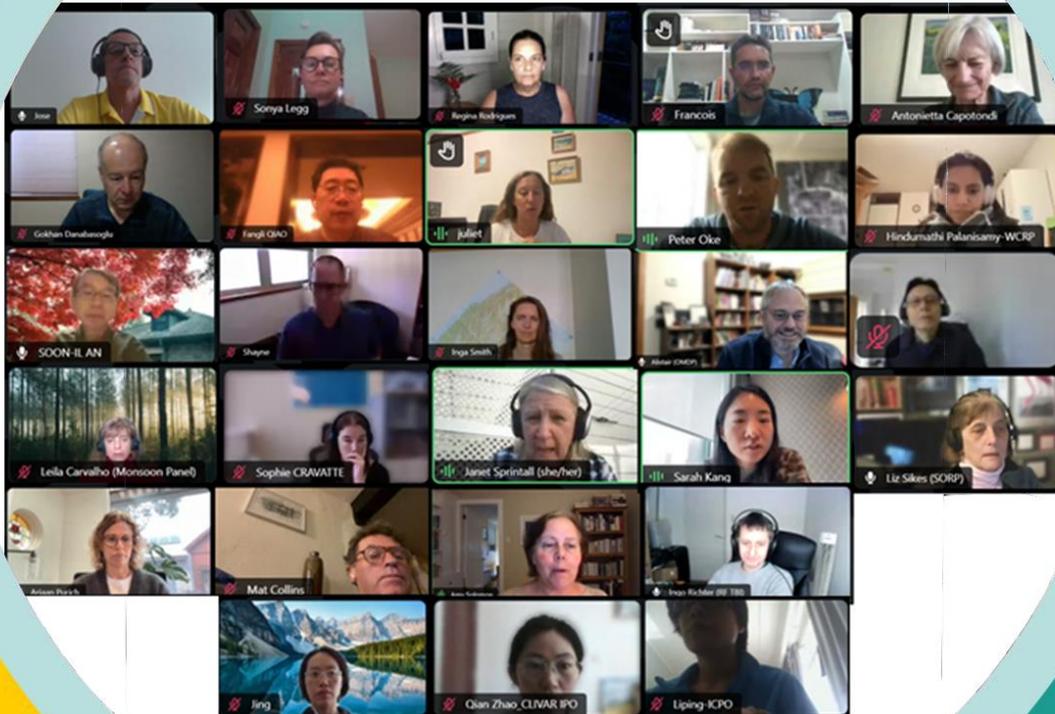


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This report was authored by Sonya Legg (Princeton University) and Francois Engelbrecht (University of the Witwatersrand) with the contribution from the CLIVAR Scientific Steering Group and the staff from the International CLIVAR Project Office.

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Overview

As decided by the CLIVAR SSG co-chairs, the first part of the 28th Session of the CLIVAR SSG was held online over two sessions. On the 5th of December 2022, the SSG met to discuss the membership proposals and funding request of our groups, and to decide on the new Research Foci that CLIVAR will sponsor (The Marine Heat Waves RF was finally selected); on 2nd February 2023, the CLIVAR SSG met again online to discuss the annual reports presented by the CLIVAR panels and Research Foci. The second part of the CLIVAR SSG session is planned to be held in a hybrid mode alongside the WCRP Open Science Conference in Kigali in October of this year.

This second online session was attended by the CLIVAR SSG members, panel/RF cochairs, a representative of the WCRP Secretariat, and staff of the ICPO.

Sonya Legg, CLIVAR SSG co-chair, welcomed the attendees and introduced the new co-chair Francois Engelbrecht, who replaced Wenju Cai; and the new SSG members Roxy Koll and Fangli Qiao. Representatives of each CLIVAR panel and Research Foci then presented the main outcomes of each group in 2022, and their plans for 2023. This was followed by comments/questions from the CLIVAR SSG members and other participants. Based on these discussions, the ICPO will prepare feedback letters to the CLIVAR groups; also, a short meeting report will be prepared and published online.

1. Welcome and Introduction to New SSG Members

- Sonya welcomed all participants, explained the goals of the session and introduced new members: Roxy Koll and Fangli Qiao as SSG members, Francois as new SSG co-chair
- A tribute to Will de Ruijter (Juliet)

2. Panel Reports

2.1 IORP (Janet Sprintall)

1. IORP membership was introduced
2. Main activities of IORP: Quarterly IORP telecon; Slack channel for ECS; 4 Task Teams: WIO workshop TT, ECS TT, IndOOS Tracking TT, Science-to-society TT; Workshops
3. WIO Workshop: Encourage the WIO countries to engage in ocean observation and marine research. 22 students + 12 lecturers in person + over 100 online
4. SDA² Framework & application to MHW SS
5. IndOOS-2 implementation tracking: During COVID: extreme losses in RAMA/OMNI mooring arrays, also XBT, Argo, GO-SHIP; BAMS article to alert the community about the permanent gap in the IO observation
6. Meetings in 2022: IIOSC 2022 and IORP-19, CLIVAR-GOOS Workshop, OOPC-25, AGU's EOS article of IO network
7. MHW summer school (24-29 July 2023, Trieste, Italy and online): Cross-panel Science Organizing Committee. Application of SDA² Framework for pre-school mentoring activities and CLIVAR Exchanges
8. Future activities: IIOSC 2023 in Perth in Feb 2023; MHW SS and MHW RF meeting in Trieste; BAMS paper on impact of COVID on IndOOS; ECR network; Expand IO Science to policy and society; Closer link with SIBER looking at 2025 and beyond – Pilot project is CoLaB.; Enhance link with OOPC, e.g. through joint members (Tammy Morris)

Discussions:

1. **General comment:**

Sonya: The WIO workshop is an excellent capacity building activity, important to focus on the problems faced by IO observing system. The pan-CLIVAR-GOOS workshop is also a big success. IORP is an exemplar for ECR activities.

2. **Linkage to WCRP Academy?**

- Sonya: Have you made any link with WCRP LHAs?
Janet: Will closely associate with WCRP LHA for research training coordination.

3. **Connection to GOOS and OOPC**

- Sonya: We are planning to have a joint discussion with OOPC, by inviting panel co-chairs to join as well.
Juliet: What is fantastic is that Tammy Morris (a new member of IORP) is also now part of OOPC, so that really will work towards cementing CLIVAR IORP and OOPC.
- Sonya: Are you preparing a CLIVAR/GOOS workshop report?
Juliet: Yes, an official report + an article to highlight what we have done and the next steps are being prepared, with ECR participant involved.

4. **IO mooring arrays**

- Soon-Il: How many countries are participating in the mooring buoys? Any Increase in more mooring buoys in the IO?

Janet: Current - ROK, Indian, Indonesia, China, Japan and other countries; no idea for new deployments. BAMS paper will highlight which moorings should be really sustained and where the countries should invest.

5. Predictivity of tropical cyclones and impacts on rainfall

- Francois: Increased tropical cyclones and impacts on rainfall, how about research on the variability of landfalling cyclones?

Janet: Some IORP panel members are actively involved in the research. BAMS article will assess the impact on our ability to predict such variability and to forecast MHW.

Juliet: Thanks Janet to add to that I think the Mozambique workshop was a key component towards Francois's question. It is only through empowering these countries and through enhanced observations in the western Indian Ocean that we can fully understand the link to the ocean. There have been a number of papers that have looked at this cyclone/ocean relationship in the western Indian Ocean.

- Francois: Thanks Janet, and Juliet for pointing to the Mozambique workshop. The vulnerabilities in Mozambique and Madagascar remain tremendous... good to know these feature prominently in IORP. Specifically, I will say, also how tropical cyclones hazards will change (increase) in response to regional ocean warming.

6. Any sponsored activities at WCRP OSC 2023?

- Sonya: Janet and Juliet, are there any plans to have any IORP sponsored poster clusters, side-meetings etc at the WCRP open science conference in Kigali?

Janet: Yes, we will have a poster cluster on Marine Heat Waves with plans to invite posters from the summer school participants and RF members too.

- Gokhan: Along the lines of Sonya's question, many reports do not mention any meetings or other activities associated with the OSC. Maybe Jose can answer this question. How are we covering the expenses for those panels with participation at the OSC? I missed the previous SSC meeting, sorry for this question. For example, I do not see a request in IORP summary for this purpose.
- Jose: We do not have a budget for that, we have some funds for participants of the SSG meeting. which can be used for SSG and panel members.
- Sonya: I think one or two panels may be having their panel meeting at the OSC, and there are funds allocated for that. There are also funds for the SSG in-person meeting.
- Juliet: We certainly need to look at our involvement in the OSC in Kigali and will discuss this next week at the meeting but I am also interested to know the response to Gokhan's question. I am not clear though, does that mean there are funds for attendance at the OSC?
- Jose: there are no panel/RF CLIVAR meetings planned in Kigali, only the MP Africa WG is planning to meet.
- Gokhan: I think this is a major issue. I am worried that participation at OSC seems like an afterthought for many panels. This will reduce the CLIVAR presence.
- Sonya: There will be CLIVAR SSG meeting there, and there are many relevant science sessions (some organized by CLIVARs members) which CLIVAR members are encouraged to submit abstract to. Deadline for abstracts for WCRP OSC is Feb 28th.
- Francois: As attending SSG members in Kigali we can of course through our scientific presence represent CLIVAR panel research and activities as well as we can. From my side, I'll interact with Juliet and Janet towards contributing to showcase the work of IORP.
- Hindumathi: Information on Sessions and Poster Cluster has been updated: <https://wcrp-osc2023.org/program/program-sessions>, <https://wcrp-osc2023.org/program/program-poster-clusters>. Many sessions of interest to CLIVAR.

- Sonya: Sarah Nicholson (OMDP co-chair) and I are convening a poster cluster on ocean mixing and climate.
- Sonya: For the OSC, note that there is some limited financial support for ECRs to attend (see the OSC webpage): <https://wcrp-osc2023.org/call-abstract>. Not just for ECRs, also for low to lower-middle income countries

Actions:

1. **To connect the MHW summer school with WCRP Academy LHA.**
2. **To prepare a report for the CLIVAR-GOOS workshop.**
3. **To enhance the interaction with OOPC, through joining the CLIVAR-OOPC discussions and focal member in the panel (i.e. Tammy Morris).**
4. **To consider the researches on the predictivity of tropical cyclones and impacts on rainfall in the IO region.**
5. **Francois to interact with Juliet and Janet towards showcase of the work of IORP at WCRP OSC 2023.**

2.2 PRP (Shayne)

1. PRP membership: good expertise, geographic and gender balance
2. TPDV WG: ECS participants; Quasi monthly telecon; Nature review article is being prepared and will be finalized during the next in-person meeting in Melbourne
3. ENSO CM WG: ECS participants; Outlines and draft content of synthesis paper is prepared.; Telecons
4. ENSO metrics: BAMS article and a few papers on applications of metrics ; New metrics and new observational reference datasets; Teaching material for the ENSO summer school in July 2022. Can contribute to WCRP LHAs
5. Involvement of observing programme
 - NPOCES: LLWBCs, 2 cruises, webinars series, and 4th NPOCE Open Science Symposium on Western Pacific Ocean Circulation and Climate.
 - Ocean Isotopes: Samantha Stevenson being contact with previous US CLIVAR working group, two review papers.
 - TPOS: final TPOS2020 Steering Committee Meeting in May 2022; new TPOS governance (SAC & ICG), several TPOS process studies are underway.
6. Scientific Capacity building and career support
 - ENSO Summer School (18-29 July 2022, Trieste, Italy and online)
 - ICTP-CLIVAR Summer school on MHW in July 2023
 - NPOCE invite ECRs as speakers
 - TPDV and ENSO CM WGs have ECR members
 - MPOWIR: Mentoring Physical Oceanography Women to Increase Retention, Antonietta & Samantha Stevenson involved.
7. Future activities:
 - 2023 Workshop on tropical Pacific and its interbasin interactions (14-17 February)
 - Finish two review papers on ENSO conceptual model and TPDV respectively.
 - Interaction with PICES, e.g. WG40 and WG49.
 - Support and provide inputs to sustain observation programs along the basin boundaries, e.g. TPOS, NPOCE and CLIVAR-GOOS workshop.

Discussion:

1. General comment

- Cai: PRP did a great job. Janet is a co-chair to NPOCE. Thanks to Shayne for coordinating the workshop in Melbourne next week. Antonietta is active in many areas, and making effort in formulating the MHW RF.
- 2. Connection with WCRP LHAs**
- Sonya: For the ENSO summer school, are there any connections with WCRP Academy? E.g share the materials with them?
Antonietta: We communicated to WCRP Academy before the Summer School. Good idea to communicate after the school. All presentations were recorded and can be shared.
 - Sonya: Glad to see the TPDV WG has connection to EPESC LHA.
Antonietta presented TPDV at one of the EPESC workshop.
- 3. Enhance the connection with PICES.**
- Fangli: Any planned activity for enhancing connection with PICES? PICES annual meeting 2023 will be organized in the US.
Antonietta: PICES welcomes climate expertise from CLIVAR. Main connection is via PICES WG49, I am serving as co-chair and ex-officio representing CLIVAR. WG49 also has synergy with the new MHW RF of CLIVAR.
- 4. Gokhan: Not specific to PRP, but to majority of CLIVAR panels. Any presence at 2023 WCRP OSC? Any plans to jointly organize capacity building activities at OSC?**

Actions:

- 1. To connect WCRP Academy and share the material of ENSO summer school with them.**

2.3 CDP (Sarah Kang)

1. Current activities: weather-climate interaction across different spatio-temporal scales; ocean basin to ocean basin and tropical-extratropical teleconnections; development of predictive theories of climate dynamics, involving non-linear interactions between the dynamics and physics of the atmosphere and ocean.
2. Panel members: Chile and South Africa for geographic balance, need to improve gender balance.
3. Virtual meeting over 4 days in June 2023. Pre-recorded presentations.
4. Panel achievements: 1st CLIVAR CDP annual workshop successfully organized in Sep/Oct 2022.; Co-organize 3 other workshops; 4 conference sessions.
5. Scientific capacity building: ECS members recruited in CDP; Summer school on theory, mechanisms and AMOC-weather-climate link on different time scales.
6. Other major panel activities: Participate in the CLIVAR joint workshop in Melbourne; Sarah in CFMIP Science Steering Committee; Robert Wills: leads Forces SMIP; Plan to submit paper based on 2022 and 2023 CDP workshops; Potential establish a WG on tropical Pacific SST Trends

Discussions:

1. CDP's interaction with ARP on AMOC related activities.

- Sonya: Any ARP members are involved in organizing the AMOC workshop? Nice to see more interaction with other panels.
- Gokhan: Lack of internal communication. CLIVAR AMOC TT has set up another workshop on AMOC observation in Hamburg in July 2023.
- Sonya: OK, it's good to see that ARP is indeed involved in the workshop/SS with TBI.

2. CDP's focuses. Cooperated activities.

- CDP has organized several meetings/workshops. However, are there any cooperated activities among all panel members?

Sarah: Yes, this might be an issue, as we have diverse expertise in the panel. And it is the reason why we are planning for a WG. We are trying to have different themes for CDP annual workshops, which will cover different expertise within the panel.

3. Sonya: The 6-week virtual annual workshop seems like a good way to have a panel flagship activity.

4. Will the CDP summer school be hybrid?

- Sonya: Will the workshops and summer school at ICTP be hybrid? Encourage to have online participants, even after the pandemics, as people from global south may have difficulty in securing funds, applying visa, and etc. to attend in person meetings.

Sarah: We want to have all lecturers in person.

Jose: Virtual access will be available, practical sessions will be only for in-person participants.

Ingo: we are planning for hybrid for the summer school and we contacted AMOC TT but it seems that we have different interests.

Leila: online decreases carbon footprint too.

5. Focus of CDP's work

- Fangli: CDP is a critical topic. What are the main focuses of CDP?

Sarah: 3 main themes as shown in the first slides. But may be changed along implementation.

6. Pacific SST trend

- Shayne: The SST trend working group sounds like a great idea.
- Francois: Discussions between CDP, PRP and CFMIP scheduled for next week on Pacific SST trends.

Action item: Continue to communicate regarding AMOC workshop/summer school with AMOC TT, and ARP. Communicate with WCRP Academy LHA about summer school.

2.4 ARP (Regina):

1. Membership:
2. 3 WGs: 1) AMOC Task Team, 2) Ocean climate risk and coastal resilience and 3) Tropical Atlantic and trans-basin interactions
3. AMOC TT: Also include members outside CLIVAR; 2 meetings and 2 review articles (led by Laura & Maria Paz respectively)
4. Ocean Risk WG: New WCRP strategic plan – science for society; MHW RF on MHW jointly prepared by IORP, PRP and ARP is approved; Ocean Risk Hub for WCRP My Climate Risk LHAs: Jenifer Veitch (SAEON), Roxy Koll (IITM), Susan Bates (TNC)
5. Tropical Atlantic WG: Cross activities with TBI RF (Ingo, Greg, Regina), joint workshop with CDP on AMOC; CLIVAR Exchanges on TAOS
6. Other activities: CLIVAR/GOOS/ICTP workshop (15-17 Aug 2022); CLIVAR-FIO Summer School (15-20 Aug 2022); EBUS OSC in Peru (19-23 Sep 2022); Joint PIRATA-TRIATLAS GA and Conference (3-7 Oct 2022); Royal Society Meeting on Atlantic Overturning (Dec 2022); EUREC⁴A-OA and TOMIC: Datasets in Copernicus Special Issue in 2021; sessions at AGU 2021 and EGU 2022 meetings; Special Collection on Ocean Science in the South Atlantic on Nature Communications earth & environment: Regina is a guest editor, 6 articles with contribution of ARP members.

7. Future activities: In person ARP meeting on 17 July 2023 at Hamburg. Workshop on meeting AMOC Observation needs in a changing climate on 18-20 July, Hamburg, Germany; CLIVAR/ICTP Summer school on MHW in July 2023; Workshop and Summer school on Atlantic Tropical Basin Interaction in July 2023; WCRP OSC 2023: Cross-panel poster sessions on MHW. Abstract submission deadline: Feb.28; Atlantic Blog: AMOC (Eleanor, Feb), Atlantic Nino (Ingo, Mar.), Atlantic MHWs (Regina, Apr.). Call for other contributions; Monthly AMOC webinars & webinars on LHA My Climate Risk Ocean Risk Hubs
8. Reflections on recommendations from SSG in 2022

Discussion:

1. Connection to WCRP Academy?

- Sonya: Any connection with WCRP Academy about the Ocean Macroturbulence Summer School?
Regina: No. Will do that.

2. ARP Membership:

- Sonya: You are allowed to recommend men in membership. Slight gender imbalance with more women than men.

3. Regional ocean risk hubs.

- Francois: Glad to see the linkage with WCRP LHAs, especially with MCR LHA. What is the value added of regional ocean hubs and their linkage with CLIVAR?

Regina: MCR Ocean Risk Hubs are operated in a bottom-up approach, working with the local communities. It is to deliver the climate information to society. We are already in the process of implementing a hub at South African Environmental Observation Network (SAEON), led by Jennifer Veicht. And we already have one in South Africa, University of Cape Town led by Chris Jack. Here is the link for the hubs: <https://www.wcrp-climate.org/mcr-hubs>.

- Francois: That is very good to know. Last two questions: what is the nature of a hub? It sounds as if hubs will have a physical location and perhaps staff associated with it. To what extent will these hubs be collaborative across institutes?

Regina: We have Q&As in this link and answer your questions: <https://www.wcrp-climate.org/mcr-hubs>

4. Special issue on Nature Communications earth & environment

- Janet: Thanks Regina for mentioning the work that is being done by many women of all career stages in the South Atlantic. See recent article: <https://www.nature.com/articles/s43247-022-00646-9>

5. Fangli: The Panel is well organized. It has very broad areas but with 3 focuses. Suggest other panels to be concise as well.

6. Connection with TBI RF.

- Cai: What are the connections with TBI RF?

Regina: Currently through three overlapping members (Ingo, Greg and Regina).

Action:

1. To recruit more male members in the panel.
2. To connect the CLIVAR/FIO summer school with WCRP Academy LHA.

2.5 SORP (Elisabeth)

1. SORP is a joint panel of CLIVAR, CliC and SCAR. Terms of Reference.
2. Membership: Diversity of expertise, and ties to other panels/Groups by members (SOOS, FRISP, UN Decade, SCAR)

3. Monthly meeting in different times to accommodate different time zones.
4. Key topics maintained: Constrain the role of the Southern Ocean in the planet's heat and freshwater balance Issues; Constrain the Southern Ocean's role in global carbon cycling
5. Meetings and workshops: Townhall and session at OSM2022; Session at EGU; UN Ocean Science Conference; NORP-SORP joint workshop (SPICEUP): over 200 attendants. Putting together white paper for BAMS. Postponed activities due to COVID: GCOS/GOOS/WCRP OOPC Ocean Heat and freshwater
6. Task Team 1: Freshwater experiments: SOFIA Initiative. Application for TT submitted to SG.
7. Task Team 2: Highlighting small and developing Antarctic programmes: Open call for CLIVAR Exchange special
8. Highlights in 2022: Bi-polar connections: joint summer school with NORP; Forming new task teams; Connection to WCRP LHAs
9. Future plans:
Near-term: SOPR-15 alongside EGU, Advance SOFIA; Joint SS with NORP; CLIVAR Exchange special issue; Session at SOOS workshop.
Long-term: Connection with other panels: NORP, SOOS, OMDP, CDP; WCRP LHA, OOPC, ASPeCt.

Discussions:

1. SORP summer school.

- Sonya: Summer School is planned for 2024?
Elisabeth: Yes, we submitted a proposal in 2022 to CLIVAR but not accepted.
Sonya: You are encouraged to find other funding sources other than ICTP and FIO to organize summer schools.

2. SOFIA project

- Sonya: Suggest to create a webpage for SOFIA.
Elisabeth: Need to check with Ruth.
- Ariaan: A preliminary website but without much detailed info.
- Inga: Great to see so much productive activity, enthusiasm, and plans for the future. I am a member of SOFIA and I can confirm that it is as dynamic and fruitful as described in the talk and report.

3. Joint meeting with NORP during IUGG 2023?

- Inga: NORP is also planning their business meeting alongside IUGG. Any possibility to hold a joint meeting there with NORP?
- Liz: I'm guessing that the choice of IUGG for the SORP business meeting is a large part of the motivation. Make that: meaning NORP & SORP meetings being in the same place is a motivator.
- Inga: Thanks Liz, yes I noticed the SORP report said SOOS conference was the plan, but IUGG makes more sense from that co-meeting opportunity. It would be interesting to see comparison of relative GHG emissions, too.

Action items: Website for SOFIA, propose summer school for 2024.

2.6 MP (Leila)

1. Brief introduction of MP: 3 regional working groups
2. Current focus: Virtual MP and Regional WG meetings (4 WG-AFM, 3 WG-AAM, 0 WG-AMM but with email exchanges); R2O for Monsoon seasons in SE Asia (R2O) subgroup; High impact weather events (HIW) subgroup; New activity on 2022 Asian monsoon as

- experienced in different regions; WG-AFM; Review paper; IWM-7 workshop; AOGS 2022 Annual meeting; Knowledge exchanges
- Plans for future: Active participation in the WCRP OSC 2023: Organizing Committee members, session convenors, theme leads, several poster clusters, in-person meeting of MP & WG-AFM

Discussions:

- How to synthesize and coordinate activities cross MP regional WGs?
 - Leila: MP Regional WGs are dealing with regional issues for regional monsoons. It is convenient to organize telecons for people working in the same region.
 - Sonya: Are there any connections to the CLIVAR region panels, e.g. Indian Oc, Pacific?
 - Leila: Even go beyond. Also working on south Atlantic.
 - Sonya: Suggest Regional WGs to invite CLIVAR region panel representatives in their meetings.
 - Leila: Time zone issues.
 - Sonya: You can always find people in the convenient time zones from CLIVAR region panels.
 - Janet: That's a great idea to coordinate with the MP. We will reach out Leila to see how we can make that happen in the IORP.

2.7 GSOP (Peter)

- Membership: new members give additional expertise on coupled and regional observation
- Meetings: No in-person meetings, [check details on virtual meetings]
- Achievements: Best practice use of observations; Deep Argo Mission; Argo trajectories: under ices, product (velocity)
- Ongoing/Planned activities: How does data assimilation of observations impact dynamical balance of models? What metrics are most suitable for assessing data assimilating systems?

Discussions:

1. Argo data archive

- Francois: Which institute to archive Argo data? Current interaction with OMDP?
Peter: The management of Argo data is strict. US is the leading country in Argo, which maintains more than half of Argo floats.

2. Link with OceanPredict

- Peter: Links with OceanPredict, e.g. through new members. Attended related workshop, not strong links.

3. To organized a workshop to get the whole community involved.

- Sonya: Glad to see the progress and two projects. You do not have to do all the work for the panel. Suggest to organize a workshop/conference to get the whole community involved and enlarge the impacts. Learn from SOFIA meeting.
- Sonya: Maybe get everyone excited by having a workshop? Encourage to have hybrid panel meeting instead of waiting everybody to appear in the same place.
- Francois: Yes! With invited representation from OMDP.
- Gokhan: Is the problem lack of appropriate membership?
- Peter: Not a broad interaction among panel members. I will discuss with Natalie to organize virtual meetings.

4. Link with WCRP ESMO project??
 - Cai: It is quite good to focus on something. How long the Argo data can be expected?
 - Peter: Technical aspect. last for 20 years.

Action item: Reach out to ESMO chairs, to make connections.

Action item: Make a plan for a hybrid or virtual science activity (e.g. a workshop) involving the wider community (not just panel members) to focus and energize the panel.

2.8 OMDP (Alistair)

1. Google Scholar page
2. Membership: 4 new members. Restructure of membership age. A co-chair will step down.
3. OMIP for CMIP ocean diagnostics specification projects
4. JRA55-do will discontinued in 2023, a new project under development for replacement
5. Slack and virtual meeting are routine.
6. Large SWOT-AdAC/OMDP meeting.

Discussion:

1. Involvement in CMIP7

- Francois: Are you starting to plan for CMIP7? What is the OMDP's role in CMIP7?
- Alistair: Several OMDP members representing in CMIP7 WGs. Primarily through OMIP, and it will continue. Consider to work on new dataset with high resolution. Timeline for CMIP7 has not been settled. Coupled model centers will work on other arenas.

2. Membership and new co-chair in need for OMDP

- Gokhan: Could you please clarify the co-chair issue?
Alistair: We don't want to have another co-chair from US. Asking for volunteers.
- Regina: Just a few members from global south, may be because of lack of operating centers in those countries. However, countries who do not have infrastructure and capacity, may also provide their views.
Alistair: We currently focus on the biases on global models. Better scope to include people from global south to look at regional biases.

3. Machine Learning

- Antonietta: Any activities on Machine Learning?
Alistair: represented by people but not focus. We are planning to organize activities along this line.

4. OMDP's communication with NORP and SORP

- Sonya: @Alistair, you listed polar water mass analysis as a current activity: is there any communication with Northern or Southern Ocean Regional panel members on that?
Alistair: @Sonya I believe the Arctic papers listed included NORP panel members. I heard earlier the idea of inviting a GSOP panel member to our meeting and I think the same should be applied to NORP and SORP. This makes sense to me if we start having topic based meetings within OMDP, which I will suggest to the panel.
- Sonya: Yes, inviting member from NORP/SORP and any other panel focused on an area of OMDP current interest is a good idea.
Liz: the format of SPICE-UP was a great success! The dialog aspect worked really well.
- Sonya: In addition to the BAMS paper, it would be nice to have a short write-up about the format for CLIVAR, to act as a template for other virtual meetings.

Inga: @NORP @SORP @OMDP There was a very successful joint OMDP-SORP short discussion session/workshop at the CLIVAR-OSC in 2016 (pre-NORP existing), which eventually contributed/led to SOFIA. Perhaps something could be planned at the SORP and NORP meetings alongside IUGG?

Alistair: +1 @Inga Let's follow up - do you have link for the NORP/SORP meetings?

Amy: Hi Inga, great idea. Let's organize a joint meeting alongside IUGG.

Action items

1. **Continue to diversify membership, including representatives for wider variety of regions**
2. **Invite GSOP, NORP, SORP etc representatives to relevant panel discussions.**

2.9 NORP (Amy)

1. Overview on objectives, task teams and communications.
2. Membership: a challenge to have people rotating off at the same time. 2 Ex-officio will be full panel members with year. 2 new members appointed. Need to appoint a new co-chair. (Ben to replace Ruth, also standing for OOPC)
3. NORP/SORP SPICE-UP workshop (13 – 15 June 2022): Three topics, each include key note speakers from NORP and SORP, all keynotes recorded. Can use for classes in the future. Breakout sessions focused on identifying model improvements and additional observations that will advance the understanding of fresh water, sources, pathways and impacts. A BAMS paper is in preparation.
4. Co-sponsor for the Aspen Global Change Institute workshop on "Arctic Climate and Weather Extremes: Detection, Attribution, and Future Projection" 15-20 May 2022
5. Arctic Processes in CMIP6 Bootcamp: Several projects were initiated. Not coordinating with WCRP academy yet.
6. WWRP polar prediction project: a 10-year projects of WWRP: Member on SSG; Leading Sea Ice Task Team; Membership on Processes Task Team; Leading Forecast Model Evaluation
7. Collaboration with international community: EGU 2022 session; EU H2022 Arctic activities: CRiceS and PolarRES; Actively participation in WCRP/CliC Polar CORDEX activities; Monthly telecons with reports of international Arctic collaboration and campaigns updated on scientific studies, planning for future activities.
8. Future activities: In person NORP-3: July Berlin, Germany; 2023 AGU sessions; NORP/SORP Summer school on polar freshwater: a follow on to SPICE-UP workshop; Review papers: 1) Arctic Ocean heat flux; 2) Seasonality of the Arctic freshwater; Coordinate with GSOP for assimilation and reanalysis; National representative: plan to activate it to secure support for Arctic Ocean-sea ice state estimates.

Discussions:

CMIP6 Bootcamp

- Sonya: Could you tell us about some details of the CMIP Bootcamp?
Amy: 24 graduate students and postdoc attended. Many good projects and will be continued. Ruth is leading this. Some instructors are virtual. All students were in person.
- Antonietta: We also want to have group projects in the upcoming MHW Summer School. How were they organized in the Bootcamp?
Amy: Experts suggested projects, students chose projects based on the background. Students are working in groups.
- Jing: what are the plans to continue the projects? Any funding support to the projects?

We will discuss that in Germany. We had funding from IASC/CLIC/CLIVAR for the bootcamp but we need to secure follow-on funding to complete the projects.

Jing: We also had good project proposals came out from the CLIVAR/FIO summer school on Ocean Macroturbulence last year. But need to work out how to encourage students to continue them.

Action item: (from earlier OMDP discussion): plan joint NORP/SORP meeting at IUGG, invite OMDP representatives.

3. Research Foci Reports

3.1 TBI RF (Ingo)

1. Goals, membership
2. Overview of activities: PRP-TBI RF workshop in Melbourne: 30 in person participants, 1st in-person meetings. Cross-panel interaction. Breakout sessions for individual WGs on Feb. 16. ICTP-CLIVAR Summer School on TBI and AMV (7-day summer school + 3-day workshop). Multi-decadal modulation on TBI in Madrid (May 2023, Belen). Several meetings for CoEx. Regular online meetings for RF and WGs
3. WG1: Coordinated GCM Experiments (CoEX): 1st tests by NCAR, BSC, and BCCR; Dangers of overly strong restoring have been highlighted; Run slightly behind the schedule on finalization of experiment design.
4. WG2: Theory and ICMs: Ongoing activities: LIMs, Causal discover tools (ML), proposal to JST on CDT and teleconnections. Plans: develop intermediate complexity model of TBI (TBI Cane Zebiak Model) ; Dependence of TBI on background state.
5. WG3: Observations: Identify existing multidecadal datasets, key regions and modes in each basin; identify key regions and modes in each basin that affect other basins; create a summary of the key points/recommendations from individual tropical basin reviews
6. WG4: Paleo proxies: Collaborated with NCAR scientists (Dave Schneider and Clara Deser) to develop a paleoclimate section in the Climate Data Guide at NCAR; Increase awareness of available paleoclimate datasets for TBI research; Prepared a list of major paleoclimate datasets and associated experts; Organizing paleoclimate lectures/sessions at the upcoming TBI summer school/workshop and other meetings
7. Future activities: Paper on TBI CoEx design; Move CoEx beyond test phase; AGU session on TBI; TBI RF timelines

Discussions:

Francois: Current Seasonal to decadal predictions focus on TBI in the past cold/warm events so far. It would be good to also look at the changing of TBI under the climate change.

1. The work package on paleo proxies is interesting. To what extent is that also been pursued through the links of TBI in a warmer world? Is that a focus in TBI in the past colder and warmer worlds?

-Of course, that's a very interesting topic. We didn't put it in our proposal, concerning it may broad the topic too much. We should collaborate with the other people more on this. But at the moment we haven't been looking at the influence of the greenhouse gas forcing, global changing. We are more interest in the international variability that might be modulated by natural cycles up to multi-decadal variability.

2. The topics of the AMOC workshop with respect to the CLIVAR AMOC task team was decided quite long ago, which was determined based on the input that has been approved by both US

CLIVAR and the international AMOC community, such as RAPID, OSNAP, etc, and that is what the communities want to discuss. What is the basis of the topic you chose for your workshop in Trieste? Is there a need to have two AMOC workshops in one year? Maybe it can be postponed to next year?

- The AMV topic was arose from both TBI and CDP. We also realize the need for a summer school so that we want to merge the two events and submitted the proposal for a CLIVAR summer school. The proposal was rejected by CLIVAR so that we submitted the proposal to ICTP directly and got the funding.

We have reached out to AMOC task team but Eleanor was not enthusiastic about merging the two AMOC workshops. [topics are quite different]

3. We should have more coordination on how meetings with similar topics are handled.

Clarification of funds

Jose: CLIVAR has approved 5000 CHF support for this summer school. The USCLIVAR support is pending. In addition, CDP will get 5000 for their panel meeting which will be held alongside the summer school.

Action item: Continue communicating with AMOC TT and ARP about the workshop/summer school.

3.2 MHW RF (Antonietta)

1. Motivation for this RF by reviewing the status of MHW research, and scientific challenges

- What are MHWs?
- Where did MHWs occur?
- Problems with definition
- Mechanisms (important for predictability)
- Subsurface characteristics
- Compound events
- Biogeochemical extremes
- MHWs in a changing climate

2. Objectives and membership of this RF Mechanism

3. Deliverables

- Summer School
- A set of tools
- Special sessions at international conferences
- A workshop with GOOS/Ocean Observing Co-design programme and PICES
- A special collection of papers
- Review or group papers
- Inputs to observational groups

Discussions:

The webpage of the MHW RF is already online: <https://clivar.org/research-foci/marine-heatwaves>.

1. About the plan to fit the effort into several observation programmes. Since GSOP is conscious of seeking broader impacts of their Argo projects, maybe this can be a project legacy and be a new dimension in CLIVAR GSOP?

- For the MHW plan, we meant to identify which level of the observation would be more useful for marine heat waves, but a lot of observation programmes, including ARGO are limited to the durations, resolution. So the reanalysis is great tool for looking at the marine heat waves. We should establish a dialogue with GSOP.

Action: Establish a dialogue with GSOP.

Other issues:

- In-person CLIVAR SSG meeting alongside WCRP OSC 2023. Venue is being explored. Can be outside the conference venue.
- ICPO will prepare the report for this meeting, and SSG will review it.
- Letters to each panel will be prepared by ICPO.
- This is Jose's last SSG meeting after 7 years' service. Thanks to Jose and ICPO.
- New hosting agreement with OUC is being finalized.

APPENDIX A. Participants

CLIVAR SSG MEMBERS		
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APPENDIX B. Agenda

28th Session of the CLIVAR Scientific Steering Group (part 2). Online

Agenda

Addition of 30-minute break will result in a **total duration of 4.5 hours**

Thursday, February 2		Session	Presenter - Discussion lead	Time	
Chair: Sonya Legg					
	1	Welcome and Introduction to New SSG Members	Sonya Legg	10	
Start Time Thursday, February 2 nd 17:00 EST (22:00 UTC)	2	Panel Reports			
		2.1	CLIVAR/IOC-GOOS Indian Ocean Region Panel	Janet Sprintal	20
		2.2	Pacific Region Panel	Shayne McGregor	20
		2.3	Climate Dynamics Panel	Sarah Kang	20
		2.4	Atlantic Region Panel	Regina Rodrigues	20
		2.5	CLIVAR/CliC/SCAR Southern Ocean R. Panel	Elisabeth Sikes	20
		2.6	Monsoons Panel	Leila Carvalho	20
		2.7	Global Synthesis & Observations Panel	Peter Oke	20
		2.8	Ocean Model Development Panel	Alistair Adcroft	20
		2.9	CLIVAR/CliC Northern Oceans Region Panel	Amy Solomon	20
	3	Research Foci Reports			
	3.1	Tropical basin interaction	Ingo Richter	20	
	3.2	Marine Heat Waves	Antonietta Capotondi	20	
		Any Other Business/Next SSG	Sonya Legg	10	

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