GCOS

KEEPING WATCH OVER OUR CLIMATE

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WORLD METEOROLOGICAL ORGANIZATION

INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION

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1 Introduction

1.1 Opening of the session

The 26th session of the GCOS Steering Committee was opened by Stephen Briggs, Chairman of the Steering Committee (SC), who welcomed the participants to Helsinki, Finland, and thanked the host, the Finnish Meteorological Institute (FMI). FMI was represented by Maria Hurtola, Head of International Affairs, who appreciated that the Steering Committee had chosen FMI as venue for its meeting and for participating in a science day on User Uptake and Arctic, the preceding day.

The participants (Annex 1) introduced themselves.
The agenda (Annex 2) was approved without comments.

1.2 Chairman's Introduction – Stephen Briggs

The special report of the Intergovernmental Panel on Climate Change (IPCC) on the impact of global warming of 1.5C underpinned the roles of GCOS. Observations of emissions and atmospheric composition and the way GCOS can contribute to these observations play an important role in guiding policy which is important for mitigation.

Observations also provide the underpinning of climate services and are crucial for the delivery of better information for public service and political decisions. Space agencies have responded to the GCOS Implementation Plan (IP) and the joint CEOS-CGMS Working Group on Climate (WGClimate), of the Committee on Earth Observation Satellites and the Coordination Group for Meteorological Satellites, has developed a plan to respond to the space related actions in the IP, ensuring a long term commitment to GCOS goals. The chairman stressed that efforts to improve general public awareness of climate and communication has improved, and gave as an example that the climate indicators identified by GCOS are strongly supported.

The panels provide the expertise to identify and manage the Essential Climate Variables (ECV), and their internet based fora will address the new topics presented in the GCOS IP, such as the observations needed to close the global cycles and support adaptation.
GCOS now needs to understand how best it can address the Paris Agreement. Work in this direction has already started and was presented during this meeting. Finally, the chairman stressed the importance of strong partnerships for the delivery of the programme`s objectives.

2 Sponsors remarks

2.1 International Science Council - Heide Hackmann (remote)

The merger of the International Council for Science (ICSU) and the International Social Science Council (ISSC) has been completed and the governing board met the week before the steering committee and adopted a high-level strategy that now needs to be operationalized. The International Science Council (ISC) is the global voice of science and the relation with GCOS is critical to this vision. It is important for ISC to strategically strengthen the role that they play as sponsor and to play a more strategic role in the way they engage with their co-sponsored programs. Therefore, in its role of GCOS co-sponsor, ISC aims to strengthen the relationship with GCOS. The governing board will prepare and publish an action plan to address co-sponsorships and to strengthen synergies.

To operationalize the strategy, four areas need to be considered:

- Agenda 2030;
- Digital revolution (open access, open science, artificial intelligence);
- The role of science in public policy;
- Global science systems development.

ISC is more active in the first and second area, while the third and fourth is more process oriented. In the concluding remarks, Heide Hackmann underlined that GCOS is a partner in successful delivery.

Following a question on the status and future of the data repositories of the World Data System (WDS) of ICS, Heide Hackmann confirmed that ISC is going to continue to support the mission of the WDS.
GCOS is starting working on observations supporting adaptation, which links with the ISC bodies, and Heide Hackmann indicated that the Governing Board will review the strategic role of partnering programmes to ensure integrated knowledge of climate science into social sciences. Finally, she agreed on the importance of communication on impact-based climate science.

2.2 The World Meteorological Organization (WMO) - Pavel Kabat

Pavel Kabat, Director of Research and Chief scientist at WMO, presented an overview of the WMO new strategy, which focuses on championing an integrated, seamless Earth system approach to the delivery of weather, climate and water information, with a strong focus on data, and science to services. Science will be at the core of the new structure.. As a consequence of the proposed rigorous integration of the Technical Commissions, there will be the establishment of a science advisory panel, of which GCOS will be a contributing partner. The focus will be on integrated science, and World Climate Research Programme (WCRP) is committed to continuing to partner strongly with GCOS. WMO is discussing with co-sponsors of GCOS expert panels (GOOS and WCRP) if the organizations can do more together.

2.3 The Intergovernmental Oceanographic Commission (IOC) - Albert Fischer

Albert Fischer highlighted IOC's activities are organized across Ocean Sciences, Ocean Observations and Services, and Ocean Governance and Management; and presented the Intergovernmental Oceanographic Commission (IOC) high level objectives:

- Developing indicator frameworks on the state of ocean health and the functioning of marine and coastal ecosystem services, as the custodian agency for the Sustainable Development Goals (SDG) 14 indicators;
- Reducing the risk posed by tsunamis and other extreme sea-level events such as coastal flooding and storm surges;
- Monitoring and documenting the impacts of climate change on the world's ocean, coasts and marine ecosystems and developing technical and human capacities toward designing ocean-based adaptation and mitigation strategies;
- Enhancing knowledge of emerging ocean science issues.

Planning for the UN Decade of Ocean Science for Sustainable Development has commenced, and is a major focus for IOC. The Global Ocean Observing System GOOS sees the Decade as an innovation incubator for new observing technologies and methods to advance the sustained observing system. There will be a number of member state supported planning events in 2019, with the Decade commencing in 2021. He stressed that partnerships are important if it comes to the use of science. IOC has four co-sponsorships in common with WMO, i.e., GOOS and GCOS, WCRP, and the Joint Technical Commission on Marine

Meteorology (JCOMM); the JCOMM Observation Coordination Group (OCG) is particularly relevant to GCOS as it is responsible for implementing the in situ observations of ocean ECVs. IOC is the host sponsor for the Global Ocean Observing System - GOOS is now working on an ambitious, forward looking strategy, focussed on engagement and impact, integration and delivery and building for the future including expanding into human impacts on the ocean. IOC sees the co-sponsorship of GCOS as very beneficial for IOC as GCOS is able to drive and maintain the information flow from science to policy within the United Nations Framework Convention on Climate Change (UNFCCC). IOC encourages the involvement of GCOS in supporting adaptation and recognizes that the challenge is the complex landscape when helping countries to define their needs in terms of observations for adaptation. He recommended that GCOS should be clearer on how to be more relevant to IOC members. He was concerned of the profile of GCOS in relation to the WMO reform relative to other co-sponsored programmes. He also encourages strengthened collaboration with World Climate Research Program and the IPCC as this is an important delivery pathway for climate observations.

2.4 UN Environment Programme (UNEP) - Hartwig Kremer

Hartwig Kremer presented the main objectives for UN Environment Programme. He informed that UNEP is also a custodian for 30 SDG indicators. With regard to the importance of partnerships, he recalled that UNEP is also co-sponsoring the IPCC and that the then ICSU pushed for a Global Environment Monitoring Service (GEMS), of which GEMS water is still existing and thriving. The global quality fresh water assessment will be done in cooperation with WMO. Global environmental monitoring is an open area for collaboration with GCOS. Other topics presented are the collaboration with the private sector and the ongoing work on big data. The annual UN Environment Emissions Gap Report 2018 will be released in November 2018, and it presents an assessment of current national mitigation efforts and the ambitions countries have presented in their Nationally Determined Contributions. He reported on a new science division within UNEP which is collaborating with UNEPLive, Global Resource Information Database (GRID) centres and is building on a new so-called “World Environment Situation Room”. UNEP is looking into the use of citizen science and Artificial Intelligence and how to strengthen more the collaboration with the private sector. The UN Environment Assembly (UNEA) in March 2019 will, inter alia, focus on the Big Data issue.

Finally, he was touching on the re-established Programme of Research on Vulnerability, Impacts and Adaptation (PROVIA) which will be renamed to World Adaptation Science Program (WASP) after its first meeting in Stockholm in a couple of weeks’ time. In this regard, he recommended that GCOS should contribute and follow attentively the new programs developments.

UNEP expectations are to engage further on ECVs and focus on what is needed to provide observations for adaptation as well as including the full value chain by working on the access to adaptation finance, the knowledge, analysis and networking for adaptation and the adaptation policy and planning.

In the discussion following the statements from the sponsors, the importance to really connect with the sponsors and to support their ambitions was underlined. Reinforcing the connections with its sponsors and focusing on its strengths will enable GCOS to better fulfil sponsor’s expectations.

On behalf of the Group of Earth Observations (GEO), Douglas Cripe offered to help GCOS with the technical side of data, in particular through support where needed in coordinating and providing a curated, authoritative repository for in-situ data.

It was noted that GCOS has the capability to serve the request from all its sponsors on a broad range. The following recommendation and task were agreed by the SC.

Number	Action	Responsibility	Notes
SC-26/1 Recommendation	Engage with sponsoring organizations on the strategic strengthening of GCOS, on building synergies and on demonstrating how GCOS as a partner can successfully deliver to their respective work, action or strategic plans, and how GCOS can support their ambitions.	D/GCOS	2. Sponsors remarks
SC-26/2 Task	Reinforce, where the connections are strong. Focus on GCOS ability to support sponsors.	D/GCOS	2. Sponsors remarks

3 GCOS Secretariat Activity Report

3.1 GCOS director's report - Carolin Richter

Carolin Richter presented the GCOS activities since the last SC`s session. The GCOS IP is guiding the progress of GCOS's plans, and GCOS is assuring the availability of systematic climate observations, in partnership with WCRP, taking into account the needs of the Parties to the UNFCCC and the IPCC. The GCOS strategy had been discussed at last SC and is now being considered by partners before its final adoption by the WMO Congress in 2019. The vision of GCOS is "a world where users have free access to the climate-related information they need" and the aim is "to ensure the availability and quality of observations necessary to monitor, understand and predict the global climate system so that communities and nations can live successfully with climate variability and change".

The global indicators, which are meant for describing the rate and range of climate change, have been very successful and are now also becoming an input to the UNFCCC. They are surface temperature, ocean heat, ocean acidification, sea level, glacier mass balance and Arctic and Antarctic sea ice. Supplementary indicators, such as the top of atmosphere energy balance, methane, N_2O, halocarbon greenhouse gases and snow extent, as well as indicators for extremes (heat waves, heavy precipitation, droughts and ecosystem change) require additional consideration. This is reflected in Task SC-26/3.

The Paris agreement is a major driver for climate observation needs, and adaptation is an important aim of the Paris agreement. GCOS will provide to the 24th meeting of the UNFCCC Conference of the Parties and the 49th session to its Subsidiary Body for Scientific and Technological Advice (COP24/SBSTA49) a report on "Systematic Observations and the Paris Agreement" as background information.

On a working level, the Atmospheric Observation Panel for Climate (AOPC) has two task teams on the use of radar observations and lightning observations for climate studies, respectively. The GCOS surface reference network task team has already met and is working towards proposing the establishment of such a network. The Terrestrial Observation Panel for Climate (TOPC) has established a task team on Climate Adaptation Observations that will meet in February 2019 . The Ocean Observations Physics and Climate Panel (OOPC) conducts reviews and evaluations of the observing system. A key focus currently is the review

of whether the observing systems can meet the requirements needed to track heat and freshwater storage changes in the ocean, essential for closing global energy and water budgets.

The first regional workshop took place in Fiji and was held jointly with the WMO Integrated Global Observing System (WIGOS). It was hosted by the Fiji Meteorological Office and supported by the Secretariat of the Pacific Region Environment Programme (SPREP). The workshop focused on radiosonde observations and developed an outline for a Pacific region observing network plan which will be presented to COP 24.

The next regional workshop was planned in Uganda in October 2018, in cooperation with WIGOS, the Climate Change Service (C3S), the Global Framework for Climate Services (GFCS) and UNFCCC. It was planned to concentrate on the basic climate observations (e.g. surface pressure and temperature and upper-air) with a special focus on data management. The progress report on the GCOS Surface Network (GSN) and the GCOS Upper Air Network (GUAN) showed that the availability of observations is getting worse, and significant areas of GSN and GUAN are not meeting the minimum requirements, with Africa being the worst performing WMO region. Through the GCOS Cooperation Mechanism technical support for sustainability of observations is possible, with clear benefits for the climate observing systems, particularly in Africa but also in other remote areas. However, there are limitations due to resource availability.

Carolin Richter presented the time plan for GCOS: a science conference in the last quarter of 2021, the revision of the 2015 Status Report in the first quarter of 2022 and the revision of the GCOS IP in the last quarter of 2022. Finally, partnerships with GEO, GFCS, IPCC, space agencies, WCRP and the C3S were presented. The SC was reminded that GCOS does not provide a single point of entry for climate data, but rather a framework in which it contributes with requirements.

3.2 New web page, tag line, Essential Climate Variable fact sheets - Valentin Aich

Valentin Aich presented the new tag line: “Keeping watch over our climate”, which was approved by the SC, and the new GCOS website.

On the website, the text describing GCOS should be reviewed in order to make clearer the essence of the programme and GCOS’s unique role (Task SC-26/4).

Valentin Aich presented the ECV fact sheets, and showed two examples, one for the ECV surface temperature, and the other for glacier. The SC agreed that the definitions of the ECV products should be included in the ECV fact sheets (Task SC-26/5) and that, in order to avoid misunderstanding about the message in the ECV fact sheets, draft guidance material for the ECVs would have to be drafted (Task SC-26/6).

Number	Action	Responsibility	Notes
SC-26/3 Recommendation	Continue to consider the subsidiary indicators.	GCOS Panels	3. GCOS Secretariat Activity Report
SC-26/4 Task	New GCOS web site: Review the text which describes GCOS and be clearer on the essence of the programme and on GCOS unique role.	GCOS Secretariat	3. GCOS Secretariat Activity Report
SC-26/5 Task	Fact sheets: Review the ECV fact sheets and the definitions and terminology.	GCOS Secretariat (coordinate with panels and ECV stewards)	3. GCOS Secretariat Activity Report
SC-26/6 Task	Fact sheets: Ensure that the difference between ECV and indicators is clear.	GCOS Secretariat (coordinate with panels and ECV stewards)	3. GCOS Secretariat Activity Report

4 Panels reports

4.1 The Ocean Observations Physics and Climate Panel (OOPC) - Bernadette Sloyan

Bernadette Sloyan, co-chair of OOPC, highlighted the role of OOPC as delivering the ocean component to GCOS: This is a complicated role given the need to consult with the other expert panel of GOOS in order to meet this mandate. Both the GOOS Biogeochemistry and Biology panels meet towards the end of the year, and there is a need to coordinate advice to these panels in order to meet GCOS responsibilities.

Looking towards 2019, the co-chair noted that the joint panel meeting is a great opportunity, and more planning is needed to ensure it is a success. In addition, the preparations for the OceanObs'19 decadal conference (September 2019) is an ongoing major focus, which is part of a decadal planning effort for ocean observing, focussed on better connecting observations to users. She strongly encouraged GCOS to be prominent in the planning for the conference.

Bernadette Sloyan presented the main activities of the panel, as well as highlighting some of the climate relevant activities of the other groups in GOOS that OOPC draws on. These activities included the assessment and review of requirements for the Essential Ocean Variables (EOV) and ECVs. She noted that the EOV specification sheets comprise an in depth analysis of users and users of the observing system, and the scales of variability to inform the observing system design. Key work plan efforts include contributing to closing the climate cycles including a strategy for improving air-sea heat fluxes, progress in delivering surface ocean CO_2 observations, the establishment of a review of the observing system to track ocean heat and freshwater storage, development of requirements for ocean acidification observations, and the emerging issue of oxygen deoxygenation. OOPC is strengthening engagement with OceanPredict (formally GODAE OceanView) as a key user of ocean observations as well as partner in the design and evaluation of observing systems. Cross talk between panels and programmes is being brokered by OOPC; for instance, GOOS biogeochemistry is working with the Global Atmosphere Watch regarding the potential for coincident observations of atmospheric and surface ocean chemistry. The co-chair also highlighted that we are seeing significant developments of emerging technologies for observing ECVs, presenting both a challenge and an opportunity in managing how they are integrated into the observing system. Particularly for multidisciplinary challenges such as acidification and deoxygenation. She highlighted the International Decade of Ocean Science for Sustainable Development as a significant opportunity for advancing ocean

climate observations. Looking forward, OOPC would like to progress a project on sustained observations of boundary currents, and will continue to advise on regional review efforts.

Bernadette Sloyan then outlined the status of the observing system which is enabled through the JCOMM Observations Coordination Group and the JCOMM Observing Program Support Centre (JCOMMOPS). The JCOMMOPS online platform will enable us to track the GCOS IP targets for observing networks on demand. A report card is provided now, highlighting the status of the observing system, and its importance for key applications.
During the discussion, the complex role that OOPC plays was acknowledged, and the SC chair asked if OOPC was comfortable that it could respond to the expectations of GCOS. Bernadette Sloyan noted that the panel was encouraged by progress in discussions between GCOS and GOOS, including the GCOS-GOOS leadership bilateral meeting as a good start; but still would appreciate if OOPC was given more advanced notice in requests for input from GCOS due to its dual role in GOOS and GCOS, and the need to consult across many other constructs of GOOS in order to deliver to GCOS (this was discussed further in agenda item 5.3). Pavel Kabat noted that as all GCOS panels reach out to the modelling community, the links and the consistency to WCRP should be ensured. Furthermore, with reference to land-sea fluxes, it was suggested to follow up on community engagement with Future Earth coast project (Task SC-26/9). Rodney Martinez pointed out that with regard to the regional workshops and GCOS should identify related priorities in this region.

4.2 The Atmospheric Observation Panel for Climate (AOPC) - Ken Holmlund

Ken Holmlund, chair of AOPC, presented the main activities of the panel. AOPC has been focusing on the actions of the GCOS IP. IP rapporteurs within AOPC have been identified and have provided a better formulation of the IP actions as well as regular updates to the status of the actions. AOPC has identified ECV stewards to coordinate all relevant issues of the ECVs and as points of contact for all GCOS related questions regarding ECVs. They have been working on the definition of the ECV products, now completed for all ECVs and sent for discussion to WMO for OSCAR/Requirements, which is the Observing Systems Capability Analysis and Review tool of WMO, and on the ECV fact sheets. AOPC relies on WGClimate for activities related to the satellite observations of the ECVs, and partly on C3S for collecting and storing ground-based observations of ECVs. Ken Holmlund presented the updates on the four task teams established to address IP actions. It was noted, that it is important to ensure consistency between the Global Basic Observing Network (GBON) and GUAN, and to ensure that GSRN links to the Commission for Instruments and Methods of Observation Commission (CIMO), the Commission for Climatology (CCl) and the Commission for Basic Systems (CBS), taking into account sea surface observations from GO-SHIP and ARGO (Recommendation SC-26/10).

4.3 The Terrestrial Observation Panel for Climate (TOPC) - Michael Zemp

On behalf of the chair, Wolfgang Wagner, Michael Zemp presented the main activities of the panel. TOPC had created a forum to enable discussions for updating ECV requirements and progress on TOPC IP actions and to facilitate discussion amongst panel members and the wider community. TOPC had also identified IP rapporteurs and ECV stewards, who have reviewed the fact sheets. TOPC had established a Task Team on Climate Adaptation Observations. It was suggested that the task team should be a GCOS Task Team and therefore it should include AOPC and OOPC representatives. The Task Team will report to the Joint Panel Meeting in Morocco and will need to coordinate its input with the SC subgroup to draft a strategy for GCOS to support observations for adaptation (see section 6.3) (Task SC-26/11). TOPC requested stronger guidance from GCOS SC with respect to priorities, tasks, cross-panel task teams and cross-panel implementation processes. It was recalled that the Green Climate Fund (GCF) is discussing a climate

rational and could include the deliberations of the task team on observations for adaptation. Further, it was noted that the former PROVIA and new WASP will be able to offer a forum for adaptation, and that there are national efforts, like for example in The Netherlands, which has founded a "cluster of climate excellence".

Discussion following the presentations of the three panels emphasized the importance of reaching out to the modelling community, and to include WCRP in the work of GCOS. The three GCOS expert panels are shared with WCRP, ensuring therefore the involvement of WCRP in the preparation of the agenda for the panel meetings. The connection with WCRP needs to be sustained by providing links and consistency with WCRP on next panel meetings (Recommendation SC-26/7). Finally, it was agreed to identifying regional priorities of WMO members/IOC members with regard to organizing regional workshops (Task SC-26/8).

4.4 Implementing GCOS - Michael Zemp

Michael Zemp presented the role of the ECV stewards and the IP rapporteurs. AOPC and TOPC have already adopted these roles, while for OOPC, given the complexity of its structure, it would be impossible to introduce the IP rapporteur role. The Terms of Reference for panel membership was also presented for approval by the SC. It was considered that this document would be of help for the managers, who will have a clear understanding of the commitment required by the experts to join the panels. The SC approved the document with minor changes, such as time expectations and inspirational charge. It was also decided that general guidance and functions for panel members, as well as the description of the roles for ECV stewards and IP action rapporteurs will be attached to appointment letters (Task SC-26/12).

Number	Action	Responsibility	Notes
SC-26/7 Recommendation	Ensure links and consistency with WCRP on next panel meetings	D/GCOS	4. All Panel reports
SC-26/8 Task	Identify regional priorities of WMO members/IOC members with regard to organizing regional workshops.	D/GCOS	4. All Panel reports
SC-26/9 Task	Follow up on community engagement with regard to land-sea fluxes with Future Earth coast project.	GCOS Secretariat, UNEP	4a. OOPC
SC-26/10 Recommendation	GSRN, GUAN: Ensure consistency between GBON and GUAN, and GSRN links to CIMO, CCL, CBS.	AOPC	4b. AOPC

Number	Action	Responsibility	Notes
SC-26/11 Task	Adaptation: TOPC TT on Observations for Adaptation to invite AOPC and OOPC representatives to attend TOPC TT. TOPC TT to report to the joint panels meeting. The SC subgroup to draft a strategy for GCOS to support observations for adaptation (see task SC-26/27) also to report at the joint panels meeting. SC subgroup and TOPC TT to coordinate inputs before the meeting in March.	GCOS Secretariat, TOPC TT (Nigel Tapper), SC subgroup on observations for adaptation	4c. TOPC
SC-26/12 Task	Agree on attaching General guidance and functions for panel members to appointment letters, including description of the roles for ECV stewards and action rapporteurs. Streamline duties including time expectations and inspirational charge	GCOS Secretariat	4d. Implementing GCOS

5 Vision of a future GCOS

5.1 GCOS Joint Panel meeting in March 2019, Morocco – Second GCOS Science conference in 2021 – Regional workshop

GCOS Joint Panel meeting in March 2019, Morocco

The SC discussed how to best organize the GCOS Joint Panel meeting to address the important issues of interest to GCOS. The GCOS Joint Panel Meeting should be framed around GCOS strategy (Recommendation SC-26/13) and will serve as a platform for the panels to work together on scientific and on cross-panel topics.

The engagement of the regional entities is essential for GCOS. Therefore, it was suggested that strategic guidance on how to be more relevant to the members and the key requirements from the regions, should be developed and communicated to the panels during the GCOS Joint Panel Meeting, and fostering discussion by including in the agenda for example Sea Level Rise and coastal inundations (Task-26/14). This meeting will run in parallel with the WCRP Data Advisory Council (WDAC) and the WGClimate meetings, whose members can contribute to items of mutual interest. The meeting will be structured in three main sections, the first dedicated to overarching information of common interest, the second to cross-panel work and the third for the individual panels. The main topics selected for the cross-panel portion of the meeting are observations in support of adaptation and the global cycles. For the global cycles, the meeting should help establish the observations requirements and ensure that they are consistent across the domains. Three SC members were identified to lead the preparation of the meeting for each of the cycles, and to introduce the topic at the meeting by framing the challenges of the cycles (Task SC-26/16). A first draft of the agenda for the GCOS Joint Panel Meeting that reflects the discussion was drafted by the panel

chairs. In the months preceding the GCOS Joint Panel Meeting, the chairs, together with the GCOS Secretariat, will hold several teleconferences to finalize the draft agenda. The process will also include interactions with WGClimate, WCRP and WDAC (Task SC-26/15).

Number	Action	Responsibility	Notes
SC-26/13 Recommendation	Align the joint panel discussion to the GCOS strategy (goals and objectives)	GCOS Secretariat + panel chairs	5a. Joint Panels meeting
SC-26/14 Task	Include agenda item for GCOS JPM on the way forward for regional planning	GCOS Secretariat + panel chairs	5.a. Joint Panels meeting
SC-26/15 Task	Coordinate with panel chairpersons and secretariat to agree on top priorities and to draft the agenda of the joint panel meeting, along lines agreed at SC. Set up teleconferences in November and December. Have agenda available in December and list of attendees ready in early January. Interact with WGClimate and WCRP, WDAC.	GCOS Secretariat + panel chairs	5a. Joint Panels meeting
SC-26/16 Task	SC leads to develop scoping document for each climate cycle, Han for Carbon, Johnny for water with support from Hartwig, Toshio for Energy . Ready on 25 February 2019	Han Dolman, Johnny Johannessen, Hartwig Kremer, Toshio Suga	5a. Joint Panels meeting

Second GCOS Science Conference

The SC agreed to plan a second science conference in 2021. The conference should be coordinated with WCRP in collaboration with the World Weather Research Programme (WWRP) and the Global Atmosphere Watch (GAW) Programme. As part of the agenda, success stories based on first science conference in 2016, and examples like the, “monitoring of glaciers”, and “interaction with space agencies”, should be showcased, together with considering the consequences of headline indicators. (Recommendation SC-26/17, Recommendation SC-26/18, Task SC-26/19).

Number	Action	Responsibility	Notes
SC-26/17 Recommendation	The SC agreed to plan a 2nd GCOS Science Conference in 2021.	GCOS SC Chair	5a. 2nd GCOS Science Conference in 2021
SC-26/18 Recommendation	Consider where GCOS can contribute to the "good news" story and what are the consequences of headline indicators.	GCOS SC	5a. 2nd GCOS Science Conference in 2021
SC-26/19 Task	Coordinate conference with WCRP's plans in collaboration with WWRP and GAW. Showcase success stories since 1st GCOS Science Conference as part of the agenda. Prepare conference for end of 2021.	GCOS SC	5a. 2nd GCOS Science Conference in 2021

Regional workshop

Valentin Aich presented the plans for the regional workshop in Uganda , 31st October to 2nd November 2018. The aim of the workshop would be to improve observations needed for climate services to support climate policy, adaptation and mitigation. WIGOS, UNFCCC, C3S and GFCS were partner in this workshop. The workshop would include a training session from Copernicus about how to use data from the Climate Data Store (CDS) for supporting climate services. The Climate Data Store has the capability of monitoring the user access and it will be able to monitor whether the people taking part in the training session are using the data, thus providing an understanding on whether the workshop has been successful (Task SC-26/20)

Number	Action	Responsibility	Notes
SC-26/20 Task	East Africa Workshop: Ensure follow up	GCOS Sec	5a. Regional workshops

5.2 A seamless, integrated science for services approach - Pavel Kabat

Pavel Kabat presented the new WMO reform and the WMO new strategy, where research will be a cross cutting effort connecting all WMO parts to deliver a seamless, integrated science for services approach. Observations will play a fundamental role in the WMO reform.

GCOS was invited to collaborate with WCRP on a joint funding and partnership strategy (Recommendation SC-26/21 and Task SC-26/22).

The following discussions pointed out that the future WMO Science Advisory Panel and Research Board will have to provide opportunities to coordinate climate activities.

Number	Action	Responsibility	Notes
SC-26/21 Recommendation	Continue to collaborate on a joint funding and partnership strategy with WCRP.	D/GCOS	5b. Seamless, integrated science for services approach
SC-26/22 Task	Follow invite to WCRP JSC meeting 6-10 May 2019, in Geneva.	D/GCOS and GCOS SC Chairperson to coordinate attendance	5b. Seamless, integrated science for services approach

5.3 The Global Ocean Observing System (GOOS) 2030 strategy - Toste Tanhua

After a presentation of GOOS main activities, Toste Tanhua, co-chair of the GOOS Steering Committee, gave an outline of the GOOS programme and how it is organized. He outlined the status of the observing system, which delivers 1 million observations per day, and how the Framework for Ocean Observing governs the development of the observing system. GOOS delivers to Climate (through GCOS), Operational Services, and Ocean Health. He further described the GOOS structure, including the three expert panels; Physics (OOPC), Biogeochemistry and Biology. The GOOS co-chair then presented the GOOS strategy, focussed around deepening engagement and impact, system integration and delivery, and building for the future.

He noted the synergies between the GOOS and the GCOS strategy. A strong GCOS/GOOS partnership is beneficial for both parties. Working together on common objectives will help strengthen engagement with sponsors, research and space agencies; GCOS is seen as delivery pathway for GOOS's climate theme; comparability in requirement definition and broadening the partnership for delivery. The GOOS co-chair also mapped the key delivery pathways for GOOS, including climate. GOOS would like to see more visibility regarding GCOS's delivery to e.g. seasonal-inter-annual prediction; a key pathway to impact for climate services. The Tropical Pacific Observing System, 2020 project will be critical to improving forecasts. This is a project which is contributing to GCOS and GOOS.

GOOS and GCOS co-parent OOPC, which can be seen as a broker for all pieces of GOOS delivering for GCOS. It is therefore important to recognize the conclusions of the GOOS-GCOS SC chairs bilateral meeting (Recommendation SC-26/23) which highlights area where GCOS and GOOS can work more closely together, and to better support and enable OOPC in its complex role in delivering to both programmes. Further details on the proposed way forward are outlined in the GCOS-GOOS Relationship Paper, which builds on the GCOS-GOOS Bilateral Meeting Report.

The discussion following the presentation concentrated on the coastal zone. There is a gap in coastal observations that needs to be filled without neglecting the open ocean. The existing observing system is not designed for coastal requirements, as the observation scale does not capture the required spatial and temporal resolution. However, coastal observations are important as they represent the boundary conditions for the open ocean. Adaptation may also lead to ocean observing requirements, e.g., related wind parks and carbon sequestration.

While Toste Tanhua's talk highlighted the synergies between the GCOS and GOOS strategies, the SC discussed the differences. The GOOS co-chair noted that, partly as a reflection of the maturity of the two programmes and the observing systems, the GCOS Strategy was focussed on delivering ongoing tasks, whereas the GOOS strategy is focussed on developing and improving the observing system, partnerships, building for the future. The SC noted that GCOS could consider working further on the GCOS strategic focus

on 'identify user needs' given needs are evolving. The need to build for the future could also be considered further in GCOS forward planning. It was noted that the SC have talked about the need to increase focus on adaptation, climate services. It is also important for GOOS that GCOS succeeds in these areas, as they are important delivery pathways for GOOS also.

Number	Action	Responsibility	Notes
SC-26/23 Recommendation	Consider the OOPC as broker for all elements of GOOS delivering to GCOS. Recognize the conclusions of the GOOS-GCOS SC chairs bilateral meeting.	GCOS SC Chair GOOS SC Chair	5c. GOOS Strategy
SC-26/24 Recommendation	Learn from GOOS strategy to enhance the forward looking strategy of GCOS.	D/GCOS	5c. GOOS Strategy

5.4 The Global Basic Observing Network (GBON) - Rob Varley

Rob Varley introduced the new concept of the GBON. Numerical Weather Prediction (NWP) needs observations from the whole globe and WMO is the only organization having the mechanism to provide these observations. Satellites provide global observations, but they are not sufficient as surface pressure and vertical wind profiles as well as other variables such as land cover, snow and ice beneath dense clouds are not measurable from space. Surface observations are needed for satellite calibration and validation and there is evidence from impact studies that ground based observations are necessary. Benefits of radiosondes are not local but global, and therefore WMO needs to develop an overarching design for the GBON to meet threshold requirements for NWP.

As a first step, requirements are drafted for atmospheric pressure, air temperature, humidity and horizontal wind, with a resolution of 500 km or higher and with an hourly frequency. As GBON includes mandatory provisions, capacity development will be required. On this matter, the importance of supporting the GBON implementation using the GCOS Cooperation Mechanism was recognized. Once the establishment of GBON is started, other applications areas other than NWP, such as seasonal forecast and climate monitoring, will be considered. GBON is not restricted to the National Meteorological and Hydrological Services (NMHS) as observations are made also by other entities. QA/QC is not addressed yet, but will be in the future. The GCOS will ensure that the panels are informed about the GBON concept, which will be taken into account when designing related networks (Recommendation SC-26/25).

Number	Action	Responsibility	Notes
SC-26/25 Recommendation	GCOS Secretariat to ensure that panels will be informed about the GBON concept . Panels to consider GBON in related network designs. Recognise the support of GCOS Cooperation Mechanism to GBON.	GCOS Secretariat Panels GCOS Network Manager	5d. GBON

6 Updates

6.1 UNFCCC update - Florin Vladu

Florin Vladu presented the efforts of significance for the SBSTA workstream undertaken by GCOS and the wider science community, which are on the development of climate indicators (global surface temperature, global atmospheric carbon dioxide and glacier change) and the importance of ocean-related climate indicators (ocean heat content, ocean acidification, sea level rise, and Arctic and Antarctic sea ice extent), for informing on the state of the global climate; the joint GCOS/WIGOS workshop for Pacific small island developing States in Nadi, Fiji, and the development of a Pacific region observing network plan; the progress made by the satellite community, in close collaboration with GCOS, in the development of the essential climate variable inventory. He also noted that observations are needed to understand the current state of the environment at a global level. He explained the outcome of the IPCC report on the 1.5 C warming, underlining the difference in climate impacts for temperature increase of 1.5C and 2C. He finally gave an overview of the schedule of COP24. During the discussion following the presentation, it was noted that there is a great interest of the panels to support the contribution of GCOS to the Global Stocktake, which should therefore more prominently discussed by the panels. A comprehensive list of GCOS contribution to SBSTA will be provided to the SC attendee to facilitate the understanding of GCOS's role within UNFCCC (Task SC-26/26).

Number	Action	Responsibility	Notes
SC-26/26 Task	Provide a list of GCOS contributions to SBSTA (e.g., statement, technical documents and reports, taking part in informal consultations) to SC attendees.	D/GCOS	6a. UNFCCC

6.2 GCOS Support to the Paris agreement and the Global Stocktake - Sybil Seitzinger

The Steering Committee at its last session in 2017 formed a task force to develop a plan to identify the observations needed to support the Paris Agreement. Sybil Seitzinger presented the outcome of this work, which focused on observations to support adaptation and mitigation. Global climate observations are essential to adaptation measures and products derived from them can support local planning for adaptation activities. They are needed to help plan adaptation strategies, to observe how effective those strategies are and to provide information that could be used to modify strategies as climate change unfolds. Observations are needed for mitigation to help for the revision of mitigation plans. The report of the task force includes a list of 16 actions aimed to ensure that GCOS supports the Paris agreement and the Global Stocktake. Many of them are relevant for the support of adaptation and the TOPC Task Team on observations for adaptation is asked to review them and consider for guidance at its meeting in February 2019. (Task SC-26/27).

Number	Action	Responsibility	Notes
SC-26/27 Task	List of actions from TT on Paris Agreement to be reviewed and considered for guidance at the TOPC TT Observations for Adaptation meeting-February 2019	TOPC TT Adaptation	6b. GCOS support to Paris Agreement

6.3 Are we providing the right information for observations to support adaptation measures?

The SC discussed the role of GCOS in supporting adaptation, which is not only about providing regional data and higher time resolution, but it is also about defining information needs, such as number of dry days, number of hot days, recurrence time of floods. The support for adaptation may require additional observable parameters and these may not necessarily map onto the existing ECVs. In order to understand whether the current ECVs can support adaptation, the panel should work on sharpening the definitions of the ECVs and consider whether an additional layer of specifications for the ECVs would be needed. This can be done by comparing the current list of ECVs with a list of products needed for adaptation. A new application area might be needed to take into account the requirements to support adaptation and mitigation. The SC recommended that GCOS should build confidence in this kind of information, as an essential role of GCOS is the one of a trusted advisor. It was pointed out that is about communication to demonstrate with users and decision makers that the information is sound.

The panel chairs shared the concern that the panels are not suited to discuss the requirements needed for observations in support of adaptation. The need of additional experts on observations in support of adaptation is also reflected in the report of the task force for the Paris agreement (see 6.2). The TOPC task team on observations for adaptation responds to this need of additional experts to work on this specific adaptation topic. UNEP with WASP is leading the “World Adaptation Gap Report”, and Rotterdam will host a “Global Centre on Adaptation”, which both will provide excellent information sources.

The SC recommended that the continued cooperation and interaction with PROVIA would be a very effective way with regard to exploring requirements for observations in support of adaptation. The Director of the GCOS secretariat had been invited to be a member of the Science Committee of WASP and the SC recommended to provide an input opportunity to guide GCOS on observations in support of adaptation.

The GCOS programme review board of its co-sponsored organizations in 2014 already recommended that sponsors should consider giving GCOS a mandate that included the support of observations for adaptation and mitigation of climate change and its regional impacts. This was supported by WMO Cg-17 in 2015 which noted with appreciation the key outcomes of the review, and which requested that the GCOS programme should continue to identify observational needs for climate services and commended the SC for evolving the programme on the basis of the review. Given the very complex nature of “adaptation”, a decision needs to be made about the role of GCOS supporting “adaptation” at a strategic level. A possible way forward is for GCOS to look at the National Adaptation Plans (NAPs) and identify the observations that will be necessary for the nations to use their NAP and to evaluate the success of the adopted measures. If this study is based on NAPs, the confidence of the information given by GCOS will increase. The panels will then use this information to work on supporting adaptation by setting the requirements, identifying the gaps and advocating for new systems to close those gaps. An analysis of the NAPs is therefore needed. At this point (November 2018), only 11 NAPs are available. However, the development of NAPs will be supported by the Green Climate Fund (GCF), and the WMO secretariat, together with its GCOS programme, is working on the climate rationale that will be a manual on how to prepare a NAP.

A subgroup of SC members, led by Sybil Seitzinger, will draft a short paper on GCOS strategical approach on how to use observations to support adaptation. Through analysis of the NAPs, they will identify the

observations needed for adaptation, and will report back to the SC. The final report will be presented at the GCOS Joint Panel Meeting. Membership and details of this subgroup are reflected in Task SC-26/28.

Number	Action	Responsibility
SC-26/28 Task	Set up a SC subgroup to draft a strategy for GCOS to support observations for adaptation to provide strategic guidance on GCOS approach to adaptation recognizing UNFCCC/IPCC approach to adaptation management by National Adaptation Plans (NAPs) and the Global stocktake. SC subgroup to report to the joint panels meeting in March.	Sybil Seitzinger, Florin Vladu, Han Dolman, Michael Zemp, Rodney Martinez, Hartwig Kremer, Nigel Tapper; panel chairs and GOOS representative invited to engage.

7 World adaptation science programme (WASP) - Hartwig Kremer

Hartwig Kremer gave a presentation on PROVIA and its main activities. PROVIA is part of the World Climate Programme which is led by WMO, with its secretariat hosted by UNEP. It acts as an international panel, comprised of international and national scientists, policy leaders, investors, bankers and private sector representatives, with the main focus on climate adaptation science and services to support the UNFCCC intergovernmental process and IPCC reporting. Currently, PROVIA is implementing the Country Level Impacts of Climate Change (CLICC) project. The main objectives of CLICC are to facilitate global and national understanding of country level climate impacts; support climate actions through consistent and comparable communication of impacts and risks; promote good practice and collective learning in assessing climate impacts. Pilot projects will be implemented in China, Ghana, Zimbabwe, Malawi and Middle East. Plans for 2019 include: technical guidance on assessing vulnerability, impacts and adaptation to climate change; adaptation gap report; research priorities report; project proposal aims to contribute to close adaptation knowledge gaps at sub regional level; country report on the second round of CLICC pilots and CLICC Technical Guidance.

There is ongoing interaction between GCOS and PROVIA, and GCOS values this cooperation. Hartwig Kremer is part of the TOPC task team on observations for adaptation and this will ensure the establishment of a link between GCOS and PROVIA.

8 Communicating on climate

8.1 How does GCOS ensure good communication with the more generic users of climate information? - Stephen Briggs

In light of the intensive discussion related to agenda items 6.2 and 6.3, this discussion was rather short. In terms of communication, GCOS has an essential role as a trusted advisor, and can build confidence in the community and on the political scene in the information for adaptation. This relies on GCOS ability to demonstrate, through conversation with its users, that the information delivered by GCOS is scientifically trusted as it is based on sound science and sound observations.

8.2 WMO view on indicators - Manola Brunet

Manola Brunet gave an update on WMO`s Technical Commission for Climatology (CCl) activities. The role of CCl is "To develop guidance material for Members for in the provision of climate information for high-level climate policy processes and decision support, on the past, present and future status of key climate features, such as headline indicators on the state of the climate system, sector-specific climate indices and extreme climate events". The WMO Annual Statement on the State of the Global Climate is an example flagship product in this respect. The global headline climate indicators featured in the WMO annual climate statement, defined based on GCOS concept, are surface temperature, ocean heat, atmospheric CO_2, ocean acidification, sea level, glacier mass balance and Arctic and Antarctic sea ice extent. An important aspect in reporting on the State of the Climate Indicators is identifying the link between climate change with observed high impact events, such as, for example, heat waves, droughts, storms, heavy precipitation and floods. However, there is currently no agreed-upon single indicator to use for characterizing the status of extreme event globally.

CCl is working on a scientific paper on climate indicators, in collaboration with GCOS, WCRP and other stakeholders, to promote the alignment with IPCC and the Paris Agreement Global Stocktake. UNFCCC has now a MoU with WMO which includes Statement of the Climate and WMO and GCF signed a USD 1.4M agreement to develop and test a methodology to ensure all GCF projects include a climate rationale founded on the best available climate science. The GCOS secretariat is actively contributing to the work of WMO on the climate rationale of the Green Climate Fund, and it is recommended for this collaboration to continue (Recommendation SC26/29).

It was noted that the latest statement on climate contains less information than usual on impacts. This is due to the fact that countries do not provide complete information for the statement or in certain cases, like for socioeconomics impact, none at all.

Number	Action	Responsibility	Notes
SC-26/29 Recommendation	Communication: Continue to work with WMO secretariat on climate rationale of the Green Climate Fund.	GCOS Secretariat	9. Communication

9 GCOS budget – Carolin Richter

Carolin Richter presented the resourcing, budget and priority activities of GCOS for 2019. A discussion ensued about GCOS priorities if additional resources became available.

The SC approved the document which lays out the budget estimation for the coming two years.

The following was suggested subject to availability of additional resources, in order of priority:

- 2-year staff contracts;
- Additional regional workshops;
- Additional staff for OOPC;
- Extension of the GCOS Cooperation Mechanism to the other panels;
- Additional task teams.

10 GCOS Cooperation Mechanism (GCM) - Tim Oakley (remote)

Whilst the GCM is a well proven process, it is based on a reactive approach, which means that the GCM works primarily on projects where help has been requested and sufficient funds are available. The GCM should be considered a high profile activity, and GCOS should try to improve the support for it. Several suggestions were made in this respect, including approaching UK funding agency (DFID) and the European Commission (EC); asking governments of developed countries to sponsor certain countries or stations; coordinating with other programs like the WMO Voluntary Cooperation Programme; and increasing the GCM visibility by telling the story about the importance of observations to save lives. Carolin Richter explained that the process of asking funds for the GCM requires a certain degree of formality and that she has already delivered a document about the GCM to the new WMO director for mobilization.

Number	Action	Responsibility	Notes
SC-26/30 Task	Approach UK funding agency (DFID) and EC for potential funding fit network improvement.	GCOS SC Chair GCOS Secretariat	10b. GCOS Cooperation Mechanism

11 AOB

11.1 Reducing the GCOS carbon footprint - Michael Zemp

Michael Zemp introduced the discussion on how to reduce GCOS carbon footprint. While there are many actions that can be taken at a personal or political level, it is important for credibility to look at what can be done at the professional level. One obvious possibility is to reduce the air travel associated with GCOS meetings. It is decided that as a first step GCOS Secretariat will monitor GCOS operation and the respective footprint. There were several proposition on the possibility to organize meetings in a different way, for example live-streaming or organizing meetings around regional nodes. Although this discussion was triggered by the desire to limit emissions, it subsequently identified many other potential benefits in terms of efficiency and effectiveness of meetings. This could lead to much more fundamental reorganization of the work of GCOS and its bodies, and further discussion on this subject should follow. A group led by GCOS Secretariat agreed to review the arrangements of future meetings and to produce a paper on how best to change the meeting format for the SC (Task SC-26/31).

Number	Action	Responsibility	Notes
SC-26/31 Task	GCOS goes green: Monitor GCOS operation and respective carbon footprint and review arrangements of future operations.	GCOS Secretariat plus Sue Barrell, Michael Zemp, Ken Holmlund, Stephen Briggs	11c. Reducing the GCOS carbon footprint

11.2 Reflection on GCOS science day 2018 - Ken Holmlund

Ken Holmlund thanked FMI noting that the science day was very well organized and resulted in a good engagement regionally and a good connection with the Arctic Council. The link of GCOS to the Arctic Monitoring and Assessment Programme (AMAP) needs to be examined, and this is reflected in Recommendation SC-26/32. This is the 4th GCOS science day and it ensures a link to the country enabling the regional component. Therefore, it is important to tailor the topics to the host country. Following the

discussion about reducing GCOS carbon footprint, it was suggested that in the years where the SC would not meet, a science day could be organized by GCOS national coordinators.

Number	Action	Responsibility	Notes
SC-26/32 Recommendation	Science day: Explore the link of GCOS to the Arctic Monitoring and Assessment Programme (AMAP), and how to interact with the Polar Space Task Group (PSTG) and the EC Panel of Experts on Polar and High Mountain Observations, Research and Services (EC-PHORS) and the Year of Polar Prediction (YOPP)	GCOS Secretariat	11d. Reflection on Science Day 2018

11.3 List of actions of the meeting

The list of actions from the meeting was presented, discussed and agreed upon. The list can be found in Annex 3.

12 Close of the session

The SC and the staff of the GCOS Secretariat thanked very much the local organizing team for all the arrangements. Next meeting will be hosted in collaboration by IOC and ISC, in Paris, France, from 28 October to 1 November 2019.

Annex 1: List of Participants

Members of the GCOS Steering Committee:	
Prof. Stephen BRIGGS (Chairman) GCOS Secretariat c/o WMO 7 bis, avenue de la Paix P.O. Box 2300 CH-1211 GENEVA 2 Switzerland	
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Invited Experts	
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WMO expert on GBON Dr Robert A VARLEY DSc CDir CMet	

Sponsors	
WMO Represented through Dr Pavel KABAT	**International Science Council (ISC)** Remote presentation by Heide HACKMANN International Science Council (ISC) 5, rue Auguste Vacquerie 75016 PARIS France
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Dr Caterina TASSONE Scientific Officer, AOPC GCOS Secretariat	Dr Valentin AICH Junior Professional Officer GCOS Secretariat
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Dr Arslan Ali NADIR Scientist, Satellite Services and Research Erik Palmérin aukio 1 P.O. Box 503 00101 HELSINKI Finland	Dr Johanna TAMMINEN Head of Earth Observation Research Erik Palmérin aukio 1 P.O. Box 503 00101 HELSINKI Finland
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Annex 2: Agenda

Monday 22 October 2018

GCOS Science Day – Focus on the Arctic: from 09 hrs to 16:30 hrs.

In conjunction with the GCOS Steering Committee Meeting, there will be a GCOS Science Day on Monday, 22 October 2018, at the premises of the Finnish Meteorological Institute.

In 2018, the Finnish and regional community is invited to present local actions with regard to climate observations, science and adaptation in the Arctic region. The GCOS Science Day will consist of 4 sessions:

- GCOS activities in global and regional context
- Arctic now and tomorrow
- Science-based information for decision makers
- Climate change and observing initiatives

The agenda for the Science Day can be found here on: **gcos.wmo.int**

or using the link here.

Please, do not forget to register as our host will need your name for security reasons.

Steering Committee Meeting Tuesday 23 to Friday 26 October 2018

Day 1 of the Steering Committee - Tuesday 23 October 2018		
	Agenda Item	**Documents and Annotations**
09:00 1a	Welcome Host	
1b	SC Chairman	Stephen Briggs >Report from last SC 2017 (Hangzhou) meeting
2	Sponsors remarks	• WMO: Johannes Cullmann (Director, Climate&Water Department) • IOC: Albert Fischer (Head, Ocean Observations and Services Section - GOOS – JCOMM) • UN Environment: Hartwig Kremer (Head of GEMS Water Unit; Science Division and Climate Technology Centre and Network, CTCN, Economy Division) • International Science Council: Heide Hackmann (via videoconference)
3	GCOS Secretaria Activity Report	• Carolin Richter >Activity report, June 2018 available. >3_GCOS_Directors_Report_to_SC_2018 • Valentin Aich New web pages / tag line / ECV fact sheets >3_communication_overview >3_sst_ECV_factsheet >3_surface-temp_ECV_factsheet >3_glacier_ECV_factsheet
	Morning coffee break	
4	All panels will report on Day 1:	AOPC, TOPC and OOPC reports from 2018 meetings are available. >AOPC-23 (EUMETSAT, Darmstadt, Germany, 2018) >OOPC-21 (INIDEP, Mar del Plata, Argentina, 2018) >TOPC-20 (WMO, Geneva, Switzerland, 2018)
4a	Ocean Observations Panel for Physics & Climate, OOPC	Co-Chair Bernadette Sloyan / supported by Katy Hill focus should be to highlight critical issues and questions of strategic importance
	Lunch Break	
4b	Atmospheric Observation Panel for Climate, AOPC	Chair Kenneth Holmlund / supported by Caterina Tassone focus should be to highlight critical issues and questions of strategic importance
	Afternoon coffee break	
4c	Terrestrial Observation Panel for Climate, TOPC	On behalf of the chair Wolfgang Wagner: Michael Zemp / supported by Valentin Aich focus should be to highlight critical issues and questions of strategic importance

4d	Implementing GCOS: what are the established processes: ECV stewards, IP action rapporteurs, cross-panel fora. SC to approve ToR for Panel Membership	Michael Zemp supported by Caterina Tassone, Valentin Aich Disicussion will be of relevance to the in-camera session for memberships. >Doc.4d - ToRs General GCOS Panel membership >Doc.4d Role ECV-Stewards &IP-Action-Rapporteurs
Adjourn 17:30		

Day 2 of the Steering Committee - Wednesday 24 October 2018		
	Agenda Item	**Documents and Annotations**
09:00 5	Vision of a future GCOS – introduction:	Stephen Briggs
5a	Joint Panels meeting March 2019, Morocco Preparing for 2nd GCOS Science Conference in 2021 Regional Workshop – the current workshop for East Africa and future planning	Recalling 1st GCOS Science Conference in 2016 (Amsterdam): http://www.gcos-science.org/ Concept note for all-Panels meeting available >Doc.5a - GCOS Time Plan >Doc.5a - DRAFT for 2nd Science Conference >Doc.5a - Draft for GCOS Joint Panel Meeting >Doc.5a_regional_workshop_eastafrica_20180713
	Morning coffee break	
5b	A seamless, integrated science for services approach (45 min)	Pavel Kabat (Director Research, Chief Scientist, WMO) In addition: brief presentation and discussion about WMO reform and the new strategy, where research will be a cross cutting, horizontal fundament connecting all WMO parts (a seamless, integrated science for services approach). The focus will be on a need to enhance GCOS - WMO future collaboration in this context >Latest information and draft of WCRP strategy
5c	The GOOS 2030 strategy - discussion on aligning strategies and partnership (45 min)	Toste Tanhua (Co-Chairman, Steering Comittee GOOS) UN Decade for Ocean Sciences (Sue Barrell, supported by Katy Hill) >5c_GOOS_Strategy_Draft_Oct_2018.docx >5c_GCOS-GOOS_Relationship_GCOS_DRAFT
	Lunch Break	
5d	The Global Basic Observing Network (GBON)	Rob Varley GBON is basically the global extension of the work that started off at the Joint GCOS-WIGOS Workshop in Fiji 2017, and the target applications for it are Global NWP and climate reanalysis >5d GBON-Concept-draft
5e	Vision of a future GCOS - discussion: Progress of GCOS & development of relations to UNFCCC, WCRP and other partner programmes of relevance	Stephen Briggs / Carolin Richter Open discussion on where GCOS is going. Do we provide the righ information to sponsors, users? Voice your concerns and criticism and bring in your views. >Doc.5e_-_brief_presentation_on_GCOS_Strategy >Doc.5e - GCOS Strategy V2.0
	Afternoon coffee break	

6a	UNFCCC update	Florin Vladu
6b	GCOS support to the Paris Agreement and the Gloabl Stocktake SC to approve document submission to UNFCCC/SBSTA49	Discussion led by Sybil Seitzinger Document of Task Team available: >Doc.6b - SystematicObsPA 1.7
6c	Are we providing the right information for adaptation measures?	Discussion led by Han Dolman supported by Caterina Tassone / Valentin Aich • TOPC TT Adaptation • The planned ECV user workshop in 4-7 Feb 2019, focussing on adaptation observation needs • Seeking for guidance from SC on participation of marine/coastal experts from the other panels, or, IPCc WG II? >Doc.6c - ECV user Workshop draft
Adjourn		

Day 3 of the Steering Committee – Thursday 25 October 2018

	Agenda Item	**Documents and Annotations**
09:00	Visit (only a.m.) to the Aker Arctic ice laboratory offering a wide range of ice model testing services and model ice conditions for testing of model ships. https://akerarctic.fi/en/services/ice-model-testing 	
	Lunch Break	
14:00 7	World Adaptation Science Programme (**PROVIA**)	Hartwig Kremer
8	Merger of ICSU to ISC (15`)	Lucilla Spini (TBC)
	Afternoon coffee break	
9	Communicating on Climate: How does GCOS ensure good communication with the more generic users of climate information? For example, how do we relate to insurances of risk?	Stephen Briggs Manola Brunet, suceeding Tom Peterson in being President of the WMO Commission for Climatology, to comment and give the WMO (Commission for Climatology) view on indicators
Adjourn		

Day 4 of the Steering Committee – Friday 26 October 2018		
	Agenda Item	**Documents and Annotations**
09:00 10a	Resourcing, Budget, Priority activities for GCOS in 2019 ff SC to approve budget and priorty activities	Carolin Richter >Doc.10a_Budget_Document_October_2018 >Doc.10a_-_List_of_Meetings_2018-2019
10b	GCOS Cooperation Mechanism	Stephen Briggs • Target for developing aid. • Disucss funding mechanisms. >Doc.10b_GCOS_GCM_Report_of_Activities >Doc.10b_GCM_Project_Candidates_2018 • Information on recent WMO Resource Mobilization and Parnership activities (Green Climate Fund) >10b_climate_rationale_presentation
	Morning coffee break	
11a	AOB as emerged out of the past days	
11b	Agree on List of actions from this meeting	Caterina Tassone >11b_GCOS_Objectives_Functionalities >11b_SC25_Action_update
11c	What GCOS can contribute to achieve the Paris Agreement: Reducing the GCOS carbon footprint	Michael Zemp
11d	Reflection on Science Day 2018	Kenneth Holmlund, Arslan Ali Nadir (FMI, host), Maria Hurtola (FMI, host) Past Science Days were held in Cape Town (2015), Guayaquil (2016), Hangzhou (2017), 2019?
12	Next meeting / next science day 2019	>12_proposed_dates_SC-2019
13	Close of formal meeting.	
noon	Lunch Break	
In-Camera	Only for SC-Members, Panel chairpersons, representatives of WMO, IOC, UNEP and ISC, GCOS Secretariat staff.	We will discuss members and candidates for panels & steering committee; leaderships. >incamera_SC_Membership_2018 >incamera_AOPC_Membership_2018 >incamera_OOPC_Membership_2018 >incamera_TOPC_Membership_2018
Close		

Annex 3: Consolidated List of Actions

Number	Task/recommendation	Responsibility	Agenda Item
SC-26/1 Recommendation	Engage with sponsoring organizations on the strategical strengthening of GCOS, on building synergies and on demonstrating how GCOS as a partner can successful deliver to their respective work, action or strategic plans, and how GCOS can support their ambitions.	D/GCOS	2. Sponsors remarks
SC-26/2 Task	Reinforce, where the connections are strong. Focus on GCOS ability to support sponsors.	D/GCOS	2. Sponsors remarks
SC-26/3 Recommendation	Continue to consider the subsidiary indicators.	GCOS Panels	3. GCOS Secretariat Activity Report
SC-26/4 Task	New GCOS web site: Review the text which describes GCOS and be clearer on the essence of the programme and on GCOS unique role.	GCOS Secretariat	3. GCOS Secretariat Activity Report
SC-26/5 Task	Fact sheets: Review the ECV fact sheets and the definitions and terminology.	GCOS Secretariat (coordinate with panels and ECV stewards)	3. GCOS Secretariat Activity Report
SC-26/6 Task	Fact sheets: Ensure that the difference between ECV and indicators is clear.	GCOS Secretariat(coordinate with panels and ECV stewards)	3. GCOS Secretariat Activity Report
SC-26/7 Recommendation	Ensure links and consistency with WCRP on next panel meetings.	D/GCOS	4. All Panel reports
SC-26/8 Task	Identify regional priorities of WMO members/IOC members with regard to organizing regional workshops.	D/GCOS	4. All Panel reports
SC-26/9 Task	Follow up on community engagement with regard to land-sea fluxes with Future Earth coast project.	GCOS Sec, UNEP	4a. OOPC
SC-26/10 Recommendation	GSRN, GUAN: Ensure consistency between GBON and GUAN, and GSRN links to CIMO, CCL, CBS.	AOPC	4b. AOPC

Number	Task/recommendation	Responsibility	Agenda Item
SC-26/11 Task	Adaptation: TOPC TT on Observations for Adaptation to invite AOPC and OOPC representatives to attend TOPC TT. TOPC TT to report to the joint panels meeting. The SC subgroup to draft a strategy for GCOS to support observations for adaptation (see task SC-26/27) also to report at the joint panels meeting. SC subgroup and TOPC TT to coordinate inputs before the meeting in March.	GCOS Sec, TOPC TT (Nigel Tapper), SC subgroup on observations for adaptation	4c. TOPC
SC-26/12 Task	Agree on attaching General guidance and functions for panel members to appointment letters, including description of the roles for ECV stewards and action rapporteurs. Streamline duties including time expectations and inspirational charge.	GCOS Sec	4d. Implementing GCOS
SC-26/13 Recommendation	Align the joint panel discussion to the GCOS strategy (goals and objectives).	GCOS Secretariat+ panel chairs	5a. Joint Panels meeting
SC-26/14 Task	Include agenda item for GCOS JPM on the way forward for regional planning.	GCOS Secretariat+ panel chairs	5a. Joint Panels meeting
SC-26/15 Task	Coordinate with panel chairpersons and secretariat to agree on top priorities and to draft the agenda of the joint panel meeting, along lines agreed at SC. Set up teleconferences in November and December. Have agenda available in December and list of attendees ready in early January. Interact with WGClimate and WCRP, WDAC.	GCOS Secretariat+ panel chairs	5a. Joint Panels meeting
SC-26/16 Task	SC leads to develop scoping document for each climate cycle, Han for Carbon, Johnny for water with support from Hartwig, Toshio for Energy . Ready on 25 February 2019	Han Dolman, Johnny Johannessen, Hartwig Kremer, Toshio Suga	5a. Joint Panels meeting
SC-26/17 Recommendation	The SC agreed to plan a 2nd GCOS Science Conference in 2021.	GCOS SC Chair	5a. 2nd GCOS Science Conference in 2021

Number	Task/recommendation	Responsibility	Agenda Item
SC-26/18 Recommendation	Consider where GCOS can contribute to the "good news" story and what are the consequences of headline indicators.	GCOS SC	5a. 2nd GCOS Science Conference in 2021
SC-26/19 Task	Coordinate conference with WCRP`s plans in collaboration with WWRP and GAW. Showcase success stories since 1st GCOS Science Conference as part of the agenda. Prepare conference for end of 2021 .	GCOS SC	5a. 2nd GCOS Science Conference in 2021
SC-26/20 Task	East Africa Workshop: Ensure follow up	GCOS Sec	5a. Regional workshops
SC-26/21 Recommendation	Continue to collaborate on a joint funding and partnership strategy with WCRP.	D/GCOS	5b. Seamless, integrated science for services approach
SC-26/22 Task	Follow invite to WCRP JSC meeting 6-10 May 2019, in Geneva.	D/GCOS and GCOS SC Chairperson to coordinate attendance	5b. Seamless, integrated science for services approach
SC-26/23 Recommendation	Consider the OOPC as broker for elements of GOOS delivering to GCOS. Recognize the conclusions of the GOOS-GCOS SC chairs bilateral meeting.	GCOS SC Chair GOOS SC Chair	5c. GOOS Strategy
SC-26/24 Recommendation	Learn from GOOS strategy to enhance the forward looking strategy of GCOS.	D/GCOS	5c. GOOS Strategy
SC-26/25 Recommendation	GCOS Secretariat to ensure that panels will be informed about the GBON concept . Panels to consider GBON in related network designs. Recognize the support of GCOS Cooperation Mechanism to GBON.	GCOS Secretariat Panels Tim Oakley	5d. GBON
SC-26/26 Task	Provide a list of GCOS contributions to SBSTA (e.g., statement, technical documents and reports, taking part in informal consultations) to SC attendees.	D/GCOS	6a. UNFCCC

Number	Task/recommendation	Responsibility	Agenda Item
SC-26/27 Task	List of actions from TT on Paris Agreement to be reviewed and considered for guidance at the TOPC TT Observations for Adaptation meeting-February 2019	TOPC TT Adaptation	6b. GCOS support to Paris Agreement
SC-26/28 Task	Set up a SC subgroup to draft a strategy for GCOS to support observations for adaptation to provide strategic guidance on GCOS approach to adaptation recognizing UNFCCC/IPCC approach to adaptation management by National Adaptation Plans (NAPs) and the Global stocktake. SC subgroup to report to the joint panels meeting in March.	Sybil Seitzinger, Florin Vladu, Han Dolman, Michael Zemp, Rodney Martinez, Hartwig Kremer, Nigel Tapper; panel chairs and GOOS representative invited to engage	6c. Are we providing the right information for adaptation measures?
SC-26/29 Recommendation	Communication: Continue to work with WMO secretariat on climate rationale of the Green Climate Fund	GCOS Secretariat	9. Communication
SC-26/30 Task	Approach UK funding agency (DFID) and EC for potential funding fit network improvement.	GCOS SC Chair GCOS Secretariat	10b. GCOS Cooperation Mechanism
SC-26/31 Task	GCOS goes green: Monitor GCOS operation and respective carbon footprint and review arrangements of future operations.	GCOS Secretariat plus Sue Barrell, Michael Zemp, Ken Holmlund, Stephen Briggs	11c. Reducing the GCOS carbon footprint
SC-26/32 Recommendation	Science day: Explore the link of GCOS to the Arctic Monitoring and Assessment Programme (AMAP), and how to interact with the Polar Space Task Group (PSTG) and the EC Panel of Experts on Polar and High Mountain Observations, Research and Services (EC-PHORS) and the Year of Polar Prediction (YOPP)	GCOS Secretariat	11d. Reflection on Science Day 2018

Annex 4: List of Acronyms and Abbreviations

Arctic Monitoring and Assessment Programme	AMAP
Atmospheric Observation Panel for Climate	AOPC
Climate Data Records	CDR
Climate Data Store	CDS
Committee on Earth Observation Satellites	CEOS
Commission for Basic Systems	CBS
Commission for Climatology	CCl
Commission for Instruments and Methods of Observation Commission	CIMO
Conference of Parties	COP
Copernicus Climate Change Service	C3S
Coordination Group for Meteorological Satellites	CGMS
Country Level Impacts of Climate Change project	CLICC
Essential Climate Variable	ECV
European Commission	EC
Essential Ocean Variable	EOV
EC Panel of Experts on Polar and High Mountain Observations, Research and Services	EC-PHORS
Finnish Meteorological Institute	FMI
GCOS Cooperation Mechanism	GCM
GCOS Reference Upper-Air Network	GRUAN
GCOS Surface Network	GSN
GCOS Upper Air Network	GUAN
GCOS Steering Committee	SC
Global Atmosphere Watch Programme	GAW
Global Basic Observing Network	GBON
Global Climate Observing System	GCOS
Global Environment Monitoring Service	GEMS
Global Framework for Climate Services	GFCS
Global Ocean Observing System	GOOS
Global Resource Information Database	GRID
Global Terrestrial Network	GTN
Green Climate Fund	GCF
Group on Earth Observations	GEO
Implementation Plan	IP
Intergovernmental Panel on Climate Change	IPCC
Intergovernmental Oceanographic Commission	IOC
Integrated Observing System	IOS
International Council for Science	ICSU
International Social Science Council	ISSC
International Global Atmospheric Chemistry	IGAC
International Science Council	ISC
Joint Commission on Oceanography and Marine Meteorology	JCOMM
JCOMM Observing Program Support Centre	JCOMMOPS
Memorandum of Understanding	MOU
National Meteorological and Hydrological Services	NMHS
National Weather Prediction	NWP
Observations Coordination Group	OCG
Observation System Capabilities and Review tool	OSCAR
Ocean Observations Physics and Climate Panel	OOPC
Polar Space Task Group	PSTG
Programme of Research on Climate Change Vulnerability, Impacts and Adaptation	PROVIA

Secretariat of the Pacific Region Environment Programme	SPREP
Subsidiary Body on Scientific and Technological Advice	SBSTA
Sustainable Development Goals	SDG
Terrestrial Observation Panel for Climate	TOPC
United Nations	UN
UN Environment Assembly	UNEA
United Nations Educational, Scientific and Cultural Organization	UNESCO
United Nations Environment Programme	UNEP
United Nations Framework Convention on Climate Change	UNFCCC
World Adaptation Science Programme	WASP
World Climate Research Programme	WCRP
World Data System	WDS
Working Group	WG
World Weather Research Programme	WWRP
WCRP Data Advisory Council	WDAC
World Meteorological Organization	WMO
WMO Integrated Observing System	WIGOS
Year of Polar Prediction	YOPP

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