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KEEPING WATCH OVER OUR CLIMATE

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25nd Session of the Ocean Observations Panel for Physics and Climate (OOPC-25)

Darmstadt, Germany

20-21 October 2022

GCOS-251
GOOS-281
WCRP 2/2023

UNITED NATIONS ENVIRONMENT PROGRAMME

INTERNATIONAL SCIENCE COUNCIL

Chair, Publications Board

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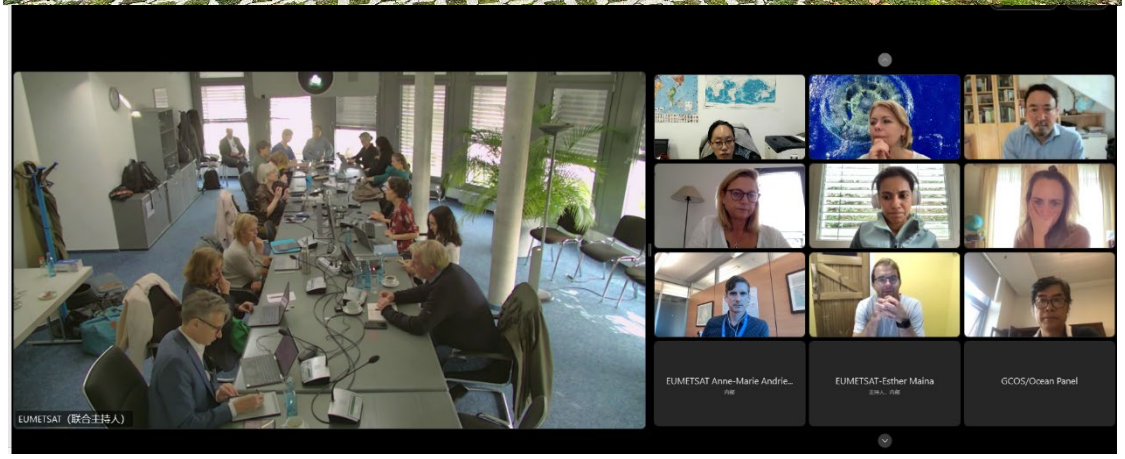

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WMO unesco International Science Council UN environment programme

GOOS
The Global Ocean Observing System

WCRP
World Climate Research Programme

DAY 1: THURSDAY 20 OCTOBER 2022

Introduction

The OOPC-25 Session was held in Darmstadt, Germany, kindly hosted at EUMETSAT Headquarters with the support of their staff. It was the first in-person meeting after the 2019 GCOS Joint Panel Meeting in Marrakesh. The 2022 OOPC edition provided an opportunity to: (1) connect with related programmes, bodies and initiatives (e.g. GOOS Biogeochemistry, CLIVAR and GCW) to work together to develop the global ocean observing system and contribute to GOOS/GCOS/WCRP strategic objectives; (2) review progress achieved in the different activities carried out by the panel; (3) start preparing the 2024-2027 OOPC Workplan.

1. Why are we here: the role of OOPC and connections to other bodies

Han Dolman, Chair of GCOS, and Anthony Rea, Director of GCOS, welcomed the participants and opened the meeting. They both stressed the importance of OOPC input both during the GCOS Climate Conference and while developing 2022 GCOS Implementation Plan, and how the relevance of ocean observations in the framework of the climate observing system is becoming clearer. They also highlighted that 2022 GCOS Implementation Plan would be presented at COP27 in Egypt, where the main message would be on emphasizing the need of sustained investment on climate observations.

1.1 Statements from GCOS, GOOS and WCRP

Albert Fischer, Head of GOOS Secretariat reminded the participants about the three main areas of work for GOOS, including climate, ocean forecasts and warnings, and ocean health. He described where OOPC sits as part of GOOS Core team and highlighted its role in the framework of GCOS IP when setting targets and priorities as well as means of assessing progress across GOOS elements. He stressed the 3 GOOS programmes currently running under the Ocean Decade (Observing Do-Design, CoastPredict, Observing Together).
Mike Sparrow and Hindumathi Kulaiaippan Palanisamy represented WCRP Secretariat. Mike Sparrow went over WCRP Strategy as well as the main projects and Lighthouse Activities and two new areas of work (Climate Intervention and Understanding Linked carbon, water and energy cycles). He also mentioned the 2023 WCRP Climate Conference and invited OOPC to join.
Sabrina Speich, chair of OOPC highlighted that while the connection with GOOS and GCOS is straightforward, the on-going re-structuring of WCRP together with COVID has made it difficult to establish clear links with WCRP, even though there has always been mutual awareness and many OOPC members are also participating in WCRP activities.

N°	Action	Responsibility
O1	Consider joining WCRP Open Science Conference in Kigali (https://wcrp-osc2023.org/).	OOPC members

1.2 Presentation from AOPC

Tim Oakley, seconded expert from UK MetOffice providing support to AOPC together with Caterina Tassone, described briefly the composition and working procedures of their panel. Some cross AOPC-OOPC activities like the air-sea fluxes and activities around reference stations were highlighted.

1.3 OOPC Progress Report

Sabrina Speich and Weidong Yu presented the achievements of OOPC in the last year and highlighted the main areas of work in connection with GCOS and GOOS panels, as well as WCRP. One of the activities in the OOPC Workplan 2020-2023, the Heat and Freshwater budgets and storage was identified as still very relevant for the panel, but no progress has been done in the last years. This was a point of discussion during the meeting (see point 5.4).
The presentation is available here.

1.4 CLIVAR Panels[1]

Representatives from the CLIVAR panels IORP (Indian Ocean Regional Panel), ARP (Atlantic Regional Panel), GSOP (Global Synthesis and Observations Panel), NORP (Northern Ocean Regional Panel) and from ICPO (International Coordination Project office) attended the OOPC meeting in person and on-line. The meeting focused on defining the role of OOPC and connections to other bodies including WCRP and CLIVAR.

The presentations are available here.

Birgit Gaye presented some of the most recent the activities of IORP, including the Western Indian Ocean Workshop, the IndOOS-2 implementation tracking including assessing the impacts on IndOOS-2, the new focused activities on marine heatwave (MHW, as well as the early career scientists and Indian Ocean Youth Ambassadors initiative.
Regina R. Rodrigues presented the WCRP Lighthouse Activity on My Climate Risk (MCR) and the recent updates from the Atlantic Regional Panel. Ms Jing Li from ICPO added that the CLIVAR Exchanges special issue on the Tropical Atlantic Observing System (TAOS) is being prepared, by synthesizing the key outcomes from the TAOS Review Report. In addition, the CLIVAR AMOC Task Team is preparing a workshop to assess the observation gaps of AMOC.
Peter Oke briefly introduced the Global Synthesis and Observations Panel (GSOP) of CLIVAR, including its members and expertise, research interests, as well as the two joint activities: 1) How does data assimilation of observations impact dynamical balance of model? 2) What metrics are most suitable for assessing data assimilating systems?
Benjamin Rabe reported the key activities organized by NORP in 2022, which include the Arctic Processes CMIP bootcamp, NORP-SORP Workshop on Polar Fresh Water, and open call for CLIVAR new members.
The major uptakes from the discussions are:

- Strengthened cooperation between WCRP/CLIVAR and OOPC through building formal links was reiterated during the meeting.
- More links can be pursuit through broader WCRP community, besides CLIVAR, there are also potential opportunities to collaborate with the new core project (ESMO) and other lighthouse activities of WCRP;
- To strengthen the cooperation with three UN Ocean Decade Programmes coordinated by GOOS, i.e. Ocean Observing Co-Design, CoastPredict and Observing Together.

The marine heatwave related activities were found of interest by the participants. The potential links can be established through:

- CLIVAR Summer School and research foci on MHW.
- Ocean Observing Co-Design exemplar group on Marine Heat Wave.
- Cooperation with the Ocean Indicators Task Team led by Karina von Schuckmann.

[1] This section is adapted from the report on CLIVAR website.

- GSOP may further consider assessing the different methods for coupled data assimilation on forecasting systems, by referring to the experiments led by Magdalena Balmaseda (ECMWF) on the impacts of ocean observations in seamless forecasting systems.
- A joint working group by GCOS/GOOS/CLIVAR may be further explored to promote the pan-tropical ocean observing system.

Given the number and breadth of potential areas of common interest, it was decided that a follow up meeting should be organized, to have a more strategic approach to the OOPC/CLIVAR joint work.

N°	Action	Responsibility
O2	OOPC to convey a meeting with the Executive Management of CLIVAR to clarify priorities and next steps to make progress on those areas.	Weidong Yu, Sabrina Speich

Sabrina Speich inquired about the outputs from recent meetings in CLIVAR Atlantic Panel and the struggle to achieve long-term commitments to sustain the observing system in the regions.

N°	Action	Responsibility
O3	Draft a short document stating the current situation in terms of ocean observing in the Atlantic, so that OOPC can do some advocacy.	CLIVAR Atlantic Panel/ Regina Rodrigues

1.5 IOCCP/BGC Panel

Maciej Telszewski introduced the Terms of Reference and current members of the GOOS Biogeochemistry panel/International Ocean Carbon Coordination project (BGC panel) and indicated the activities where BGC's work intersected with OOPC's.
The presentation is available here.
Amongst those, Maciej distinguished those where individual BGC members participated in some of OOPC activities (e.g. OASIS) and those where the whole panel was represented (the case of the Indicators task team). He also highlighted some of the areas where a common cross-GOOS panel approach would be desirable, such as the Ocean Best Practices System or the discussion about the Economic Evaluation of elements of the Framework of Ocean Observing.
A discussion followed around the importance of BGC panel activities in the context of the WMO GHG initiative, which is also strongly connected to OASIS, since the exchanges of carbon between the ocean and the atmosphere need to be better understood. It was stressed that OASIS is a joint effort, led by OOPC, but with the participation of BGC (as well as AOPC and BioEco). It was clarified that WMO's interest lies mainly on the surface exchange, and that connects well with the efforts of GOOS BGC community to operationalize the surface ocean carbon monitoring.
Also, WMO is now pushing for an expanded new definition of requirements that could potentially include variables from BGC of BioEco.

1.6 Observations Coordination Group

David Legler provided an overview of the role of OCG across 7 foci for actions (including requirements, observing advances, data management or OceanOPS) and 12 networks, whose status is tracked annually in terms of implementation, data delivery etc. He introduced the concept of "emerging networks" and what the major successes and concerns are. He also

advanced some developments related to interactions with other initiatives: industry, WMO, Ocean Decade…
Presentation is here.
The presentation focused then on the intersections between OCG and OOPC around two areas: (1) requirements and WMO request to OCG/GOOS to engage in their Rolling Review of Requirements & Statement of Guidance for the Ocean Application Area; (2) Review/evaluation and design of an integrated global observing system. While (1) aligns naturally with what OOPC and OCG do, this task will require extra effort and some discussion must be held to decide on how many resources can be invested. Regarding (2), the Ocean Observing Co-Design Program proposes exemplars of where to focus with or without partnering with other bodies. The Tropical Pacific Observing System TPOS2020 was presented as a successful case where the evaluation and design process led to some concrete outcomes in terms of investment. He stressed the importance of the connection with modelling and users as part of the co-design process and integration across the value chain.
Some discussion followed around the request from WMO for GOOS to take care of the Oceanic Applications, which do not necessarily align with GOOS interests, while it is also a good opportunity to improve the connection with WMO. This discussion was continued on Day 2. The particularities of the uncrewed surface vehicles emerging network due to the involvement of the private sector in that network were also referred to. GOOS will have to see how to develop good practices or documentation adapted to this type of public-private endeavours that are likely to become more important in the future.

1.7 GOOS Ocean Decade Programmes

Emma Heslop described the 3 transformative UN Decade Programmes that are led by GOOS, including Ocean Observing Co-Design, CoastPredict and Observing Together, their developments in the last year, and explained how OOPC can engage with them and what kind of synergies can be found.

The presentation is available here.
Concerning the connection between the Ocean Decade programmes and the GOOS Regional Alliances (GRAs), specific sessions from the Observing CoDesign Programme and GRAs representatives had been taking place, while for Observing Together some of the project are already involving actors from GRAs. Investment is an issue to ensure success of the Ocean Decade related activities, and this has not become any clearer after one year of developing the framework and developing ideas that need some resources to lift those. However, the importance of the huge momentum and the mobilization of experts outside GOOS that are now connected through the Ocean Decade was recognized.

OOPC members should consider engaging with the Ocean Decade, in particular with the GOOS Ocean Decade Programmes. OOPC members are encouraged to join the Observing Co-Design Programme Supporters Forum Session for GOOS Panels on November 29 and to discuss how this fit with the OOPC requirements process.

N°	Action	Responsibility
O4	Engage with the Ocean Decade, and in particular with some of the GOOS Ocean Decade Programmes. Potential links with the Ocean Decade programmes, projects and actions should be considered when designing the new OOPC Workplan 2024-2027. OOPC members should report periodically in their involvement and contributions to the UN Ocean Decade.	OOPC members

2. From Global to Coastal: GOOS/CLIVAR panel

Weidong Yu reported on the GOOS/CLIVAR panel organized in Trieste, Italy on 15-17th August 2022. The workshop looked at observing systems both at a global and regional scales, but also put special emphasis in giving the voice to the views of rim countries and small island states. There were also breakout discussions around three topics: oceanographers' connection, low cost and new technologies and co-design with stakeholders. He also commented on the decadal reviews from IndOOS, TAOS and TPOS and the strong connections between the basins. He put forward the idea of working on building an integrated tropical ocean observing system, based on the experience from IndOOS, TPOS and TAOS.
The advantage would be that there are already many elements in place to create the pan-tropical approach. There were some concerns, however, that such a pan-tropical approach vs. the regional one, would make it more difficult to succeed in engaging with some of the local actors and coasts, that may be less interested in joining a global endeavour, while they may be interested in joining a regional one.
Again, this indicates that there is a need to strengthen cooperation between WCRP/CLIVAR and OOPC.

N°	Action	Responsibility
O5	OOPC and GOOS to convey a meeting with representatives of CLIVAR and the three Tropical Systems to consider working towards a global tropical ocean observing system.	OOPC co-chairs

3. GCOS IP and GCOS Climate Observation Conference: Actions for the ocean community: Who does what and how to have more impact together?

3.1 GCOS Implementation Plan

Belén Martín Míguez presented the 2022 GCOS Implementation Plan focusing on the Actions that are related to the improvement of the ocean observing system.
The presentation is available here.
These Actions spread over 6 themes, from filling data gaps to improving engagement with countries, from data management to emerging needs. The intention of the presentation was to use the Actions proposed in the GCOS IP as an area of interaction between OOPC and other elements of GOOS (panels, OCG) as well as CLIVAR.
Most of the discussion was around Action D2: Ensure Global Climate Data Centres exist for all ECVs. Currently, two global data centres are mostly taking care of Argo data, while collection efforts for other variables are sparse and scattered. In particular, for quality-controlled ocean climate data, in many cases efforts are done by individuals, without any guarantee of continuity. Probably the clue would be having a good cross-linkage and connection between the centers, because it is going to be impossible to convince all data producers to send data to the same repository. Essentially, you want to support national efforts that will ultimately be linked to regional and global data centers that will share the metadata.
Experts agreed it is not possible to have one single data center doing all and holding all the data. It may be feasible for certain networks or variables (like the example of Argo), but it is not realistic on a broader scale. The key is to ensure that data collected are stored properly in centres (not necessarily one single centre, as this would be unfeasible) that, in its turn, can be plugged into a system of centres. Another aspect is the time involved in preparing data so that

exchange is possible, as well as the aspects that hinder data disclosure (like researchers not wanting to share certain data). Resources involved in data management should be accounted for and solicited when requesting funding to collect data.
There was a question about the possibility to introduce amendments to the GCOS IP, both the Actions and the Requirements (in particular, completing the references that would justify the values proposed in the requirements). It was explained that the satellite agencies, mobilized through WGClimate, will be publishing an answer to GCOS IP. This example could be followed by other communities who have suggestions or objections to GCOS IP. The ECV requirements specifications sheets may need to be completed in the future if there is enough community feedback.

3.2 GCOS Climate Conference

The Co-chair of OOPC, Sabrina Speich presented the main outputs from 2022 GCOS Climate Conference, whose Scientific Committee she chaired. The conference was hosted from 17-19 October in Darmstadt, Germany, with the support of EUMETSAT. It brought together 140 participants from 29 countries. The results of the Conference were condensed in a Conference Statement that, amongst other things called for sustained, long-term funding to monitor the Essential Climate Variables, as well as to address priority regions where there are still gaps like the subsurface ocean.

DAY 2 FRIDAY 21 OCTOBER 2022

4. EOV/ECVs requirements

4.1 EOV/ECV Integration: the new EOV specification sheet

4.2 Can we improve the list of Essential Ocean Variables (EOVs)/Essential Climate Variables (ECVs)?

The purpose of these two items is to provide an update on the ongoing efforts to improve the alignment of the EOV and ECV requirements definition processes and to discuss further improvements in order to achieve a more fit-for-purpose framework, as explained by the OOP officer. She also introduced the new EOV template available to display the EOV requirements with a new format that allows to present both the EOV and the ECV requirements.
The presentation is available here.
Some of the points raised in her presentation were:

- Is the current set of EOV/ECV too focused on surface phenomena? Should we include more variables in the deep ocean?
- Should more attention be given to coastal processes?
- Can the framework be rationalized/simplified?

Maciej Telszewski stressed the relevance and usefulness of the framework specially to communicate and how the ocean biogeochemistry variables were defined. In spite of that, the level of implementation is still limited and there is a need to have an EOV paper, which would also be the reference to think of further expansions, or to establish links with other sets of ocean variables proposed by other communities. Belén Martín Míguez explained that there is already a draft paper and offered sharing it with those the participants interested providing feedback. It was suggested to engage with those who had been involved in the past such as Bernardette Sloyan or Johannes Kartsesten.

Some members pointed out that there is a need for GOOS/GCOS and WCRP to rethink the framework and the current structure that is not totally consistent, or at least to communicate better the reasons for certain variables (example of surface and subsurface salinity or sea ice not really being a measurable variable as such). A discussion followed on the insufficient communication on the framework, resulting in misunderstandings.

N°	Action	Responsibility
O6	Invite other members from GOOS community who were involved with the development of the EOVs to contribute to the paper once the first draft is ready: OceanOPS, Bernadette Sloyan, Johannes Karstensen. Circulate the paper amongst OOPC members for information.	OOPC officer

Other members warned that the user's perspective should be taken into account to a greater extent when setting up the requirements, and there is a risk if the framework changes too rapidly, that user communities cannot keep pace with those changes.
The traceability from the science to requirements around the phenomenon concept was raised. We defined the requirement from the observable to understand the science question and that makes it possible to justify the choice. However, right now this is not always well explained.

N°	Action	Responsibility
O7	Revisit the ECVs requirements tables and add references when appropriate.	OOPC members

4.3 Global Cryosphere Watch (GCW) and Sea Ice Variables

Petra Heil provided a brief overview of the WMO GWC programme, which is an international mechanism for supporting all key cryospheric in-situ and remote sensing observations.
The presentation is available here.
She then presented the proposal of a revised structure for the Sea Ice Essential Climate Variables of GCOS, which is the result of a community effort.
This proposal has been reflected in a paper submitted to BAMS journal. Arctic sea ice is a key component of the climate system, and unprecedented changes are now being observed. It is less well observed in the Antarctic, but it is clear that the behaviour there is very different and that it extends far beyond its extent. Therefore, many other variables must be taken into account to understand it and model it. Experts settled on a set of 7 geophysical variables, which in their opinion qualify as independent ECVs: sea-ice concentration, thickness, snow-depth, surface temperature, surface albedo, age, and drift.

4.4 WMO and the Rolling Review of Requirements

The OOPC Scientific Officer introduced this item drawing on the presentation given by David Legler the previous day. The WMO has requested OCG/GOOS to help with developing Statements of Guidance for Oceanic Applications, one of the Earth System Applications Categories within their RRR (Rolling Review of Requirements) Framework, and to develop the observational requirements for some of those Applications. These applications range from Ocean Mesoscale Forecasting and RT monitoring to Maritime Safety or Climate Monitoring (which is currently already taken care of by OOPC within GCOS).
The presentation is available here.

The question is to what extent OOPC and GOOS are interested in contributing to the process, how easy it is to align and how realistic it is that there are enough resources for that.
David Legler provided some further insights: some points of contact for those application areas may be available, and some flexibility in the definition of the areas themselves may be possible. It is not easy to appraise the level of effort that this process will require. He emphasized that the Statement of Guidance is a reference document for Met Services, which influences investment in networks and technology. Thus, this would be a way to have a voice, and bring the need to support ocean observations to light.
A discussion followed where OOPC members mentioned on-going communities and initiatives that had expertise in those Application Areas. IOOS (Integrated Ocean Observing System, US), for instance, works on setting requirements for applications in coastal areas. OceanPredict project would be very well positioned to take care of some of the mesoscale prediction applications area within this RRR framework. Besides, Peter Oke could be key to establish the linkage with that community.
IOOS is currently doing something similar, in particular in coastal areas. OceanPredict has expertise in mesoscale forecasting, while CoastalPredict UN Decade programme would be better positioned to take responsibility for coastal forecasting (two of the proposed Oceanic Application Areas). Also NOAA intends to present a proposal on coastal forecasting to US CLIVAR. Copernicus/CMEMS is working on Climate Services. Yet, it is still necessary to pool those initiatives and communities so that their contributions can be reflected in the Statement of Guidance. It needs some linkage and oversight; a focal point is still needed and OOPC acknowledges the strategic interest of this activity and wants to contribute.

4.5 New EOVs: Ocean Mixing and Bottom Pressure

Nicole Couto presented a proposal for new emerging EOV: Ocean Mixing. This would measure the three-dimensional turbulent interleaving and blending of oceanic waters with different properties, happening at small spatial (1 m) and temporal (s to min) scales. She explained the scientific relevance of Ocean Mixing including its connection with the upwelling branch of the thermohaline circulation and air-sea fluxes. She also described the state of the art in terms of feasibility and cost-effectiveness of ocean mixing measurements using current and new technology. According to the proposal, the readiness level of networks and instrumentation would suggest that Ocean Mixing should be considered an emerging EOV.
Next Bruce Howe presented Ocean Bottom Pressure (OBP), and the sensors used to measure it, enabling to monitor gravitational and internal tides, internal waves, tsunamis and storm surges, providing essential information about the structure of Earth's crust and vertical deformation of the seafloor, as well as crucial to de-aliasing and correction of other measurements such as satellite altimetry but also remote gravity (GRACE). OBP also serves as a proxy of ocean mass variability giving information on the large-scale ocean circulation and the variability in the Earth's gravity field. Bruce Howe presented bottom pressure as a very important variable because it is a boundary condition, one of the variables in the equations of motion, and it is a variable that is integrative across the water column. Some discussion followed on the complementary of measuring bottom pressure remote sensing and Argo.
Regarding Ocean Mixing, OOPC experts asked some clarifications concerning what variables were being measured to derive mixing as this might be considered more a compound variable.
OOPC members endorsed the proposal of Ocean Bottom Pressure as an Essential Ocean Variable. This proposal will have to be submitted to GOOS Steering Committee with the support of OOPC.
The presentations are available here.

5. OOPC Activities reporting

The following presentations are available here.

5.1 OASIS

Meghan Cronin explained the first steps and motivations of the OASIS programme (now endorsed as a UN Decade Programme with a 10y frame, that acts as an umbrella to other UN Decade projects and actions) summarized into three *grand ideas* encompassing (1) a globally distributed in situ air-sea observing network; (2) satellites optimized for air-sea fluxes; (3) improved models and understanding of air-sea interaction processes.
She described the 5 OASIS Theme Teams and related activities and initiatives around process studies essential to OASIS like FUTURO, QUICCHE and North Atlantic and Japanese Hot Spot Process.
She stressed that OASIS is a *de facto* GCOS and GOOS cross-panel initiative very much relying on the GCOS and GOOS panels expertise, as well as on other partners like IOCCP, SOLAS etc. OASIS is basically pooling in as much expertise as possible and leveraging it.

N°	Action	Responsibility
O8	Formalize relation between OASIS and GOOS/GCOS panels.	OOPC Officer/ OOPC co-chairs/Meghan Cronin

5.2 Ocean Indicators

Karina von Schuckmann provided an overview of the development of the activity, from the initial proposal to the establishment of a cross-GOOS Task Team, including members with complementary expertise (policy, social science, indigenous knowledge) to the series of meetings and interviews with the members. She explained why defining ocean indicators can help nations meet the targets of several international agreements (e.g. UN 2030 Agenda on Sustainable Development), and the essential role of ocean observations to obtain those indicators. She also summarized the main outputs gathered through the interviews and presented the concept for an ongoing perspective paper on ocean indicators, which will set the scene, propose a clear definition for an ocean indicator, propose a set of criteria, which will allow to choose them after a scoring process that can vary depending on the scale (global, regional and local). She asked the other GOOS panels to suggest a set of 5 champion indicators as a proof of concept. Ultimately, this initiative should lead to an international call for a long-term programme under the Ocean Decade.

N°	Action	Responsibility
O9	Work on the definition of list indicators as a proof of concept.	OOPC, BGC and BioEco panel

Maciej Telszewski and Véronique Garçon (BGC panel) acknowledged the importance of this activity, offered support (co-organizing/funding workshops) and invited Karina to participate at the next BGC meeting.
Some discussion followed on how to define indicators that are useful at the local level. Karina explained that the indicators are meant to be the same across scales, but the way you obtain the indicator value (maybe the variables that will be considered to obtain the indicator may change – example of marine heatwaves), and clearly the stakeholders will vary too.

5.3 Boundary Systems Task Team

Marjolaine Krug reminded the participants of the overall objectives and composition of the Task Team. She described the main activities undertaken by its members, including participation in conferences and meetings, as well as the series of webinars. These webinars took stock of knowledge on 6 well known boundary systems. Then she summarized the main outputs from the webinars including a series of recommendations for users and funders of such systems, covering system design and modelling, and stakeholder engagement. The team is currently working on a white paper presenting those recommendations. She expressed her wish to step down as leader of the task team, while remaining engaged until the paper is finished.

Tamaryn Morris co-leads the Boundary Current Exemplar Project, which is part of the GOOS Observing Co-design programme (UN Decade) together with Ann-Christine Zinkann. She summarized the rationale for the exemplar after holding two Boundary Current Workshops connected to OCG, and the decision to focus on two very different pilot regions: Agulhas and the Gulf Stream. This project presents many points in common with the BSTT and some of its members are also part of the BSTT.
The presentation is available here.

Clarifications were sought regarding the concrete connections existing between BSTT and the Boundary Current Exemplar.BSTT has been actively involved in shaping the exemplar through participation in workshops. Some suggestions for collaboration were offered: the Coordinated Kuroshio Study II (also a UN Ocean Decade programme) and contacting Magdalena Balmaseda (linking to the modelling community and the use of coupled-models).The current approach (1ECV for sea ice), which does not permit proper reporting and makes it difficult to get adequate funding and keep in track for development of Climate Data Records.

5.4 Observing System Evaluation and Strategy for Ocean Heat and Freshwater Storage and Transports

This activity was part of the 2020-2023 workplan and aimed at assessing the capability of the current observing system to quantify changes to the ocean heat and freshwater reservoirs, to improve the ability to model and predict global and regional climate drivers and impacts, including impacts on weather, ocean and atmosphere extremes, marine ecosystems and resources, and to develop strategies required to optimize the observing system. Despite a strong start, COVID19 and the fact that the activity leader stepped down from OOPC impacted its progress. OOPC members agreed this activity should continue and several questions were raised: should carbon be incorporated into this activity? Should simply be part of a larger activity on cycles (regionalization of the cycles i.e looking at what happens at a more regional scale)?

An important initiative to consider is RECAP-2 (regional evaluation of the carbon cycle), with a lot of information already available online that should be studied. It will also be pertinent to build on Palmer et al. 2019 paper (OceanObs19). Things to consider are:

- RECCAP-2 project RECCAP-2 ECV Project (esa.int)
- Palmer et al. 2019
- Integration from the surface to the bottom
- Variations and extremes of carbon/water/energy and implications for the ecosystems
- Natural carbon pump
- Identify hot and compound hot spots, focusing in under sampled areas

- The regionality can be different for each of the components, and this adds to the strong temporal variability intrinsic to each cycle. The Ocean Indicator framework could be useful to approach this
- The main areas of interest could vary depending on whether our main stakeholders are scientists, or we think of societal relevance

N°	Action	Responsibility
O10	OOPC members agreed to develop a short document (2 pages max) reflecting the discussion with a clear proposal on the scope for this activity.	Benjamin Rabe, Eitarou Oka, Karina von Schuckmann

6. The future: new membership and workplan

OOPC Officer presented the current list of OOPC members, indicating that there is a need to replace three members who left in 2022, and highlighting that many of the members have been in the panel for more than the 3+3 period which is indicated in the Terms of Reference. Hence, there is also a need for some renewal in a near future. A call for applications to be part of OOPC was opened for two months (15 September-15 November) and it is important to decide what skills/background we are looking for in the candidates. Besides, the current workplan is finishing (2020-2023) and new activities must be put forward.
A round of interventions was opened where participants to the meeting indicated the following:

- There is a need to consider the time availability and motivation as contributing to the panel is a voluntary activity. People with a less high-profile, mid-career and even in an early career stage, could be a great addition. In the BGC panel there are two early career researchers at least.
- It is important to understand that the stewards do not "own" the EOV, but they must be connected to the community that works in that field and collect their feedback.
- The panel could consider engaging members "unofficially", meaning that they could attend the meetings even without being formally appointed.
- Coastal observations should be one of the fields where the panel would benefit from getting more members. Other fields that were mentioned were polar regions and deep ocean.
- The need to achieve a good geographical balance, in particular ensuring participation from South America, was also raised.

Marjolaine Krug is stepping down from the leadership of BSTT and from OOPC as of 1 March 2023. She highlighted all she had learnt during her position and offered to organize a meeting in South Africa, even if she is no longer part of the panel.
Tony Lee offered to take over from Marjolaine Krug as the steward of surface current.
Other members who joined the panel in 2017 indicated their intention to stay still for one or two more years.

N°	Action	Responsibility
O11	Circulate the announcement as widely as possible (including the CLIVAR office) and convey a meeting once the call is closed.	OOPC officer and members

7. GOOS Implementation Plan

OOPC officer explained the difference in approach between GCOS Implementation Plan, discussed earlier (activities that lead to an improvement of the global climate observing system, regardless of who carries them forward), and the GOOS Implementation Plan (activities run specifically by the GOOS community including the panels to fulfil the objectives in GOOS Strategic Plan and organized according to those strategic objectives). OOPC Workplan is part of the GOOS IP. Monday.com tool is used to show GOOS IP activities, what elements of GOOS (e.g. panels, GRAs, OCG...) are involved with them, how they are connected, the milestones, and the resources.
Various conversations have taken place to bring Regional Network Coordination/OO19 synthesis under the G7 Future of Oceans Initiative (FSOI), but no progress has been made so far.

N°	Action	Responsibility
O12	Revise the content on Monday.com in coordination with the leaders of the activities to add milestones and outputs.	OOPC officer and OOPC members

Monday.com was presented as a handy tool to track down and visualize outputs/milestones/achievements, useful for fund-raising.
However, some members complained that there were multiple requests for reporting and limited resources to do it properly. It was clarified that reporting for Monday.com purposes should not imply extra work, but that it would sufficient to forward information already provided for other purposes.
There was also some discussion around the difficulties to navigate the UN Ocean Decade, as there is no previous experience with such a framework. Besides, some concerns were expressed around difficulties and unclarity to getting access and releasing new funding, while simply participating in the Ocean Decade does require a lot of resources. On the bright side, it was recognized that the UN Decade is being effective in putting communities together, bringing many novel ideas to the table and encouraging a more successful process of raising funds at the national level. It is a bet to a certain extent, but we should be optimistic.
More reasons to be optimistic about increased support for ocean observations were mentioned: (1) greater recognition of the role of ocean observations for forecasts at all ranges; (2) implementation of the Paris Agreement, which implies national reporting on adaptation, and consequently, more observations for that reporting.

8. Next meeting

The next OOPC meeting (OOPC-26) will most likely take place in conjunction with the other GCOS panels, as part of an in person Joint Panel Meeting, which will be hosted by ECMWF in Bonn, Germany, at the end of June 2023.

ANNEX 1: AGENDA

DAY 1: Thursday 20 October MORNING: Room NW 472 - Meeting Room - 4th Floor North	
The meeting starts at 11:00, names in *italics* indicate remote participation	
11:00-13:00 11:00-11:45 11:45-12:30	**Item 1 - Why are we here: the role of OOPC and connections to other bodies** Statements and short presentations from: **1.1 Statements GCOS, GOOS, WCRP** - Han Dolman, *Albert Fischer, Mike Sparrow* **1.2 GCOS panels - AOPC** - Caterina Tassone **1.3 OOPC - Progress Report** - Sabrina Speich and *Weidong Yu* **1.4 Global Cryosphere Watch (GCW)** - *Petra Heil* **1.5 CLIVAR regional panels and Lighthouse activities** **IORP** - Birgit Gaye (Juliet Hermes, Roxy Koll), **GSOP.** - Peter Oke
12:30-13:00	**General discussion How OOPC and rest of connected bodies can better work together**
13:00-14:00	Lunch break
Thursday 20 October AFTERNOON	
14:00-15:30	**Item 2 - Outcomes from CLIVAR-GOOS Coastal Workshop (Aug. 15-17, 2022, Triest)** From the coast to the open ocean --> working towards a global tropical ocean observing system - a protocol for the truly global system -- *Weidong Yu*
14:30-15:15	**Item 3 - GCOS IP and GCOS Climate Observation Conference: Actions for the ocean community: Who does what and how to have more impact together?** **3.1 Presentation on GCOS IP and the Ocean related actions** - Belén Martín Míguez **3.2 Report on GCOS Climate Observation Conference** - Sabrina Speich
15:15-15:30	**Item 1 (cont'd) - Why are we here: the role of OOPC and connections to other bodies** Presentations from: **1.6 GOOS panels -(BGC/IOCCP)** - Maciej Telszewski
15:30-16:00	General discussion: How OOPC and rest of connected bodies can better work together
15:30-16:00	Coffee break
16:00-18:00 16:00-16:45 16:45-17:30	**Item 1 (cont'd) - Why are we here: the role of OOPC and connections to other bodies** **1.7 OCG** - *David Legler, AC Zinkan* **1.8 Ocean Decade** - *Emma Heslop, Mairéad Donovan* **1.5 CLIVAR Regional Panels and Lighthouse activities (cont'd)** **NORP** - *Benjamin Rabe* **CLIVAR ARP** and **My Climate Risk -** *Regina Rodrigues* **LHA EPESC -** *Patrick Heimbach*
17:30-18:00	**General discussion:** How OOPC and rest of connected bodies can better work together

DAY 2: Friday 21 October MORNING: EUMETSAT-Room PC 006 - Meeting Room	
09:00-10:30	**Item 4 - EOV/ECVs requirements** **4.1 EOV/ECV Integration: the new EOV specification sheet** **4.2 Can we improve the list of EOVs/ECVs? Rationalisation, regional considerations, more variables** - Belén Martín Míguez **4.3 Candidate EOVs: Sea Ice-related ECVs -** *Petra Heil*
10:30-11:00	Coffee break
11:00-13:00	**Item 5 -OOPC Activities reporting** **5.1 Air-Sea Fluxes** - Meghan Cronin **5.2 Ocean Indicators** - Karina von Schuckmann Freshwater/Heat exchange (discussion about continuity) **5.3 Boundary Systems Task Team** (including connection with GOOS/CLIVAR workshop, from the open ocean to the coast) - Marjolaine Krug, *Tamaryn Morris*
13:00-14:00	Lunch break
Friday 21 October AFTERNOON	
14:00-14:30	**Item 6 - GOOS IP and how to make sure the activities are properly reflected**
14:30-15:30	**Item 7 - The future: new membership and workplan**
15:30-16:00	Coffee break
16:00-18:00	**Item 4 (cont'd)- EOV/ECVs requirements** **4.4 Contribution of OOPC to the WMO Rolling Review of Requirements** **4.5 Candidate EOVs: Turbulence mixing, Bottom pressure, geothermal flux** *- Nicole Couto, Bruce Rowe, Laura Cimoli, Justin Stopa* **Item 8- WRAP UP and next meeting**

ANNEX 2: LIST OF ACTIONS

N°	Action	Responsibility
O1	Consider joining WCRP Open Science Conference in Kigali (https://wcrp-osc2023.org/).	OOPC members
O2	OOPC to convey a meeting with the Executive Management of CLIVAR to clarify priorities and next steps to make progress on those areas.	Weidong Yu, Sabrina Speich
O3	Draft a short document stating the current situation in terms of ocean observing in the Atlantic, so that OOPC can do some advocacy.	CLIVAR Atlantic Panel/ Regina Rodrigues
O4	Engage with the Ocean Decade, and in particular with some of the GOOS Ocean Decade Programmes. Potential links with the Ocean Decade programmes, projects and actions should be considered when designing the new OOPC Workplan 2024-2027. OOPC members should report periodically in their involvement and contributions to the UN Ocean Decade.	OOPC members
O5	OOPC and GOOS to convey a meeting with representatives of CLIVAR and the three Tropical Systems to consider working towards a global tropical ocean observing system.	OOPC co-chairs
O6	Invite other members from GOOS community who were involved with the development of the EOVs to contribute to the paper once the first draft is ready: OceanOPS, Bernadette Sloyan, Johannes Karstensen. Circulate the paper amongst OOPC members for information.	OOPC officer
O7	Revisit the ECVs requirements tables and add references when appropriate.	OOPC members
O8	Formalize relation between OASIS and GOOS/GCOS panels.	OOPC Officer/ OOPC co-chairs/Meghan Cronin
O9	Work on the definition of list indicators as a proof of concept.	OOPC, BGC and BioEco panel
O10	OOPC members agreed to develop a short document (2 pages max) reflecting the discussion with a clear proposal on the scope for this activity.	Benjamin Rabe, Eitarou Oka, Karina von Schuckmann
O11	Circulate the announcement as widely as possible (including the CLIVAR office) and convey a meeting once the call is closed.	OOPC officer and members
O12	Revise the content on Monday.com in coordination with the leaders of the activities to add milestones and outputs.	OOPC officer and OOPC members

ANNEX 3: LIST OF PARTICIPANTS

OOPC Members:

Sabrina SPEICH, France (Co-hair)
Weidong YU, China (Co-chair)
Maria Paz CHIDICHIMO, Argentina
Meghan CRONIN, United States
Marjolaine KRUG, South Africa
Tony LEE, United States
Eitarou OKA, Japan
Peter OKE, Australia
Benjamin RABE, Germany
Karina VON SCHUCKMANN, France

Experts:

Raja ACHARYA, India
Nicole COUTO, United States
Albert FISCHER, France
Birgit GAYE, Germany
Petra HEIL, Australia
Patrick HEIMBACH, United States
Juliet HERMES, South Africa
Bruce HOWE, United States
Roxy KOLL, India
David LEGLER, Unites States
Tamaryn MORRIS, South Africa
Mairéad O'DONOVAN, France
Hindumathi PALANISAMY, Switzerland
Regina RODRIGUES, Brazil
Katrin SCHROEDER, Italy
Michael SPARROW, Switzerland
Maciej TELSZEWSKI, Poland
Ann-Christine ZINKANN, United States

GCOS Secretariat:

Han DOLMAN (GCOS Steering Committee Chair)
Belen MARTIN MIGUEZ
Tim OAKLEY
Anthony REA
Caterina TASSONE

(Names in *italics* indicate remote participation)

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