERVATION PANEL FOR CLIMATE
AGG	AOPC ADVISORY GROUP ON GSN AND GUAN
ARM	ATMOSPHERIC RADIATION MEASUREMENT PROGRAMME
BUFR	BINARY UNIVERSAL FORM FOR THE REPRESENTATION OF METEOROLOGICAL DATA (code)
BSRN	BASELINE SURFACE RADIATION NETWORK
CAS	COMMISSION FOR ATMOSPHERIC SCIENCES (WMO)
CATCOS	CAPACITY BUILDING and TWINNING for CLIMATE OBSERVATIONS
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
CMPs	GCOS CLIMATE MONITORING PRINCIPLES
COP	CONFERENCE OF the PARTIES
DEFRA	DEPARTMENT FOR ENVIRONMENT, FOOD and RURAL AFFAIRS (UK)
DOI	DIGITAL OBJECT IDENTIFIER
DWD	DEUTSCHER WETTERDIENST (GERMANY)
EC	EUROPEAN COMMISSION
ECMWF	EUROPEAN CENTRE FOR MEDIUM-RANGE WEATHER FORECASTS
ECV	ESSENTIAL CLIMATE VARIABLE
ESA	EUROPEAN SPACE AGENCY
ET-DARE	EXPERT TEAM ON DATA RESCUE (CCL)
EUMETSAT	EUROPEAN ORGANISATION FOR THE EXPLOITATION OF METEOROLOGICAL SATELLITES
GAW	GLOBAL ATMOSPHERE WATCH (WMO)
GEO	GROUP ON EARTH OBSERVATION
GCM	GCOS COOPERATION MECHANISM
GFCS	GLOBAL FRAMEWORK FOR CLIMATE SERVICES
GHGS	GREENHOUSE GASES
GNSS	GLOBAL NAVIGATION SATELLITE SYSTEM
GOOS	GLOBAL OCEAN OBSERVING SYSTEM
GOS	GLOBAL 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
IASI	INFRARED ATMOSPHERIC SOUNDING INTERFEROMETER
ICM	IMPLEMENTATION AND COORDINATION MEETING (GRUAN)
IGBP	INTERNATIONAL GEOSPHERE-BIOSPHERE PROGRAMME
ISTI	INTERNATIONAL SURFACE TEMPERATURE INITIATIVE
IPET-DRMM	INTER-PROGRAMME EXPERT TEAM ON DATA REPRESENTATION MAINTANENCE AND MONITORING

IPET-OSDE	INTER-PROGRAMME EXPERT TEAM ON THE OBSERVING SYSTEM DESIGN AND EVOLUTION
JMA	JAPAN METEOROLOGICAL AGENCY
KNMI	ROYAL NETHERLANDS METEOROLOGICAL INSTITUTE
NCDC	NATIONAL CLIMATIC DATA CENTER (USA)
NWP	NUMERICAL WEATHER PREDICTION
NOAA	NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (USA)
OGC	OPEN GEOSPATIAL CONSORTIUM
OOPC	OCEAN OBSERVATIONS PANEL FOR CLIMATE
OPACE	OPEN PANEL OF CCL EXPERTS
RBCN	REGIONAL BASIC CLIMATOLOGICAL NETWORKS (WMO)
PR	PERMANENT REPRESENTATIVE
PW	PRECIPITABLE WATER
RRR	ROLLING REQUIREMENTS REVIEW (WMO)
SAF	SATELLITE APPLICATION FACILITY
SAG	SCIENCE ADVISORY GROUP (GAW)
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)
SC	STEERING COMMITTEE
TAO	TROPICAL ATMOSPHERE OCEAN PROJECT
TRITON	TRIANGLE TRANS-OCEAN BUOY NETWORK
TOPC	TERRESTRIAL OBSERVATION PANEL FOR CLIMATE
UNESCO	UNITED NATIONS EDUCATIONAL, SCIENTIFIC AND CULTURAL ORGANIZATION
UNFCCC	UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE
WGCM	WCRP WORKING GROUP ON COUPLED MODELLING
WCRP	WORLD CLIMATE RESEARCH PROGRAMME
WDCGG	WORLD DATA CENTRE FOR GREENHOUSE GASES
WIGOS	WMO INTEGRATED GLOBAL OBSERVING SYSTEM
WDAC	WCRP DATA ADVISORY COUNCIL
WMO	WORLD METEOROLOGICAL ORGANIZATION
WOAP	WCRP OBSERVATIONS AND ASSIMILATION PANEL
WRDC	WORLD RADIATION DATA CENTRE (WMO)
WRMC	WORLD RADIATION MONITORING CENTRE
WSL	EIDGENÖSSISCHE FORSCHUNGSANSTALT FÜR WALD, SCHNEE UND LANDSCHAFT
WWW	World Weather Watch

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