

Report of the 27th Session of the CLIVAR Scientific Steering Group

Online, 1, 4 & 5 April 2022



June 2022

WCRP Publication No.: 1/2022
CLIVAR Report No.: 202201

Bibliographic information

This report should be cited as:

Cai W., and S. Legg: 27th Session of the CLIVAR Scientific Steering Group. WCRP Publication 1/2022; World Climate Research Programme (WCRP): Geneva, Switzerland; 62 pp

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Executive Summary

The [27th Session of the CLIVAR Scientific Steering Group \(SSG\)](#) took place on April 1, 4 and 5. Given the situation of the COVID pandemic, and to reduce our carbon footprint, the SSG-27 was held in a completely online format. This year, it focused more on internal WCRP and CLIVAR business, bringing together over 40 scientists from all over the world, including the CLIVAR SSG members, co-chairs of CLIVAR panels, Research Foci (RF) and WCRP Sea Level Grand Challenge (GC), as well as the invited representatives from the UN Ocean Decade, US CLIVAR, WCRP Secretariat, and from the five WCRP Lighthouse Activities (LHA) and the two new WCRP Core Projects.

To accommodate the online mode and different time zones, the session was split into 3 days, with participants gathering for approximately 4 hours each day. On the first day, representatives from the WCRP LHAs, new Core Projects and from the UN Ocean Decade and US CLIVAR outlined their activities and brought up ideas for possible future collaboration with CLIVAR. Participants were also updated with the status of the multi-panel workshop on ocean observation, which is to be organized in Italy this year, and constructive comments were received for including blue carbon as a topic and involving representatives from WCRP LHAs and new core projects

Activities and plans of CLIVAR panels were reported by panel co-chairs on Day 2, and those of RFs and the SL GC on Day 3. During the plenary discussion on Day 2, the SSG put emphasis on the capacity building for Early Career Scientists, and discussed the experience and lessons learned of new meeting formats (hybrid, online), the knowledge exchange between panels, as well as the WCRP Open Science Conference (OSC). Jose Santos, Executive Director of ICPO, also reported the secretarial updates on Day 3. The CLIVAR leadership then had great discussions on future RFs, CLIVAR summer schools, cross-panel activities, and the 3rd CLIVAR Open Science Conference.

As part of the preparation of the WCRP OSC, the SSG put a lot of emphasis on the capacity building, carbon footprint reduction, as well as the experience of organizing hybrid or online meetings during SSG-27. The SSG encouraged the CLIVAR groups to continue making efforts on capacity building, especially for the Early Career Scientist and scientists from the Global South, and to promote gender and geographic balance of the membership.

Comments and suggestions to panel/RF/GC business were given during the reports and have been sorted out and distributed to each panel/RF/GC by the ICPO, covering suggestions on future work, interaction with other groups or projects, financial guidelines, etc.

Table of Actions

All Groups	<ol style="list-style-type: none"> 1. To continue to build connections with other panels/LHAs/partner projects where strong links exist, or where stronger connections would be beneficial. Panels are encouraged to develop specific actions (e.g., joint activities, workshops) to build on these connections. 2. To devise specific plans for capacity building, by involving early career scientists (ECS) and researchers from the Global South. 3. To help identify ocean hubs for My Climate Risk Lighthouse Activity. 4. To communicate panels/RF/GC capacity building activities to the WCRP
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	<p>Academy.</p> <ol style="list-style-type: none"> 5. To develop ideas/proposals for cross-panel interactions and communicate them to the ICPO. 6. To look at all the proposed activities and identify appropriate ones to seek the endorsement of the UN Ocean Decade. 7. Region Panels to connect to regional coastal observation and marine prediction activities in their basins. 8. Encouraged to share information with other panels on their successful activities for capability building. <i>CLIVAR Exchanges</i> can be used as a venue to communicate best practices. 9. To be noted that care is needed not to always identify the same people serving in different groups, as not to overburden them by community work, or to negatively affect their career advancement. 10. Encouraged to consider similar tutorial activities like the Arctic Processes in CMIP6 bootcamp being planned by NORP, which will link models and observations together and focus on training of ECS and capacity building. 11. Communication and interaction between CLIVAR and GOOS, in particular with GOOS Regional Alliance, should be strengthened, probably through IORP, GSOP, OOPC and the upcoming CLIVAR/GOOS workshop. 12. To propose science topics for the WCRP Open Science Conference and side events alongside the conference. 13. To consider focusing more on diagnostic comparisons of existing simulations when organizing or planning new MIPs.
CDP	<ol style="list-style-type: none"> 1. To consider how panel activities can link to the WCRP LHAs, e.g., to avoid overlap with EPESC LHA. 2. To consider how to involve ECS and researchers from the Global South in CDP activities and consider capacity building in the future. For the CDP workshop, please build in a mechanism whereby ECSs are able to connect with senior scientists, for example, a discussion forum or a tutorial session or “meeting mentors” session. 3. To obtain some African participation in the panel (and better Southern Hemisphere participation). Francois (francois.engelbrecht@wits.ac.za) is happy to recommend some names when the next opportunity to extend membership arises. 4. To make a survey after the ‘six-week’ workshop and report to SSG the experience/lessons gained.
GSOP	<ol style="list-style-type: none"> 1. To contact Andy Moore (ammoore@ucsc.edu) to establish a link with the coupled data assimilation experiments conducted by WGNE and DAO. 2. To refer to the reports from other panels (e.g., CDP) on ideas of how to

	<p>organize successful online/hybrid panel meetings.</p> <ol style="list-style-type: none"> 3. To bring in new African members. Juliet Hermes (juliet@saeon.ac.za) and others might be able to help recommend candidates from Africa. 4. To build stronger links with other activities, e.g., GOOS OCG and ETOOFS, CLIVAR region panels, and new ESMO core project. There would be benefit to both sides if GSOP is involved in ESMO discussion, similar to what OMDP does. 5. To consider digital twins as a focus, and to link with the Digital Earth LHA, which also has a data assimilation component.
MP	<ol style="list-style-type: none"> 1. To report to CLIVAR SSG if the panel has any links with the WCRP LHAs. 2. To establish stronger links with the CLIVAR region panels, especially IORP. 3. To coordinate and synthesize activities across regional WGs on comparing and contrasting dynamical processes that operate in different regions.
OMDP	<ol style="list-style-type: none"> 1. To report to the SSG the experience and lessons gained after the Fila Change workshop. 2. To increase interaction with other panels by inviting representatives of relevant panels to join particular OMDP discussion/activities. For example, invite GSOP to the SWOT discussion, invite ARP people when working on analysis of the model bias of the Atlantic. 3. To interact with GSOP to see if they would be interested in joining with the discussion among OMDP, DAO and WGNE.
ARP	<ol style="list-style-type: none"> 1. To discuss the foci of science activities the panel plans to engage in for the next few years and formulate task teams for each focus area. This should be a priority for a near-future teleconference. 2. To learn from IORP and include activities for ECSs and capacity building in future plans.
IORP	<ol style="list-style-type: none"> 1. Juliet Hermes to contact Eleanor Frajka-Williams (ARP co-chair) to send her the information about CoLAB. 2. To conduct a survey and share the experience/lessons from the planning/organizing of the hybrid WIO workshop after it is held.
NORP	<ol style="list-style-type: none"> 1. To get in touch with the Safe Landing Climate Lighthouse Activity and the sea ice tipping point. 2. To inform NORP members about a workshop on Observing, Modeling, and Understanding the Circulation of the Arctic Ocean and Sub-Arctic Seas, which is another potential interface between US CLIVAR and NORP. 3. Suggested to keep 2-3 members in the panel with a one-year extension, regarding the continuity of panel membership.

PRP	<ol style="list-style-type: none"> 1. Suggested to application of ENSO metrics to initialized predictions, and to evaluate how ENSO properties may change as prediction lead time increases. 2. To integrate ECS and enhance capacity building activities in a global sense (e.g., people from Global South) through its WGs and other activities, beginning at the planning phase. Activities specifically focused on capacity building (e.g., training schools, boot camps) are also encouraged. 3. PRP and TBI RF to coordinate the work on TPDV and ENSO Conceptual Model and avoid a duplication of effort. 4. In the TBI RF, a working group led by Dietmar Dommenges (dietmar.Dommenges@monash.edu) is being formed on conceptual models. There should be some interesting overlaps/synergies with the ENSO Conceptual Working Group.
SORP	<ol style="list-style-type: none"> 1. To get in touch with the Safe Landing Climate Lighthouse Activity and the sea ice tipping point. 2. To make contact with the SO carbon group in PMIP, regarding the role for paleo climate information and modeling. 3. Suggested to consider the scenario/perturbation experiments to circumvent the lack of realistic interaction with ice-sheets in climate models. 4. To conduct a survey and share the experience/lessons from the planning/organizing of the joint SORP-NORP workshop (e.g., as a report or CLIVAR Exchanges contribution). 5. Encouraged to submit a request for the formation of a task team for the proposed Southern Ocean Freshwater release experiment Initiative (SOFIA), including an assessment of the ability and interest of modeling centers to perform the model experiments.
EBUS RF	<ol style="list-style-type: none"> 1. Suggested to look into the paleocean/paleoclimate component in the context of EBUS, and coastal Nino/Nina in the EBUS areas (e.g., Chilean Nino, Ningloo Nino). 2. To consider how to pass the legacy of the EBUS RF when the group sunsets. 3. To contact Dr. Regina Rodrigues (regina.rodrigues@ufsc.br), for setting up a hub for ocean climate risk under My Climate Risk (MCR) LHA; and/or Dr. Shoshiro Minobe (minobe@sci.hokudai.ac.jp) for connection to the Explaining and Predicting Earth System Change (EPESC) LHA.
SL GC	<ol style="list-style-type: none"> 1. Suggested to consider the influence of internal inter-annual/decadal variability as the presence of these natural variations can change the estimates of "high-end" values. 2. To reach out to the Regional Information for Society (RIS) core project, as well as the WCRP lighthouse activities of Safe Landing Climates and My Climate Risk for passing the legacy of the grand challenge. It might be of

	<p>value to invite them to attend the Sea Level Conference as a first step.</p> <p>3. Suggested to make the upcoming conference in Singapore carbon neutral in all respects possible, including buying carbon offsets for flights.</p>
TBI RF	<p>1. To add capacity building for ECSs and include ECSs and experts from the Global South in the upcoming workshop and future activities.</p> <p>2. Suggested to examine the impacts of Atlantic Nino on the Pacific La Nina, and the potential role of the equatorial Atlantic in ENSO seasonal prediction.</p> <p>3. To discuss with PRP TPDV WG and the PRP ENSO Conceptual Models Working Group to coordinate activities.</p>
CLIVAR-GOOS Workshop	<p>1. Weidong to bring back the suggested topics on Blue Carbon and low-carbon observation/decarbonating observation system to the organising committee of the workshop.</p> <p>2. To invite representatives from ESMO, MCR and RfS to attend the workshop.</p>
ICPO	<p>1. To start revising and reviewing the RF guidelines and make a timetable. The whole process of open call to be completed by the end of 2022.</p> <p>2. To contact the people who have submitted a RF proposal during the last open call and ask them to resubmit if they are still interested.</p> <p>3. To draft the Call for Summer School proposals by including the history of the arrangement for the two summer school series.</p> <p>4. To prepare a one-page concept note for the CLIVAR Open Science Conference and share it with the SSG.</p>

1. OPENING SESSION

1.1 Welcome and meeting objectives (Sonya Legg)

Sonya Legg, co-chair of the CLIVAR Scientific Steering Group (SSG), welcomed all participants, introduced the housekeeping and the agenda, presented the WCRP's new structure, and explained the meeting objectives:

- Day 1: to communicate with the two new core projects and the Lighthouse Activities focusing on how CLIVAR can contribute to them;
- Day 2&3: to facilitate communication between CLIVAR panels, research foci, and the Grand Challenge; to review their progress and plans; and to enhance collaboration and links.

1.2 WCRP Presentation (Hindumathi Kulaiappan)

Hindumathi joined the WCRP Secretariat in July 2021 and is responsible for CLIVAR, GEWEX, SPARC and the new emerging topics.

Hindumathi started with a brief introduction about WCRP. The first part of the presentation was about the progress on rolling out the “new WCRP”: the Strategic Plan, Lighthouse Activities, new Core Projects. It is important to engage climate scientists, social scientists and stakeholders. Therefore, in addition to its mission, WCRP now has a special focus on bridging climate science and society. There are two new Core Projects and five Lighthouse Activities (which are short term, and run until 2028). The WCRP Grand Challenges will sunset by the end of 2022, after which they will transition to other research activities within WCRP.

In the second part of the presentation, Hindumathi introduced the three emerging topics of the WCRP:

- Climate Intervention Task Team: aims to assess research activities in Carbon Dioxide Removal (CDR) and Solar Climate Intervention (SCI). The Task Team will provide recommendations to the JSC in 2022. Nominations are under consideration.
- Global Precipitation Experiment (GPEX) Tiger Team: to develop a strategy for how WCRP will address major gaps in the field of precipitation. The Tiger Team will be of a limited time duration and will operate on a fast time scale to produce a WCRP GPEX concept ideally in June 2022. The Tiger Team will recruit one member from each core project; call for members ends on 15 April 2022.
- Cycles and Budgets Task Team: aims to produce a strategy that can be coordinated and facilitated as a cross-cutting theme across the WCRP. The Task Team will be of a limited duration and sunset by the end of 2022. The Task Team will recruit one member from each core project; call for members ends on 15 April 2022.

The third part of the presentation was about the updates from the WCRP Secretariat, including membership, budget, and upcoming meetings.

- The new membership guidelines are to be approved in JSC43, with clear guidelines on gender and regional balance. Call for JSC members in 2023 will finalize by the end of May

2022.

- 2022 budget is closed and approved. JSC encourages face-to-face meetings in the foreseeable future given the need; also encourages CPs and LHAs to think about new ways of using the available budget for 2023.
- The WCRP Open Science Conference in Rwanda on 23-27 October 2023. There is a call for topics and side events from the CLIVAR community.

Questions and Comments

1. What is the status of the Climate Research Forum (CRF) and Regional Focal Point (RFP)? (Sonya Legg)
 - Very successful activities of the CRFs, covering most of the regions except Africa due to multiple reasons. Will work to have a CRF in Africa. Will not have the capability to carry out CRFs as last year. Hope to get engaged with the RFPs again, especially for the OSC2023 regarding regionally relevant activities.
 - There will be a big focus in Africa at the OSC. It is intended to build on the connections made by the past CRFs
 - The CLIVAR IORP is looking for Early Career Researchers (ECRs) in the African region. Both CLIVAR ARP and IORP have representatives from Africa (not only South Africa).
2. Will the Open Science Conference facilitate both virtual and in-person attendance? (Baylor Fox-Kemper)
 - The meeting is planned to be fully hybrid.
 - Sonya is in the organizing committee and can keep Baylor updated. Baylor offered to share experience of the next OMDP meeting which will be in a multi-site hybrid format.
3. How will the LHAs and the two new CPs operate? Will they have project offices? (Jose Santos)
 - The two Core Projects, ESMO and RIfS, will have project offices; call for hosting institutes have been published and already have bids.
 - LHAs will not have separate offices. But one of the LHAs, My Climate Risk, has identified 8 hubs around the world. LHAs are supposed to enhance communication across Core Projects.
 - Also working on getting secondments, e.g., Beatriz supports the WCRP Academy.

1.3 Current Status of LHAs

In this session, representatives from the five WCRP Lighthouse Activities gave an overview and current status of their LHAs respectively.

1.3.1 My Climate Risk (Regina Rodrigues)

Regina Rodrigues, outlined the goal, structure and current status of this LHA. In achieving its goal, MCR is not organized in a hierarchical manner but as a network sharing resources anchored by regional hubs. The MCR is now putting together the Terms of Reference and is in the process of setting up hubs. Regina also brought up some examples of compound events between CLIVAR and MCR on ocean extremes and adaptation. CLIVAR can provide climate science expertise for MCR while MCR will facilitate the co-production and co-ownership with end-users of climate information.

Questions and Comments

1. What role does the MCR scientific team play? How does it connect with the local hubs? (Sonya Legg)
 - The MCR is planning for its first general assembly in May, and has already had webinars, seminars, short schools for regional hubs at different time zones. The idea is to create an environment to share information, experience, and knowledge.
2. There seems to be considerable overlap with the new WCRP core project on Regional Information for Society Core Project.
 - There are connections but they are taking different approaches (My Climate Risk is more bottom up). Certainly, My Climate Risk feeds into RfS.
 - LHAs are activities the Core Projects can use to showcase. Science is always done by the CPs. LHAs connect the experts from CPs and local people from the beginning.
3. Will you use forecast or prediction, e.g., seasonal forecasting? (Magdalena Balmaseda)
 - The institutes currently identified for regional hubs focus more on land, but want to set up a hub on ocean and climate risk and to get institutions involved with this purpose. That would be one of the things for early warning systems.
4. Will there be other hubs? How were the ones you listed chosen? (Masa Kageyama)
 - List of the current Hubs and additional info on: <https://www.wcrp-climate.org/my-climate-risk>
 - Yes, there will be other hubs, and we are working with other institutions already. For some of the hubs we approached them because we felt they share our values such as the Himalayan University Consortium (HUC), but others approached us.

Action 1: CLIVAR panel/RF to identify ocean hubs for MCR LHA.

1.3.2 Explaining & Predicting Earth System Change (Rowan Sutton)

The co-chair of the EPESC started the presentation with the background, motivation, overarching objectives of the LHA. Changes in ocean and atmosphere circulation and their influence on hazards is a special focus of the LHA.

Rowan then summarized EPESC's progress in 2021-22: a website set up, the Initial Science Plan completed, management structure formed, a workshop conducted in September 2021; preparing a BAMS paper (to be submitted soon), building links with Detection and Attribution

community (IDAG), calling for new members, and developing a webinar series.

Rowan emphasized the three themes of EPESC, which are observing and modeling Earth system change, integrated attribution, prediction, and projection, and Assessment of current and future hazards, and introduced the research questions identified under the themes. The cross-cutting approaches/activities were also presented. He then listed some of the implementation priorities of the three Working Groups, where there are numerous opportunities for collaboration with CLIVAR.

Questions and Comments

1. The focus on multi-annual/decadal seems to exclude interannual/seasonal. Any reason for that? It seems to me that understanding the changing impact of interannual variability is tractable and urgent. (Magdalena Balmaseda)
 - EPESC has a clear focus on multi-annual to decadal time scale. The idea is to pick a small number of areas where focused efforts could be beneficial.
 - Shorter time scales are of course important, but we cannot do everything, so we need to focus.
2. One of the main uncertainties is from the scenario. Why do you take a single forcing experiment? (Soon-Il An)
 - The single forcing experiments are areas to extend the AMIP methodology. It is multiple experiments with different individual forcing, not just one single forcing.
3. How well are oceanographers represented in EPESC? If there is a lack of representation, how can CLIVAR help? (Sonya Legg)
 - Got a lot of representations from the open call which just closed. Looking for representations of all sorts of dimensions. Hope when the recruiting process completes, there will be a much better share.
 - Sonya mentioned that GSOP and OMDP of CLIVAR would be great places to bring in expertise to the LHA.

1.3.3 WCRP Academy (Angela Maharaj)

This presentation stressed the motivation, key idea, and the two phases of development of the LHA. The WCRP Academy serves as a “marketplace” for climate science training, and would be both inward and outward facing. The timeline for setting up the LHA is 2 years and it will have a horizon for 5-10 years.

The first stock take survey has been completed with over 400 responses and the results have good geographical and gender balance. The results are still under analysis.

Questions and Comments

1. How can CLIVAR’s capacity building activities and other events be included in the database of the WCRP Academy. (Sonya Legg)
 - At the moment, the best way is to reach out to co-chairs or through the WCRP secretariat. A website is under development. The Academy can also provide help on

webpage building to make sure it contains the information people are looking for.

2. What kind of coding training is included in the survey? Some of the topics that people want training in may not be climate specific e.g. general coding or graphics skills. Is there an opportunity for partnerships here? (Mat Collins)
 - The stock take survey is not that detailed. We are using the survey for further consultation to reach out to people for their specific needs. Will collaborate with groups that are already providing training. Will also set up a set of principles for outside providers.
 - Sonya: There is an oceanographic summer school which includes python coding for participants - one example how to teach coding in a climate-related school: <https://coessing.org/>
 - Liping: The CLIVAR/CliC NORP CMIP6 bootcamp will teach some coding skill, via cloud computing interface to analysis CMIP6 output, apply the tools to answer research questions: <https://www.clivar.org/events/arctic-processes-cmip6-bootcamp>
3. How does the Academy intend to link up with WMO training centres? (Francois Engelbrecht)
 - The WCRP Academy has strong connections to the WMO Global Campus.
 - WCRP Academy intends to work collaboratively with existing training centres like the WMO. And the WMO global campus framework is something we are looking at.
 - One of Academy's member is Luciane Veeck who is in WMO training division and she has been providing suggestions on linking with WMO's training activities as well

Action 2: Panel/RF co-chairs to communicate their capacity building activities to the WCRP Academy.

1.3.4 Safe Landing Climates (Steven Sherwood)

Steven outlined the purpose of the LHA and detailed its five themes as well as respective Working Groups. The LHA has already had some successful activities, including the Tipping Point Online Discussion Series, the WG brainstorming sessions, and a discussion paper to be submitted.

The presentation also provided some ideas on how CLIVAR can get involved, including the areas of ocean variability and consequences, ocean carbon uptake, and sea level rise.

Questions and Comments

1. Are there any members from the Sea Level Grand Challenge? (Sonya Legg)
 - Heiko Goelzer from the SL GC is in the steering group.
2. Regarding the tipping points, is Sea Ice included as a topic that you focus on? In terms of the pathway for raising topics, how would NORP and SORP contribute? (Mike Patterson)
 - The WGs are having meetings and brainstorming about what they want to focus on. It's not come up yet. NORP and SORP are encouraged to get in touch with us.

3. Is WG1 also interested in short term extremes on top of centennial/millennial time scales? (Masa Kageyama)
 - Our time horizon is decadal to longer, but that doesn't mean we are only interested in things that are happening slowly. Extreme events and their changes are definitely a key part of the high-risk Working Group.
4. Where do regional tipping points fit into the LHA? Huge concerns in Africa in terms of the tipping points of climate, grass, forests, etc. (Francois Engelbrecht)
 - Great point. Your example is motivating our WG on water. We are trying to work with Future Earth and other groups on how to do that better.
 - Magdalena: Following up on Francois's comment: tipping points for society associated with climate change may occur earlier than tipping points in climate. So it seems that including societal dimension in this LHA is quite important.
 - Francois: That is exactly the case! For example, a certain agricultural sector may have associated with it a biophysical threshold of collapse (which may relate to a certain level of global warming), but under socio-economic realities collapse may occur well before the biophysical threshold is reached.
4. CLIVAR OMDP has done about 6 papers on AMOC stability over the last 10 years. I am sure there would be interest in our group. (Baylor Fox-Kemper)
5. SORP has started an initiative for joint freshwater-release model experiments (SOFIA) which may be an opportunity for collaboration. I will report on that on Monday. In fact, this may also relate to single forcing experiments mentioned by Rowan. (Torge Martin)
6. I'm curious about the Safe Landing Climates' take on presenting tipping points vs. irreversible change due to slow processes (ice sheets, deep ocean, etc.). In AR6 these were merged in what I thought was a nice way. (Baylor Fox-Kemper)
 - Yes, we are interested in any of these that will have significant impact and not too fussed about technical distinctions of tipping point or not, etc.

Action 3: NORP and SORP are encouraged to get in touch with SLC LHA and discuss the sea ice tipping point.

1.3.5 Digital Earth (Andrew Gettelman)

This presentation gave us an overview of the 'Digital Earth' LHA, including its goal, 4 themes, personnel and organizational updates, and the 3 focus areas, on which the Digital Earth LHA is planning for a workshop this year. In terms of collaboration, the Digital Earth LHA is developing links with GEWEX on hydrology space and with ISIMIP.

Questions and Comments

1. Is there collaboration with OMDP? OMDP organizes a workshop on high-resolution ocean modeling. (Torge Martin)
 - We have oceanographers engaged. One of the main points is that there has been active work on high-resolution modeling in the atmosphere, but our main effort is whether we can make it from global to regional and bring it across the earth system,

and better linking it to the ocean is one of the key aspects.

- Baylor: There were a lot of discussions on that during the WCRP meeting last week. OMDP just submitted a paper on intercomparing five, kilometer-scale ocean models. We think we are highly aligned, but we have not figured out what the right pathways are. I don't think it is necessarily this collaboration network that makes the most sense of that.
 - Martin Visbeck: Note also that there is a link to the ocean decade activity in this space on Digital Twins of the Ocean <https://ditto-oceandecade.org/>
2. Are you thinking about model-data fusion for long-term CMIP/IPCC scenario projection simulations? Correcting systematic errors? (Mat Collins)
- We are thinking about at a maximum both an initialization perspective and a model evaluation perspective. It is more in terms of developing a model, i.e., can we use model-data fusion technique and data simulation system to figure out where the biases are and how to eliminate them.
 - Masa: Maybe an additional thought on the link with long-term climate change or large ensembles which will not be accessible with ultra-high-resolution (UHR) models...

1.4 Current Status of New “Homes”

In this session, co-chairs of the two new WCRP Core Projects gave presentations about their projects.

1.4.1 Regional Information for Society (Sara C Pryor)

This presentation provided an overview of the RIfS, with a focus on its vision and mission, objectives, science plan, structure, and relationships within WCRP. Among its four research clusters, cluster 3 on seasonal to decadal predictability is closely related to CLIVAR.

Questions and Comments

1. CLIVAR can play a role in ocean-connected weather and climate extremes. The CLIVAR/GEWEX Monsoons panel may also play a role in this respect. (Sonya Legg)
2. There is also a need for better regional information on seasonal and decadal (your point 2) as well as for weather and climate extremes (your point 3). Do you see CORDEX devoting any activity to these predictions? I also see a room for regional ocean information with higher resolution models (regional) at these time scales, which may also link with DITTO. Any thoughts? (Magdalena Balmaseda)
 - We think CORDEX will still mostly focus on external forced climate, and seasonal to decadal predictability is an area that CORDEX has not been very active in, while this new cluster will put emphasis on this.
 - Not a lot of representation of oceanographers, and there is no focus on the ocean yet. This is an interesting point and I will bring it back at the next ICG meeting next week.
 - Magdalena: is there a need to link CLIVAR with CORDEX regarding the regional

downscaling on prediction and projection?

- Sara: Part of our activity in cluster 1 is to increase the use of regional coupled models. I understand that it doesn't fully couple, but ROMS coupled to atmosphere is one of our key thrusts.
3. Regarding ocean participation, emerging regional coastal climate foci could perhaps be engaged. (Mike Patterson)
 - Totally agree - great idea. I'll take this back to ICG
 4. At MCR we will have hubs working on ocean climate risk. It would be great to work with RfS on this. (Regina Rodrigues)
 - This would be great - if you have any science plan for my climate risk that you can share, we would definitely welcome it.
 5. I was talking about coastal regions where a large fraction of the population lives, and appear to be increasingly more vulnerable. This is an area with important ocean involvement. (Antonietta Capotondi)

1.4.2 Earth System Modelling and Observations (Catherine Senior)

Cath gave an overview of the project, including its vision and goals, timeline and roadmap, and proposed governance. She then briefly introduced the science questions they are looking at. The science plan for ESMO is still under development. With science priorities identified, the four Writing Teams are taking them forward to develop the plan. The ESMO-organized/sponsored meetings and workshops in 2021-22 were also listed during the presentation. In the end, Cath brought up some ideas for possible collaboration between ESMO and CLIVAR.

Questions and Comments

1. Good to see that you specifically listed the connection with OMDP. It would be also good to have some connection with GSOP and regional panels. Another way to connect would be the planned CLIVAR-GOOS workshop on ocean observing system in Italy this August. It might be good to have an ESMO representative attending the workshop. (Sonya Legg)
 - Good point. We'll make sure to have a representative at the workshop.
2. It would be good for CLIVAR GSOP and ESMO to have more connections. (e.g. activities on reanalysis intercomparison, observation requirements, analysis of increments for detecting model bias, or data assimilation methods for climate). (Magdalena Balmaseda)
3. From the looks of the WGs and some of the words on the slide, I see a strong emphasis on the modeling. Adding one Obs Panel may be fine, but still not getting us to fully-balance. I do think a 'special' link to GCOS and the Obs actions for example in CLIVAR might provide an opportunity. (Martin Visbeck)
 - Mat Collins: I would include re-analyses under observations. These are increasingly used in model evaluation, especially where there are no good gridded datasets. However, us modelers don't really understand the strengths and weaknesses of re-analyses. (Mat Collins)

- Martin: What I am looking for is a 'visible' balance between observations - models and all the bits in between such a model-data fusion and reanalysis.

1.5 Discussion on UN Decade (Martin Visbeck)

This presentation started with a video showing the fragments of the 1st International UN Ocean Decade Conference. It then showed the 10 Ocean Decade Challenges, with an emphasis on #5 enhancing understanding of the ocean-climate nexus, where CLIVAR could play an important role. Martin also briefly introduced the Decade Action Framework, and gave an example of the programmes of the Decade, which was the Digital Twins of the Ocean (DITTO), an activity that will enable ocean related development “what-if” scenarios. The last part of the presentation listed several opportunities for CLIVAR to get engaged with the Ocean Decade, including registering CLIVAR activities as Ocean Decade Projects, using the Decade as a platform to advance the ocean-climate nexus, connecting to the ECOP community, and contributing capacity building actions.

Questions and Comments

1. There is a call to become DITTO partners, can you mention what would be the benefits of becoming a partner of DITTO? (Jose Santos)
 - There are opportunities for a wider engagement in the Decade, where some of other CLIVAR activities can become part of the Decade, not only the DITTO program. It will bring visibility and engagement and bring your work to a broader audience in a simpler way.
2. There have been several calls for engagement, but I find it hard to keep up. Where do we go to find out more information, e.g., the deadline? (Sonya Legg)
 - We now have a new website which works very well for looking for information. The next announcement for opportunity would come out in a few weeks with a deadline in August. We are trying to make the call open every 6 months. The website of the Decade Forum (<https://forum.oceandecade.org/>) is also very informative.
3. Can we request for endorsement of the UN Decade for CLIVAR's upcoming activities? In what scale should the activities be? (Sonya Legg)
 - On the global level there are programmes, which are something a little smaller than CLIVAR. And there are also projects that are much smaller regional or national activities. Some of the activities of CLIVAR could wonderfully become a project. Then there are also actions which are one-off activities like workshops or summer school, and you can register your activities if they are related to the Decade. The result will come out within 10 days. Highly encouraged to register some of the CLIVAR activities as a Decade Action, which may help attract people outside the community.
4. CLIVAR is planning to propose the upcoming CLIVAR-GOOS workshop on observations as an “action”. (Jose Santos)

Action 4: *The SSG to look at the proposed activities and identify appropriate ones to seek for the endorsement of the UN Ocean Decade.*

1.6 Discussion: Multi-panel workshop on observations (Weidong Yu)

Weidong Yu, co-chair of the Organizing Committee, presented the updates of the CLIVAR-GOOS Workshop to be organized in Trieste Italy in August, including the organizing committee team, proposed attendees, initial agenda, and the deliverables. The 3-d workshop is expected to bring together participants from CLIVAR panels and partners such as IOC-UNESCO, SOOS, etc. There is planned to be a workshop report, an article submitted to an international journal, and a special edition of *CLIVAR Exchanges* after the workshop.

Questions and Comments

1. Do you consider having a session on Blue Carbon and one for low-carbon observation/decarbonating observation platform? (Mat Collins)
 - Great recommendation. We have a coastal ecosystem session, but a very good idea to consider the topics you mentioned, will bring it back to the organizing committee to discuss.
2. Will there be a virtual option for participation? (Mike Patterson)
 - Yes, the workshop will be hybrid.
3. Have you thought about inviting some people from ESMO, MCR, and RfS?
 - I realized the strong potential for connection with the mentioned LHAs and Core Project. It will be good to invite some experts from those groups.

Action 5: *Weidong to bring back the suggested topics on Blue Carbon and low-carbon observation/decarbonating observation system to the organising committee of the workshop.*

Action 6: *The organising committee to invite representatives from ESMO, MCR and RfS to attend the workshop.*

1.7 US CLIVAR Report (Chidong Zhang)

The presentation began with the newly-initiated US CLIVAR research challenge: Climate at the Coast, which was kicked-off with a white paper published in July 2021. The basic motivation is the vulnerability within both natural and human systems along coasts due to natural and human activities. As the first major activity of the challenge, there will be a workshop in April specifically addressing daily to decadal ecological forecasting along North American Coastlines. The activity is closely connected to the CLIVAR-GOOS workshop to which US CLIVAR has contributed a lot.

US CLIVAR also established a new one-year Study Group on Air-Sea Transition Zone to Advance ESP, aiming to identify the challenges and the way forward to observe the air-sea transition. This group connects to CLIVAR GSOP and WCRP ESMO. There is also a US CLIVAR Working Group on mesoscale and frontal-scale ocean-atmosphere interactions and influence on large-scale climate, which connects to CLIVAR OMDP and TBI RF.

The US AMOC Science Team sunsets in 2022 with a workshop and a report.

The presentation also listed some other US CLIVAR workshops planned in 2022, introduced the US CLIVAR Summit organized in March, and discussed future interaction between US CLIVAR and CLIVAR.

Questions and Comments

1. Many US CLIVAR workshops were delayed, is US CLIVAR now committed to holding them in a hybrid mode? (Sonya Legg)
 - There are 7 workshops coming up, and they will all be hybrid, with no more delay. Learning from the experience of the multi-year prediction workshop organized this week, there is a technical challenge about how to hold virtual and in-person poster sessions at the same time. Can share the lessons learnt with CLIVAR.
2. Regarding your DEI (Diversity, Equity and Inclusion) discussion, have you come to any decisions? (Sonya Legg)
 - Haven't made the concrete plan yet. Currently we have asked each panel to discuss what they can do to promote DEI. We are collecting the information. We plan to come up with concrete action items to promote DEI within US CLIVAR and to figure out how US CLIVAR can jointly work with other agencies to promote DEI. After the summit, we will form a DEI team within US CLIVAR, which will be in charge of finalizing the action plan.
 - The US CLIVAR has made a lot of efforts in the past, which will promote the process of DEI. US CLIVAR can attract participation both through the organization and activities. We also want to have our panels engaged in very specific topics to their panel regarding science, e.g., environmental justice.
 - The aspects regarding the DEI you mentioned are also becoming more and more included in CLIVAR and WCRP activities, e.g., MCR LHA. I have been working on a paper on gender equity and oceanography, and the CLIVAR panels have one of the best gender parities. But we still need to do more to ensure we include people from all around the world and give them a voice. US CLIVAR also has a great way of bringing in people at early career stages and with different career backgrounds. (Sonya Legg)
3. With our research challenge on climate at the coast and the upcoming workshop, do you envision within CLIVAR downstream a coastal focus that will take on internationally not only on the ocean observation basis? (Mike Patterson)
 - See a possibility for future Research Focus, which we are going to discuss on Day 3.
 - Coastal issues and needs emerge in several different areas, e.g., MCR LHA, US CLIVAR. A RF bringing experts from different panels would be good. It is a very important topic, and the coastlines are where a large part of the population live. (Antonietta Capotondi)
 - We give CLIVAR credit on having RFs. The EBUS RF impacted the research with countries, e.g., research on California current in the US, and Germany also came up with an international programme on EBUS. (Mike Patterson)
4. Transition from a US AMOC Program to an International AMOC Program has already started and there have been several meetings between USCLIVAR and ARP-CLIVAR towards this end. Gokhan Danabasoglu made a presentation on behalf of CLIVAR during

the US CLIVAR Summit. (Jose Santos)

1.8 General Discussion

1. When listening to the panel/RF/GC reports on Day 2&3, should note down proposed activities that would be possible UN decade programme and have connection with other LHAs and homes, i.e., GSOP to be engaged in ESMO activities, and CLIVAR/GOOS workshop to include other WCRP initiatives. (Sonya Legg)
2. Some of the traditional research carried out in CLIVAR may not be done in the LHAs. Does CLIVAR have to re-shape the boundary? (Magdalena Balmaseda)
 - LHAs are cross-disciplinary, and their expertise are drawn from core projects. We want to make sure what we do isn't duplicated. (Sonya Legg & Antonietta Capotondi)
 - The LHAs are formed under the same idea of the GCs, enabling people from different WCRP groups to engage in one common topic. The WCRP is aware that it didn't work for GCs. We should coordinate in a timelier manner. (Jose Santos)
 - CLIVAR has nominated people to be included in the LHAs. We could also encourage the LHAs to invite people from different CLIVAR panels to particular discussions or WGs. We should also follow up what the LHAs are doing. (Sonya Legg)
 - I am co-chairing both the MCR LHA and the ARP, and we have two ARP members' institutions interested in hosting the regional hubs of MCR. (Regina Rodrigues)
3. The international research environment is changing, the other area for CLIVAR is coastal ocean and coastal observation. The observation within CLIVAR originally isn't local and regional. Is there a need for engagement with the OceanPredict community? (Magdalena Balmaseda)
 - CLIVAR-GOOS workshop plans to invite the modeling groups like CoastPredict.

Action 7: *The SSG and panels/RFs to look at all the proposed activities and identify appropriate ones to seek the endorsement of the UN Ocean Decade.*

Action 8: *Region panels to connect to regional activities in their basins.*

2. PANEL REPORTS

2.1 CLIVAR/IOC-GOOS Indian Ocean Region Panel (Juliet Hermes)

- The IORP Terms of Reference was revised: JCOMM OCG -> GOOS OCG; IOC Perth Project Office shutdown at the end of last year, a concern for the support
- Recruited 5 new members this year.
- Given that in-person meeting is not possible due to COVID, IORP organizes teleconferences every quarter, and the co-chairs and Jing from ICPO meet every month. A Slack channel was also set up for communication, in particular for ECS.
- IORP is planning for a Western Indian Ocean workshop in Mozambique and online this June, funding received both from CLIVAR and POGO.
- Next key priority is to set up task teams within the panel focusing on several aspects including capacity development, IndOOS-2 implementation tracking, ECS, expanding science to policy and society, and CoLaB (Coastal Lab in a Box).

Comments from the SSG

The SSG thought that the IORP annual report was very detailed and extensive. SSG was also impressed by the way IORP has involved ECRs and encouraged all the panels to take a look at these activities and see what can be emulated elsewhere. Regarding the capacity building on translating the climate information to society, Magdalena suggested that IORP could publish in CLIVAR *Exchanges* specifically on basin climate. Juliet agreed that this was a great idea, she suggested we could refer to the [Ocean Observing System Report Card 2021](#) where there are both plenary reports on importance of the ocean observing system and case studies, so that the policy makers can not only see the observations, but also see the stories behind .

Questions

1. What would IORP like CLIVAR to do about the shutdown of the IOC PPO and shrinking support from the IOC GOOS that they mentioned?
 - IndOOS does not get the momentum of the same amount of support from GOOS as other panels have (AtlantOS, TPOS2020). We have an ex-officio member from IOGOOS on the IORP panel. The pan-CLIVAR workshop has a stronger GOOS involvement; maybe this will help to counter the shutdown of the IOC PPO. At the moment there is very little GOOS involvement between CLIVAR IORP and GOOS, but IORP is understanding how it can make it move forwards since GOOS is a key stakeholder.
2. ARP would be interested in hearing more on CoLAB.
 - Juliet will contact Eleanor on a separate email to send her the information.
3. Is there any feedback from the South Asia CRF? Any comments on how you are able to be involved and what is the benefit from the CRF?
 - Will ask Roxy to provide that information and then send it to Sonya.

- Hindumathi said the WCRP secretariat was also a part of the Organizing Committee. There were about 200 participants and the majority were graduate students and ECS. One outcome of the survey research from this CRF is that people in that region hope to have more workshops or training in relation to climate science, which has also been considered within the WCRP Academy: how WCRP can help to promote more such activities. In the future WCRP hopes to be able to work with the RFP (Roxy is the link) to promote this.
4. Share the experience for organizing the hybrid WIO workshop, especially the logistics?
- Will have the experience to share after the workshop. The workshop was initially planned to be in Mozambique and Kuwait but finally will only be in-person in Mozambique. It has attracted many people and many hoped to join online. Now the organizing committee is in the process of figuring out how to better design the lectures so that they can maximize the hybrid format and the in-person and online participants can overcome the different time zones.
5. How was the IndOOS-2 implementation affected over the past two years? There was not too much progress.
- RAMA has been badly impacted with many of the mooring array lost. The RAMA status by mooring highlights the extreme losses of RAMA moorings due to lack of servicing during COVID. Most of the array is not reporting data. Many of the buoys are presumed lost. This presents a problem not just for deployments, but for the costs of replacement moorings (more than \$3M).
 - An alarm has been raised for the Indian Ocean with regards to Argo floats (activity is on decrease, intensity of deployment as well and half of the array in older than 5 years with large gap developing in the West). This means that we can lose half of the Argo array in the IO in the next few months. Similar situation for the Global Drifter array. They are in the same state, and the RAMA array is at 10% activity.
 - Regina said there was the same situation for the PIRATA in the Atlantic.
 - Good news is that the cruise activity is starting again, hoping to turn things around. In general, it has been impacted significantly but looking positive for the future.
 - For more information, please refer to the [Status of Presently Deployed RAMA Mooring](#).

Action 9: Juliet Hermes to contact Eleanor Frajka-Williams (ARP co-chair) to send her the information about CoLAB.

Action 10: IORP to conduct a survey and share the experience/lessons from the planning/organizing of the hybrid WIO workshop after it is held.

2.2 CLIVAR/CLiC/SCAR Southern Ocean Region Panel (Torge Martin)

- SORP membership is diverse and well-balanced.
- Organized and participated in several online meetings/workshops in the last year, including

the OMDP panel meeting and associated high-resolution ocean modeling workshop, SORP-14, and Ocean Sciences Meeting 2022.

- Ongoing limitations caused by COVID: cancelled or postponed meetings / workshops, impeded workflow, cancelled cruises and field programs, limited access to laboratories, limited work hours.
- Highlights of SORP actions in 2021/22: contribution to SOOS science plan; contribution to UN Decade; form of new task teams on freshwater experiments and on highlighting small and developing Antarctic Programs (a special issue of CLIVAR *Exchanges* under preparation).
- SORP is closely linked to the WCRP Safe Landing Climates LHA and the EPESC LHA.
- Plans for 2022/23: NORP/SORP freshwater workshop in later this year; advance SOFIA activity; CLIVAR Exchanges; and continue to monitor COVID impacts.
- Continue to improve coordination and collaboration within and outside CLIVAR over the longer term.

Comments from the SSG

The SSG commended them for their work including maintaining and building links with NORP and OMDP. In addition, Mike Sparrow mentioned that the SORP co-chairs contributed to the [Southern Ocean Action Plan](#), which should have been presented during the report. Regarding the role for paleo climate information and modeling, Masa suggested that it would be a good time to make contact with the SO carbon people in PMIP, and she can provide the link between SORP and the PMIP people. The SSG was interested in the SOFIA, it was suggested that if models do not include realistic interaction with ice-sheets, one can think of scenario/perturbation experiments.

Questions

1. SOFIA seems to be a nice coordinated program, what are the scientific questions that you want to focus on that are different from other freshwater experiments?
 - The focus is on reconciling many other freshwater experiments because the way freshwater enters the ocean depends on the model setup. The currently published papers have only limited compatibility. Our idea is to follow a CMIP style to invite groups, and to start with a simple experiment which prescribes uniform freshwater distribution. It is hoped to have a slow entry-level and then push people to do a more complicated experiment in a joint manner and enhance exchange between groups.
2. Does SOOS include the deep ocean circulation measurement?
 - Of course, please explore the SOOS map on the deep ocean circulation measurement. The deep Argo floats have enhanced coverage, and there are also repeated transects on icebreaker cruises. There are difficult regions to have continuous measurements, some of the ocean front of the ice shelves of the Antarctic shelf is difficult to keep up during the pandemic because of lack of exchange of the instruments.
3. The coupling to ice sheets and ice shelves includes not only just melting but also the interactions under the ice shelf, is this included in the experiments?

- The groups that are involved right now (8 groups) still do not want to be involved in interactive ice sheet and ice shelves, but there are other communities going in this direction. The classic climate models used for future projections still don't have that interaction, but regional models mostly have. The first tier of the experiments is without interaction, but the advanced tiers would include this. It is a wide field, and has a lot of uncertainties included because of the diversity of the models.
4. The freshwater input is only one of the aspects of ice-sheets impact on climate. I wonder if this can be complemented with other aspects such as albedo and mechanical influence (e.g., via surface waves or others). Even if models do not include yet realistic interaction with ice-sheets, one can think on scenario/perturbation experiments. Are there any activities in this regard in SORP or others?
- Except for one group, all the other groups of SOFIA run coupled climate models. Most of them have contributed or are contributing to the CMIP6 and are state-of-the-art models. They have some representation in terms of albedo for the ice sheet, sea ice and sea ice mechanics. The amount of melt is especially prescribed, there is heat loss by the ocean due to the melting and there is melt water input. There is no interaction between the ice sheet and the ocean in these models.
 - Will take back this comment to the SOFIA groups. That will be part of the group discussion just focusing on one process and not all at once.
5. In the context, I imagine that one of the things from SOFIA is to make ice shelf/ice sheet melting and freshwater inputs from that. Is this part of it?
- Yes, that is part of it. There is a vast range of methods of prescribing freshwater being implemented right now, e.g., at the coast, the surface, over depth spreading by the iceberg melt, etc.
6. About the "way forward": is SORP asking for increased time from the ICPO, or something else (e.g., to be able to spend WCRP-CLIVAR funds on salary to employ someone?)
- We had a long discussion on what we can do and how we can define ourselves or tasks in the light of SOOS being present and being a growth of time. SOOS has a person dedicated to running the programme, keeping people together, and helping with communication. A similar situation is true for SO UN Decade, also supported by a person to help with all the communication, do report, and ask for inputs. In comparison, the region panel of CLIVAR cannot provide such support at the same intensity. There could be more support in terms of maintaining web pages and twitter channels. We are intending to enhance the communication between SOOS and SO UN Decade. We both need to have members of different groups to help exchange information with SORP, but if the panel is run by individual panel members, it cannot have the same level of activities like SOOS.

Action 11: SORP to make contact with the SO carbon group in PMIP, regarding the role for paleo climate information and modeling.

Action 12: SORP is suggested to consider the scenario/perturbation experiments to circumvent the lack of realistic interaction with ice-sheets in climate models.

Action 13: SORP to conduct a survey and share the experience/lessons from the planning/organizing of the joint SORP-NORP workshop (e.g., as a report or CLIVAR Exchanges contribution).

Action 14: SORP is encouraged to submit a request for the formation of a task team for the proposed Southern Ocean Freshwater release experiment Initiative (SOFIA), including an assessment of the ability and interest of modeling centers to perform the model experiments.

2.3 Pacific Region Panel (Shayne McGregor)

- Working on four key activities over the last few years: ENSO Metrics, ENSO Conceptual Models Working Group (starting in Spring 2022), science paper on Tropical Pacific Decadal Variability, involvement with the Observational Program.
- Activities planned for 2022 and beyond
 - 1) To finalize the activities of the ENSO Conceptual Models WG;
 - 2) To continue the activities of the TPDV WG;
 - 3) To support and provide inputs to sustained observational programs along the basin boundaries;
 - 4) The ENSO summer school to be organized in Trieste, Italy this July, as PRP is involved in its organization.

Comments from the SSG

Regarding the scientific activities, the SSG suggest to consider the application of ENSO metrics on initialized predictions, and to evaluate how the ENSO properties change as a function of lead time. For other activities, the SSG suggested to consider bringing in ECS from the global South into the PRP WGs, Sonya said that the WG is a good way for training people. For the future activities, to proactively consider including capacity building. About the cross-panel interaction, SSG suggested PRP have some discussion of the overlap between the TPDV activity and the TBI RF. In addition, a RF Tropical Basin Interactions WG led by Dietmar Dommenges is being formed on conceptual models; there should be some interesting overlaps/synergies with the conceptual WG.

Questions

1. Congratulations on the work on ENSO metrics for climate models. The work that PRP is doing is very explicit. Do you have any plans for the application of the ENSO metrics on initialized predictions, and to evaluate how the ENSO properties change as a function of lead time, as the model drifts to its own climate? This could be relevant for the LHA on understanding, and also for the LHA on Digital Earths. as well as to interpret operational seasonal forecasts.
 - A great idea, will discuss this among the group. End point is to have a couple of models by ourselves, but not sure how long it will take us to get there. Actually, there is a lot of data available.
2. Very detailed and long report. MPOWIR is mentioned as a US program. Could/should CLIVAR support a similar global effort (Inga)? Meanwhile, we noticed that PRP organizes summer school and involves ECS in the WGs, and some members also take part in some mentoring activities. However, they are explicitly organized by PRP. We are wondering if you could take the examples of these capacity building activities and do something more

global. Also wondering how much the ECS representation in the WG is from Global South? And what other activities have you tried to integrate ECS and build capacity? Need to involve the ECS and build the capacity in a global sense, not only for ECS from particular wealthy countries.

- We used to have geographic and gender bias in the panel but we have been trying to correct this. As we have only small turn-over each year, things are happening gradually. We are recruiting an ECS member and a member from the Global South this year.
3. There are significant overlaps between TPDV WG and TBI RF. Perhaps it would be useful to have some discussion of the overlap between the TPDV activity and the TBI RF.
- Understand the overlap and the potential and will coordinate with TBI RF in the future. Antonietta is the shared member and will leverage the cooperation. A strong focus of TPDV is on the extratropical to tropical exchanges of the ocean but at the same time the group is aware of all the other exchanges, maybe a comparison experiment will be helpful to understand the relative importance of these exchanges.
4. What is the status of Pacific observations, have they been impacted by COVID? This is important as reported in <https://link.springer.com/article/10.1007/s00703-021-00792-3>
- As far as I understand, for the NOAA moorings, it is not as bad as the 2013/2014 situation. However, there are some logistic issues caused by the pandemics and the Western Pacific is under-observed at this point of time.
 - Please see <https://www.pmel.noaa.gov/gtmba/historic-tao-data-return> for a time series of tropical pacific moorings.

Action 15: PRP to integrate ECS and enhance capacity building activities in a global sense (e.g., people from Global South) through its WGs and other activities, beginning at the planning phase. Activities specifically focused on capacity building (e.g., training schools, boot camps) are also encouraged.

Action 16: PRP and TBI RF to coordinate the work on TPDV and ENSO Conceptual Model and avoid a duplication of effort.

2.4 Atlantic Region Panel (Eleanor Frajka-Williams)

- Membership changes finalized in March 2022, with some members rotated off, some recruited, some renewed, and the change of one co-chair.
- Established the CLIVAR AMOC Task Team, which is intended to support the AMOC community when US CLIVAR AMOC Science Team sunsets in this summer.
- The CLIVAR-FIO summer school, proposed by ARP, is going to be organized in 2022 with two nodes.
- TAOS Review report published in 2021, a special issue of CLIVAR *Exchanges* is being coordinated by Regina and Sabrina.
- ARP members have also played a leading role in AMOC and SAMOC reviews, and were

involved in fieldwork, observations meetings and plannings, LabSea2022 network and the AtlantOS program.

- Planned topics for 2022 include: AMOC, TBI activities, LHAs on ocean extremes and impacts, special collection on the South Atlantic; ARP also plan to post one Atlantic blog every 1-2 months and to organize quarterly telecons and possible in-person meetings.

Comments from the SSG

The SSG supports ARP's outreach activities (e.g., blog) to highlight ongoing events on the Atlantic. Regarding the moving forward of the science research, the SSG suggested ARP to decide on the science activities that the panel is going to focus on for the next few years, and make some informal task teams to have people who are specifically focused on that involved in those activities. Likewise, the SSG hoped ARP will pay more attention to capability building and suggested they refer to the IORP annual report, and to consider how APR can include ECS in the ARP scientific activities.

Questions

1. Good to see some work has occurred, and it looks like by the time of the SSG meeting that they will have updates to give (Horizon Europe funding results, NCEE special issue on South Atlantic). The funding request to support an in-person meeting is a little vague, but perhaps that is not surprising given the uncertainty around other in-person meetings that the panel wishes to align with.
 - The Horizon Europe funding results have come out. The bid that Eleanor was leading was well reviewed and will depend on the Horizon Europe Association of the UK, but she didn't know in what form it will be funded. Four projects are led or involved by ARP and AMOC TT members.
2. Please explain how the Meehl et al. (2020) paper resulted from ARP work?
 - This is something that we have been paying attention to: what are the activities done because of ARP, and what are the activities done by ARP members in the course of other activities. We hope to keep the members' own research interest but at the same time, to keep the connection to make sure not losing sight of the Atlantic progress as a whole.
3. Please provide more details/plans on the Special Issue on the South Atlantic? Will there be an open call, with some focus on involving Global South researchers?
 - The special issue is mainly by invitation. I have been personally asking researchers from South America and Africa to submit their work on several aspects ranging from marine ecosystems to cyclones in the South Atlantic. If you have relevant research or you would like to participate, please let Regina know. The deadline of submission is by the end of April; it will be released around September. Planned to publish in nature communication: earth and environment at the second anniversary. 10 papers will be published at least, some papers (SAMOC for example) have been reviewed. The editorial board is led by women; one goal is to showcase more women's work on operational oceanography. See the link:
<https://www.nature.com/commsenv/submit/calls-for-papers#OceanScienceSouthAtlantic>
4. Reading from the ARP report, the AMOC work seems to be put on hold and other things

are finished up (e.g. TAOS Review and so on). What are the science activities that ARP is going to focus on for the next few years, and then may formulate task teams to have people specifically focus on each particular activity? You may discuss this in your next panel meeting. What are your capacity building and ECS supporting activities? Have you thought about this?

- The idea of trying to decide on some research topics of ARP concentrated effort has come up. The process is underway and may have some concrete ideas on the topics and subgroups before the next ARP meeting.

Action 17: ARP to discuss the foci of science activities the panel plans to engage in for the next few years and formulate task teams for each focus area. This should be a priority for a near-future teleconference.

Action 18: ARP is encouraged to learn from IORP and include activities for ECSs and capacity building in future plans.

2.5 Climate Dynamics Panel (Noel Keenlyside)

- Membership: Not good in gender balance (few female representatives) and geographical diversity (no representative from the Southern Hemisphere except one from Australia).
- Organized CDP-5 and two other panel meetings online in 2021.
- Organized several meetings/workshops online and in hybrid format.
- Main plans for 2022:
 - 1) CDP annual workshop series with 6 weekly sessions in September and October;
 - 2) Several other meetings/workshops organized by CDP members.

Comments from the SSG

The SSG commended the impressive number of virtual and hybrid workshops/meetings in 2021 CDP had. Although there are no publications this year, they have one in progress. In the planned activities, the “six weeks” workshop sounds like a great idea, and it will be interesting to see what the responses are and whether other panels want to emulate that idea. SSG hoped CDP can report the experience/lessons of this workshop. Regarding the cross-panel activities, SSG suggested CDP considering how the panel activities can link to the WCRP LHAs. Regarding the capacity building, SSG suggest CDP considering proactively involving the ECS in the CDP activities in the future. For this year’s CDP workshop, think about how ECS can connect with senior scientists. The SSG also suggested CDP to include Africa members in the next open call of membership. There are good pockets of climate dynamics researchers in South Africa now, so it seems feasible to obtain some African participation in the panel (and better SH participation). Francois was happy to recommend some names when the next opportunity to extend membership arises.

Questions

1. Funding request is to support IT for a virtual conference: this is refreshing compared to the usual travel funding requests, and I would support this request. However, I am not sure

what the IT support will involve: is this at the hosting end, or to provide access to those in places/situations with limited connectivity/resources?

- For some of the meetings organized, CDP had professional people helping in running the meeting. For this meeting, it seems the CDP will not need the IT support since ICPO has helped to organize it, but hopes to rent some licenses of online platforms (virtual poster session, for example). CDP hopes the event will be held to be a regular annual activity and to a very inclusive community. This workshop is the first step.
2. In the planned activities in 2022, what is “the pattern effect workshop...” about?
 - Please refer to the [homepage](#) of the workshop. A hybrid meeting and open to all, it is a part of the group working on the equilibrium climate sensitivity, how global warming, the sea surface warming pattern arises and how that affects the radiative feedback.
 3. It is good to be linked up with LHAs. Is there any interaction with the LHA on understanding/attribution? There seem to be substantial common areas.
 - There is a lot of potential overlaps, CDP needs to work more in this direction.
 4. Do you have plans for making sure the ECS and global south scientists can engage in the activities? Any specific activities to highlight the ECS’s working or tutorial sessions on the side, etc.? I think there is a lot of potential for the activities you are proposing to have something specifically oriented towards capacity building as well. Please proactively focus on capacity building.
 - Most of the activities are online or hybrid, so that the ECS can easily access these activities. There is a poster session of the annual CDP workshop which can give an opportunity to the ECS to show their works. One of the potential outcomes of the workshop will be a special issue of CLIVAR Exchanges, which is also a platform for ECS to show their work. But CDP will consider more capability building in the future.

Action 19: CDP to consider how panel activities can link to the WCRP LHAs, e.g., to avoid overlap with EPESC LHA.

Action 20: CDP to consider how to involve ECS and researchers from the Global South in CDP activities and consider capacity building in the future. For the CDP workshop, please build in a mechanism whereby ECSs are able to connect with senior scientists, for example, a discussion forum or a tutorial session or “meeting mentors” session.

Action 21: CDP to obtain some African participation in the panel (and better Southern Hemisphere participation). Francois (francois.engelbrecht@wits.ac.za) is happy to recommend some names when the next opportunity to extend membership arises.

Action 22: CDP to make a survey after the ‘six-week’ workshop and report to SSG the experience/lessons gained.

2.6 Monsoons Panel (Suryachandra Anguluri)

- Formed 3 regional Working Groups with focused research plans and objectives.
- Contributed to the organization of IWM-7 and S2S training workshop as well as a few

sessions in leading conferences.

- Supporting RCOFS (SASCOF, ASEANCOF and others).
- Published 7 Chapters (mostly review articles) in the book titled "Multi Scale Global Monsoons System".
- Contributed to at least 50 research articles in the last one year by members.
- Cross-Panel activities initiated: IPCC AR6 and CMIP6 especially on GMMIP, IORP, SPARC, GEWEX and S2S.
- Membership proposal approved by the SSG, balance sought between regional interest, GEWEX/CLIVAR relevance, expertise, gender, etc.
- Plan to continue to contribute to cross-panel coordination, ECS involvement, WCRP new structure, etc.

Comments from the SSG

The SSG congratulated the monsoon panel on revitalizing the regional working groups. and the very active participation from all around the globe in those working groups. For the cross-panel activities, SSG hoped to see some link between MP and the LHAs, and hoped for MP to consider the links with CLIVAR region panels, especially IORP. In addition, SSG suggested MP to coordinate and synthesize activities across regional WGs to compare and contrast processes at different regions.

Questions

1. Glad to see activities for supporting forecast information (e.g. S2S and SASCOF). A good opportunity to train "climate forecasters", a role that does not exist as such yet, but becoming increasingly important. Do you have any links with any of the LHA?
 - There should be some links to the LHAs; we will contact another co-chair and get back to the SSG.
2. What are the links with regional panels, especially the Indian Ocean Panel?
 - We have been involved in the IndOOS-2 paper published in BAMS by IORP which focuses on the Indian Ocean Observation System. Another MP member proposed an activity on observation requirements for the monsoon forecast, and will discuss it with IORP.
3. For the panel as a whole, what activities have you done to coordinate and synthesize across the regional WGs? E.g., to compare and contrast the processes not only in different regions, but also to think about monsoon processes as a whole.
 - Each MP member is part of regional WGs and is doing the leadership of the WGs. The members identify WG activities that are important (for example, the systematic biases in the models) and bring it to the panel discussion. To identify the gap among the WGs is one of the jobs of the MP members.

Action 23: MP to report to CLIVAR SSG if the panel has any links with the WCRP LHAs.

Action 24: MP is suggested to establish stronger links with the CLIVAR region panels, especially IORP.

Action 25: MP is encouraged to coordinate and synthesize activities across regional WGs on comparing and contrasting dynamical processes that operate in different regions.

2.7 Global Synthesis & Observations Panel (Peter Oke)

- With two new Co-Chairs; three members rotating out, three new members joining; and three current members renewing, GSOP is renewing connections within the panel, finding common ground, and formulating plans to work together.
- Planned activities include:
 - 1) Comparing observation impacts across multiple systems
 - 2) Investigating model response to assimilation updates
 - 3) Understanding dynamical balance with free-running and data assimilating models
- GSOP is hoping to meet face-to-face in October
- GSOP members are active in many UN Decade activities

Comments from the SSG

SSG realized that it is a tough challenge for the new co-chairs to fire up the group during the times of COVID, meanwhile, SSG said we need to find the right balance to work with limited budget and our responsibility as climate scientists to reduce travel vs pursuing in-person activities. Thus SSG suggested GSOP to refer to the other panel reports for ideas of how to organize successful online/hybrid panel meetings. It might still be difficult to get the whole panel together in person this year, but we need to carry on science in between the in-person meetings and having workshops.

Regarding the membership, with the stepping down of Isabelle, GSOP needs to bring in an Africa member in the next open call of CLIVAR members.

Regarding the cooperation with other groups, SSG suggested contacting Andy Moor, the co-chair of DA-TT for the coupled data assimilation. In addition, SSG suggested the co-chairs linking with GOOS OCG (Observation Coordination Group) and ETOOFS (Expert Team on Operational Ocean Forecast Systems), and reaching out to the ESMO, indicating their willingness to be involved in some of the ESMO discussions. SSG also hope that by affiliating to CLIVAR, GSOP can contribute to ESMO. Meanwhile, GSOP can consider digital twins as a focus, and to link with the DE LHA which also has the data assimilation component.

In terms of the scientific issues, SSG recommended GSOP to consider the nature of the forcing and the adjustment presented in the data analysis.

Questions

1. Understand you are establishing a good connection with OceanPredict which will enhance GSOP's work in the observing systems. Meanwhile, in order to make GSOP's contribution

more impactful, do you think it can be done through the existing GSOP membership, or need to recruit new members in some specific perspective required?

- We have about 3-4 members who are willing to get on board and to do calculations to run experiments and to perform analysis. SynOPS project is a spin-off of the OS-Eval TT. This is something that GSOP can link with. We don't need to recruit, but we will look for other opportunities. Through collaborating with the OS-Eval TT, we believe we will have good outcomes.
2. Are there any links with the GOOS Observation coordination group or the GOOS Expert Team on Operational Ocean Forecast Systems (ETOFS)? I think it would be useful to link up with GOOS OCG, Mathieu Belbeoch maybe the link.
 - He is a relatively new member; we will try to let him exert more effect on the connection.
 3. The observation impact is of course a long-standing important area. Another area that can be focused on is the dynamics in the assimilation systems. For example, in CORDEX, people usually test regional climate models by forcing them with reanalysis data, but what is the nature of the forcing, to what extent is dynamic adjustment always present in the reanalysis datasets, and what is the impact of the data assimilation systems on instability in the reanalysis?
 - The model dynamic adjustments to data assimilation is really an area worth getting the panel to work on. I will look at a few, very specific and relatively small-scale cases of what happens to an ocean eddy when we adjust it with ocean assimilation data.
 4. The planned joint activities "ocean observation impacts" may have a potential contribution to the new WCRP home ESMO.
 - I did spend some time looking at the various WCRP LHAs and the new homes. I felt like we need to reshape the panel if we want to map onto them. But I will look again to see if there is a place for GSOP.
 5. The report says that remote meetings were held, but then the achievements section said that nothing was achieved, or did I misread that? What can CLIVAR do to support GSOP to achieve more panel business remotely?
 - We planned to meet face-to-face a year ago, but we did not do it because of travel restrictions. I do not think that is necessary. We just need to motivate people. We would like to identify what are the things the members are like to do, within the scope of GSOP's terms of reference.
 6. I know things are difficult with a diverse panel. I am wondering if the digital twins activity is one area to bring a focus. DA and observations are key for the development of digital twins, and it covers the different time and space scales.

Action 26: GSOP to contact Andy Moore (ammoore@ucsc.edu) to establish a link with the coupled data assimilation experiments conducted by WGNE and DAO.

Action 27: GSOP to refer to the reports from other panels (e.g., CDP) on ideas of how to organize successful online/hybrid panel meetings.

Action 28: GSOP to bring in new African members. Juliet Hermes (juliet@saeon.ac.za) and

others might be able to help recommend candidates from Africa.

Action 29: *GSOP to build stronger links with other activities, e.g., GOOS OCG and ETOOFS, CLIVAR region panels, and new ESMO core project. There would be benefit to both sides if GSOP is involved in ESMO discussion, similar to what OMDP does.*

Action 30: *GSOP to consider digital twins as a focus, and to link with the Digital Earth LHA, which also has a data assimilation component.*

2.8 Ocean Model Development Panel (Baylor Fox-Kemper)

- Midway through co-chair changes, the team is poised for new directions.
- Slack and virtual meetings are routine. Ambitious new plan for multisite, hybrid international meeting with reduced carbon footprint and early career opportunities.
- Large SWOT-AdAC/OMDP meeting in planning.
- Due to an update on projects, some are very active.
- All of these projects map on to the Lighthouse Activities.
- Panel members are heavily involved in AR6, ESMO.

Baylor said after they have tried this workshop, they will find a global south node if the next workshop is still multi-node.

There was a discussion around the global south members. Gokhan said we need to be judicious when the panels recruit global south members since they are often recruited for several different panels, which will cause a big workload to them. However, Francois pointed out that the number of scientists in the Global South is increasing so there will be more outstanding scientists. Compared to the commitment, the benefit to be a CLIVAR member is bigger to the scientists and even their institutions. Even though they may be overstretched, they can always say no. So CLIVAR will continue to promote the diversity of the membership.

Comments from the SSG

The SSG was glad to see that virtual meetings were able to be held. It would have been good to have the authors, title, etc. of the papers listed, not just the DOI links in the annual report. SSG commended OMDP for appointing a female co-chair from the Global South.

The 4 nodes workshop is a good idea which can avoid international travel and at the same time still have face to face interactions. SSG recommended OMDP to report to SSG on the experience and lessons after the workshop.

Regarding how OMDP is trying to link up with other panels, the SSG suggested OMDP to invite people from the relevant panels to join in its particular discussion/activities. For example, to invite GSOP to join in the SWOT discussion, to invite ARP people when it is working on analysis of the bias of the Atlantic, etc. Also, OMDP was recommended to contact GSOP folks to see if they would be interested in joining with the discussion among OMDP, DAO and WGNE.

SSG recommended [OMDP to have specific plans for capacity building.](#)

Questions

1. I support the travel funds being used to support early career researchers. At the start of Appendix A (point 5), it is stated that travel funds will be limited to invited speakers, students, and early career scientists, but at the end of Appendix A (point 11), it is stated that OMDP is looking to "support travel costs for some panel members and young researchers". Does this mean that all the invited speakers will be panel members?
 - We will invite the invited speakers to come to their local site which is not very far. We do have some funds reserved for bringing invited researchers to their local site, but most of the travel funds will be reserved for early career researchers. The advantage of the multi-site format is that we can reduce the travel cost while still having large international collaboration and participation.
2. How many of the listed papers were OMDP work (at least two of the papers do not seem to mention OMDP or CLIVAR anywhere?). How did these papers result from panel work?
 - The standard is that more than one author or the single author being an OMDP member, working on topics that are related to some of those OMDP projects, indirectly stemming from the collaborations that are initialized by OMDP. Please see the [OMDP Google Scholar](#) page.
3. Multi-sites meeting is a good idea. It will reduce international travel but still have face-to-face interaction. Please let us know if this is successful.
 - We were trying to have some sites in the Global South, but could not find the partners that were pretty sure it was going to work. We have both potential sites in South America and in Africa as well. We will try next time.
4. Given your interest in SWOT, Peter just reported they were interested in the dynamics of data assimilation, do you see any opportunity to connect Ocean Modelling Panel with GSOP?
 - Welcome GSOP folks to attend the OMDP-SWOT workshop. In addition, the OMDP ocean initialization project has ongoing discussions with DAO and WGNE and is related to initialization of the ocean and coupled data assimilation; that would be a nice link. Baylor will email to some of the GSOP folks to see if they would be interested in joining with the project discussion.
5. Any plans to interact with DITTO?
 - We have just interacted with Martin. We are wondering how the Digital Twin differs from a standard ocean model, since all of the Digital Twins are being built of ocean models that the OMDP is involved in developing. Maybe one key distinction of the Digital Twins effort is that they involve ML and ANN, which is something OMDP would be very interested in learning more about, but it is not OMDP's near term planning. The ML and ANN will be discussed during the OMDP-SWOT workshop, and in the WCRP open science conference will be a good opportunity to build some of those collaborative networks.
6. What are the panel efforts for capability building?

- First, the new co-chair, Sarah Nicholson is the first female co-chair of OMDP and she is also a ECS and from global south, who can help to recruit the global south members in the future. Second, the multi-site format of the OMDP-SWOT workshop will give opportunities for ECS to engage in and lead those convene sessions. What the inter-site communication is focused on is centered around what the ECS's interests and experiences are. Also this workshop will give ECS an opportunity to do a good job and gain some recognition. Third, OMDP is trying to diversify the panel by including more early- and mid-career panelists. The OMDP idea of 4 hubs with travel for ECRs prioritized, is good for the capability building of the ECS.

Action 31: *OMDP and other panels are noted that care is needed not to always identify the same people serving in different groups, as not to overburden them by community work, or to negatively affect their career advancement.*

Action 32: *OMDP to report to the SSG the experience and lessons gained after the FilaChange workshop.*

Action 33: *OMDP to increase interaction with other panels by inviting representatives of relevant panels to join particular OMDP discussion/activities. For example, invite GSOP to the SWOT discussion, invite ARP people when working on analysis of the model bias of the Atlantic.*

Action 34: *OMDP is encouraged to interact with GSOP to see if they would be interested in joining with the discussion among OMDP, DAO and WGNE.*

2.9 CLIVAR/CliC Northern Oceans Region Panel (Amy Solomon)

- Membership:
 - 1) 10 members need to rotate off the panel at the end of 2022-- Everyone but the 2 new members from last year;
 - 2) 3 scientists have been invited to serve as ex-officio members until current members start rotating off the panel.
- Activities in 2021:
 - 1) 2nd Session of the CLIVAR/CliC Northern Oceans Region Panel, September 15 and 22, 2021;
 - 2) Engaged with the WWRP Polar Prediction Project.
 - 3) Collaboration with the international community, e.g. Sessions at vEGU 2021, etc.
- Activities in 2022:
 - 1) Co-sponsor for the Aspen Global Change Institute workshop on "Arctic Climate and Weather Extremes: Detection, Attribution, and Future Projection", 15-20 May, 2022;
 - 2) NORP Arctic processes CMIP6 Bootcamp in Helgoland, Germany, 5-14 October, 2022;

- 3) Arctic Heat Flux Review Paper;
- 4) Other additional activities such as sessions at 2022 AGU and EGU annual meetings, review paper on seasonality of the Arctic freshwater, etc.

Comments from the SSG, ICPO and US CLIVAR

The US CLIVAR ED, Mike Patterson suggested that the Workshop on Observing, Modeling, and Understanding the Circulation of the Arctic Ocean and Sub-Arctic Seas is another potential interface between US CLIVAR and NORP. Patrick Heimbach is on the SOC and can be a link to NORP and US CLIVAR. The NORP co-chairs will inform the NORP members and encourage everyone to participate in this workshop during the next panel telecon.

Jose Santos, the ED of ICPO, mentioned that a large number of members rotating off in one year is a common problem for some panels, so he suggested that NORP can keep 2-3 members in the panel for one more year based on the CLIVAR membership guideline.

Regarding the capacity building, the SSG thought that the bootcamp idea was great, and encouraged other panels to consider whether they can arrange some kind of tutorial activities that focus on training of ECS and capacity building. Also, the SSG was happy to see NORP focus on the CMIP6 data analysis on the Arctic rather than do a bunch of new intercomparisons, while at the same time, the bootcamp links the model and observation. SSG suggested NORP consider what kind of activities they could do if there are travel and funding restrictions. We need to avoid organizing meetings that end up only with people who can pay for that. We need to organize events that do reach the Global South and still fit into the available resources.

Questions

1. Great to see a paper resulting from NORP work with NORP people as co-authors. I couldn't find a description of how this came about, and NORP and CLIVAR do not seem to be mentioned in the paper, but perhaps this will be in the presentation at the SSG meeting? If not, please ask for more details.
 - Did mention CLIVAR and NORP in the review paper; this paper came out last year so it wasn't included in the annual report.
2. Arctic Processes in CMIP6 bootcamp: what is the plan if it cannot be held in person, or many participants cannot make it, due to global disruptions of some kind?
 - The reason to postpone it is to have it in-person. It will not be called "bootcamp" unless it is in-person. NORP doesn't have a contingency plan other than postpone it.
3. Have there been any disruptions because of the political situation?
 - No disruptions due to political events from the NORP side. But Mike Sparrow said there have certainly been disruptions to the Arctic Council and their Working Groups (AMAP etc.). CliC have noticed some issues with datasets etc. held in Russia. Patterson said US CLIVAR is also anticipating the potential inability for Russian scientists to travel to the US for the June Workshop, given current travel restrictions. The ability to discuss collaborations, esp. regarding access to Russian in situ data, may be impacted. A hybrid format is considered in case that some people can't attend in-person.

Action 35: NORP to inform its members about a workshop on Observing, Modeling, and

Understanding the Circulation of the Arctic Ocean and Sub-Arctic Seas, which is another potential interface between US CLIVAR and NORP.

Action 36: *NORP is suggested to keep 2-3 members in the panel with a one-year extension, regarding the continuity of panel membership.*

Action 37: *Other panels are encouraged to consider similar tutorial activities like the Arctic Processes in CMIP6 bootcamp being planned by NORP, which will link models and observations together and focus on training of ECS and capacity building.*

2.10 Discussion: cross-panel issues

A. Capability building for ECS

The SSG encourages capability building especially for ECS, mainly in the following points:

- The SSG praised the efforts that the panel co-chairs have made to bring ECS to the panel, and encouraged them to continue to make this effort.
- The way IORP has involved ECRs is impressive, the SSG encourages all the other panels to take a look at these activities and see what can be emulated elsewhere.
- Encourage CLIVAR panels to consider whether they can arrange any kind of tutorial activities that focus on training of ECS and capacity building (the NORP bootcamp is a good example). In the current situation, possible travel restrictions may not be an issue for the NORP because the participants mainly come from the NH and in-person activity is not quite as difficult as bringing people from all over the globe. However, we need to consider what types of training activities we can do if there are travel restrictions as well as funding restrictions. To bring a large group of ECS together does cost a lot so we need to find other sources and ways to make sure that these activities don't end up just being provided for the people who have the money to pay for them, to make sure the global South is able to participate in these activities.

Action 38: *Panels should devise specific plans for capacity building, by involving early career scientists (ECS) and researchers from the Global South.*

B. The experience/lessons of the hybrid/virtual meeting, with respect to ECS.

- The SSG emphasized the need to share the experience and lessons of the hybrid and online meetings.
- The SSG was aware that although online meetings are theoretically available to everyone, there are pros and cons of it. From a survey among the participants of CESM Tutorials and meetings conducted by CESM, it was found that an overwhelming majority of ECS was asking for in-person meetings and more in-person interactions with senior scientists. Similar responses from ECRs regarding in-person vs. virtual meetings have been seen by the SSG. Especially for the EGU, AGU, the ECS are not always willing to attend virtually. In the current situation, a hybrid meeting seems a better choice.
- However, how to organize a successful hybrid meeting is more challenging than either in-

person or fully virtual, especially for the poster session. Thus the SSG hope the workshop/training organizers will conduct surveys among ECS regarding the benefits of virtual meetings, then CLIVAR will compile a best practices document based on different panels' experience. These lessons/experiences will also be useful for the planning for the WCRP Open Science conference.

- Mike Patterson introduced some lessons from the hybrid US CLIVAR summit 2022. About 60 (40%) people participated personally. In terms of a poster session, the difficulty is how to effectively facilitate the interaction between in-person and online participants, e.g., how to mix both of them. In fact, Mike found that the people who participated in person had their own side conversations while excluding the online participants. On the other hand, hybrid meetings are usually more expensive than fully virtual or in-person. We not only have to provide in-person logistics support such as beverages but also we need to pay for the platforms as well as the IT support for a stable platform.
- Following are some online/virtual activities that were mentioned during the SSG-27:
 - The [FIO-CLIVAR summer course](#) will be Hybrid with nodes in China and Ecuador, so we are also learning along the way (upcoming)
 - The hybrid [WIO workshop](#) organized by IORP (upcoming)
 - The OMDP workshop will have 4 nodes in different continents (upcoming)
 - The CDP annual workshop (upcoming)
 - The TBI workshop has done a survey, results can be seen in the [CLIVAR exchange](#).
 - [The US CLIVAR summit](#)

Action 39: *In addition to reporting capacity building activities within panels, panels are encouraged to share information with other panels on their successful activities for capability building. CLIVAR Exchanges can be used as a venue to communicate best practices.*

C. Knowledge exchange between panels

Participants shared the experience for knowledge exchange between CLIVAR panels, and with other WCRP groups such as the LHAs, the new ESMO, and Rifs homes. The SSG heard suggestions or concerns and ways in which CLIVAR SSG and ICPO can help. Discussions points included:

- Format of interaction: individual or higher level? Regina hoped there could be something a little bit structured that can facilitate the interactions instead of just stopping on the individual level. Gokhan had the same opinion. In the past 10+ years, when mentioned about the interaction between panels, it always goes onto one person who acts as the liaison of two groups, which doesn't successfully work. From the OMDP experience, asking people from other panels to the OMDP meetings is time consuming since sometimes people don't have time to join in the volunteer activities.
- Research emphasis. Ingo mentioned that LHAs are more on climate change research and adaptations, while some of the CLIVAR panels/RF (TBI for example) focused on inter-annual variability; it is difficult to find the connections between the

LHAs and the science focus of some CLIVAR panels/RF. Regina said there are three different LHAs which focus on different time scales: the MCR is short-term, the SLC is long term, the EPESC is between inter-annual to decadal which well fit the tropical inter-basin variability.

- The pan-CLIVAR regional meeting which involves the CLIVAR regional panels as well as RF would be a good format for cross panel interactions, we can consider holding this every few years. Ingo suggested the regional panels together with the TBI can have such multi-panel meetings once a year to do brainstorming. Sonya encourages the panels to send invitations to the other regional panels and assign somebody to join for the panel interaction.
- Connection to the LHAs. The LHAs are defining what they are going to do and they are becoming more and more visible in the climate research, people will be focusing a lot of attention on them. It would be useful if there are some PPT slides/documents that show where CLIVAR science is important in the LHAs, and that would be useful for CLIVAR know where it need to engage. CLIVAR should be proactive about how it engages. There are many common interests between CLIVAR and the LHAs, for example, my climate risk activity on the ocean climate risk, the ocean heat uptake, the sea level rise etc. CLIVAR needs to contact the LHAs co-chairs and suggest that they invite CLIVAR panel members with respect to specific topics that are relevant to CLIVAR science. It is not necessary to have people sitting in both teams, but to keep the communication ongoing.
- CLIVAR/GOOS interactions, in particular with GOOS Regional Alliance. IORP is the only panel with a formal affiliation with GOOS. The pan-CLIVAR meeting is co-sponsored by GOOS, which can be a link. The OOPC is also an important narrative part that builds connectivity between the basin panel and GOOS. GSOP is another connection which will be helpful to elevate different GOOS component programs and be valuable to climate research. In the future, CLIVAR and GOOS will enhance communication.

Action 40: *Panel co-chairs should continue to build connections with other panels/LHAs/partner projects where strong links exist, or where stronger connections would be beneficial. Panels are encouraged to develop specific actions (e.g., joint activities, workshops) to build on these connections.*

Action 41: *Panel co-chairs are encouraged to develop ideas/proposals for cross-panel interactions and communicate them to the ICPO.*

Action 42: *Region panels are encouraged to connect to regional coastal observation and marine prediction activities in their basins.*

Action 43: *Communication and interaction between CLIVAR and GOOS, in particular with GOOS Regional Alliance, should be strengthened, probably through IORP, GSOP, OOPC and the upcoming CLIVAR/GOOS workshop.*

D. WCRP Open Science Conference

Sonya is the CLIVAR rep for the WCRP OSC. She introduced the current status of the OSC. The OC just had a meeting and the date and the location has been set. It's going to be in Kigali in 2023 October in hybrid format. About 7-8 WGs of the OC has been set to address different issues: to address how to hold a hybrid conference, to integrate global north and south in the activities, on early- and mid-career researchers and making sure they are included, to address

how we can connect to climate services and society, regional activities, etc. Some of the SOC members have volunteered to be the members of WGs. The WCRP secretariat has sent the members emails and is organizing meetings. Hopefully next month will see some progress.

Hindumathi has sent out an email asking for science topics. It will be a great start if CLIVAR can provide OC with some topics of interest. Further, many CLIVAR members are already working with WCRP as a part of the above WGs. CLIVAR should establish a subgroup and discuss what areas do CLIVAR want to be covered. This OSC is for all the WCRP community so that it is an opportunity to connect CLIVAR's research with other aspects of WCRP.

If the core projects want to organize activities in 2023, it is encouraged to be alongside the OSC, but be careful to avoid the clash around the same time as OSC.

Action 44: *Panels/RFs are encouraged to propose science tropics for the WCRP Open Science Conference and side events alongside the conference.*

E. MIPs coordination

Some groups are organizing or planning model intercomparison projects around questions raised by the groups. On the other side, the modeling groups are overwhelmed with the modelling intercomparison projects. There is a coordinating challenge between the computer resources & people of the modeling centers and the sciences and it needs to be discussed across panels. We need to be judicious about it.

Maybe we need to focus more on diagnostic comparisons of existing simulations. For example, the NORP CMIP6 bootcamp is focusing on the CMIP6 data analysis.

Action 45: *Coordinating challenges need to be considered when organizing or planning new MIPs. Instead, panels could consider focusing more on diagnostic comparisons of existing simulations. For example, the NORP CMIP6 bootcamp is focusing on the CMIP6 data analysis.*

3. RESEARCH FOCI/GC REPORTS

3.1 Eastern Boundary Upwelling Systems (Ryan Rykaczewski)

- Motivation, overarching questions, and timeline of the EBUS RF.
- Submitted 2 papers recently and is working on another one, as the final paper of the RF.
- EBUS conference in Lima this fall – two sessions organized by EBUS RF members.
- Small pelagic fish symposium in Lisbon organized this fall by EBUS RF members.
- Passing on knowledge within CLIVAR LHA: recommendations offered in the manuscript draft may have relevance to My Climate Risk, Digital Earths, and Explaining and Predicting Earth System Change.

Comments from the SSG

About the legacy of the EBUS, SSG suggested to contact Regina who is the co-chair of both My Climate Risk (MCR) and the Atlantic regional panel if EBUS wants to build the connection with the LHAs. MCR is planning to set up a hub for ocean climate risk. In addition, they can contact Shoshiro Minobe if EBUS wants to contact Explaining and Predicting Earth System Change LHA.

Questions

1. Do you have an active Paleocean / Paleoclimate component within EBUS RF?
 - The group members don't have the expertise on paleoclimate. But the Lisbon small pelagic fish symposium will put emphasis on the paleoclimate perspective, and the sedimentary record will be discussed then. Also the Lima EBUS Conference also has the paleoclimate session. Ryan is the chair of the session in Lisbon symposium on the paleo perspective, which will reconcile what we understand about upwelling dynamics from the paleo record with what we think we understand about upwelling dynamics from model projections.
2. Any focus on coastal Niño/Niña? In eastern boundary areas, where warming or extreme events occur, which have substantial impacts on marine ecosystems and people around the region. Is there any focus on such events, for example, Chilean Niño, Ningaloo Niño, etc.?
 - In the EBUS perspective manuscript, particularly in the Pacific systems there are sections that touch on the fact that the future of upwelling systems and their coastal ecosystem in upwelling regions largely depends upon the feature of El Niño and how El Niño affects the coastal regions. In the past, the group emphasized on the local force and changes in the local upwelling dynamics; now there is an increasing recognition that most of variability in the observed record is associated with El Niño, and El Niño affects/tele-communicates to the coastal area and California current at the subtropical area. The group has identified it as a persistent uncertainty, but don't have an answer to how the coastal Niño/Niña will affect the upwelling. Art Miller is a member of EBUS RF that may work on this. We identify this as persistence and uncertainty, but we do not know how El Niño impacts the coastal region.

3. It's good to see the renewed effort to get the perspective paper out; do you need anything from CLIVAR to help with this?
 - There has been some discussion of soliciting inputs on a few aspects and will discuss with the small group to see if they want to invite additional co-authors. There has been some discussion on having people with expertise in downscaling or high-res MIP, especially downscaling approaches in the EBUS, to join in. Now there is a candidate having the experience and EBUS will contact the people directly.
4. The report says that OSM 2022 was to be the last "official" activity of the EBUS RF, so the Lima conference is not officially an activity of the EBUS RF, is that correct? (Inga)
 - Yes, that is correct.

Action 46: *The EBUS RF to consider how to pass the legacy of the EBUS RF when the group sunsets, and encourages the group to contact Dr. Regina Rodrigues (regina.rodrigues@ufsc.br), for setting up a hub for ocean climate risk under My Climate Risk (MCR) LHA; and/or Dr. Shoshiro Minobe (minobe@sci.hokudai.ac.jp) for connection to the Explaining and Predicting Earth System Change (EPESC) LHA.*

3.2 Regional Sea Level Change and Coastal Impacts Grand Challenge (Robert Nicholls)

- Special Issue on 'Coastal Climate Services' in Frontiers in Marine Science, comprising 16 papers – based on a conference held at BGRM, Orleans
<https://www.frontiersin.org/research-topics/13632/climate-services-for-adaptation-to-sea-level-rise>.
- A high-end estimate of sea-level rise for practitioners – a community approach which is in review of Earth's Future.
- Assessment of subsidence for practitioners.
- Global survey of sea-level rise scenarios in practice (2021) – being developed for publication.
- Practitioner workshops on sea-level science and its use – being developed for publication and preparation for Sea Level 2022.
- Singapore Conference: Sea Level 2022, July 2022 (closure of the Grand Challenge).

Comments from the SSG

SSG suggested to consider the influence of internal interannual/decadal variability. The presence of these natural variations can change the estimates of "high-end" values.

There is a concern about the carbon neutrality of the meeting conference. The conference venue is using renewable electricity and making carbon offsets and has an online component, however, the SSG thought that the flights for the on-site participants can be made carbon neutral by buying carbon offsets. Robert agreed that that should be highlighted.

Also the SSG was concerned about the legacy of the Grand Challenge. The SSG suggested

the co-chairs to contact RIfS which connects the social science and user communities to show their experience on connecting with the user communities through grand challenge, to contact as well as the SLC and MCR. The organizing committee of the Sea Level Conference will invite them to attend the conference as a first step.

Questions

1. Are you only focusing on sea level trend or are you also considering the influence of internal interannual/decadal variability? The presence of these natural variations can change the estimates of "high-end" values
 - Part of the grand challenge has been looking at sea level forecasts over the decadal scales, which is particularly important. So that has been presented within the GC and we agree to make it a central focus.
2. Given the importance of the topic, what are the main recommendations from the group for follow up activities derived from the Grand Challenge? Maybe a "longer term" action group / RF?
 - Yes, there is a great need to continue the activities and we are exploring this. The online practitioner workshops and the upcoming SL conference in Singapore are trying to produce a community that facilitates the dialogue between scientists and practitioners, for scientists to understand how the decision was made, and then to leverage co-production of solutions. What we are going to achieve beyond the conference is to create a 'sister activity' — an organization or society that deliberately engages the scientists and practitioners. High-end sea level rise has attracted so many interests.
3. Are events like sea level rise and storm surges considered in the GC?
 - Yes. This is a broad field and the GC is trying to cover as much as it can. One of the co-chairs, Kathy McInnes focuses on waves and storm surges, and Kevin Horsburgh is leading on storm surge research in the UK. They will report during the conference.
4. Just to clarify: Appendix A of the report is blank, so presumably they are asking for the \$20k mentioned from somewhere other than CLIVAR SSG allocations?
 - The 20 K allocation comes directly from WCRP

Action 47: *The SL GC is recommended to reach out to the Regional Information for Society (RIfS) core project, as well as the WCRP lighthouse activities of Safe Landing Climates and My Climate Risk for passing the legacy of the grand challenge. It might be of value to invite them to attend the Sea Level Conference as a first step.*

3.3 Tropical Basin Interaction (Ingo Richter)

- Special Issue of CLIVAR *Exchanges* published (Jose, Ingo, Noel).
- Sessions on TBI at AGU 12/2021 (conveners: Yuko, Chunzai, Andrea, Ingo).
- Established four Working Groups (WGs): WG1 Coordinated GCM experiments, WG2 Theoretical approaches and ICMS, WG3 Observations, WG4 Paleo proxies.

- International workshop focusing on first results from Coordinated Experiments; possibly hosted by Noel in Norway in fall 2022.
- International workshop on interdecadal modulations of teleconnections to be held in Madrid in 2023 (proposal funded by Spanish government).
- JpGU session on tropical oceans (5/2022); co-chaired by Ingo.
- Timeline of the TBI RF.

Comments from the SSG

Regarding the capacity building, although TBI has the intention to organize a summer school, there is not a concrete plan about this. The SSG suggested to add some activities that are specifically for ECS and for people from the global south, and suggested TBI to increase the interaction with the global south in the upcoming workshop. For the cross-panel activities, SSG suggested TBI having discussions with TPDV and PRP ENSO Conceptual Models working group. For science issues, SSG suggested Ingo **to consider the cost of computer time and carbon footprint for doing the GCM experiments.**

Questions

1. Which kind of ideas do you have for coordinated GCM experiments? Are you thinking of pacemaker experiments, or are you also envisioning other strategies?
 - Most based on the pacemaker experiment but also include a mixture of initialized hindcasts with the pacemaker components. The original idea was to test the influence of the individual basins on the skills of seasonal predictions. The SST is restored in one basin in the so-called pacemaker hindcast, and then the initialized predictions are run in the other basins. There are three different tiers of them; tier three is similar to the CMIP outlines, and additional experiments will be conducted for tier three depending on the needs.
2. Did Atlantic Niño play a part in the latest Pacific La Niña. Have you tried to use the interbasin in the ENSO prediction?
 - That is an interesting topic to look into in more detail. I have not studied this specific 2021 event in detail yet, but together with Noel we will look into more and then study that in more detail. Will extend to a period to cover this particular Atlantic Niño once the experiment is running.
3. The cost (money, human resources, carbon footprint) of the TBI experiments is quite a challenge.
 - The experiments will take some computer time but there is not too much problem. The cost will depend on the individual setups. Tier one is split into two parts: the conventional hindcast experiment and the pacemaker hindcast experiment, people can focus on only one of them, and this will reduce some computer time.
4. Is the success of TBI dependent on having lots of groups participate in the coordinated experiments or if you only have one or two you will still be able to have a successful TBI?
 - In addition to the coordinated experiments, the TBI RF has the other three WGs. Of course, at least around 5 groups are needed for the successes & robustness &

systematic intercomparison of the TBI coordinated experiments. There are many individual models and protocols, but no such systematic intercomparisons to check the robustness.

Action 48: TBI RF to add capacity building for ECSs and include ECSs and experts from the Global South in the upcoming workshop and future activities.

Action 49: TBI RF is suggested to examine the impacts of Atlantic Nino on the Pacific La Nina, and the potential role of the equatorial Atlantic in ENSO seasonal prediction.

3.4 Discussion on Future RFs

- As the EBUS RF sunsetting, it is time to think of having another CLIVAR research focus.
- Usually there will be an open call sent to all CLIVAR groups to make proposals. In the case of TBI RF, 5 proposals were received. After the review of the SSG, the decision was made. The whole process will take about 6 months, and the decision is usually made by the end of the year so the RF can kick off at the beginning of the next year.

Discussions

1. How coordinated do we have to be with LHAs and other WCRP activities? (Gokhan Danabasoglu)
 - Should not duplicate what the LHAs are doing, can look for something that's important to CLIVAR and that the LHAs are ignoring. But not mandated to be tied up with the LHAs. LHAs are for 10 years. RFs are for 5 years. (Sonya Legg)
2. At the end of their cycles, how will the RFs and the Sea Level GC fall into other activities and have a legacy? Need to make sure that this point is included in the proposals. (Gokhan Danabasoglu)
 - There is a sea level working group within the safe landing climates LHA. A few existing members of the current Grand Challenge are a part of it. (Hindumathi Palanisamy)
 - Legacy of EBUS is the manuscript. Motivate EBUS research in the US. Connect MCR LHA. (Sonya Legg)
3. How many RFs are we looking for? Funding? (Mauricio Mata)
 - The main limitation on the amount of RFs is the ICPO staff. As the EBUS RF and Sea Level are completed, in principle, two new RFs can be supported by ICPO staff. 5000 CHF for each RF, funding is not an issue. (Jose Santos)
 - Looking for two new RFs, but this will depend on the quality of the proposals. (Sonya Legg)
4. Last time we got 5 proposals, and shall we particularly re-approach them? (Wenju Cai)
 - Yes, we should contact them. (Sonya Legg)

Action 50: ICPO to start revising and reviewing the RF guidelines and make a timetable. The whole process of open call to be completed by the end of 2022.

Action 51: ICPO to contact the people who have submitted a RF proposal during the last open call and ask them to resubmit if they are still interested.

4. OTHER ACTIVITIES

4.1 ICPO Report (Jose Santos)

Jose Santos, Executive Director of the ICPO, reported the activities conducted/coordinated/participated by ICPO in the past year.

- In 2021, the International CLIVAR Monsoon Office transformed into an independent International Monsoon Project Office reporting directly to the WCRP and WWRP, and the Monsoons Panel is jointly coordinated by ICPO and IMPO.
- Apart from organizing CLIVAR meetings and preparing publications, ICPO has also contributed a lot to the WCRP Implementation, including supporting its activities, contributing to LHA science plans, attending teleconferences, contributing to WCRP reports to partners and Newsletters, advertising WCRP activities, etc.
- ICPO was actively involved in the UN Ocean Decade, especially its Digital Twins of the Ocean Programme and Ocean Observing Co-design Programme.
- ICPO is in charge of the Qingdao hub of the SPARC 7th General Assembly to be organized in October this year, as a good example of coordination between two WCRP Core Projects.
- ICPO has made great effort in mobilizing resources for the upcoming activities, a large proportion of which is provided by US CLIVAR.
- Jose's main concern at the current time is to go back to China as soon as possible. FIO has provided great support during the past two years under the situation of global pandemic.

Questions and Comments

1. Incredible job, especially during the time of pandemic. (Sonya Legg)
2. Is the agreement with FIO extended? (Gokhan Danabasoglu)
 - The agreement is until 2024. See no problem in renewing it after that.
3. A lot of workshops/summer schools planned this summer. Is there going to be a logistical problem for organizing them too close together? (Sonya Legg)
 - It's really challenging, especially the date of CLIVAR-FIO Summer School overlaps with that of the CLIVAR-GOOS workshop. But ICPO will be able to manage through separating staff for different activities.
 - Sonya: Suggest to keep this in mind for next year to spread things out.

4.2 Discussion: CLIVAR Summer Schools/Cross panel workshops (Sonya Legg)

4.2.1 Summer schools

- Two schools planned this year: CLIVAR-FIO summer school on 14-20 August and the ENSO summer school at ICTP on 18-29 July.
- Future schools in mid-2024 at FIO and 2023 or 2025 at ICTP.
- Suggestion: hold an open call for proposals for summer schools this summer, and it would be better to make the summer schools more of a cross-panel effort.

Discussions

1. FIO and ICTP summer schools have extra fundings and the fundings are 100% guaranteed. Made open calls for summer schools previously. ICPO can draft the call and send it to the SSG for comments before publishing. (Jose Santos)
2. Should we decide on the time of the two summer schools now or later? (Mauricio Mata)
 - The agreement with FIO is to organize the school every two years, and this is the same for the ICTP summer school. Ideally the two schools should be organized in different years. (Sonya Legg)
 - To include the history of the arrangement in the open call. (Sonya Legg)
3. Is it FIO who comes up with the title of the summer school or CLIVAR? (Gokhan Danabasoglu)
 - CLIVAR decides the title. After the decision, CLIVAR proposes it to FIO. FIO has the right to veto, but that usually won't happen. Same for ICTP. (Jose Santos)

Action 52: ICPO to draft the Call for Summer School proposals by including the history of the arrangement for the two summer school series.

4.2.2 Cross panel workshops

- Three cross panel workshops this year.
- Suggestion: hold an annual open call for cross panel workshops every summer.

Discussions

1. OMDP is supposed to be involved in the CLIVAR-GOOS workshop, but no email was received about it. Is this workshop aiming to bring all the membership together? (Gokhan Danabasoglu)
 - This workshop is not a multi-panel meeting, by "cross panel" it means that it includes people from different panels. (Sonya Legg)
 - Enrique is representing OMDP in the organising committee of the CLIVAR-GOOS workshop. (Jing Li)

2. Should make a criterion for panels to have tangible outcomes when they propose workshops. (Gokhan Danabasoglu)
3. There are informal meetings between TBI RF members and panels, as a way to exchange ideas. (Ingo Richter)
 - Good way to establish links. No need to submit a proposal for this. (Sonya Legg)

4.3 3rd CLIVAR OSC

- Planning for 3rd CLIVAR OSC in 2024-2025?
- Steps: 1) agree on a year; 2) prepare one-page concept note; 3) contact CLIVAR community for host institution.

Discussions

1. FYI - US CLIVAR is celebrating its silver anniversary next year, when Gokhan will be chairing the SSC. Planning will start later this summer. (Mike Patterson)
2. Given that the WCRP OSC is in 2023, it might not be good to organize the CLIVAR OSC too close to it. Is it necessary to have the 3rd CLIVAR OSC, as a big conference can be very costly? (Gokhan Danabasoglu)
 - Qingdao conference was very successful, and it really focused on early career scientists, which benefits. That's one way to justify an in-person conference. Agree to have a break after the WCRP one and to think about how to differentiate from it. (Sonya Legg)
3. Biggest contribution of CLIVAR is its regional reach, involving representatives from so many countries, especially the global South. Maybe this is another point to justify a CLIVAR conference, combined with the focus on ECS. (Francois Engelbrecht)
 - WCRP is trying to include people from more countries, and it in many ways is learning from the experience of CLIVAR, especially with its structure of different regional panels. (Sonya Legg)
4. More realistic for 2025, allowing us to learn from the lessons of the WCRP OSC. Personally, I think South America is a good location, especially since the WCRP OSC is in Africa. (Sonya Legg)
 - I also agree that 2025 is a more suitable year. Our science is evolving quite fast and even if 2 years (from the WCRP OSC) seems a relative short period, lots of new stuff can show up. (Mauricio Mata)
5. The Pan-CLIVAR meeting was very successful, bringing all CLIVAR panels together. Maybe consider this format. (Gokhan Danabasoglu)
6. Will prepare a one-page concept note and share it with the SSG members. (Jose Santos)
7. The WCRP OSC is calling for science topics. Encourage CLIVAR and individual panels to input. (Sonya Legg)

- We also encourage side events at the OSC if CLIVAR panels are interested.
(Hindumathi Palanisamy)

Action 53: *ICPO to prepare a one-page concept note for the CLIVAR Open Science Conference and share it with the SSG.*

5. POST-MEETING SURVEY

A post-meeting survey was conducted right after the meeting, with 19 responses received in total. The survey includes questions asking attendance to the meeting and factors that prevented them from attending the meeting; their participation in the Q&A; their preference of the online platform; the useful aspects of the meeting and aspects that could have been improved; as well as their suggestions for future virtual meetings.

According to the survey, 68.5% participants attended more than half of the SSG-27, and the timezone (42%) and working and other commitments (26%) are two important factors that prevented people from attending the whole meeting. 94.7% of the participants were able to share their viewpoints through the Q&A chat. Participants preferred to use Zoom (57.9%) and GoToMeeting (26.3%) than other platforms (Webex, Google Meet, Microsoft Teams). Participants found in general that the CLIVAR SSG-27 was very useful, as it provided an overview of the updates as well as challenges and strategies of CLIVAR activities conducted by each panel/RF, and suggestions on further enhancement of the work were received from the attendees during the discussion session. Time zone issue is the main limitation of the virtual meetings, and it is difficult to resolve, and the demand for in-person meetings was raised. Also, there were also demands for more time for discussions, and may be in a distributed way after each session, rather than keep all the decision making to the end. In the future, it was suggested to lean more heavily on asynchronous format by making stronger use of the annual reports and pre-recorded presentation offline, and focusing on Q&A in the meeting. It was also suggested to enhance the discussions among panel/RF co-chairs on cross-panel activities and connections, the interaction with WCRP LHAs and other core projects, etc.

Detailed analysis of the survey can be referred to Appendix D.

APPENDIX A. Participants

CLIVAR SSG MEMBERS		
Name	Email	Affiliation
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APPENDIX B. Agenda

27th Session of the CLIVAR Scientific Steering Group.

1-5 April, 2022. Online

Agenda

(Addition of short breaks may result in daily sessions taking a little longer than the expected 4-h period)

Participants: CLIVAR SSG members, CLIVAR Panel/RF representatives, Observers					
Friday, April 1		Session		Presenter - Discussion lead	Time
Chair: Sonya Legg					
Start Time 12:00 UTC	1		Opening Session		
		1.1	Welcome and meeting objectives	Sonya Legg/W. Cai	10
		1.2	WCRP presentation	Hindumathi Kulaippan	20
		1.3	Current status of LHAs		
			• My climate Risk	Regina Rodrigues	15
			• Explaining & Predicting Earth System Change	Rowan Sutton	15
			• WCRP Academy	Angela Maharaj	15
			• Safe Landing Climates	Steven Sherwood	15
	• Digital Earth	Andrew Gettelman	15		
	Break				30
		1.4	Current status of new “Homes”		
			• Regional Information for Society	Sara C Pryor	15
			• Earth System Modelling and Observation capabilities	Catherine Senior	15

		1.5	Discussion on UNDecade	Martin Visbeck	20
		1.6	Discussion: Multi-panel workshop on observations	Weidong Yu	20
		1.7	US CLIVAR Report	Chidong Zhang	20
			General Discussion	Sonya Legg/W. Cai	30
Monday, April 4		Session		Presenter - Discussion lead	Time
Chair: Wenju Cai					
Start Time 10:00 UTC	2		Panel Reports		
		2.1	CLIVAR/IOC-GOOS Indian Ocean Region Panel	Juliet Hermes	20
		2.2	CLIVAR/CliC/SCAR Southern Ocean R. Panel	Torge Martin	20
		2.3	Pacific Region Panel	Shayne McGregor	20
		2.4	Atlantic Region Panel	Eleanor Frajka-Williams	20
		2.5	Climate Dynamics Panel	Noel Keenlyside	20
	Break				30
		2.6	Monsoons Panel	Suryachandra Anguluri	20
		2.7	Global Synthesis & Observations Panel	Peter Oke	20
		2.8	Ocean Model Development Panel	Baylor Fox-Kemper	20
		2.9	CLIVAR/CliC Northern Oceans Region Panel	Amy Solomon	20
		2.10	Discussion: cross-panel issues	Sonya/Cai	30
Tuesday, April 5		Session		Presenter – Discussion lead	Time
Chair: Sonya Legg					

Start time 20:00 UTC	3		Research Foci/GC Reports		
		3.1	Eastern Boundary Upwelling Systems	Ryan Rykaczewski	20
		3.2	Regional Sea Level Change and Coastal Impacts Grand Challenge	Robert Nicholls	20
		3.3	Tropical basin interaction	Ingo Richter	20
		3.4	Discussion on Future RFs	Sonya/Cai	20
	Break				30
	4		Other Activities		
		4.1	ICPO report	Jose Santos	20
		4.2	Discussion: CLIVAR Summer Schools/Cross panel workshops	Sonya/Cai	30
		4.3	3 rd CLIVAR OSC		20
		4.4	Closing of public part of SSG	Sonya Legg/W. Cai	5
	5		<i>In camera</i> – SSG and ICPO only		
			Review of 2022 Meeting proposals and budget	ICPO staff/SSG	20
			Any Other Business/Next SSG		10

APPENDIX C. Acronyms

AMOC	Atlantic Meridional Overturning Circulation
ANN	Artificial Neural Network
CMIP	Coupled Model Intercomparison Project
CMIP6	CMIP Phase 6
CRF	Climate Research Forum
DAO	National Aeronautics and Space Administration (NASA) Data Assimilation Office
DA-TT	Data Assimilation Task Team
DE	Digital Earth
DEI	Diversity, Equity, and Inclusion
DITTO	Digital Twins of the Ocean
ECS	Early Career Scientist
EPESC	Explaining and Predicting Earth System Change
GOOS	Global Ocean Observing System
IMPO	International Monsoon Project Office
IOOS	The U.S. Integrated Ocean Observing System
IPCC	Intergovernmental Panel on Climate Change
MCR	My Climate Risk
ML	Machine Learning
NH	Northern Hemisphere
OC	organizing committee
OOPC	Ocean Observations Physics and Climate Panel
OSC	Open Science Conference
OS-Eval TT	Observing System Evaluation
RFP	Regional Focal Point

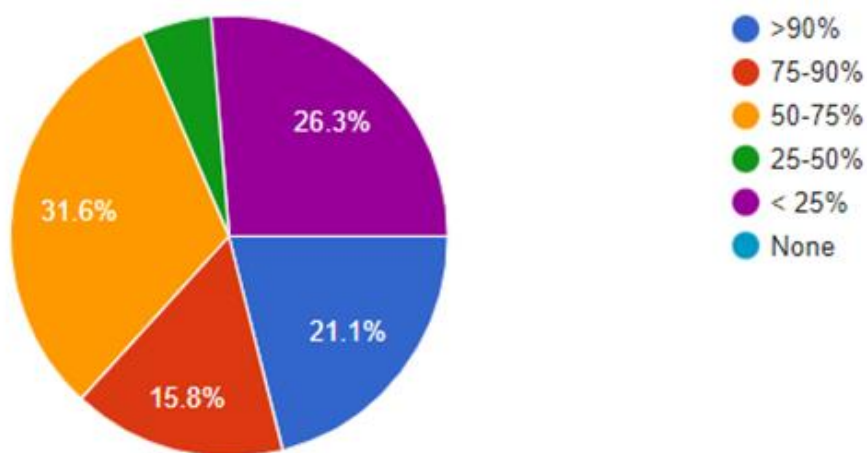
RIfS	Regional Information for Society
SH	Southern Hemisphere
SLC	Safe Landing Climates
SO	Southern Ocean
SOOS	Southern Ocean Observing System
SWOT	Surface Water and Ocean Topography satellite mission
TAOS	Tropical Atlantic Observing System
TPDV	tropical Pacific decadal variability
TT	Task Team
WG	working group
WGNE	Working Group on Numerical Experimentation (WCRP/WMO Research Board)

APPENDIX D. Summary of responses for SSG-27 Survey

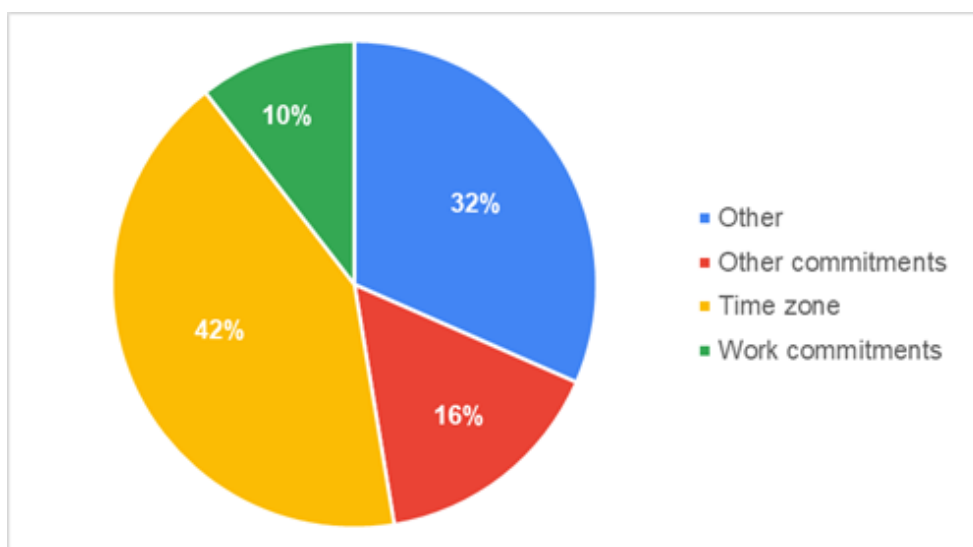
Summary of responses for SSG-27 Survey

19 responses received

1. What percentage of the meeting did you attend?



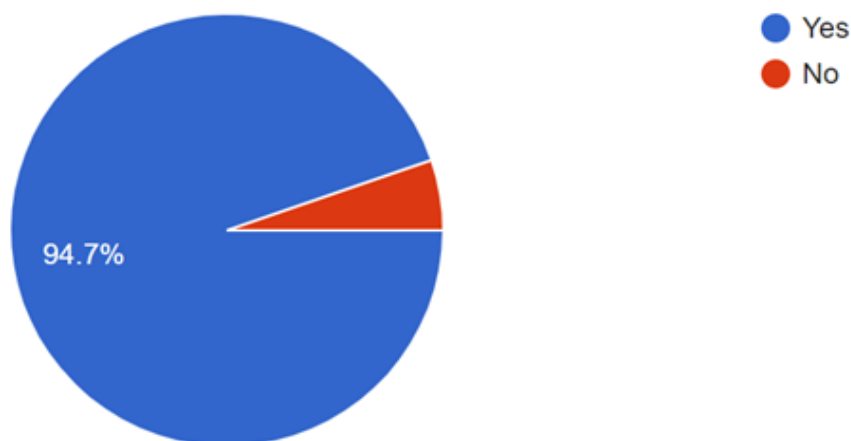
2. What factors prevented you from attending the whole meeting?



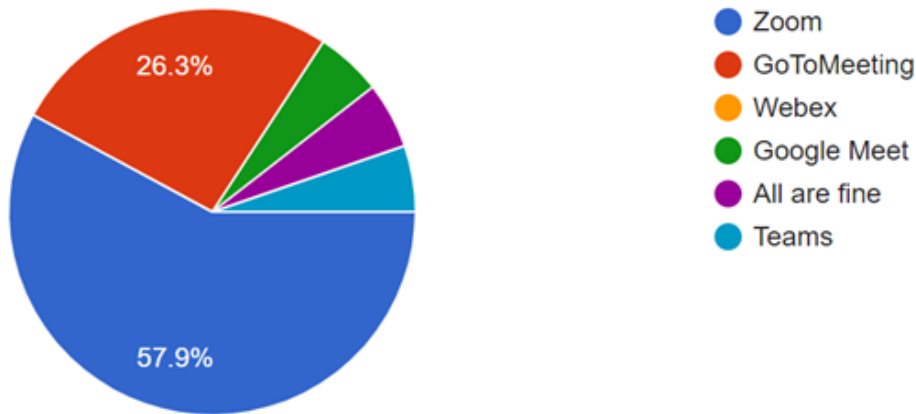
Details for “Other” include:

- Frankly, this meeting is too long. As many of the presentations are redundant with the annual reports, a much shorter (5min) Q&A would be appropriate, assuming the SSG actually reads the reports in preparation. There are also far too many non-CLIVAR talks from other WCRP efforts, diluting the effectiveness of how CLIVAR can interact with the wider community effectively.
- Time zone, work commitments, other commitments
- I attended the entire meeting (2 responses)
- Invited for 1 day
- none

3. Were you able to share your view points through Q&A, chat?



4. Which platform do you prefer and use more?



5. What aspects of the meeting did you find useful?

(1) General

- All parts that I attended were useful
- Well moderated and open for input from the group
- Presentation and discussion were both useful
- Updates form activities and resulting discussions
- Short reports from projects and interaction with PIs

(2) Knowing each group's activity

- The meeting gives an overview of the CLIVAR activities.
- It was good to hear about the challenges and strategies of other panels.
- It was good to know the updates on various panels and activities within CLIVAR
- Sharing the activities of other panels
- Knowing each group's activity.
- Hearing what the other panels had been doing and how they went about it.

(3) Discussion

- Time for discussion
- Good discussions throughout the meeting.
- Discussions with SSG members and panel co-chairs

- Time for discussions
- Interesting discussions
- (4) Feedback and suggestions from attendee
 - Feedback on my talk and relationships between CLIVAR and ESMO
 - Suggestions from attendees about enhancements to our work.
- (5) Other aspects
 - Recording

6. What aspects of the meeting could have been improved?

- (1) Time zones and meeting format
 - The main limitation of the virtual meetings is the time zones, a factor that reduces the number of participating members and limits discussion, but this issue is hard to improve.
 - The time zone issue is difficult to resolve. In person meetings might be more effective, when feasible.
 - I missed the last discussions (couldn't keep awake). Maybe "distributing" the discussions after each session would be good, so that we don't keep the decision making just to the end?
 - Nothing really but I would say that not many participants were used to GoTo platform (not a criticism against the organizers but just a point I observed) Having recordings available after the sessions
 - It was a good virtual meeting. Having said that, being virtual will in my view always be limited
 - Would be nice to have a face-to-face meeting
- (2) More time for discussion
 - More time discussion scientific gaps and priorities
 - More time to discuss cross-panel activities.
 - more time for Q&A
 - Some of the feedback was a little harsh I thought.
- (3) Others
 - More complete participation from full SSG and co-chairs through the whole meeting
 - Shorter.

- It worked fine for me
- None (4 responses)
- See below

7. What suggestions do you have for future virtual CLIVAR meetings?

(1) Time zones and meeting arrangement

- Time zone permitting, a broader participation of all panels and RFs' co-chairs, and enhanced discussion of joint activities would be very constructive.
- the spread of time zones continues to be a challenge, maybe having two parallel sessions for certain topics?
- Maybe more sessions but shorter? It is somewhat difficult to keep the same level of concentration for four hours.
- I would lean much more heavily on asynchronous aspects, e.g., stronger use of distributed annual reports and prerecorded panel presentations, focusing narrowly only on Q&A and discussion aspects in shared time. It is not the case that the SSG meeting could be replaced with an email, but 75% of it could. 12 hours of zoom contact annually is probably 6x more than is effective, and the fact that travel costs have been eliminated makes this time even more valuable, not less. Every week I'm asked to join virtual meetings to "check in", only about 20% of the time are the effectively run.
- We could limit the presentations (panels, etc) for two days and on the third day do Breakout groups to discuss cross-panel activities and LHA interaction
- Avoid virtual meetings when possible. They work well for groups that are well acquainted, but this is a rather far flung, multidisciplinary group. Real interaction has its benefits, and I hope other ways could be found to offset the carbon footprint.
- Virtual is fine for SSG but nothing really beats in-person
- As soon as it becomes possible, return to face-to-face meetings.
- Hope not to have virtual meeting.

(2) Meeting content

- would have been good to invite other Core Projects, even if as observers (understand that timing meant they wouldn't have been able to present)
- Discussions on different topics led by different SSG members/co-chairs
- Discussion among the panel co-chairs regarding how to enhance connection
- It would have been good to have other Core Project Directors/Co-Chairs (not only the two new CPs) invited for cross CP interactions with CLIVAR.
- If there is one particular area that is a focus for the SSG perhaps this can be identified

and communicated to the cochairs well in advance (the year prior), so they have time to effectively incorporate it panel plans. Also, some guidance is always welcomed.

(3) Others

- well run meeting ... also the daily reminders were helpful
- I thought that it is excellent already
- This worked well
- None (2 responses)

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