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20th Session of the GCOS/WCRP Atmospheric Observation Panel for Climate (AOPC-20)

WSL, Birmensdorf, Switzerland
17-20 March 2015

GCOS-190
WCRP-13/2015



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Note this report does not describe all the presentations but summarises the discussions and actions agreed.

Preceding this meeting a joint session of TOPC and AOPC was held on the 18th March 2015. A note of this session included in Annex 5.

Presentations are made available at <http://www.wmo.int/pages/prog/gcos/index.php?name=AOPC-XX> and for the joint session

<http://www.wmo.int/pages/prog/gcos/index.php?name=TOPC-AOPC>

Contents

1. Opening of the Meeting.....	5
2. Update on programme activities	5
2.1. GCOS Update.....	5
2.2. GCOS Cooperation Mechanism (GCM)	6
2.3. GEO Update	6
3. Discussion on AOPC/TOPC Cross-cutting issues.....	6
4. Collaboration with WCRP.....	6
5. ECV-Based Evaluation of the Overall Atmosphere Monitoring System.....	6
5.1. Update on the GCOS Status Report	6
5.2. Composition ECVs	7
5.3. Upper-air ECVs	8
5.4. Surface ECVs	8
5.5. WIGOS	10
6. Joint Agenda Item with the SWISS GCOS Roundtable:.....	10
7. Recommendations for the next GCOS Implementation Plan	11
7.1. Report back from Advisory Group on GSN and GUAN (AGG) meeting	11
7.2. Report from GSN Monitoring Centres	11
7.3. Report from NCDC Analysis/Archive Centre.....	12
7.4. Report on the status of GRUAN	12
7.5. Report from Global Precipitation Climatology Centre	12
7.6. Report from Global Atmosphere Watch	12
8. Space-based Observations.....	13
9. Data management.....	13
10. Future activities of AOPC.....	13
10.1. AOPC Terms of Reference.....	13
10.2. AOPC Work Plan 2015-2018.....	13
11. Closure.....	14
Appendix 1 List of Participants.....	15
Appendix 2 Agenda.....	20
Appendix 3 Notes on AGG provided by Prof. Phil Jones.....	25
Appendix 4 DRAFT Terms of Reference	28
Appendix 5 Joint TOPC/AOPC Session	30

20th Session of the GCOS/WCRP Atmospheric Observation Panel for Climate (AOPC-20) 17 - 20 March 2015

Minutes

1. Opening of the Meeting

The meeting opened with a welcome to the Swiss Federal Institute for Forest, Snow and Landscape Research, WSL, by its Director, Prof. Konrad Steffen. The list of participants can be found in Annex 1. The agenda (Annex 2), with the addition of a presentation on the Observing System Capability Analysis and Review (OSCAR) database, was adopted with the following considerations:

- The overall aim of this meeting was to review the status of Essential Climate Variables (ECVs) in preparation for the status report. AOPC needs to check what is missing in the current list of ECVs and also check that they are all needed.
- As there are term limits potential new members need to be identified. It is important to increase the diversity of AOPC members and expand membership to the permitted maximum of 12.

#	Action	Deadline	Responsibility
20/1	Nomination people for new Implementation Plan writing Team	September	AOPC Chair
20/2	Make proposals for new panel members (try to extend membership diversity), in particular: <ul style="list-style-type: none"> • Cloud expert 	July	All

2. Update on programme activities

2.1. GCOS Update

Presentation	
Status of next GCOS Assessment cycle, future expectations of TOPC.	Carolin Richter
The Ocean Observations panel for Physics and Climate (OOPC)	Katy Hill

The AOPC Chairman, Dr. Kenneth Holmlund, added that the panel should consider if the Implementation Plan should be complemented by a supplement on in-situ observations in the same way the “Satellite Supplement” had been generated for the last Implementation Plan. The next plan needs to be more visionary in expressing the needs for 2050. The GCOS Director, Dr. Carolin Richter replied that this was recommended in the GCOS review, suggesting looking ahead into a period of 20-30 years.

Dr. Albert Klein-Tank, AOPC Vice-Chairman, mentioned in relation to Programme of Research on Climate Change Vulnerability, Impacts and Adaptation (PROVIA) on a joint EUMETNET/WMO conference which is being planned.

2.2. GCOS Cooperation Mechanism (GCM)

Prof. Adrian Simmons, who is leading the drafting of the GCOS Status Report, said that in the status report he was more positive on the performance of the surface and upper-air networks, where there has been a significant increase in both availability and data quality.

2.3. GEO Update

Presentation	
Group on Earth Observations (GEO) - 2015 Update -	André Obregón

Some of the points that followed:

- How can GEO leverage data access and delivery without adding to the workload?
- WCRP is engaged in GEO and is willing to support the GEO data discovery and brokering of the Earth System Grid Federation.
- Free and open access; how do GEO encourage and police this?

3. Discussion on AOPC/TOPC Cross-cutting issues

The discussion was postponed to the joint session (Annex 5).

4. Collaboration with WCRP

Dr. Michel Rixen, WCRP, was giving a presentation at the joint day (Annex 5), but already remarked that a task team on fluxes is being established by WCRP within the Data Advisory Council (WDAC).

5. ECV-Based Evaluation of the Overall Atmosphere Monitoring System

5.1. Update on the GCOS Status Report

Presentation	
Report on the Status of the GCOS Status Report	Adrian Simmons

The ECV table is divided into surface ECVs, Upper air ECVs and composition but this could be changed for next Implementation Plan as this is not a clear-cut differentiation. Surface and Upper air are WMO terminology with surface essentially below 10m and upper air above that.

Satellite continuity in the future is uncertain for many space agencies. JAXA now needs to get funds on a case-by-case basis so their plans are not guaranteed. On the other hand, China is

starting to strengthen its commitments and role as a member of the international Earth Observation community.

The section in the Status Report on the need for systematic observations will recognise the needs are broadening. Adaption needs will drive a requirement for finer time resolution.

#	Action	Deadline	Responsibility
20/3	AOPC to take note of the schedule for the status report and contribute to the review, especially precipitation, water vapour and clouds	March/April	All
20/4	Consider current grouping of atmospheric ECV with a view to a new arrangement for the new Implementation Plan	Discuss and agree before September	All

5.2. Composition ECVs

Presentation	
Atmospheric Composition Issues	James H. Butler

A specific issue raised by the presentation was that the meaning of a “GCOS network” is unclear. This can be agreed for baseline networks but for more comprehensive networks it is unclear. Is there a formal process for a network to become an “official” GCOS network? There is information available on the status as official GCOS networks of the networks mentioned on GOSIC site.

With respect missing observations it is not clear if measurements are made and not transmitted or not made at all.

Some of the BSRN and O3 stations have been closed (Chesapeake Lighthouse, Canada) and the network needs strengthening. Nauru and Manus in Pacific have also been lost. AOPC should establish if there is a need to continue investing in these sites. Also, there is a need for a robust ground network of sites to calibrate satellites – and sufficient geographic coverage - to be able to cover loss of some sites. Can satellite programmes, maybe on a systematic basis, be more linked to in-situ measurements through the provision of support to calibration/validation or reference sites? WMO may have a role here in promoting a surface based component of the global observing systems using satellites.

GCOS should support the BIPM/WMO agreement on coordinating calibration of GHG concentrations, traceability etc. There is an opportunity at a BIPM meeting in Paris 1 July, at which Andreas Becker will take part on behalf of GCOS.

The question was raised whether we do want to elaborate the aerosol ECV as including but not restricted to aerosol optical depth, light scattering and absorption coefficient.

#	Action	Deadline	Responsibility
20/5	Recommend that a surface based component is		GCOS

	an integral part of global observing systems using satellites. Contribute to vision papers (GOS for 2025, WIGOS 2040)		WMO
20/6	Support the BIPM/WMO Mutual Recognition Arrangement on coordinating calibration of GHG concentrations, traceability etc. to avoid bias among observing systems. Represent AOPC/GCOS at a meeting of BIPM in Paris 1 st July.	1 st July meeting	AOPC Chair and GCOS Secretariat

5.3. Upper-air ECVs

Presentation	
Upper Air ECVs	Robert Husband
Upper Air Winds	Adrian Simmons

#	Action	Deadline	Responsibility
20/7	Consider and agree any on new definitions of ECVs, in particular: <ul style="list-style-type: none"> • Definitions of aerosols • Other long-lived greenhouse gases • Agree on need for observations in tropopause/mesosphere and define upper limit of ECVs 	Discuss and agree before September	All
20/8	Promote access to raw data, rather than just processed data from observations.		All
20/9	Opening up archives is a good contribution but countries should be encouraged to allow full open access to the data.		GCOS Secretariat
20/10	Produce improved plots of hourly temperature/wind measurements received by NCDC and ECWMF to better show changes and regional differences	Summer 2015	Adrian

5.4. Surface ECVs

Presentation	
Measuring ECV's in the polar environment	Steve Colwell
ECV Precipitation	Andreas Becker
Surface winds and pressure	Adrian Simmons

It was suggested that for the Status Report there should be an extra paragraph on data archives, digitization and data recovery. Dr. Klein-Tank proposed to provide some specific comments on this topic after the meeting. It was also suggested to add a summary of what is “new” compared to the last IP for the specific ECV.

The report on Pressure and Surface Winds, given by Prof Simmons, led to the proposal to get more interpretation on GSN figures. For example, show the number of data against area in GSN map, so that it can be demonstrated that for example 50% of the land only holds 5% of the data. This could be supplementary information in an annex.

Dr Andreas Becker reported on precipitation. The panel experts suggested interpreting the figures in a way that shows again the data voids or concentrations. It was recommended to update precipitation plot on historic observations.

#	Action	Deadline	Responsibility
20/11	Provide extra paragraphs on data archives, digitisation and data recovery for the Status Report to Adrian. Also Provide a summary of what is new for this ECV	April	Albert Klein-Tank
20/12	Provide more interpretation in the GSN figures; show the number of data against area in GSN map, so that it can be demonstrated that, for example, 50% of the land only holds 5% of the data. Could be supplementary information in an annex. Ask for better figures by the end of August 2015.	August 2015	Adrian Simmons
20/13	Redraw the figures in a way which shows again the data voids or concentrations; update precipitation plot on historic observations.	April	Andreas Becker to discuss with Phil Jones how the figures can be improved.

5.5. WIGOS

Presentation	
WIGOS, the RRR, OSCAR, and the WIGOS Data Quality Monitoring System	Lars Peter Riishojgaard

Dr. Lars Peter Riishojgaard provided an overview of the OSCAR databases supporting WIGOS and the WMO Rolling Review of Requirements. He expressed the view that the link between the OSCAR/Requirement database and GCOS is broken, as evidenced by the fact that the last entries from GCOS in the system date back to 2007. The panel experts were concerned about possible duplication of effort between OSCAR and the CEOS-CGMS ECV inventory activity, but it was recognized that the ECV inventory has a broader role and scope than OSCAR/Requirements that is a repository of quantitative requirements for those geophysical variables that are needed to support the WMO Programmes and application areas. How to do the gap analysis has not been decided yet. In any case, the Panel agreed that the GCOS entries were out-dated and that a process for re-engaging with WIGOS and updating the values will need to be devised.

#	Action	Deadline	Responsibility
20/14	Consider if GCOS observation requirements should be included into the WIGOS OSCAR requirements database. Consider <ul style="list-style-type: none"> • If GCOS requirements should be included • How to translate GCOS requirements to WIGOS • Should all ECV be included or a subset? • Timescale for updating existing information • Inclusion of new requirements from new IP Trial with some easy items.		GCOS Secretariat to produce proposals on these items and circulate to panel chairs.

6. Joint Agenda Item with the SWISS GCOS Roundtable:

This year the AOPC panel was run in parallel with the Swiss GCOS Round Table, on 19 March 2015, at the same venue. To benefit from the national community, a joint agenda item had been arranged on International Data Centres and the presentations had been lined up as follows:

- Swiss GCOS Data in International Data Centers (Dr Gabriela Seitz/Dr Fabio Fontana)
- The World Glacier Monitoring Service (Dr Michael Zemp)
- WDC on Green House gases Dr (Nozumo Ohkawara)

The discussion centred on the following ideas and possible actions:

- to repeat / update / revise the Key Needs from IP-10, check with Dr Alan Belward
- to use the GCOS Suisse Report and the update of the ECV tables and align timing with Status Report
- to use the Generic Table Structure for ECVs as used by MeteoSuisse to be replicated / recommended to be used
- to help to promote the Key message: long-term sustainability of funding for a data centre is essential to maintain its infra-structure.

- to include in the Status Report a summary table on characteristics following the example of GCOS Switzerland.
- to expedite the Suisse model of national GCOS activities to other countries. The Netherlands are maybe a new national GCOS office.

7. Recommendations for the next GCOS Implementation Plan

7.1. Report back from Advisory Group on GSN and GUAN (AGG) meeting

Presentation	
AGG Report Back to AOPC	Phil Jones and Tim Oakley

The summary report provided by the chairman of the Advisory Group on GSN and GUAN, Prof. Philip Jones, is included in Annex 3.

20/15	Formally ask India to designate 4 radiosonde sites as part of GUAN. Need to build relationship with India to get commitment.	Tim Oakley (GCOS Secretariat)
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7.2. Report from GSN Monitoring Centres

Presentation	
<i>GSNMC Monitoring Results 2014</i>	Nozomu Ohkawara and Andreas Becker

#	Action	Deadline	Responsibility
20/16	GSN. Where stations have been replaced and operation of new stations overlap with old stations ask for data from both stations for overlap period. Ensure this data is shared with the emerging parallel measurements database effort under the International Surface Temperature Initiative		Tim Oakley, Peter Thorne

7.3. Report from NCDC Analysis/Archive Centre

Presentation	
Report from the GCOS Archive/Analysis Center	Matthew Menne

#	Action	Deadline	Responsibility
20/17	Produce report cards on receipts by DWD/JMA, ECMWF, NCEI for each country to track what is received		Matthew Menne
20/18	Support ICOADS Land Archive integrating existing separate archives and NCDC.		GCOS Secretariat

7.4. Report on the status of GRUAN

Presentation	
GRUAN	Peter Thorne

#	Action	Deadline	Responsibility
20/17	Check on GRUAN paper for “Our Common Future” conference		GCOS Secretariat
20/18	Approve ICM-7 report when it is available		GCOS Secretariat & AOPC Chairs

7.5. Report from Global Precipitation Climatology Centre

Presentation	
Report from the Global Precipitation Climatology Centre (GPCC)	Andreas Becker

#	Action	Deadline	Responsibility
20/19	Cooperate on updated data request letter		GPCC & GCOS Secretariat
20/20	Support alternative ways for joint daily data acquisition, in particular OGC compliant XML & cooperation with GEO		GPCC & GCOS Secretariat
20/21	Review meta information		GPCC & GCOS Secretariat
20/22	Consider web services for data and product dissemination		GPCC & GCOS Secretariat

7.6. Report from Global Atmosphere Watch

Presentation	
WMO/GAW Contributions to GCOS	James Butler

#	Action	Deadline	Responsibility
20/23	Clarify the formal process for a network to become a GCOS network.		Tim & GCOS Secretariat
20/24	Produce some text on what are GCOS, reference and baseline networks. There is a parallel effort ongoing in GAIA-CLIM to deliver in November led by Peter Thorne with Tim Oakley involved.	Inclusion in status report and discussion at next AOPC	Adrian & Peter & GCOS Secretariat

8. Space-based Observations

Presentation	
<i>Report of the GCOS Space Rapporteur to AOPC-20</i>	Robert Husband

9. Data management

Presentation	
<i>Climate Monitoring and Assessment: a ccl contribution to address ECVs</i>	Manola Brunet

#	Action	Deadline	Responsibility
20/25	Support WMO CCI and their promotion of GCOS ECVs as part of GCOS outreach. In particular continue to support WMO CCI data rescue i-DARE international data rescue portal. Also encourage USAID to support data rescue from ACMAD microfiches by IEDRO (supported by GCOS/CCI).		GCOS Secretariat
20/26	Encourage that rescued data being entered into global/regional data centres. Consider storing images of rescued data rather than just digitised data. NCEI will do this for land data.		GCOS Secretariat

10. Future activities of AOPC

10.1. AOPC Terms of Reference

Annex 4 contains the draft of the AOPC Terms of Reference that was presented for discussion.

#	Action	Deadline	Responsibility
20/27	Consider and make suggestions for the AOPC Terms of Reference		AOPC Chairs

10.2. AOPC Work Plan 2015-2018

Presentation	
<i>AOPC Work Plan</i>	Carolin Richter

#	Action	Deadline	Responsibility
20/28	Produce a position paper on AOPC way forward from which a draft work plan can be produced and agreed	try to agree this year	Carolin

11. Closure

The GCOS Secretariat and the panel participants expressed their sincere gratitude to the host of the meeting, Prof. Konrad Steffen and his assistant Ms Rosmarie Buechi. The AOPC benefited greatly from the provision of excellent meeting facilities and enjoyed thoroughly the generous hospitality of WSL.

The meeting closed on 20 March 15 30 hrs.

Appendix 1 List of Participants

**GCOS/WCRP
ATMOSPHERIC OBSERVATION PANEL FOR CLIMATE
TWENTIETH SESSION (AOPC-XX)
WSL, ZURICH, SWITZERLAND, 17-20 MARCH 2015**

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Appendix 2 Agenda

20th Session of the GCOS/WCRP Atmospheric Observation Panel for Climate (AOPC-20)

17 - 20 March 2015

Preliminary Agenda – Status 9 March 2015

A meeting of the Advisory Group on GSN/GUAN (AGG) will precede AOPC-20 on Tuesday (17 March 2015) from 9.00 – 13.00. All participants from AOPC are welcome to attend. An agenda will follow, for further questions please contact the GCOS Implementation Manager Mr Tim Oakley (TOakley@wmo.int).

Tuesday, 17 th March 2015				
14:00	1. Opening of the Meeting			
–	Welcome and introductions	1.1	Holmlund/Briggs	
14:15	Adoption of Agenda	1.2	Holmlund/Klein-Tank	
	Conduct of the Meeting	1.3	Holmlund/Richter	
14:15	2. Update on programme activities			
–	2.1 GCOS Update	2.1	Richter (30')	Status of next GCOS Assessment cycle, future expectations of AOPC.
15:45	2.1.1 Update on Panel activities	2.1.1		Update on TOPC and OOPC, to prepare for the joint AOPC/TOPC (see item 3.).
	2.2 GCOS Cooperation Mechanism (GCM)	2.2	Oakley (30')	Update on GCM; Potential input from/benefit for AOPC. Recommendations from AOPC members for certain GCM projects.
	2.3 GEO Update	2.3	Obrégon (30')	Update on GEO activities, the new Implementation Plan, discussion on SBA Climate, with focus on activities related to Atmosphere ECVs.
15:45 – 16:15 Coffee Break				
16:15	3. Discussion of AOPC/TOPC			
–	Cross-cutting issues	3.	All (60')	Where is the key potential for a stronger future collaboration? What are the main issues of discussion? Where would the AOPC experts like to see stronger involvement from TOPC experts?
17:15				

17:15	4. Collaboration with WCRP			
– 18:00			All (60')	<p>Overview on WCRP and ideas on possible input for new GCOS IP will be given by Michel Rixen at the joint day on 18 March.</p> <p>TOPC would like to see a stronger involvement with the larger WCRP community, and AOPC should decide if they would like to follow the same path. Panel members to discuss how to stronger involve the larger WCRP community, and what is expected.</p> <p>The output of the discussion will feed back into discussions at the joint panel's day.</p>
18:00	End of Day 1			
19:00	Group Dinner, AOPC jointly with TOPC participants, WSL is inviting all to the Restaurant at the Uetliberg			

Wednesday, 18 th March 2015				
Joint Session Day with the participants from the 17 th Session of the GCOS/GTOS/WCRP Terrestrial Observation Panel for Climate (TOPC-17) Agenda will be circulated separately.				

19:00 Group Dinner (hosted by the GCOS Switzerland (MeteoSuisse), at the Hotel Leuen)				
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Thursday, 19 th March 2015				
Continuation of AOPC-20				
09:00	5. ECV-BASED EVALUATION OF THE OVERALL ATMOSPHERE MONITORING SYSTEM			
– 12:30	5.1 Update on the GCOS Status Report	5.1	Simmons (30')	Update on the current status of the chapter on atmospheric ECVs.
	5.2 Composition ECVs	5.2	<p>Atmospheric/composition experts in their area of expertise to report on current scientific gaps, issues of concern, and what is expected from AOPC to further observations. (ECVs: Carbon dioxide, Methane and other long-lived greenhouse gases, Ozone and Aerosol supported by their precursors)</p> <ul style="list-style-type: none"> • Jim Butler / Dale Hurst 	
	5.3 Upper-air ECVs	5.3	Experts in their area of expertise to report on current scientific gaps, issues of concern, and	

			<p>what is expected from AOPC to further observations. (ECVs: Temperature, Wind speed and direction, Water vapour, Cloud properties, Earth radiation budget)</p> <ul style="list-style-type: none"> • Temperature (Peter Thorne/Roger Saunders/Tim Oakley) • Wind (Adrian Simmons) • Water Vapour (Roger Saunders/Peter Thorne/Tim Oakely) • Clouds (Ken) • Earth Radiation (Roger Saunders)
	5.4 Surface ECVs	5.4	<p>Experts in their area of expertise to report on current scientific gaps, issues of concern, and what is expected from AOPC to further observations. (ECVs: Air temperature, Wind speed and direction, Water vapour, Pressure, Precipitation, Surface radiation budget)</p> <ul style="list-style-type: none"> • Specific focus on cold regions (Steve Colwell) • Temperature (Phil Jones/Matt Menne) • Wind (Adrian Simmons) • Water Vapour (Peter Thorne) • Clouds (Ken?) • Surface Radiation (Albert?/Nozumo?) • Pressure (Adrian Simmons/Phil Jones) • Precipitation (Andreas Becker)

12:30 – 14:00 Lunch Break			
14:00 – 15:00	Joint Agenda Item with the SWISS GCOS Roundtable: International Data Centres:	6	<p>SWISS GCOS Roundtable Every year, the Swiss Federal Office of Meteorology and Climatology (MeteoSuisse) is organizing a National GCOS Roundtable. This year, AOPC member Gabriela Seiz has invited AOPC participants to join the agenda item on International Data Centres:</p> <ul style="list-style-type: none"> • Swiss GCOS Data in International Data Centers (Gabriela Seitz/Fabio Fontana) • The World Glacier Monitoring Service (Michael Zemp) • WDC on Green House gases (Nozomu Ohkawara)
15:00 – 15:15 Break			
6. Recommendations for the next GCOS			

15:15 – 17:45	Implementation Plan What needs to be done for missing ECVs? AOPC to recommend new ECVs or delete old ones? (30`)			
	7. Report of AGG, GSN, GUAN, and GRUAN GPCC, and GAW			
	Report back from AGG meeting	7.0	Phil Jones/Tim Oakely	The AGG has met prior to the Panel, on Tuesday 17 March 9 – 13 hrs.
	Report from GSN Monitoring Centres	7.1	Becker/Ohkawara	Joint report of DWD and JMA
	Report from NCDC Analysis/Archive Centre	7.2	Menne	
	Report on the status of GRUAN	7.3	Thorne	
	Report from Global Precipitation Climatology Centre	7.4	Becker	
	Report from Global Atmosphere Watch	7.5	Butler	
17:45	End of Day 2			

Friday, 20 th March 2015				
9:00 – 10:30	8. Space-based Observations			
	Reports on activities related to space-based observation, Review of cross-cutting actions from 2011 Satellite Supplement	8.1	Husband (30`)	
	9. Data management			
	Climate Monitoring and Assessment	9.1	Manola Brunet (30)	Prof Brunet will inform the panel how the WMO Commission for Climatology is addressing ECVs.
	General discussion and review of IP-10 data-centre table	9.2	All (30`)	GCOS Implementation Plan (p.77 ff), GCOS-138 http://gcos.wmo.int/Publications/gcos-138.pdf

10:30 – 10:45 Coffee				
10:45	10. Future activities of AOPC			
–				
12:15	AOPC Terms of Reference	10.1	All (30')	Review of AOPC ToRs, including a discussion on defining the future AOPC role and its key connections.
	AOPC Work Plan 2015-2018	10.2	All (30')	Key AOPC activities to progress within the next four years; discussion on timeline.
	11. Revision of Action Items and Wrap Up discussion			
	11.1 Review of action items	11.1	Holmlund/Klein-Tank (30')	Review of last years' actions.
12:15 – 13:15 LUNCH				
13:15	12. Wrap-Up discussion	12		
–	13. Closure			
16:00	AOB	13.1		
	Next session	13.2		

Appendix 3 Notes on AGG provided by Prof. Phil Jones.

Report Back – so Summary

Changes to the GSN/GUAN Networks

GSN

Canada has informed GCOS of 4 closures and suggested 4 new sites (all less than a km away).

Jordan has informed of 2 closures and suggested 2 new sites.

GCOS needs to respond to both countries to accept the changes and modify the master GSN list.

GUAN

3 sites are not reporting since 2012/3 – Karachi, Honiara and Port Moresby.

AGG suggests that these three sites be removed from the GUAN list.

Project Reports

a) Madagascar for GSN

Reporting better, but much of this comes from the original manned stations and not the AWSs! Software is working better and we're getting CLIMATs from the manned stations!

Project has problems with BUFR, but these are issues with BUFR and not just this particular project.

Issues/Lessons learned:

- (1) Can we get the parallel measurements from the manned and AWS sites? These are useful to look as they are for a tropical location.
- (2) AWSs require the replacement of SIM Cards every year. System works when the power is up. Power outages at the centre mean that message don't get out when there is no power.
- (3) Better if data went to the cloud and not to the centre, but this would have data issues with the NMS.
- (4) Can the missing CLIMATs be rescued from the NMS if the project goes back to the country?

b) Angola and DRC – projects in abeyance. Equipment is at the HQ in the country, but no way of getting this to the stations. There is an African technician, supported by GCOS, who is now able to be sent to countries for assistance.

c) GUAN

Gan and Harare have had their hydrogen generators repaired.

Yerevan – GCOS is supplying sondes.

Hydrogen Generators, Lack of sondes and communication issues are the main cause of poor performance.

d) GSN Monitoring the GSN and also RBCN uses performance statistics com from NCDC/NCEI. How many people use these? Why are there slight differences with those from DWD/JMA? There is a need to check membership lists to ensure all are using the same one.

GUAN

It was recognized that there is a need to boost Pacific Islands for GUAN. East African performance is poor for GUAN. There have been no requests for assistance. Actions from 2014

Little progress seems to have been made from our meeting at ISPRA last year.

- Strengthening membership of GSN and GUAN
- Manual for Congress
- CCI Data Rescue
- Tiered Networks

Role on Monitoring Centres - several appear to be doing nothing. There is a need to reinvigorate some.

BUFR – based on a recent presentation from the Met Office to ECMWF

Summary points

- (1) ECMWF were not making much use of significant levels compared to the Met Office.
- (2) It is now possible to take account of position of the sonde during the ascent. Position unique to BUFR. It has been noticed that some launch sites differ from the positions in Volume A.
- (3) 55% of countries using reformatted TEMPs for BUFR! This needs to improve.
- (4) 15% of native BUFR - mainly Europe, Canada and Mexico.
- (5) Operational centres will whitelist BUFR stations then use.

Presentation also discussed SYNOP data availability in BUFR. Similar issues in that many are just putting data into BUFR, so not taking advantage of its greater potential to include more information.

For both U/A and SYNOP messages in BUFR, it is vital that the coding is correct and that operational centres can decode the message.

In terms of strengthening GSN and GUAN, we need to do....

- (1) CCL and CBS have both recognized that we need a Daily CLIMAT message. CBS developed a template for 'daily CLIMAT' messages. According to information received by AGG this is expected to be classified 'operational' as of 6 May 2015. It will take some time for countries and users to take advantage of this.

(2) The CBS Lead Centres are not always working – Chile, Iran, Mozambique, Morocco. Centres at BAS, NCDC, DWD and JMA are working. When will the next lead centres meet next?

(3) Convert the AGG into a WG of AOPC?

Update regulations, 144 and 182

Other issues

(1) Indian sondes? 4 seem to be producing good data according to Tim. Emails to India haven't been answered. AGG would like to add these 4 sites to the GUAN. Informal discussions will take place,

(2) Russian network – will go back to two sondes per day from April 1. Went to one a day from Jan 1, 2015.

(3) NCDC Archive is what NCDC collects and not what DWD/JMA monitor. Does this matter?

(4) WWR volume for 2000s will be finished this year. This helps a lot in Africa and South America. Has there been any progress in getting WWR onto a more frequent timetable?

Appendix 4 DRAFT Terms of Reference

Terms of Reference (Status 2014) For discussion by AOPC panel members

The Atmospheric Observation Panel for Climate was established^[PT1] by the GCOS Steering Committee in recognition of the need for specific scientific and technical input concerning atmospheric observations for climate. The Joint Scientific Committee of the World Climate Research Programme, recognizing the benefits of the AOPC, agreed in 1995 to co-sponsor the panel, which was therefore renamed as the GCOS/WCRP Atmospheric Observation Panel for Climate. It^[PT2] meets annually in person^[PT3] to review progress and address identified issues with the global observing system for climate.

AOPC is supported, amongst others, by the **WMO Integrated Global Observing System (WIGOS)** – an integrated, comprehensive, and coordinated system that comprises *in-situ* and space-based observations of the present WMO global observing systems. WIGOS represents an integrated framework of existing WMO observing systems and aims at providing the data required for delivery of services for all regions around the globe in an effective and efficient manner. To be discussed also with the other panels., should also mention the other stakeholders

The^[PT4] goal of the AOPC is to plan, monitor and promote the atmospheric component of GCOS. Its specific Terms of Reference are as follows:

1. To maintain and periodically review the list of GCOS Atmospheric Essential Climate Variables
- ~~1.2.~~ To liaise with relevant ~~research, operational and end-user stakeholder~~ bodies^[PT5] in order to determine and maintain the requirements for data to monitor, understand and predict the dynamical, physical and chemical state of the atmosphere and its interfaces on ~~seasonal to multi-decadal~~ climate relevant time scales, on both global and regional levels.
3. To promote/advocate for the establishment, re-establishment and maintenance of an overall integrated systems^[PT6] to provide long-term, high-quality, consistent data and information to meet those requirements according GCOS monitoring principles.
- ~~2.~~ To propose and promote the establishment of new systems, or enhancements to current systems and practices, to ~~eliminate~~ address deficiencies.
- ~~3.4.~~
- ~~4.~~ To ~~regularly~~ review the current ~~state and identify gaps and inadequacies~~ ~~state~~ of the atmospheric component of the global observing system ~~for climate and atmospheric reanalyses.~~
5. To promote the ~~transfer, as appropriate, of research observing systems to operational~~ establishment of sustainable observation networks and the use best practises.
6. To promote the rehabilitation of relevant historical ~~observational and proxy climate~~ data sets.
7. To promote and review institutional arrangements to ensure that climate data and observations are:
 - ~~GCOS observations are~~ of the highest quality based on agreed metrics
 - ~~GCOS data and are~~ collected in accordance with the highest standards of practice;
 - ~~GCOS data products are relevant~~
 - ~~and of the highest quality;~~
 - ~~GCOS data are~~ archived and accessible to the user community.
8. ^[PT7]To instigate the establishment of working groups and other initiatives for pursuing AOPC goals

- ~~8.9.~~ To liaise with the other GCOS panels, WCRP steering groups and other relevant entities, such as WMO Commissions, ~~and CGMS, CEOS and space agencies~~ on atmospheric climate observing system issues.
- ~~9.10.~~ ~~To carry out~~ Respond to agreed assignments from the GCOS Steering Committee.
- ~~11.~~ To report regularly to the GCOS SC and the JSC for WCRP ~~on issues related to the atmospheric component of GCOS.~~
- ~~10.12.~~ ~~To meet annually to review progress and address identified issues with the global observing system for climate.~~

Appendix 5 Joint TOPC/AOPC Session

Joint Session of the Session of the GCOS/GTOS/WCRP Terrestrial Observation Panel for Climate (TOPC) and the GCOS/GTOS/WCRP Atmospheric Observation Panel for Climate (AOPC) 18th March 2015

1 Opening of the Meeting

The meeting was chaired by Stephen Briggs (GCOS Steering Committee Chairman), Konrad Steffen (TOPC Chairman), Kenneth Holmlund (AOPC Chairman), Albert Klein-Tank (Vice-Chairman of AOPC).
A revised agenda was proposed and agreed (Annex I)

2 Collaboration with WCRP

Presentation	
WCRP update, AOPC-TOPC session	Michel Rixen

The WCRP Data Advisory Council has created a new Surface Flux Task Team comprised of Carol Anne Clayson (lead, WHOI), Pierre-Philippe Mathieu (ESA), Brian Ward (NUI-G), Jörg Schultz (EUMETSAT) and Peter Gleckler (PCMDI). They are developing a ToR and candidate membership recommendations to address: near-term flux discussion items; flux – ECV cross walk; gaps in Observing Systems; cross community tracking of surface flux activities; and a WCRP single point-of-contact.

Inputs are requested for a Copernicus reanalysis workshop on observational requirements to be held on 29 June – 1 July 2015 at ECMWF followed by the fifth session of the WCRP Data Advisory Council (WDAC) 2 – 3 July 2015.

WDAC has cooperated on the development of the <http://ecv-inventory.com/ecv-inventory> in cooperation with WG Climate, GCOS and WMO. Initially satellite data, but in-situ data will also be implemented.

There will be a Year of Polar Prediction (YOPP) Planning Summit 13-15 July 2015, WMO, Geneva and this is an opportunity for GCOS Panel experts to participate.

Action	Task	Deadline	Responsibility
17/22	Identify GCOS presentation in Year of Polar Prediction (YOPP) Planning Summit 13-15 July 2015, WMO, Geneva	April 2015	GCOS Secretariat

GEWEX has formulated specific data needs including a Grand Challenge GC on extremes, high elevation precipitation and land surface information. These needs are being re-thought into cycles. There is also a need of validation networks.

JSC-36 will meet on 8 – 10 April 2015 to discuss the new framework.

Action	Task	Deadline	Responsibility
17/23	GCOS Panels to discuss how to possibly engage in new potential areas: urban and mega cities, decadal predictions, planet data initiative, expanded mandate into VIA and other services	December 2015	All Panel Co-chairs

WCRP has links to climate services but does not deliver them: it is not in the WCRP mandate. It is not clear that there is a need for any new ECV.

Presentation

ENSO 1/2014-3/15, A brief review	D. E. Harrison
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Recent observations point to a progressive warming of the ocean surface (an incipient El Niño) but models diverge considerably in their predictions: some clarification on the extent and severity of this event is expected after June. So far there has not been a large effect or a major global event. There have been large changes in the observing system but no identifiable long-term trends in La Niño and Southern Oscillation (SO). There is no consensus on the need for more atmospheric observations and El Niño forecasts are not really good enough for operational use.

3 Implementation Plan

Presentation	
The New GCOS Implementation Plan	Alan Belward

Alan Belward will lead the drafting activities for the new Implementation Plan, which is intended to be finally submitted to COP22 in 2016. He outlined the draft Table of Contents and introduced the pathway to the final document.

Action	Task	Deadline	Responsibility
17/24	Send formal invitation to SC-23 in Cape Town to Alan Belward	April 2015	GCOS Secretariat
17/25	Panel Chairs to send nominees to IP writing team	August 2015	Panel Chairs, GCOS Secretariat

4 Proposals for input to Implementation Plan

TOPC noted that there may be a new satellite supplement but this would be written in 2017, after the completion of the new Implementation Plan, but there has been no decision to date. However, this supplement would be very useful for the satellite agencies. There may also be a need for an in-situ supplement as well. Following their consideration of the new Implementation Plan the UNFCCC COP might ask the space agencies to react to the 2016 plan.

The new Implementation Plan should prioritise actions, which should be measurable.

All parties should be careful in documenting observations for biogeophysical cycles, as this will show the incompleteness of the observing system, e.g. the ECVs do not cover all the carbon cycle. GCOS will try to address and to fill the gaps.

Regional aspect will need to be covered in the adaptation / mitigation section. The section on how global observing systems in countries could be developed in a way that serves GCOS.

While future satellite observations should be considered in the Implementation Plan, detailed requirements should be left to the satellite supplement, as requirements are quantified only in the supplement. Global Cycles

4.1 Global Energy Cycle

Presentation	
Energy Cycles in the global climate system	Martin Wild

The revised energy balance figures in the IPCC AR5 are consistent with observations (BSRN, and CERES, EBAF and TOA fluxes)

There is a difference between the energy cycle over land and over the oceans. However, for land, the mean downward radiative fluxes have the largest discrepancies and observational data are needed to constrain the variations (GEBA sites). The surface short wave downward flux is estimated using model biases (CMIP5) against BSRN.

Uncertainties remain in surface albedo in SH/LH fluxes.

The energy balance in the ocean, as measured by ARGO, indicates that 93% of additional energy goes into the ocean.

The observations (BSRN) measure the greenhouse effect at the earth’s surface as a change of 2 Wm⁻²/decade. This compares well with models estimates of h 1.7-2.2 Wm⁻²/decade (noting that decadal changes can be observed) and we now have a good understanding of the energy budget.

Solar radiation changes are also measured. There are 56 sites in Europe (Global Energy Balance Archive (GEBA). Observations of a polluted atmosphere (example sulphur dioxide and aerosols) and cleaner atmosphere due to implementation of pollution control policies can observe the impact of the policies. This pollution reduces the solar radiation reaching the ground and can impact a number of variable such Daily Temperature Range (DTR, Tmin, Tmax). Trends in the effect of aerosols after 2000 are unclear due in to increases in emissions in China and India, no trend in Japan and reductions some other regions. The southern hemisphere is less affected. This can also impact the global water cycle: variations in observed precipitation are in line with variations in surface net radiation. However, there is an on-going debate on apparent inconsistencies between observed global energy and water cycle.

4.2 Global Carbon Cycle

Presentation	
Carbon	James Butler

Action	Task	Deadline	Responsibility
17/26	Clarify list of constituents for ECV for atmospheric composition (CO ₂ , CH ₄ , NO ₂ , other long-lived greenhouse gases and pre-cursors).	September 2015 (in time new for implementation plan drafting)	GCOS Secretariat

There was a discussion about the need for an ECV “2-degree target” to monitor progress toward this target, but it is unclear what this would be and if it could be measured.

Atmospheric concentration measurements, from satellites and in-situ cannot yet replace inventories of emissions constructed using the IPCC Guidelines although they do have a role in validating emission estimates. The emission estimates made using the IPCC are the basis for mitigation policy, targets and agreements. Atmospheric concentration and surface temperature measurements indicate the success of these policies. It is possible to envisage how emissions could be monitored remotely using satellites and ground based measurements but the technologies and infrastructure are unlikely to be available for at least 20 years if developments start now. A dialog with the IPCC may help indicate ways forward.

Measurements need validation and the relationship between satellite (total column) and surface measurements (flasks) needs to be fully understood. It is important not to oversell the capabilities of satellite observations.

It is also important to continually look at new technologies, e.g., space-based LIDAR observations (profiles) of CO₂.

4.3 The Hydrological Cycle

Presentation	
Hydrological Cycle	Andreas Becker

The quality of precipitation gridded products is good, as they are quality controlled and processed. However, while the volume of data collected is increasing, a significant fraction of these observations is not being made available. Data availability is a critical issue and a major cause of uncertainty in the water balance. Countries do apply conditions on the use of data so this may be a data policy issue. The next Implementation Plan should discuss improvements in remote and in-situ measurements.

Developing a systems approach to monitoring environmental cycles would mean we could measure, as a minimum, stocks and fluxes for each cycle. This would be more systematic., however there are practical considerations – not all the items measurable, e.g. NPP.

New ECVs about isotopes should be considered, as these can be markers or indicators that help develop understanding of CO₂, ice, water vapour etc. Switzerland has introduced these as “national ECVs”.

Another potential ECV is evaporation and/or transpiration.

However GCOS needs to be rigorous and conservative in adopting new ECVs or in changing the requirements of others, especially because space agencies have based their plans on the existing ECV requirements.

4.4 Discussion

Radiation fluxes at top of atmosphere are measured but there are only local, uncoordinated and generally inaccessible measures of sensible and latent heat or heat into ground and sea. A proposal for the future would be to see if the entire energy balance at the surface as well as at the top of the atmosphere can be systematically measured.

Latent heat is a key link between energy and water cycle and it would be good to ensure consistency between two cycles. There are some regional fluxes available. WCRP is working on some of these fluxes so GCOS would need to collaborate with them on the scientific aspects. They could be included as part of “surface energy budget”. One issue is whether global or land and sea data are enough to drive models and what resolution is needed.

Accuracy is not just about the precision of data but the consistency and coherence of all ECVs. The ECVs should give a holistic view of the planet. Radiation is important for both terrestrial and atmospheric panels.

Climate engineering is another potential user of GCOS type data. It is not clear whether the available data are useful and sufficient to tackle this problem. Could the observation system pick up the signal of geo-engineering? GCOS should work with WCRP in dealing with this topic.

UNFCCC is GCOS’s primary customer but the ECVs are also important to the understanding of other biogeochemical cycles, as well as to address the other Rio conventions (desertification and biodiversity).

Specifically, data about extremes are needed to deal with Disaster and Risk Reduction (DRR).

The meeting considered the current list of ECVs and how they related to the 3 cycles discussed and to each panel (see Table 1 below). While it is not finalised, it is included here to inform future cross-panel discussions.

5 AOB

It was agreed that the joint meeting was useful.

Revised panel membership should ensure gender balance as well as regional balance as far as possible.

More cross-panel links are needed to cover ECVs that relate to the different domains. The panel co-chairs need to monitor progress and ensure these links are maintained.

Action	Task	Deadline	Responsibility
17/27	Appoint a panel member to attend other panels. There should be a standing invitation for panel chairs to attend meetings	Before next panel meeting	GCOS Secretariat
17/28	Ensure actions are delegated and consider an executive group to oversee progress.	June 2015	Panel Chairs

Table 1 Consideration of ECVs and 3 Environmental Cycles

			Energy Cycle	Hydrological Cycle	Carbon Cycle
Atmosphere	Surface	Air temperature	Major3	Minor	Minor
		Wind Speed and direction	Minor	Minor	Minor
		Water Vapour	Minor	Major2	-
		Pressure	-	-	-
		Precipitation	Major2	Major2	Major2
		Surface Radiation Budget	Major2	Major2 (driver)	Major1
	Upper Air	Temperature	Major	minor	-
		Wind speed and direction	Minor	Major2	Minor
		Water Vapour	Minor	Major2	-
		Cloud Properties	Minor	Major1	Minor
		TOA Earth radiation budget (inc Solar irradi)	Major3	Minor	-
	Comp	Carbon Dioxide	Minor	-	Major2
		Methane+ LL GHGs	Minor	-	Major2
		Ozone and Aerosol, + precursors.	Minor	Minor	Minor
	Oceanic	Surface	Sea Surface Temperature	Major 3	Major3
Sea Surface Salinity			Minor	Major2	Minor
Sea Level			-	Major3	-
Sea State			Minor	Major3	Minor
Sea Ice			Minor	Minor	-
Surface Current			Minor	Minor	Minor
Ocean Colour			Minor	-	Major2
Carbon Dioxide pp			-	-	Major2
Ocean Acidity			-	-	Major2
Phytoplankton		-	-	Major1	
Subsurface		Temperature	Major 2	Minor	Minor
		Salinity	Minor	Minor	Minor
		Current	Minor	Minor	Minor
		Nutrients	-	-	Major2
		Carbon Dioxide pp	-	-	Major2
	Ocean Acidity	-	-	Major2	
	Oxygen	-	-	Major2	
	Tracers	Minor	Minor	Minor	
Terrestrial	River Discharge	Minor	Major1	Minor	
	Water Use	-	Major1	-	
	Ground Water	-	Major2	-	
	Lakes	-	Major3	-	
	Snow Cover	Minor	Major1	-	
	Glaciers and ice caps	Minor	Major1	-	
	Ice sheets	Minor	Major2	-	
	Permafrost	-	Minor	Major1	
	Albedo	Major1	Minor	-	
	Land Cover (inc. vegetation type)	Minor	Minor	Major2	
	Fraction Absorbed PAR	Minor	Minor	Major2	
	Leaf area index	Minor	Minor	Major2	
	Above ground biomass	-	Minor	Major1	
	Soil Carbon	-	-	Major1	
	Fire disturbance	-	-	Major2	
Soil Moisture	Minor	Major1	Major1		

Notes:

- 1) This table has not been checked or reviewed and is not definitive.
- 2) Major indicates a significant relevance, Minor a lesser relevance and “-“ small or none
- 3) Major3: adequate/mature measurements; Major2: measurements that can be used, Major1: emerging observation

ANNEX 1 Agenda of Joint Session

Joint Session of the Session of the GCOS/GTOS/WCRP Terrestrial Observation Panel for Climate (TOPC) and the GCOS/GTOS/WCRP Atmospheric Observation Panel for Climate (AOPC)

18th March 2015

Wednesday, 18 th March 2015.				
Chairs: Steven BRIGGS, Konrad STEFFAN, Kenneth HOLMLUND, Albert KLEIN-TANK				
09:00-10:45	1. Opening of the Meeting (15')			
	1.1 Welcome and introductions	1.1	Chairs	
	2. Collaboration with WCRP (60')			
	2.1 WCRP Update (WDAC, CliC, GEWEX) and expectations from the WCRP Climate Modelling Community with special regard to terrestrial observations	2.1	Rixen	Expectations from WCRP – how TOPC will fit into the overall WCRP structure and its core projects; WCRP input for new GCOS IP.
10.45 – 11.00 Coffee Break				
11:00 - 12:45	3 Implementation Plan			
	3.1 Introduction to Plan	3.1	Belward	Introduce IP and progress
	4 Proposals for input to Implementation Plan			
	Discussion & agree proposals	4.1	(30')	
	5 Global Cycles			
	5.1 Global Energy Cycle	5.1	Wild	Martin Wild, ETH Zurich Global Energy Cycle

12.45 – 13.45 Lunch Break				
	5.2 Carbon Cycle	5.2	Butler	
	5.3 Hydrological Cycle	5.3	Becker	
	5.4 Discussions on the cycles and ECVs	5.4		
15.30 – 15.45 Coffee Break				
15.45 – 18.00	Continue Discussions on the cycles and ECVs			
	AOB	6.1		

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