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Atmospheric Observation Panel for Climate
(AOPC-25)**

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Due to Covid-19 the planned physical meeting of AOPC scheduled to take place at Maynooth University, Ireland, 21-24 April 2020 was replaced with a set of virtual activities in the same week. The flexibility of all members, the secretariat and guests in meeting this challenge was greatly appreciated by the Chairs.

The meeting consisted of two plenary sessions and a series of smaller groups that worked on the Implementation Plan (IP) actions. This summary report covers solely the plenary sessions.

*All documents and presentations of this session are available on the AOPC-25 webpage at:
<https://gcos.wmo.int/en/atmospheric-observation-panel-climate/aopc-25>*

1. First plenary Session

Ken Holmlund opened the meeting greeting all participants and introduced Anthony Rea, Director of the Infrastructure Department at WMO.

1.1 WMO and GCOS

Anthony Rea presented the WMO strategic plan, including the five long term goals to: better serve societal needs, enhance earth system observations and predictions, advance targeted research, close the capacity gap, strategic realignment of structure and programs. The GCOS secretariat is now based in the Infrastructure Department, which primarily works to achieve the second goal in the WMO strategic plan of enhancing earth system observations and predictions and will report to the Director of the Infrastructure Department at WMO. GCOS will continue to be led by its Steering Committee guided by its four sponsors (WMO, IOC of UNESCO, UNEP and ISC). A WMO study group, including the four co-sponsors and major partners, is now in the process of being established and will consider the future governance and structure arrangements for GCOS and will make its recommendations in 2022. It is expected that the Study Group membership will include the chairs of the Steering Committee and of the GCOS panels and representatives from the co-sponsors, key partners and the user community, such as space agencies, WCRP, Copernicus, UNFCCC. Anthony Rea reiterated that WMO remains strongly committed to GCOS and its continuing work and recognizes the range of organizations GCOS cooperates with and the importance of an approach that continues to foster and strengthen such collaborations. WMO would also like to strengthen the input of GCOS into WMO regulatory and guidance activities. This, together with the visibility within WMO, should provide a better framework for those observational networks that are more research based rather than operational, for example, the atmospheric chemical networks and the reference networks.

After the talk, several questions followed around the new working arrangements and the role of the study group. A specific concern raised from the AOPC panel was that GBON is not going to be taking into account the needs for surface observations over the ocean. At the moment, GBON is targeted to observations over land and upper-air observations needed for NWP and climate reanalysis, as it is difficult to regulate observations over the open ocean but expansion of GBON to other application areas is planned for the future.

1.2 Status Report

Caterina Tassone presented the plans and timelines for the Status Report. The Status Report will be published in 2021 and the update to the Implementation Plan and ECV Requirements in 2022. These reports will be much shorter and more concise documents than the previous ones. They will be based on existing work done by the ECV Stewards and the IP Action Rapporteurs, with GCOS secretariat combining contributions and coordinating reviews (internal and public). The report outline will be agreed with the panel Co-Chairs. For the Status Report, inputs from outside groups such as WGClimat, Copernicus, WIGOS, will be also taken into consideration. A small group from the panels and the users (writing team) will compile and agree conclusions and assessments. The Status report will be reviewed by the panels and by the public, and the final report will be approved by the GCOS Steering Committee in June 2021 and delivered to UNFCCC in July 2021.

The assessment of the status of observations of ECVs is based on two pillars: i) adequacy of the observing system; and ii) data stewardship. For each of these two categories, the ECV stewards are asked to provide a 5-step rating from very good to poor and a short reason for the rating. For each ECV a longer discussion, up to a page, will be provided in the text about the ECV. To ensure coherency in the ratings between the panels, all the input by the stewards will be reviewed by the writing team. The final result of this evaluation will be published in a tabular form for easy consultation. Taking into account the timeline, the ECV Stewards are required to complete data their sheets for the assessment of the status of observations of ECVs by July 15th, 2020. Teleconferences for the three groups of ECVs; surface, upper-air and composition, will be organized at the beginning of June to consolidate and harmonize the final input to the data sheets.

Assessment of the status of Actions in the last IP will also be provided with 5-step classifications and published in a table format. Details on how to assess the IP actions can be found later in this document.

1.3 GRUAN and GSRN

Peter Thorne, co-chair of WG-GRUAN, presented an update from GRUAN to the panel. The latest Implementation Coordination Meeting (ICM-11) was held in Singapore in June 2019. GRUAN's network is expanding and a significant number of parallel RS92-RS41 launches have taken places during the transition from RS92 to RS41. However, there is a recognized need to complete an RS41 product as soon as possible. The GNSS-PW data product is in the final stages and will be available from all sites at 10-minute resolution. There is ongoing work within the GRUAN community on the R23 replacement, with some techniques showing promising results. Several scientific papers based on GRUAN have been published in the last year, underlining the value of such a network for the scientific community.

Peter Thorne presented an update on the progress for the GSRN. The job of this Task Team was to provide the documentation and work necessary to WMO members to decide if this is indeed something that the global climate community wants to take on. The report is completed (GCOS-226). The identified next steps are:

1. the approval of the proposed GSRN by relevant WMO programmes, the GCOS programme and other sponsors;
2. an offer to host and staff appropriately a Lead Centre; and

3. offers of suitable sites for an initial GSRN.

The task team will continue to work to help achieve these aims. Within WMO, GSRN is part of the deliverables of the standing committee "Earth observing systems and monitoring networks" of the Infrastructure Commission. Once the WIGOS Operational Plan is approved, which is expected either in June 2020 or in November 2020, work on GSRN can be continued, especially regarding the selection of a Lead Center.

1.4 Air-sea flux Task Team

Elizabeth Kent presented the new effort for the establishment of a SCOR Proposal for an Observing Air-Sea Integrated Strategy (OASIS).

Following from the discussion at the Joint Panel Meeting in 2019, AOPC will provide a short explanation on the current limitation of satellite observations to observe the Planetary Boundary Layer at the vertical definition required for resolving air-sea fluxes. A possible role of AOPC in the OASIS is in defining the ECV requirements for the basic variables (air temp, humidity, winds, sea state and possibly pressure) needed to calculate turbulent air-sea fluxes (heat, evaporation, momentum). Adequacy of these ECVs to constrain and evaluate model-based estimates of air-sea exchange need to be part of the ECV requirements. While the current goal accuracies are likely to be suitable, this needs to be assessed. Liz Kent and Phil Jones plan on writing a paper to explore how current sampling over the ocean meets the needs of various requirements, including air-sea fluxes.

It was decided that AOPC will not have a formal role in this group. AOPC will provide advice as requested and Liz Kent will send reports to AOPC, but she will not participate to the group in an official AOPC capacity. At a later stage, depending on how the work of the group evolves, this decision will be re-evaluated.

Action A1: AOPC (Ken Holmlund) to provide a short explanation on the current limitation of satellite observations to observe the Planetary Boundary Layer at the vertical definition required for resolving air-sea fluxes.

2. Second plenary Session

2.1 Task Team on Lightning Observations for Climate Applications (TT-LOCA)

Robert Holzworth, chair of the TT-LOCA summarized the achievement of the TT-LOCA and presented the proposed ToRs for the continuation of the task team. The proposed ToR can be found in annex 3 of this document.

AOPC approves the establishment of a new Lightning Task Team with the following terms:

- Re-draft of the ToRs to take into account discussion, i.e. point 3 will be folded into point 5 and the first point will be changed to take into account existing metadata. The updated ToRs will also include reprocessing of lightning data.
- The Task Team has a duration of two years with additional two years if needed and by approval of AOPC.
- Robert Holzworth is the chair.

If resources allow, there will be a physical meeting within a reasonable time. Valentin Aich will draft an update for the ToRs and circulate it to the TTLOCA chair and to AOPC chairs.

Action 2: GCOS Secretariat to draft an update for the ToRs and circulate it to the TTLOCA Chair and to the AOPC chairs for approval.

2.2 Assessment of the GCOS IP actions:

Peter Thorne summarized the main instructions for the assessment of the actions of the GCOS IP. The progress on the actions needs to be assessed within the context of the Implementation Plan (IP), taking into account the text in the IP leading to the action, as this is what was endorsed by UNFCCC. The rating must be based upon a quantification against the performance indicator documented in the IP. For each action, a one pager discussing the rationale for the rating and any relevant background, needs to be prepared. Plots included in the one pager can be updated if needed before final publication. WGClimate will contribute to the GCOS IP actions related to the space agencies and plan to deliver its contribution by July 2020. The IP rapporteurs for those IP actions will include this input into their final assessment of the action.

2.3 Inter-sessional work expectations on panel members

Peter Thorne summarized that the work of the panel over the coming year was exclusively to provide the necessary input to both complete the status report and provide necessary input in the preparation of the IP. He stressed the need for timeliness and consistency in this work. It was noted that each panel member will need to provide materials as follows:

1. For each IP Action they are assigned:
 - Progress score (1-5 with 5 being greater attainment)
 - One short sentence summary that justifies the score and summarizes progress
 - One-page summary / justification

The deadline for the IP action assessment is 31st August 2020. Once the assessment and one page are completed, the IP rapporteurs should send this to the GCOS Secretariat.

2. For each ECV they are the lead upon:
 - Data sheet for the status report (first plenary)

Data sheet for the status report should be completed as explained in the first part of this report. Deadline for completing the data sheet is 15 July 2020.

- Updated requirements tables

ECV stewards will update the requirements tables taking into account the comments received during the open review. As the requirements table are going to be published in the next Implementation Plan, there is no need to set a deadline yet and the previous two tasks take priority over this. However, the ECV stewards are asked to identify whether there are particular issues with their ECV requirements and to report this to the panel, so that a decision on how to proceed can be made in time for the next review.

The GCOS Secretariat will organize teleconferences for small groups of the panel members to discuss the ECV data sheets for the Status Report in May and to discuss the assessment of the IP actions in July.

Action 3:

Panel members to prepare

- the ECV data sheet for the Status report 15 July 2020
- the GCOS IP action assessment 31 August 2020
- Update of the requirements table

2.4 IP actions for next cycle

Peter Thorne presented a plan for the preparation of the IP actions for the next cycle. The proposal is to have a shorter document, with a set of integrative actions that will consider benefits of synthesis and consideration of activities across ECVs. Only important and actionable actions will be included. The next meeting of the panel is envisaged to be largely dedicated to consideration of the preparations for the next IP. Panel members were encouraged to consider what is needed in advance of that meeting.

3. Closing

Given the current situation with COVID-19, the next face-to-face meeting of AOPC will most likely take place in the first quarter of 2021, in Maynooth, Ireland. In the meantime, the panel will meet virtually in July 2020 and then periodically but at least quarterly as required.

ANNEX 1: List of Participants

- Ken Holmlund (co-chair)
- Peter Thorne (co-chair)
- Anthony Rea (WMO)
- Dale Hurst
- Elizabeth Kent
- Imke Durre
- Johanna Tamminen
- Paolo Laj
- Peng Zhang
- Phil Jones
- Rainer Hollmann
- Shinya Kobayashi
- Tim Oakley (GCOS Secretariat)
- Michel Rixen (WCRP Secretariat)
- Caterina Tassone (GCOS Secretariat)
- Valentin Aich (GCOS Secretariat)

ANNEX 2: Agenda

Timing	Who	Topic
Day 1, Tuesday 21 April 2020		
12:00–13:00	Dale, Ken, Peng, Peter	IP Actions A23-A30
13:00–14:30	All	Plenary: <ul style="list-style-type: none"> • WMO and GCOS (Anthony Rea) • Status Report (Caterina) • GRUAN and GSRN (Peter) • Aircraft data archive
15:00–15:30	Imke, Peter, Rainer, Markus, Phil	IP Action A8
15:30–16:00	Imke, Rainer	IP Action A10
Day 2, Wednesday 22 April 2020		
08:00–09:00	Peter, Tim	IP Actions A1, A11, A13, A14, A15, A17
09:00–10:00	Liz, Ken, Shinya, Peter	<ul style="list-style-type: none"> • IP Action A7 • Air-sea flux task team
12:00–12:45	Imke, Peter, Shinya, Tim, Liz	IP Actions A3, A5
12:45-13:30	Phil, Imke, Peter, Tim	IP Actions A4, A6, A12
14:00–14:30	Rainer, Dale	IP Action A28
14:30–16:00	Johanna, Paolo, Dale	IP Actions A32, A33, A34, A35, A36, A37, A38, A39, A40
Day 3, Thursday 23 April 2020		
10:00–11:00	Ken and Rainer	IP Action A22
11:00–13:00	Ken, Peng, Shinya	• IP Actions A18, A19, A31 ,Satellite Actions
13:00–15:00	All	Plenary: <ul style="list-style-type: none"> • Lightning Team (Bob) • Review of IP actions • Preparation of IP actions for next cycle • ECV requirements: identified issues

ANNEX 3: Proposed List of tasks for updated Terms of Reference for the Task Team on Lightning Observations for Climate Applications (TT-LOCA)

1. Lightning data for climate applications
 - Develop and propose a data format including metadata for lightning data for climate applications. It should on the one side provide sufficient information on lightning strokes including the uncertainty and on the other side not include individual station data so also private data providers are able to provide data
 - Review temporal and spatial ECV requirements if the suffice for climate applications (daily against hourly)
 - Organize funding for a research position to prepare an exemplary dataset integrating different types of data (satellite, RF). The goal is to integrate data of different spatial and temporal coverage and different sensors (RF, optical).
 - Explore the possibility to establish an integrated lightning data portal in collaboration with GEO
2. Thunder Day Database (TDD)
 - Continue efforts to include the TDD to the WMO Information System (WIS) and subsequently request members to complement database
 - Explore the possibility to establish an integrated lightning database with NOAA or NASA that could also encompass the TDD
3. Establish approach to identify more reliable numbers for lightning fatalities and injuries and connect with WMO/WHO working group to explore if education material etc. could be developed jointly. *(to be joined with point 5)*
4. Collaboration with GRUAN to hold field campaign to measure ionospheric potential once sensors are available
5. Liaise with other interested expert groups within WMO to ensure full consistency for applications areas for lightning (e.g. registration of private lightning data providers at the WIS; metadata for real-time lightning applications)

List of suggested members (new suggested members not listed):

Name	Affiliation	Expertise
Robert Holzworth	University of Washington, Director of the WWLLN, USA	Ground based lightning monitoring, network and data management
Yuri Kuleshov	RMIT University Melbourne, Australia	Lightning climatologies, MetService
Earle Williams,	MIT, USA	Thunder days, climate aspect of lightning, global circuit
Colin Price	Tel Aviv University, Israel	Ground monitoring, new technologies, climate aspect of lightning, global circuit, GRUAN
Steven Goodman	NASA/NOAA, USA	Satellite lightning expert

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