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WCRP World Climate Research Programme

Report of the 26th Session of the CLIVAR Scientific Steering Group

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EXECUTIVE SUMMARY

The 26th Session of the CLIVAR Scientific Steering Group (SSG) was held virtually during 8 -12 March, 2021. This is the first CLIVAR SSG session that was organized completely online.

This session brought together over 50 scientists from around the world including CLIVAR SSG members; co-chairs and members of CLIVAR panels, Research Foci (RF) and WCRP Grand Challenge (GC); as well as invited representatives from sponsors, partner projects and organizations including US CLIVAR, WCRP, OOPC, IOC-UNESCO, CliC, CORDEX, SPARC, GEWEX and IMBeR. There were also invited speakers from the five WCRP Lighthouse Activities and the two new "Core Projects/Homes" that are being proposed.

To accommodate the online mode and different time zones, the session was split into four days, with participants gathering for approximately three hours each day. The first day of the meeting focused on the "New WCRP", including its new "Core Projects", Lighthouse Activities and Regional Consultations. Activities and plans from all CLIVAR panels and RF/GC were reported by panel/RF/GC co-chairs on the second and third days. The CLIVAR leadership also had an excellent discussion on cross-panel activities on Day 3. Finally, on the last day, activities of partner projects and potential collaborations were reported by their representatives.

Comments and suggestions to panel/RF/GC business were given by the SSG and will be sorted out and distributed to each panel/RF/GC soon by the ICPO, which cover suggestions on future work and interaction with other groups or projects, decisions and feedbacks on membership proposal and budget request for 2021.

The presentations for SSG-26 are available online.

Table of Actions

All groups	1. To continue to think about connections with other panels/LHAs/partner projects, and to have more in-depth discussion with particular people where strong connections exist, or where stronger connections would be beneficial. 2. To plan on designating ECS as panel members for next year, also to strive for gender balance and geographical representation, as well as providing needed scientific expertise. 3. To think about if there's a need for inputs from other groups, and to put together and form a draft proposal for the mechanism for workshops and cross-panel activities, and circulate to SSG and panel co-chairs for inputs.
IORP	1. To revise the term 'Early Career Scientist' instead of 'Young Scientist' in the annual report.
SORP	1. To have a virtual panel meeting in this summer or fall, if the COVID-19 situation does not get well.

	2. Suggested to organize the NORP/SORP joint workshop virtually and independently. 3. Suggested to take a look at the issue of SO interaction with ice-sheets.
PRP	1. Suggested to include an extra-tropical perspective. 2. As the US CLIVAR Ocean Water Isotope Working Group is sunsetting and it is thinking about the next step, PRP should make contact with other potential users or groups that do the same work, to maintain connection to and benefit from interaction with this area of expertise. 3. The ENSO Summer School is recommended to be held virtually as an alternative if needed, as there are plenty of new collaborative software available, and it is not good for ECSs if everything is cancelled or postponed continually. Think about the name of 'summer school' carefully considering the Austral season.
ARP	1. Regarding the macro turbulence summer school, the SSG suggests to have some interaction or coordination with OMDP of which some members are interested in mesoscale eddy parameterization. 2. To follow the example of the PICES link with the PRP and consider expanding collaboration with ICES, which has a lot of work in Europe related to biogeochemistry and climate prediction related to marine ecosystems.
NORP	1. To consider including biogeochemical interactions by connecting with the Conservation of Arctic Flora and Fauna (CAFF), which is the biodiversity working group of the Arctic Council. 2. To organize the NORP/SORP jointly workshop virtually and independently. 3. To interact with OMDP for the NORP Summer school (specifically to bring in their expertise related to bias in CMIP simulations). 4. To share the NORP PPT with Paquita, who would like to share some slides with ARP at their next online meeting. 5. To engage with the Arctic Regional Climate Centre Network currently in demonstration phase under the WMO umbrella.
MP	1. To interact with IORP and other regional panels for defining the observational needs for Monsoons. 2. To identify which publications are driven by the panel/regional WGs and which are associated with the members' day job due to the diversity of work being coordinated by the MP.

	3. To think about the Panel's added value to the members, for example, synthesis papers/products.
GSOP	1. To make a virtual panel meeting in the northern hemisphere fall. 2. Steven to contact Susann or other people in the new core project on 'Earth System Modelling and Data Capabilities' to discuss where GSOP might fit for this WCRP new core project.
OMDP	1. To find someone related to the JRA55-do from Japan to replace Tsujino and Kumoro's role. 2. To reach out to the co-chairs of ARP and NORP about the OMDP's new project on model bias. 3. To figure out the boundaries of time scales for the OMDP research in the following OMDP virtual meeting. 4. To consider ocean data assimilation in initialization for seasonal and decadal prediction.
CDP	1. Shoshiro to report the summary of Hotspot2 workshop on CLIVAR Exchanges. 2. To reach out ARP and NORP about the workshop on North Atlantic-Arctic Sector predictability, to benefit from their regional expertise and enhance cross-panel interaction.
EBUS	1. To include the EBUS' response to greenhouse warming in the EBUS perspective paper (particularly its impact on the cloud). Paquita, Ryan and Alban to have a telecon on this before the general meeting of the group. 2. To discuss its sunset plan during the next group meeting and to consider what will happen to the activities of the group after its sunset. Connections with the developing Lighthouse Activities, or with specific CLIVAR panels may help in this regard.
SL GC	1. To considers seriously how to continue the support to the focus and research effort that are currently being governed by the SL GC, as it will sunset in one year. 2. To ensure the work of the SL GC finds a home in the new WCRP structure (i.e., CLIVAR, LHAs or elsewhere).
TBI	1. Suggested to explore teleconnection impacts outside the Pacific, and perhaps outside the tropics, from the experiments that the panel is carrying out. 2. To share the outcomes from the TBI workshop on what the RF is going to achieve in the paleo perspective to Masa Kageyama, who offers help to

	build stronger links with both the paleo climate modelling and reconstruction community.
CLIVAR Summer School	1. To regulate the time of the summer schools so that people won't be too busy participating in all courses in one year when international travel is allowed.
Multi-panel Workshop on Observations	1. The organizing committee of the multi-panel workshop to have a telecon soon to discuss the contingency plan as well as the funding requirement and possible funding sources.
Cross-panel activities	1. The SSG to come up with a draft proposal for the cross-panel connection based on the SSG-26 discussion and circulate it to all participants.

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 (see Appendix A), presented the detailed agenda (included in Appendix B), and explained the meeting objectives:

A. Cross-CLIVAR focus

- Facilitate communication of progress and plans between CLIVAR panels/RFs/GC
- Review progress and plans of CLIVAR panels/RFs/GC
- Enhance coordination and links between CLIVAR panels/RFs/GC: e.g., cross-cutting activities

B. Connecting CLIVAR with new WCRP activities

- Communication between CLIVAR and new Lighthouse Activities
- Communication between CLIVAR and regional Climate Research Forums
- Communication between CLIVAR and existing core projects and new "Core Projects/homes"

Question: How can CLIVAR optimize activities within this new structure?

Jose Santos, Executive Director of the International CLIVAR Project Office, reviewed the contributions from Annalisa Bracco, former co-chair and member of the CLIVAR SSG, and expressed our thanks to her as she rotated off following the meeting.

1.2 WCRP presentation (Helen Cleugh)

Helen Cleugh, vice chair of the WCRP Joint Scientific Committee (JSC), gave a presentation on the WCRP, starting with an overview of women researchers in the WCRP and the emphasis of achieving gender, geographical, age and stage of career balance among the community.

The first part of the presentation was about the progress on rolling out the "new WCRP": Lighthouse Activities, new Core Projects ("homes") and supporting arrangements. In order to better implement its new Strategic Plan and answer the high-level questions, the WCRP is under re-structuring and has added five Lighthouse Activities (LHA) and two proposed new "Core Projects". Helen also outlined the timeline of the soft transition to the new WCRP, the arrangements for 2021, as well as the current status of the LHAs. In the second and third parts, she highlighted the cross-organizational collaborations and the plans for 2021 and beyond respectively. Lastly, the fourth part brought was devoted to discussion on implications for CLIVAR.

Questions and Comments:

1. Regarding the status of the WCRP Earth System Modelling and Observational Capabilities new core project, what is the plan and timeline? What is the future of the Ocean Model Development Panel within CLIVAR? (Gokhan Danabasoglu)

- Scientists involved in the new core projects are starting to work on the plan and timeline. It is important for people to know what is going on. However, so far there's not much to share, so please be patient. We will keep you informed as best as we can.

- Concerning the second question, it is worth discussing. It's important for CLIVAR to be thinking about how they would like to interact with the new core project.

2. Some of the LHAs seem to require expertise from outside the traditional WCRP community. Is there a plan for how we might be entraining these people into WCRP to help us with the LHAs? (Mat Collins)

- Our intention is that the LHAs could engage with those skill sets through our partner organizations to bring in their expertise. Figuring out how to do that is a work in progress, but we know some of the groups that we can reach out to, i.e., the SRI conference this year is maybe one way of starting to identify some of that expertise.

3. How is the WCRP engaging the development of WMO Resolution 42 on Data Sharing (unifying met-hydro-climate resolutions) to be finalized for adoption at 2021 Congress later this year? Free, open, unrestricted observational data sharing remains foundational to the WCRP science enterprise. (Mike Patterson)

- The point of open access has been fundamental to the WCRP.

- It's good to highlight this point. WCRP has a data policy that feeds into the WMO data conference, which means WCRP fed into this Resolution from the beginning.

4. What mechanisms are there for the sunsetting Grand challenges (e.g., sea level rise) to hand over the lessons learned, connections made etc., to the relevant LHAs? (Sonya Legg)

- The Grand Challenge on Sea Level Rise has achieved its goals. That is something that needs to be acknowledged and built on within CLIVAR. We have a meeting next year when the group is going to discuss that. There should be a mechanism. (Robert Nicholls)

5. What is the difference between some of the LHAs and the new "Core Projects/homes"? i.e., the Digital Earth LHA and the WCRP Earth System Modelling and Observational Capabilities new project. (Magdalena Balmaseda)

- The new core project is where the expertise comes together to strengthen the science and technology that we need to develop. While the Digital Earth is narrower on research topic, and brings expertise from not just this core project, but also from other ones like GEWEX and CLIVAR. The nature of their connection needs to be worked through. We see LHAs as being activities that will have a timeline for delivery over a certain period of time while the core projects are where the community comes together to build their expertise and develop capabilities.

- The LHAs are specific and focus on particular issues or activities while the new Core Projects/Homes are broader and contain a wider breadth of expertise. But yes, we would expect to see connections between the new Core Projects/homes and LHAs.

6. What is the relationship between the WCRP and the Future Earth? I don't see much interaction between their national committees. Do you have any plan to promote the connections at the national level? (Dake Chen)

- Most of the engagement between the WCRP and the Future Earth is at the international level. We are also connecting through the projects underneath the Future Earth. Our current focus is on some joint activities that the two organizations can work together to bring expertise.

1.3 Discussion on Regional Consultations (Helen Cleugh)

In this presentation, Helen gave an overview of the WCRP regional consultations, including a brief recap of the Climate Research Forums (CRF) and a review of the current status of the consultations. The WCRP has identified Regional Focal Points (RFPs) for eight sub-regions among the globe who are working with JSC and WCRP Secretariat to organize and deliver the CRFs. The first forum of the Oceania sub-region was held on 10th February 2021. Discussions on the relationship between core projects and regional consultations were also presented.

Questions and Comments:

1. Is there a mechanism to formalize the process of RFPs reporting back to core-projects? (Sonya Legg)

- At the moment we have only organized one forum. What we did is to pull together a report of the key messages that came out of the forum. Let's discuss and see whether it's more effective that the regional representative comes directly to the core project or the WCRP leadership team provides the report to the core project office and/or SSG.

2. The whole activity of the CRF is very top-down driven, where is the "real" consultations in terms of co-production with local regional groups, given that it's very difficult to establish local networks into the regions? Where is the usage of existing networks that are already doing this all the time? What do the objectives of the Regional Consultations really mean? What do you expect these things to do for the WCRP? (Aurel Moise)

- I'd like to differentiate between research and coordination. These Regional Consultations are like a mechanism for engaging and providing broader information about the WCRP to researchers and/or research agencies in nations around the world, especially in developing regions where they might not have heard about the WCRP. They are complementary activities for the core projects. The regional Climate Research Forums are a platform to share information.

- It is true that the first round of the Forums is more one-way than two-way. There's quite a bit talking from us, but not enough feedback from the people we're talking to. That is something the local organizing teams and myself are discussing, about how we can do better on that.

- We have the WCRP Secretariat sitting in Geneva as part of the WMO, enabling us to know some of the work that has already been done by the WMO. It's also important that some of the WCRP core activities like CORDEX are doing a lot of important work in some of the regions and the WCRP is connected to them.

- I totally agree. The Monsoons Panel within CLIVAR has done a great job on that and has been involved in some of the activities. (Aurel Moise)

- It's important that it's not just science, but also to make sure that it's real. In some of the regions, people don't really know what the WCRP is. The CRFs are an important way to let people know more information about the WCRP, which also serves as a way to strengthen our engagement and improve diversity.

3. During the Regional Consultation process, what are the interactions between the regional expertise and the corresponding groups in core projects? (M. Ravichandran)

- Good question. Because we're saying region more about where the researchers are, perhaps rather than research challenges that have got a regional dimension to them. I acknowledge that it's important that we connect back to core projects like CLIVAR.

1.4 WCRP Lighthouse Activities

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

1.4.1 My climate Risk (Regina Rodrigues)

Regina Rodrigues, co-chair, outlined the vision, goal and purpose of this Lighthouse Activity, the challenges they are facing, and proposed solutions. 'My Climate Risk' is designed to develop a mainstream 'bottom-up' approach to regional climate risk, which starts from the decision context (and the decision scale) and enables relevant climate information to be brought into that context. Whilst any application of the framework will inevitably be specific and tailored to local concerns, the framework itself will be generic, hence flexible and applicable across a number of region types and intended to become a much-needed scientific support for the development of climate services (Labs). Regina also brought forward several questions for discussion, especially on how CLIVAR can contribute to regional climate risk assessment.

1.4.2 Explaining and predicting Earth System Change (Shoshiro Minobe)

This presentation started with two questions to CLIVAR: In what areas would CLIVAR like to work with our LHA? Are there ideas for specific mechanisms to enable collaboration on particular topics? Shoshiro then detailed the overarching objective of this group as well as questions/tasks to be addressed by sub-groups for each topic. Their activities will be on global and regional scales, with a focus on multi-annual to decadal timescales. More emphasis will be on attribution.

Questions and Comments:

1. Why is the focus on multi-annual to decadal time scales, not seasonal? Monitoring and observing the ocean have been carried out for decades, for seasonal prediction. We do have multiple ocean reanalysis products. We have already been doing regional and seasonal forecasts. But it's more difficult to do it on decadal timescale (Magdalena Balmaseda)

- Seasonal prediction is already a topic conducted within the WCRP while the multi-annual to decadal is still a new area.

1.4.3 WCRP Academy (Angela Maharaj)

This presentation stressed the background of the establishment of the LHA, including the urgent need for climate science training and overcoming some barriers. Based on this situation, the group decided that it would serve more as a "marketplace" for climate science training, which would develop an annual "stock take" of what is needed and where it is needed before the work plan and resource requirements were illustrated. Its first stock-take is scheduled to happen between May and August 2021.

Questions and Comments:

1. How will you distribute the survey? There's a wealth of online lectures available already. It would be good to contact early career groups, such as APECS (https://www.apecs.is). (Torge Martin)

- We are starting to talk to people about how we might be able to reach the broader network. At the moment, we're open to ideas. Helen mentions the CRFs, and we'd like to use avenues to advertisement and survey. This might get the attention of people in regions that we don't necessarily have access to. There are also networks such as the Universities Climate Alliance, and YESS.

1.4.4 Safe Landing Climates (Kevin Reed)

Kevin Reed, representative from CLIVAR to the 'Safe Landing Climates' LHA, outlined the scope, goals, potential topics and future plans of this group. There're so far 6 topics identified. This group also plans to Identify opportunities for synergy with other LHAs, particularly 'My Climate Risk'.

Questions and Comments:

1. How about Urban Heat Islands (UHI) as a topic? UHIs would also be highly relevant for 'My Climate Risk'. I think they are multiple overlaps between these LHAs. (Mat Collins)

- We have talked about that. I will bring it back to the group.

1.4.5 Digital Earth (Aneesh Subramanian)

This presentation gave us an overview of the 'Digital Earth', including its background, objectives and scope. According to the proposal and discussions, this group will be more of a framework than an implementation, and will be developed not only in global scales, but also regional and local level.

General questions and Comments to LHAs

1. All the LHAs are struggling to cope with their focus. The main work of the activities is listed regardless if there's a LHA or not. I'm struggling to understand the added value of the LHAs? Are they supposed to be leading things, synthesizing things, coordinating things? (Gokhan Danabasoglu)

- For the Digital Earth, it's still early stage for us, there have only been two telecons. We see this as an activity that will go on for the next decade and are considering making the program defining a framework so that other communities globally can use the same framework to develop their research. But we're still working on defining a goal. (Aneesh Subramanian)

- We had the same kind of question at the beginning. We have submitted a session for sustainability research innovation progress and we have four round table discussions in which we invited people from outside the WCRP. And the speakers and their institutions may help the LH to develop our goals. We're also planning to engage people from for example the Sea Level Grand Challenge. (Regina Rodrigues)

- Within the "WCRP Academy", the initial outline was much broader and the team has narrowed that down to provide focus around training of future climate scientists. We try to focus a bit more. I think the 'WCRP Academy' is a little bit different from the other LHAs; it essentially tries to serve most of the WCRP and LHAs in trying to help provide training and connect trainers. We also want to address equity. This is our focus, and based on consultations; I think we should be able to narrow that down more in terms of what kind of training the LHA is expected to badge, endorse and deliver. (Angela Maharaj)

- I think what Gokhan actually means is what is the scope of LHAs, what do we see the role of the LHAs in the future, to push forward the activity of the WCRP. For example, there're already WCRP summer schools, and there're trainings going on. This is a good question that Gokhan asks. I don't have the answer to it right now. (Kevin Reed)

- We're struggling. This is very important. There're already some existing activities. I think with the LHAs, we can better coordinate as far as we can. (Shoshiro Minobe)

1. The LHAs really need to bring out what they are doing that gives added value. The LHAs need to think about what they're doing that can't be done by other mechanisms. That should be key when you think about what you focus on. Any quick comment on that? (Sonya Legg)

- I agree. I think one of the ideas is that the LHAs are meant to be ambitious. With respect to the 'WCRP Academy', the key thing is whether the existing training needs a WCRP badge for a broader global community to see that's something that's endorsed and worth doing. Another thing is that it's meant to be forward-looking. The Academy needs to figure out what new training that people need, what skills future climate scientists need to be equipped with. This may be the point of added-value. (Angela Maharaj)

- I agree with Sonya. I think at least from the perspective of "Digital Earth", there's room for coordination across different communities both regionally and globally. Our LHA will play a key role in coordinating. I don't see other groups except the WCRP doing this kind of work. (Aneesh Subramanian)

3. Can you say something about how you are going to include people from regions of the world that are not currently included in your team? (Sonya Legg)

- We don't have a defined process but we have started creating a contact list to consult as broad as we can. We're interested in trying to include people from as many diverse groups within the community as possible. We have been reaching out to these communities. One issue is that not everybody has time. For example, there're usually one or two people that everybody goes to in each region and those people often end up completely saturated with requests. We're trying to provide a way in which people can be part of the team so that we can at least consult with them and get their feedback. I think there really need to be different models for different people. (Angela Maharaj)

- We have started to bring in some people from Africa, but in addition I think it's good to have some virtual workshops in which we can focus on specific regions that we're interested in bringing to the discussion. (Kevin Reed)

4. What are the gaps that WCRP can contribute to with expertise across the activities? This would help focus on some key issues. For example, for the 'WCRP Academy', there's so much existing work in regions. Whether is it possible to get a view of the things that are going on? I think there should be a narrowing-down of where WCRP can have the biggest impact rather than encompassing all. (Aurel Moise)

- We want to do the Labs that focus on some subjects because although we know there're a lot of gaps, we can't provide them all. The most important thing is putting together what has already been done and what is not foreseen to generate science itself, add more cross-cutting activities, to get expertise and use more trans-discipline area. (Regina Rodrigues)

5. Are there any thoughts of bringing in some part of the Grand Challenge on Seal Level? (Robert Nicholls)

- Sea Level Rise is a big part of the discussion we are having in Safe Landing Climate. We're talking about building on the GC metric and pathway we could use to inform activities of the LHA. (Kevin Reed)

- We're having a meeting this year, which could be linked with. We see that conference as a transition for the end of the GC, so it would be good to embrace the process as part of the transition. We can talk more after. (Robert Nicholls)

- I think Sea Level Rise is very interesting for EPESC. (Shoshiro Minobe)

1.5 CLIVAR Linkages with new "Core Projects/Homes"

In this session, representatives from the proposed two new "Core Projects/Homes" gave a presentation about their projects respectively.

1.5.1 Regional Information for Society. (Silvina Solman)

This presentation gave an overview of the RifS, with a focus on its goals and outcomes, its relationship within and outside the WCRP, its structure, resources, as well as the timeline and

roadmap. The structure of the project is still under discussion, but there will be four Building Blocks (BBs) in its initial blueprint, including BB1 Regional Climate Science, BB2 Global Information for Regions, BB3 Prediction and BB4 Dialogue with Society.

Questions and Comments:

1. My suggestion is to cross check thoroughly with WMO to make sure they are aligned, make sure they come in so they can understand what they are really doing because they have a long year history of experience in the area and they have the regional network. I really encourage you to engage the WMO to be part of this. Otherwise, this may fail. (Aurel Moise)

2. It seems that the BB about predicting climate has a lot of overlap with things already have been done within the WCRP, whereas the Dialogue with Society BB is something that we really need a new "Core Project/home" to bring in new expertise. Have you thought about rebalancing your emphasis to emphasize the societal connecting part rather than predicting the climate part which has been covered in many other places? (Sonya Legg)

- The connection with society is going to be organized within the BB4, but what I say is we need all these processes and challenges on board. They will run in their own way, but we try to meet everybody to work together to distill the information for society, which will include social scientists as well.

1.5.2 Earth System Modelling and Observation Capabilities. (Susann Tegtmeier)

This presentation started with the current situation of model, data and observations within the WCRP family. There're a lot of relevant groups and within them there are overlaps. The presentation then went into the goals and outcomes of this project, its potential structure, and the timeline and roadmap. The challenges that this project faces were also discussed.

Questions and Comments:

1. We don't see any role for OMDP or GSOP listed. We would very much like OMDP and GSOP to be represented in the start of the formation of the new Core Project". (Sonya Legg & Gokhan Danabasoglu)

- Sure, we would like that too. We'd like to have people in the modeling and data council, and we already have the CLIVAR OMDP represented.

2. This looks like a huge new Core Project! What is the idea to coordinate across all of these groups? I see question marks after some of the groups, does it mean that it's not sure whether they are going to be there or you're still planning to talk to them? (Aurel Moise)

- The goal is not to merge everything but to make sure that these groups have the right level of interaction and collaboration and we share information across the groups. At some point maybe groups will be merged, but the groups that work well will continue to exist. The idea is to make sure that we don't have overlap.

2. I completely agree with you on that. But for example, who's going to do CMIP7 in the future? Will it be within or outside the "Core Project"? (Aurel Moise)

- CMIP has always been seen as a working group on coupled model development. This

working group will be part of the new Core Project/home. CMIP itself will also have an international project office. That's why CMIP has a question mark on my side. The question mark is not whether they are coming in, but how they are coming in

4. The rationale for having a modelling & observation Core Project/home is clearer to me: to provide a uniform umbrella for observations/modelling across domains, much needed. The role of this new Core Project/home is to coordinate infrastructure/best practices, I understand. I also understand that the research activities will be left to the individual panels and working groups. Can you confirm? (Magdalena Balmaseda)

- This depends on individual groups. Some form a project and will therefore interact with the new Core Project/home. Some groups are part of other projects/councils, but others will be a part of the Core Project/home.

5. Even though CMIP and its panel will be part of this new Core Project/home, they will have their own independent project office, which is in addition to the model data office, is that correct? They have the authority over the CMIP project office? (Gokhan Danabasoglu)

- I can't answer this question right now. This is the discussion we still need to have.

2. Panel Reports

The second day of the meeting included reports from the nine panels. Each panel reported their activities during the past year and future plans. The following are common issues for most panels:

Early Career Scientist (ECS)

The SSG suggested all panels should plan on designating Early Career Scientists as panel members for next year. Panel nominations should also strive for gender balance and geographical representation, as well as providing needed scientific expertise.

Nearly all panels have indicated the importance of recruiting ECS as new panel members. However, people are still confused about the definition of ECS. For example, the standard definition from US CLIVAR is seven years of obtaining their PhD or equivalent degree (same as YESS), some thought it should be ten years from PhD, WCRP doesn't have an 'official' definition. Sonya pointed out that the definition of ECS is not monolithic for different organizations/regions, it should be flexible and depend on the individual.

Another problem emerging along with the designating ECS is the funding for attending meetings. In the current situation with the popularity of virtual meetings, it's convenient for ECS to attend the workshop/conferences/panel meeting. But they need to be supported in their careers and this includes travel, as well as actively involved in panel activities. Face-to-face (f2f) meetings are important and sometimes can't be replaced by virtual meeting, we can't let the ECS only attend only virtual meetings when their career is starting. Thus, there should be a priority for the ECS to get the travel funding in the future. There should be f2f meetings in the future, but these should be meetings with a high value for ECS.

Regarding how to organize the ECS, the Working Groups established within the Pacific Region Panel (PRP) can be a good way to entrain ECS. The Southern Ocean Region Panel (SORP) has the national representatives, it is very useful for early career research; they were asked to write the summaries of the national activities including annual activities and breakthroughs as well as future plans in the Southern Ocean. Inga and Torge (SORP cochairs) could email people who want to know more details.

Relation with the WCRP Light House Activities

The head of World Climate Research Division, WMO & Head of the WCRP Secretariat, Mike Sparrow said it's really encouraging to see the panels thinking already about how they might link into the LHAs. Though it is important for all CLIVAR panels/RFs to connect with the LHAs, the SSG pointed out that the scientific scope of the LHAs is still being defined, so the domain specific work of CLIVAR must continue.

Impact of COVID-19

The panels pointed out that COVID-19 has impeded the progress of science and activities. Nearly all of the in-person workshops/meetings/conferences were postponed or cancelled. Impacted by the control or measurements of the epidemic such as locking down of some region, the field observation was heavily hindered. It was suggested that CLIVAR take a survey on what might be lost due to the influence of the COVID-19, in order to keep the pressure on the funding agencies to keep the observations going, otherwise we might lose a large amount of data. while some communities have done this. Within CLIVAR, GSOP is looking at this. The partners, GOOS, SCAR, YOPP-SH, GOOS have worked with AtlantOs specifically to look at COVID impact and approached IORP to see if they can also support this for IndOOS.

Exploring virtual activities

The SSG co-chairs encourage the panels and RFs to explore virtual activities in the current situation, not only because of COVID-19, but also for lower carbon footprint. Sonya said that each panel should consider organizing virtual panel meetings this year. In the future, panel business is encouraged to be discussed online. There will be the f2f meetings for scientific questions, but that may be better for cross panel activities. People agree with Sonya and others about exploring virtual activities, even such things as summer schools. Plenty of new collaborative software are coming online. But we need to reconceive what we mean by "summer school". The TBI online workshop is a great success, OMDP has used asynchronous presentations to great success, these could provide experience for future online activities.

Cross panel activities and collaboration with partners

Panel/RF co-chairs should continue to think about connections with other panels/LHAs/partner projects, and to have more in-depth discussion with particular people where strong connections 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.

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

The IORP co-chair reported the updated membership. She pointed out that the panel will need more regional partnership and representation, and they have been working on this. She also recommended having an ECS in every panel. The IndOOS-2 has got great achievement in the past year and the work is moving forward: they synthesized the IndOOS-2 report as an article and published it (BAMS), published a CLIVAR Exchanges special issue on IndOOS-2, and collaborated with the IndOOS Resource Forum (IRF) for implementing IndOOS-2. IORP is leading a Task Team for tracking the IndOOS-2 Recommendations and IORP has worked with IRF and GOOS. In addition to the IndOOS-2, IORP has coordinated the RAMA-OMNI in the Indian Ocean. Juliet also reported the plan of IORP during 2021 to 2022 and beyond, such as the cooperation with other communities/projects, organizing sessions at 2021 EGU meeting, and planning of the virtual IORP-17.

Discussion

The multi-regional panel workshop is postponed to 2022, and if international travel is still not feasible, there will be a virtual meeting. For the question about how the panel will contribute to the Lighthouse activities, Juliet said the panel has mapped its activities onto the LHAs, and the LHA1 (Explaining and Predicting Earth SYstem Challenge), 2 (My Climate Risk), and 5 (WCRP Academy) are highlighted which IORP could link with. IORP will meet online in the next few weeks and will continue to discuss this question and try to let members understand what's happening in CLIVAR regarding this issue.

Comment

1. The SSG co-chairs said IORP has done a great job in many areas things such as IndOOS-2 and RAMA. It's good to bring people from all over the IO into the panel, and it's a good idea that every panel should have designated ECS. Using the term 'Early Career Scientist' is suggested instead of 'Young Scientist' in the annual report. It is also suggested that since the LHAs are still in flux, the panel shouldn't be restricted by the LHAs, and should focus on its own domain.

2. Mike Sparrow is glad to see the connection with SOLAS.

Action 1: *To use* the term 'Early Career Scientist' instead of 'Young Scientist' in the IORP annual report.

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

The SORP co-chair reported the updates on SORP membership. Ties to other groups (SCAR, YOPP-SH, SOOS) by members continue. Due to the COVID-19 pandemic, a lot of activities were impeded, especially cruises and field programs. SORP has participated in the YOPP-SH, contributed to the SOOS science plan, contributed to the UN Decade of Ocean Science for sustainable development, and has been making a synthesis from National Reports of 2019 in 2020. SORP maintained two Key topics: Constrain the Southern Ocean's role in global carbon cycling, and constrain the role of the Southern Ocean in the planet's heat and freshwater balance. SORP strengthened the links with the WCRP LHAs through reorganizing Task Teams. The Southern

Ocean is underappreciated, under sampled, bias-prone despite being key to global heat and carbon budget and sea level rise.

Discussion

Regarding the status of the Workshop on Ocean Heat and Freshwater Storage and Transports in Observations and Climate Models, Gokhan is part of the Organizing Committee. He sent an email to Matt Palmer who is the main organizer based in Met Office and is busy with IPCC until late April. The email exchange might imply that the workshop will not happen this year.

Comment

1. The SSG co-chairs suggested the panel should plan to hold a virtual panel meeting in this northern hemisphere summer or fall, given that COVID-19 travel restrictions are likely to continue, and the long period which has elapsed since the last panel meeting.

2. The SSG thinks that the ideas of framing SORP's contributions within the context of the 'Safe Landing Climates' and mitigation are spot-on, and the development of links to the LHAs by SORP is good.

3. GOOS has carried out a similar survey to look at the impact of COVID-19 on ocean observations and the result was published on the Ocean Observing System Report Card 2020. GOOS has worked with AtlantOS specifically to look at COVID impact and approached IORP to see if they can also support this. They should be happy to work with each panel including SORP.

4. Regarding the NORP/SORP joint workshop on "Role of Freshwater in Polar Ocean Climate Change and Global Linkages", which was supposed to be held in parallel with the OOPC workshop, the SSG suggests that it could be held virtually and separately, before the end of 2021, rather than delaying until the OOPC workshop is held.

5. The SSG co-chair suggested to take a look at the issue of SO interaction with ice-sheets. The heat coming from the Antarctic deep warm water to the shelf rim is a huge issue in terms of affecting the ice, ice sheets, and melting; however, the current generation of climate models don't have the ice-ocean interaction as a component, but it potentially is a huge issue in terms of the sea level rise. SORP has not focused on that yet, while the panel has members being involved in ice-ocean interactions; also the panel is involved in some SCAR instant program/project recently launched which covered the ice-ocean interaction and instability for the Antarctic ice sheet. These near coastal processes are not enough investigated and need more monitoring, and this could be future actions for the panel, at least gather information for it. It's an important part which SORP has not been active in the past few years.

Action 1: *SORP to have a virtual panel meeting in this summer or fall, if the COVID-19 situation does not improve.*

Action 2: *About the NORP/SORP joint workshop on "Role of Freshwater in Polar Ocean Climate Change and Global Linkages", which was supposed to parallel the OOPC workshop: suggest to organize it virtually and separately if the OOPC workshop is not scheduled to take place this year.*

Action 3*: Suggested to take a look at the issue of SO interaction with ice-sheets.*

2.3 Pacific Region Panel (PRP) (Antonietta Capotondi)

The AGU Monograph on El Niño Southern Oscillation in a Changing Climate, led by Michael McPhaden, Agus Santoso, Wenju Cai, was introduced; ten PRP members were involved. A science paper on Tropical Pacific Decadal Variability has completed revisions. PRP is involved with the Observational Program on NPOCE, ECCOOS and TPOS 2020 Final Report. PRP hosted the activities of the ENSO metrics group and published a relevant paper, and initiated the ENSO Conceptual Models working group. Another working group on 'Tropical Pacific Decadal Variability: Oceanic Processes and Inter-basin interactions' was in initial stages. PRP has close interactions with PICES; there was a PICES-CLIVAR working group, and some joint workshops were organized.

Discussion

1. On the relationship of PRP with TPOS: PRP wants to be constructive. But there are still many decisions that are not clear. One thing that needs to be emphasized is the importance of maintaining the present structure of the array long enough to be able to assess what would be the impact of removing some of the moorings for understanding ENSO and decadal variability, and this needs a long-time scale and time series. Meanwhile, COVID is slowing down some of the planned activities.

2. The definition of a conceptual model, is it equations? A piece of paper? Or numerical models?

    - This is the first task when the ENSO Conceptual Model Working Group first started. The conceptual model is more like mathematical formulations but simple enough to understand. Now the group is reviewing the chaos of ENSO, trying to identify the features that we think are essential but may be overlooked in models.

Comment

1. The panel seems to put all the resources on the tropical Pacific, is there any concern on the extra tropics?

    - We hope to have a natural evolution of the panel, but still some panel members are interested in broader scale processes. Moreover, the tropical Pacific decadal variability is related to processes outside the tropics. Personally, I would like to expand into the extra tropics area.

    - Paquita wanted to know more about the Ocean Isotope group, Antonietta said the Water Isotope is a working group within US CLIVAR and Samantha of PRP who does some work on paleo climate data is in this working group. The way PRP interacts with this group is to just support whatever it needs but not actively. Paquita mentioned that the group is sunsetting and is thinking about the next steps, thus it's a good time to contact other potential users or groups that do the same work. Antonietta agreed and commented that the ocean isotopes are important for interpretation for paleo records, but also important for better understanding of ecological cycles.

2. What will happen to the ENSO summer school in Trieste, Italy? Is there any alternative such as a virtual training course if it is cancelled? It will be terrible if all the activities for ECS are cancelled.

- The summer school was postponed from 2020 to 2021, but now all the in-person meetings have been cancelled until next summer. Considering the current situation, although the summer school is not officially cancelled, there is no clear progress about it. Antonietta is open to have a virtual alternative since there are many experiences of virtual activities now. This is a large summer school with many applicants from all over the world, thus the time zone would be a big issue for both the students and the instructors. Maybe it can be divided into some small trainings such as three hours per day.

3. Good to hear that Pacific Panel is interested in EPESC (Explaining and Predicting Earth System Change) LHA for Tropical Pacific Decadal Variability. We will keep in touch!

Action 1: *The panel seems to put most resources on the tropical Pacific; the SSG suggests to also include an extra-tropical perspective.*

Action 2: *As the US CLIVAR Ocean Water Isotope Working Group is sunsetting and it is thinking about the next step, PRP should make contact with other potential users or groups that do the same work, to maintain connection to and benefit from interaction with this area of expertise.*

Action 3: *The ENSO Summer School is recommended to be held virtually as an alternative if needed, as there are plenty of new collaborative software available, and it is not good for ECSs if everything is cancelled or postponed continually. Think about the name of 'summer school' carefully considering the Austral season.*

2.4 Atlantic Region Panel (ARP) (Paquita Zuidema)

The Tropical Atlantic Observing Systems (TAOS) review is almost finalized. Bill Johns and the former ARP former co-chair Sabrina Speich are co-chairing the review, with many ARP members contributing to it. The CLIVAR AMOC Task Team is formulated under the situation of the sunsetting of the US AMOC Science Team. The first activity of CLIVAR AMOC TT for 2021 is to coordinate a virtual workshop on assessing observational strategies (ToR 5). ARP also linked closely with the All-Atlantic Ocean Observing System (AtlantOS) through its current members (Brad deYoung, Maria Paz Chidichimo and Tarron Lamont). One AtlantOS case study with the focus on AMOC also complements AMOC TT. The ATOMIC/EUREC4A, a multi-disciplinary international field campaign endorsed by CLIVAR, was successfully conducted from Jan to Feb 2020, driving the science questions with a strong focus on the cloud circulation, meso and submesoscale processes and air-sea interaction. Now the team is working on data quality control and a review paper with more than 350 participating authors. The CLIVAR-FIO Summer School on Macroturbulence and its role in Earth's Climate System, which was originally scheduled in July 2020, is now postponed to 2022, aiming to be in-person, but can also facilitate virtual participation. Three science foci for the next few years have been identified for ARP, including: 1) AMOC; 2) Coastal Sea level change; and 3) Air-sea interaction from the high-latitudes to the tropics.

Comment

1. The SSG is glad to see more Southern Hemisphere (SH) scientists in the panel.

2. Regarding the macro turbulence summer school, the SSG co-chairs suggested the panel to have some interaction or coordination with OMDP of which some members are interested in

the mesoscale eddy parameterization. Since ocean macro turbulence occurs in many oceans, it's better to have a cross panel activity. The OMDP co-chair Baylor is happy to advertise it, and two emeritus members of OMDP are involved in this summer school.

3. There was also suggestion to have a virtual training course, but it needs to reconceive the name 'summer school', considering the opposite seasons of the SH. The panel will think on this in the future.

4. Noel suggested that ARP could follow the PICES link with the PRP, to consider the expanding works collaborating with ICES, which has a lot of work in Europe related with biogeochemistry and climate prediction related marine ecosystems. Noel would like to provide some names and suggestions if ARP wants the connection. ARP will have the panel telecon in a few weeks and Paquita will discuss Noel's suggestion with the panel.

5. Antonietta said PRP doesn't have biogeochemical experts. But both ICES and PICES have that expertise while CLIVAR can provide climate information.

Action 1: *Regarding the macro turbulence summer school, the SSG suggests to have some interaction or coordination with OMDP of which some members are interested in mesoscale eddy parameterization.*

Action 2: *SSG suggests that ARP follow the example of the PICES link with the PRP, to consider expanding collaboration with ICES, which has a lot of work in Europe related to biogeochemistry and climate prediction related to marine ecosystems. Noel Keenlyside would like to provide some names and suggestions if ARP wants the connection.*

2.5 CLIVAR/CliC Northern Ocean Region Panel (NORP) (Amy Solomom)

· Overview: Focus on the first two bullets of NORP's Aims in 2020.

· Updates of membership. Try to include representation from as many nations as possible.

· Activities: Cosponsored/co-organized several sessions/workshops, monthly telecons for both scientific and business staff, presentations on NORP activities at several meetings.

· MOSAiC: the first time of the year-round measurements in the central Arctic, Polarstern as the main observatory, intensive measurements of subgrid variability within the climate model grid box. Get the full data set of the Arctic climate system over the annual cycle.

· Led the ocean team and coordinated model support during the campaign and will organize some activities after the MOSAiC campaign.

· Finished a community review paper on Arctic Ocean Freshwater.

· Engagement with the WWRP Polar Prediction Project.

· The OOPC workshop, NORP summer school will be postponed to next year

· The Arctic Heat Flux Review paper is being discussed

Discussion

1. SOONIL: do any of the NORP tasks cover biogeochemical/ecosystem components?

    - No, NORP is focusing on the physical system. There are many uncertainties in the Arctic Ocean in terms of the physical system in the coupling between different components of the climate system. Maybe after some rotations when some members are changed, NORP may focus on this issue. Noel mentioned that some NORP members from Norway (Tor Eldevik, Arild Sundfjord) are very active in the large Norwegian project - Nansen Legacy - that has a strong component on marine ecosystems - climate interactions.

2. Mike Sparrow was impressed by the number of activities and connections of NORP, and was glad to see that NORP is working with PPP/YOPP and others. There has also been talk within CliC (and WMO) on the Arctic-mid latitude linkages so excellent to see this is one of your task teams. He also recommended that the Arctic Council Working Group Conservation of Arctic Flora and Fauna (CAFF) would be good to connect with in the future.

Comment

1. About the bias in the CMIP simulation, did you interact with OMDP about this?

    - Would like to have the connection. Baylor said OMDP has a couple of NORP-related projects just starting up and he is happy to add NORP to the OMDP Slack channels.

2. Regarding the NORP/SORP joint workshop on "Role of Freshwater in Polar Ocean Climate Change and Global Linkages", which was supposed to be held in parallel with the OOPC workshop, the SSG suggests that it be held virtually and separately before the end of 2021, rather than delaying until the OOPC workshop is held.

3. Kumar would encourage NORP to be engaged with the Arctic Regional Climate Centre Network (ArcRCC-Network; https://arctic-rcc.org/https://arctic-rcc.org/) currently in the demonstration phase under the WMO umbrella.

4. Paquita would like to share some NORP's slides with ARP at their next online meeting if the PPT can be shared.

Action 1: *Regarding the NORP and SORP joint workshop on "Role of Freshwater in Polar Ocean Climate Change and Global Linkages", which was supposed to parallel the OOPC workshop: suggest organize it virtually and separately.*

Action 2: *NORP to interact with OMDP for the NORP Summer school (specifically to bring in their expertise related to bias in CMIP simulations).*

Action 3: *Share the NORP PPT with Paquita who would like to share some slides with ARP at their next online meeting.*

Action 4: *To consider including biogeochemical interactions by connecting with the Conservation of Arctic Flora and Fauna (CAFF), which is the biodiversity working group of the Arctic Council.*

Action 5: *To engage with the Arctic Regional Climate Centre Network currently in demonstration phase under the WMO umbrella.*

2.6 CLIVAR-GEWEX Monsoons Panel (MP) (Aurel Moise)

· The panel structure: Monsoon Panel (MP) & 3 regional Working Groups (WG), some of the global monsoon panel's work is supported by the regional WGs.

· Membership update, ECS from YESS came on board.

· Overarching Goal of Monsoon is advancing understanding of monsoon variability and improving its prediction with observations and modelling as cornerstones of research activities.

· COVID impact: Regional contributions have slowed down overall, and the panel is currently in the process of addressing/discussing this across the working groups and some renewal is going to be unavoidable.

· Monsoon Panel had (almost) monthly meetings throughout 2020, Updating TORs and Work Plan; Presentations; Discussion on problems with regional WG's.

· Coordination on contribution to GEWEX Quarterly on 'Monsoons of the World: Addressing Global Challenges in Monsoon Research' and CLIVAR Exchanges special issue on 'India's Monsoon Mission'.

· Contributed to a review paper on past monsoon changes and their primary drivers, the projected future changes and key physical processes, and challenges of the present and future modeling and outlooks: Wang et al. (2020, BAMS).

· Introduced progress of the three regional WGs.

· The cross-panel and cross-regional activities: Asian-Australian Monsoons, Global Monsoons MIP (GMMIP) contribution to CMIP6 and IPCC AR6, Interaction with WMO/WWRP Monsoons Panel, Interaction with SPARC and GEWEX, contribute to the IPCC AR6 Activities, Contribute to IORP activities through developing research on IndOOS-2.

· The ASEAN Regional Climate Data, Analysis and Projections workshop series, and the Numerical Weather Prediction training series on model parameterization have been postponed.

Discussion

1. Monsoons Panel is a big panel which needs a lot of coordination. Are the regional working groups (WG) working well within the panel and how is the communication?

    - The regional WGs are also represented in the panel, that's a direct link to the panel. But the disadvantage with this direct link is that most people have two functions. The Monsoons Panel is reorganizing the regional WGs to include more ECS, so some senior people will be replaced by renewed ECS.

2. Who is appointing regional WGs memberships? Who is funding the regional WG activities?

    - Membership of the regional WGs is managed by the Monsoons Panel, and is not routed through the SSGs. The regional WGs are not financially supported, they don't meet face-to-face unless they can get financial support. The regional WG is purely virtual. ICMPO is in support of them.

3. Is there any guidance of the publications on what can be regarded as part of the panel publications?

   - The work of the panel is very diverse on time and space scale, and the membership is also diverse. For example, there are three monsoon systems in both African and Asia monsoons. Therefore, the outputs that could be used are diverse so the publications are diverse. It's difficult to identify which publications are driven by the panel/regional WGs and which are done by the members' day job. The regional WGs are not funded, which means their work in the groups is in alignment with and a leverage of their day job. Annalisa said that she knew the history of the panel, it's really productive. It's difficult to distinguish, but it is great to see some coordination around the WGs. Maybe the interactions are helping and it is good to see things are moving.

4. Is it possible to think about the added value of panel members? For example, some panels focus on a synthesis paper, which brings together people from different research topics.

   - Aurel thought that the main thing is to get the regional WGs more active again. Some of the regional WG members don't see the added value that they can bring, especially in the COVID situation, and that's where they will try to make progress.

5. Muthalagu: How is the interaction between the IORP and Monsoons in terms of defining observation requirements on the monsoon?

   - Annamalai who is also the co-chair of the Asia Australia WG is the main link to the IORP. Monsoons rely on Annamalai to link to IORP and decide what future activities the Monsoons Panel can share or contribute.

6. Shoshiro is glad to see Monsoons' interest in EPESC LHA, and would like to keep in touch with Aurel.

Action 1: *MP is encouraged to interact with IORP and other regional panels for defining the observational needs for Monsoons.*

Action 2: *To identify which publications are driven by the panel/regional WGs and which are associated with the members' day job due to the diversity of work being coordinated by the MP.*

Action 3: *To think about the Panel's added value to the members, for example, synthesis papers/products.*

2.7 Global Synthesis and Observations Panel (GSOP) (Steven Jayne)

· Panel membership refresh, female to male: ratio improved from 2:8 to 4:10, includes new members from Southeast Asia, will need a new co-chair next year, suggestions are welcomed.

· Continuing activities: Participation and outreach of reanalysis inter-comparison activities, participation in ocean heat content assessment efforts led by K. von Schuckman for the next IPCC report, participation in the IQuOD meetings representing reanalysis requirements and endorsement of IQuOD activities.

· Recent activities: Assessment of COVID impacts on the global observing system; endorsed the Ocean Salinity Conference in 2021; has begun an assessment of the impact of Deep Argo observations on the global ocean observing system and ocean reanalysis.

· GSOP is also looking at the importance of balanced coupled reanalyzes (e.g., the reanalyzes of the polar system with balanced fresh water and heat momentum fluxes across the entire Earth system) and encouraging more efforts from the community on this.

· There was also a discussion on the cooperation with the WCRP Sea Level Grand Challenge on the development of consistent data and climate reanalysis to represent sea level variability and its causes.

· The biggest challenge is to work out the GSOP's future under the WCRP reconstitution, aiming to participate actively in the definition of LHA on 'Explaining and Predicting Earth System Change' and 'Digital Earth', and WCRP new core project on 'Earth System Modelling and Data Capabilities'.

Comment

1. Sonya recommended a virtual panel meeting in the northern hemisphere fall. Any workshop planned in 2021 may go virtual or be postponed to next year, under the current situation.

2. Sonya suggested that Steven can contact Susann to discuss where GSOP might fit for the WCRP new core project "Earth System Modelling and Data Capabilities". The new core project is to bring together what used to be WCRP WGs. GSOP has the capability to connect there, the question is whether we want a formal role for GSOP within this new core project.

3. Sonya said we don't want the LHAs to determine everything that happens in CLIVAR panels. The LHAs science plans still haven't come out, so not everything will be part of LHAs. The LHAs are a way to bring together elements from different core projects into one high visibility effort.

4. Deep Argo is now starting to be deployed in substantial numbers, how will the data help GSOP?

    - Both Steven and Peter are the Argo PI. The GSOP members are expert on Deep Argo in terms of data, technology and sensors. The panel tries to understand how poor the coverage of Deep Argo is and then goes back to funding agencies to push forward Deep Argo to be funded. Argo is not funded at any national/international level.

5. How to design Deep Argo deployment?

    - There was a design for Argo several years ago, 5 by 5 degree array, sampling every 16-20 days. The Deep Argo does not need to be set that often. But there will be a redesign document.

Action 1: *Make a virtual panel meeting in the northern hemisphere fall.*

Action 2: *Steven to contact Susann or other people in the new core project on 'Earth System Modelling and Data Capabilities' to discuss where GSOP might fit for this WCRP new core project.*

2.8 Ocean Model Development Panel (OMDP) (Baylor Fox-Kemper)

• Key Meetings: Virtual Meeting OMDP5, October 2020 (resulted in an ahead-of schedule follow up); Joint Session with WGNE35 2-5 Nov., 2020; Virtual Meeting OMDP5.5, ~May 2021; Planned [postponed] Meeting in Kiel, Germany in 29 Sept.-1 Oct., 2021.

• Publication: through google Scholar on Ocean Model Development Panel (OMDP), 5 in 2020, 1 in 2021.

• Membership update: become enthusiastic and strong after recruiting new members, more gender and geographic balance. Need representation from Japan for JRA55.

• During the virtual meeting OMDP5, identify some scientific plan, each of these has a panelist team leader and a slack channel, many maps directly onto lighthouse activities.

• Have a few minor concerns on maintaining links to all of the modelling center partners.

Comment

1. Sonya said it's great that OMDP started to connect with people in the new core project for modeling and data. Both Baylor and Gokhan got invited to be on the interim SSG for the new core project.

2. Sonya wanted to know whether Baylor has reached out to the ARP or NORP about some of the OMDP's new projects (model biases). Baylor mentioned Dorotea is also a NORP member and Eric is involved in ARP. Having these members/Emeritus who are cross-listed has been useful. Sonya suggested it's better to make sure that the current panel leadership is aware of these activities and fit into the main panel knowledge base.

3. Wenju wanted to know more about OMIP1&OMIP2 protocol for comparisons, are there some institutions involved in?

    - The first paper came out a little rushed in order to make it in time for the deadline of AR6, but it successfully aroused interest. In the low-res case, there are over 10 takers; in the high-res, there are four modeling centers do JRA55 mesoscale result vs. low-res model. Some other modeling centers are interested in joining the comparison since the paper came out. All the figures in the papers have reproducible data so that if the modelers run this protocol, with their model added, they can easily add their model results into the ensemble to create their own figures and assess the biases.

4. Gokhan suggested finding someone related to JRA55-do from Japan, which is important since Tsujino and Kumoro have both rotated off.

    - Hiroyuki Tsujino is the Emeritus of OMDP, but he is occupied by other things. Kumoro has already served OMDP for three terms. So OMDP does need to maintain this connection. Shoshiro suggested that somebody from MRI can help to continue maintaining JRA55-do.

5. Francois wanted to know are there OMDP activities at seasonal and decadal prediction? Thinking of ocean assimilation in the initialization is helpful.

- WGNE DAO and OMDP are trying to figure out where are boundaries lie and exactly how to do that: DAO being involved in forecast within the predictability time scale, WGNE being interested in short-term (weather to seasonal climate time scales), OMDP time scales specially being decadal to centennial. But Baylor thought that it's early to talk about that until they start meeting together and discussing that. In addition, OMDP has done some processes studies like mix layer dynamics, which are reverent to a much shorter timescale than the centennial. OMDP will see how these new linkages are going to work in the May virtual meeting.

Action 1: *OMDP to find someone related to the JRA55-do from Japan to replace Tsujino and Kumoro's role.*

Action 2: *OMDP to reach out to the co-chairs of ARP and NORP about the OMDP's new project on model bias.*

Action 3: *To figure out the boundaries of time scales for the OMDP research in the following OMDP virtual meeting.*

Action 4: *OMDP to consider ocean data assimilation in initialization for seasonal and decadal prediction.*

2.9 Climate Dynamics Panel (CDP) (Noel Keenlyside)

· The current activities structured into three themes, all of them map onto the WCRP LHAs

· Six online panel meetings in 2020, including presentations from new members and panel business and organization.

· Co-organized 10 virtual conference sessions and workshops: OSM, EGU, AGU, JpGU etc.

· Organized/co-organized other activities: the Cloud Feedback Model Intercomparison Project (CFMIP) 2020 Virtual meeting; TRIATLAS/Tropical Atlantic Variability/PIRATA virtual meeting; the final meeting of PRIMAVERA, EU HighResMIP project; Nansen Tutu TRIATLAS Summer School on Ocean Climate, and Marine Ecosystems

· Tropical Basin Interaction workshop, Virtual, February 24th-26th

· CLIVAR endorsed workshop: International workshop for mid-latitude air-sea interaction. Will submit a summary report to CLIVAR.

· Planned workshop: CLIVAR workshop on towards providing more reliable regional climate change projections; Workshop on North Atlantic – Arctic Sector predictability

Comment

1. What is the status of the Hotspot2 workshop? Sonya suggested sharing the experience after it takes place.

- The workshop will continue with no foreign participants, thus will be a hybrid workshop. Shoshiro will report to CLIVAR the summary of the workshop including what is learned from the hybrid format of the workshop.

2. Sonya said the TBI virtual workshop is impressive, keeping the science going and especially helpful for the ECS; hoping to hear from Noel about the experience from the workshop, how to organize the platform, tools etc.

    - The TBI workshop (https://www.clivar.org/important-meeting-details-clivar-wcrp-clivar-workshop-climate-interactions-among-tropical-basins) was a big success. The issue of the virtual workshop is how to balance the plenary activity with posters or other types of activities. In this workshop, there were some short poster sessions, and we need to think about extending the time in the future. The poster session allows people talking more in an informal way. There is a nice platform for the poster session, where there is a neat list of all the posters, allowing the presenters to upload a short recording, people can enter each poster 'room' to chat with the presenters, etc. Another part of the workshop was the discussion session, there were 6 breakout sessions.

3. Sonya suggested CDP involve representatives from ARP and NORP in the Workshop on North Atlantic-Arctic Sector predictability, to benefit from their regional expertise and enhance cross-panel interaction.

4. Francois was not convinced that the 'climate change community' is fixed on a 'thermodynamics' view - there was in fact a great deal of work focused on changing circulation dynamics in a warmer world. But it's a good idea to focus some work on emerging constraints in the context of regional climates. Noel said the main point he wanted to make was that the huge uncertainties at regional scale are related to poorly understood climate dynamics (such as circulation response). What the models mostly agree on is the thermodynamic response.

Action 1: *CDP (Shoshiro) will report the summary of Hotspot2 workshop on CLIVAR Exchanges.*

Action 2: *CDP to reach out ARP and NORP about the workshop on North Atlantic-Arctic Sector predictability, to benefit from their regional expertise and enhance cross-panel interaction.*

3. Research Foci/GC Reports

3.1 Eastern boundary upwelling systems Research Foci (EBUS RF) (Alban Lazar)

Overview of EBUS activities in 2020 and its plans in 2021 were presented, with an emphasis on its ongoing paper. In 2020, EBUS members have participated in OceanObs'19 review papers and several papers have been published. The group is now working on its final work: A perspectives manuscript on priorities in EBUS science. Six questions have been identified for this work. The group intended to finalize a version of the draft during a RF meeting this spring, and present it to the Pacific and Atlantic Region Panels in order to narrow down the scope of the paper.

Questions and Comments:

1. The Java upwelling in the Indian Ocean is not included.

    - Indian Ocean is overlooked, it was not included when the RF was initially built. It would be nice to identify someone to help us. Weidong Yu offers to help in the Indian Ocean. The co-chairs will invite him to participate.

2. Regarding your perspective paper, which journal are you thinking of submitting to?

    - It has not been discussed yet. Willing to hear suggestions.

3. In the outline of the paper, is there any discussion on how the EBUS, particularly its impact on the cloud, may respond to greenhouse warming?

    - This may fall into article section no. 2 or 5. But I will take a note of your point. It would be important in terms of climate sensitivity, particularly how the cloud may play a part in climate sensitivity and what would be the consequence if we don't get it right.

    - We did spend time at the workshop discussing how EBUS systems might change with increased CO2, e.g., poleward movement of the coastal winds. In fact, we spent quite a bit of time discussing. Perhaps we just need to revisit our notes. I did not see it as falling under #2. Perhaps we conclude on this? It's certainly important and there are conflicting views. Ryan himself has published on it. (Paquita Zuidema)

4. Have you discussed what is going to happen with the group once it sunsets? Are some of its activities going to be transported to other panels?

    - Have not talked about what proposition could follow the work of the EBUS RF. Good point for the next group meeting in spring. Maybe try to propose something to CLIVAR.

5. Are there a lot of activities going on in 2021? Is there any large-scale programme?

    - There's basically no activity proposed for 2021. We are aware of that.

Action 1: *To include the EBUS' response to greenhouse warming in the EBUS perspective paper (particularly its impact on the cloud). Paquita, Ryan and Alban have a telecon on this before the general meeting of the group.*

Action 2: *The EBUS RF will discuss its sunset plan during its next group meeting, and to consider what will happen to the activities of the group after its sunset. Connections with the developing Lighthouse Activities, or with specific CLIVAR panels may help in this regard.*

3.2 WCRP Grand Challenge on Regional Sea Level Change and Coastal Impacts (SL GC) (Robert Nicholls)

Annual GC meeting was held in November 2020. The GC is working on a special issue on 'Climate Services for Adaptation to Sea-Level Rise' for Frontiers in Marine Science. Future plans include 1) Global Sea level conference in Singapore in 2022; 2) Participatory Stakeholder

Engagement on Sea Level Science, Decision Making and User Needs (Approach: Series of meetings. Fall 2021 (Virtual): larger group, breakouts, multiple half-days days. Several follow-up meetings leading to Sea Level 2022); 3) Follow up of high-end sea level rise framework from the community paper led by Detlef et al.; 4) New Sea level budget community effort paper (2021/2022); 5) Global assessment of sea-level rise scenarios in practice; 6) coastal subsidence and relative sea-level rise. The SL GC is relevant to all of the four WCRP Scientific Objectives and all five LHAs, particularly the 'My Climate Risk' LHA. SL GC is trying to identify how it could be linked and integrated in to the new structure of WCRP after its sunset. Emerging issues include impact of COVID-19, increasing stakeholder engagement, emphasis on Coastal Climate Services to SLC, enhanced collaboration with other WCRP activities (e.g., CMIP6 & ISMIP, CESM2-CISM2, CliC, CLIVAR OMDP); and Enhance cooperation with other international bodies on model intercomparisons and international observing programs (e.g., IOC-GLOSS, SCAR-INSTANT).

Questions and Comments:

1. What is the high-end number in the high-end scenario projections you mentioned?

    - We're trying to find the high-end number. We have distinguished four scenarios, there is a propagation, but I'm not giving it away before it has been discussed with the larger group of experts.

    - Wenju Cai suggests including offline calculation.

2. The sunset of the SL GC

    - The group only has one more year left before sunset, we really need to consider seriously how this group meets its focus and research effort.

    - It's important to ensure that as this Grand Challenge (as all GC's) sunset by the end of 2022 that the important (and high-profile) work this group is doing finds a home in CLIVAR, one of the LHAs, or elsewhere. In the WMO Regional Climate Statement meeting (RA5 - Oceana), regional sea level came up as a priority. Certainly, the work of the GC is relevant to the My Climate Risk LHA as well as e.g., Safe Landing Climates (for longer timescales)

Action 1: *To ensure the work of the SL GC find a home in the new WCRP structure (i.e., CLIVAR, LHAs or elsewhere).*

3.3 <u>Tropical Basin Interactions Research Foci (TBI RF) (Ingo Richter)</u>

This presentation firstly reviewed the TBI activities from March 2020 to February 2021, with an emphasis on its recently held workshop. This workshop has attracted more than 200 registrants in total and made fruitful outcomes. A special issue of CLIVAR Exchanges is under preparation. The group plans to split members into four Working Groups and conduct activities independently, and to initiate and oversee coordinated GCM experiments, hopefully in 2021.

Questions and Comments:

1. Congratulations. The group has been doing well as a new group. The workshop is a very fruitful one.

2. What are the timescales of the interactions you're looking for in the GCM experiments?

   - Subseasonal to decadal timescales. There will probably be pacemaker experiments to simulate things of the last 60 years. Also plan to have hindcast/pacemaker experiments that focus on two-yearly timescale for seasonal prediction.

3. You said several times that you need a link to the paleo climate community, is it the paleo climate modelling or reconstruction community or both?

   - Masa Kageyama offers help to build stronger links with both the paleo climate modelling and reconstruction community. Need to know more about the project first.

   - Will summarize the major outcomes of the workshop so that Masa can get a better idea of what the group is trying to achieve. Some paleo climate members are already involved.

   - Data not sufficient to work with it. There's a need to improve the metadata and make it more available.

4. You mentioned a couple of times that you're focusing on the Pacific-Atlantic interactions, is that also going to be included in the GCM experiment? What are the key scientific questions the group is trying to look at?

   - When we started to look at the experiment, we were really looking at the Tropical Atlantic-Pacific connection, but then we expanded to all the tropical basins. In terms of the pacemaker experiment, that would include all the basins. But the hindcast experiment will be on the Indian Ocean and Atlantic Ocean on El Niño prediction. So basically, you probably want to find out with and without the information from the Indian and Atlantic, what's the impact on Pacific El Niño, La Niña predictions.

   - We could also explore the teleconnection impact outside the Pacific, outside tropics.

5. Socializing is the most difficult part in virtual meetings. Do you have any more suggestions in addition to a longer break for better socializing?

   - Regarding socializing, next time we could have a 30-minute session for free discussion. Potentially, you could also have smaller breakout rooms. Interesting you mention gathertown. We tried it at our JAMSTEC/APL Christmas party with mixed results, people were too busy playing around with the different options to socialize much. It could work though, once you get used to it.

6. Are you going to use GFDL CM2.1 only for the coordinated GCM experiment or/and to expand like MIP-type activity under the same protocol?

   - We are aiming for multi-model experiments. This is essential to test model dependence.

Action 1: *TBI RF will share the outcomes from the TBI workshop on what the RF is going to achieve in the paleo perspective to Masa Kageyama, who offers help to build stronger links with both the paleo climate modelling and reconstruction community.*

Action 2: *SSG suggest the TBI RF to explore teleconnection impacts outside the Pacific, and perhaps outside the tropics, from the experiments that the panel is carrying out.*

4. Other Activities

4.1 ICPO Report

Jose Santos, Executive Director of the ICPO, reported the activities conducted/coordinated/participated by ICPO and/or ICMPO in the past year, including meetings, publications, featured activities, partnership building, and also the status of CLIVAR endorsed projects/activities. The upcoming events were also listed. Jose also introduced the evolution of ICMPO during this session, as it moves towards the International Monsoons Project Office in May. IMPO will continue to support CLIVAR interests in monsoons, including its role in the Monsoons Panel.

Current Coordination of groups at ICPO:

- Jing Li: ARP, EBUS, IORP, PRP, SL
- Liping Yin: OMDP, SORP, NORP, CDP
- Jose Santos: GSOP, TBI
- Rupa Kumar: Monsoons panel

Questions and Comments:

1. What does the ICPO think of Jose working online from home?
    - One advantage is that the ICPO staff sits in two time zones that have a 13-hour time difference, making it possible for the office to be available 24 hours. Regular bi-weekly teleconferences and frequent email communications every day. Our host, FIO, is very supportive of this arrangement given the current situation.
2. It is difficult to organize hybrid meetings, especially on how to engage both in-person participants and online ones. Does ICPO have a plan to ensure that certain issues like equity issues are considered?
    - Agree. The TBI workshop has provided valuable lessons. We're compiling the feedback to the workshop. Still learning.
    - The key to Hybrid meetings is to decide on which parts/participants need to be in person and which parts are open and can involve a wider audience. Some intense discussion in smaller groups will benefit from in person meetings. While opening up will allow for much greater involvement and wider communication.

4.2 CLIVAR Summer schools

Two agreements for summer schools: CLIVAR-FIO summer school in even year from 2018 and ICTP-CLIVAR summer school in odd years from 2019. Currently the FIO summer school initially planned to be held in 2020 was postponed to 2022 while the ICTP one is pending. This brings some issues:

1. We cannot keep postponing indefinitely, we have lost the momentum we had with the schools in 2018 and 2019.

2. Are we going to hold the courses 100% online or mixed?

   e.g., IOC-UNESCO ODC Training Course in 2021 (hybrid): In person in Qingdao for Chinese & International scientists already in China, virtual for others.

3. CLIVAR-FIO and ICTP-CLIVAR agreements provide important financial resources, when international travel is allowed, we might have several panels who want to organize Schools (i.e., NORP).

Questions and Comments:

1. Good point on international travel. We need to regulate the time of the summer schools so that people won't be too busy participating in all courses in one year when international travel is allowed. (Wenju Cai)

Action 1: *To regulate the time of the summer schools so that people won't be too busy participating in all courses in one year when international travel is allowed.*

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

Proposed workshop, which was originally scheduled in May 2021 is now postponed to May 2022, at ICTP, Italy. The workshop is motivated by the recent observation progress over three basins, the Community White Papers of OceanObs'19, and the UN Decade for Ocean Science. This workshop plans to get together all CLIVAR region panels and GSOP, as well as OOPC. The organizing committee of the workshop is established but still needs to be diversified with more experts from developing countries, the tentative list of speakers have been identified. Informing webinars are to be developed during the interval period. Key issues to address are: How global ocean observing systems better fit into the coastal needs, where humans interact with ocean most intensively? Discuss opportunities for developing rim countries to increase their oceanographic capabilities and improve regional forecasting in partnership with the various regional ocean observing systems.

Questions and Comments:

1. Developing countries may get the vaccine much later. What is your plan if people from developing countries can't get vaccinated and it's difficult for them to travel next year?

   - Major risk. Discussion next month. No clear plan now.

2. Need to consider the cost of the workshop as we pay for the travel cost of people from developing countries. Consider engaging them virtually?

   - Challenging issue. Some amount of funding secured by ICTP, USCLIVAR, IOC. Will calculate how many people we can support from developing countries. Still have time to raise more funds.

3. What is the current plan to cover the cost? How much is the total cost and how much funding will be available?

   - We plan to use some of the WCRP funds to cover travel. Suggest the CLIVAR SSG and OOPC panel to use their routine funding to cover members' travel cost.

   - Since panel meetings are going to be online, the WCRP cut the fund for travel costs of panel meetings. So, the funding for the workshop is now a stand-alone budget.

   - It's more important to support workshops than panel members travel to have panel meetings in person.

***Action 1**: The organizing committee of the multi-panel workshop will have a telecon soon to discuss the contingency plan as well as the funding requirement and possible funding sources.*

4.4 Discussion on cross-panel activities and model-observational connections (Sonya Legg & Wenju Cai)

• **Why?**

– Many ocean/climate problems go beyond single basins, but benefit from expertise of region specialists

– Explicitly connect observations/models/syntheses

– Pool resources, avoid duplication

• **How?**

– Thematic workshops/summer schools/topical task teams

– Link region panels with GSOP and GOOS: integrated global observations

– Link OMDP with region panels, e.g., for model bias investigations, modeling of regional phenomena

– Region panels communicate modeling needs with OMDP

• **What mechanisms can help create these connections?**

Questions and Comments:

1. Maybe workshop proposals separate from annual reports? Have calls for workshops annually? Multi-panel workshops will get preference?

2. The idea of prioritizing workshop proposals that involve multi-panels is a good one. Interact more with other groups.

3. Separate proposals for workshops and annual reports will avoid the situation that every panel tries to propose a workshop and associate their panel meeting with it so they can eventually meet in person. Should be some specific criteria. To use the funding more on supporting workshops, especially the participation of ECRs, other than covering the cost of panel members having meetings in person.

4. Sonya preferred to have all panel meetings online.

5. For cross-panel connection, maybe invite members from other panels to discuss specific topics?

6. Slack channels for more connections?

7. Panels to provide what kind of information is needed from other panels and what inputs can they provide to other panels? A shopping list of what they can benefit from other panels.

8. Provide opportunity for ECS to interact with senior scientists.

9. The SSG meeting provides a good opportunity for CLIVAR panels/RFs to know what other groups are doing, but it is only once a year. We may consider to have more gatherings or establish a mechanism for panels (or at least panel leaderships) to interact regularly.

10. Should panels establish liaisons - formally - to other panels? Too much burden for members to establish formal liaisons. Better way is for groups to think of cross-panel interactions when they design activities. Encourage joint workshops. LHAs are cross-panel, we can think of how CLIVAR activities fit into them.

11. No permanent liaison but really only upon "invitation" for planned focus activity to ensure the exchange, not at every panel meeting but only when the topic is discussed. Then probably spin off the workshop if more people should be involved.

12. I wasn't thinking the formal liaisons be 'required' to attend the other meetings, just to be on the distribution list for meeting notes and just keep the panel from forgetting. that said, it could be argued that this is the job of the co-chairs....

13. Same issues have been discussed ten years ago and the same ideas were brought forward but failed to work. Better way may be to consult other panels when they initially plan an activity.

14. The idea is to have a shopping list first. Then when it comes to specific topics, have cross-panel discussion. From that, groups can propose a workshop. Need to create mechanisms.

15. The Monsoons Panel and the IORP had discussion last year to have a joint workshop.

16. Model-observation connection. Lots of requirements from the modelling community for observations, but not the other way around. Modelling can go along to help with the observational networks. That would be a good connection. Modelling can play a big role in observations, i.e., the multi-panel workshop proposed by Weidong, it would be helpful to have a session on this topic to attract people from the modelling community.

17. Compile the notes and the SSG comes up with a draft proposal for the mechanism, and then circulate it to all participants. Any other ideas can be sent to co-chairs. Ongoing discussion. Do think about if there's a need for inputs from other groups.

Action 1: *The SSG will come up with a draft proposal for the cross-panel connection based on the SSG-26 discussion and circulate it to all participants.*

*4.5 **Discussion on UN Decade (Martin Visbeck)***

This presentation gave an overview of the UN Decade for Ocean Science. Major aspects include the Decade Outcomes, the Value-Cycle from science to societal benefit, the 10 Ocean Decade challenges, the action framework, stakeholder engagement, and the action hierarchy. It also compared where we are now and where we would like to be. One important ambition is for science to provide solutions and motivation for action.

Questions and Comments:

1. Regarding the role of science in the Decade, especially in problem diagnosis and in providing solutions, I think not only the oceanography, but also the atmospheric community, are struggling with how we sit in the whole solution space. Could you elaborate it a little bit more and give us an example of how we can get into this?

    - The fourth pillars of the high-level strategy of the WCRP is all about that. That is to ask the question how we use ocean and climate information to actually inform decisions around us. In the WCRP, CLIVAR, we have one pathway that is very well established, so in some sense we have a link-up, that is through the assessment, and we support it with our science of IPCC that works on providing motivation to mitigate risks, and information to support policies. For example, when you look at sea level at the regional level, this is very important for decision makers to get a much better understanding of what's coming on the way. CLIVAR only provides fundamental science. But some people in the CLIVAR community also sit down with decision makers. I think an emerging example is that we have a much better understanding of heat waves. We take this predicted understanding and assessment we have in CLIVAR and use them to inform policy makers. We have to think about what opportunities we have to work with those communities which are more on the toward-action side. It can be in the private sector like risk assessment and sometimes it can be on national governance. But I would agree with you that the pathway towards action is not well laid-out. Sometimes we are less connected to the solution side than we should. And I do think the Decade is an opportunity to really work to be part of the interface. It's frustrating that we don't have that much engagement there. I think some of the LHs in WCRP have this ambition built in toward this way.

    - For predicted ocean, may be CLIVAR can involve Explaining and Predicting Earth System Change LHA. CLIVAR DCVP final report indicates that multi-year prediction can be more promising for the ocean than the atmosphere. As Martin said: sea-level, heat waves etc. are important and we should work to predict them.

2. To what extent the global data processing and forecasting system of WMO is in the solution space? The WMO is planning to have the system becoming regionally seamless, which means many things. But it's certainly a view to add more operational ocean simulation data and forecast, I'd like to know your view on that.

    - WMO and IOC are just two of the actors who have a mandate from member states to actually deliver services and functions. That is an important part of that connectivity that Mat was asking for. We talked about how can we connect the ocean services to the climate services, so this is the partnership between WMO and IOC. We also talked about how we can use the content of CLIVAR science to improve this type of capability. That's the other round. Good point to connect what we do at CLIVAR and what we do in the Decade.

- Yes, it is important to make the connection to services (WMO, IOC and others), also at the last WCRP Extraordinary JSC with partners such as SOLAS and IMBeR. (Sparrow)

3. What is the status of the proposal (for programs) submitted in January? When will there be new calls for proposals? It's hard to find out what's going on from the Ocean Decade website.

    - New user-friendly website soon. Under review right now. In early April, the Decade Implementation Group will look at the proposals and will then do the evaluation. Maybe get the feedback in April or May. Expectation is that none of the programmes will go like 'yes funded' or 'not funded'. There will be more like a negotiation setting. There will be merging, discussion and debating around that.

    - There will be another round of call for the programmes, don't know the exact time, maybe the end of 2021

4. Is the Ocean Decade addressing the issue of climate mitigation strategies, including ocean geoengineering solutions? Does CLIVAR have a role in this topic?

    - Excellent question. We did discuss questions a bit like that, also the LHA discussions. When you look at the Safe Landing LHA, which is also around engineering our planet. Personally, I think it is definitely in scope. We have to see what the community comes up to take forward. And we can have cooperation.

5. You talked about ocean-climate nexus, so in this area we could use our understanding to generate solutions. In your opinion, is CLIVAR doing fairly? What else can we do to get more progress?

    - You have proposed programmes. But I don't know how it goes. I'll have a check with colleagues. Wonder when there are a couple of programmes/ideas in this ocean-climate arena, what the CLIVAR community could say to the executive planning team of the IOC to offer help for programmes/events. It's not about competition, but about work together.

5. Interactions with Other Projects

The fourth day of the SSG meeting focused on the interactions between CLIVAR and other projects. Representatives from some other projects were here to share aspects of their works, particularly on how we can best cooperate and coordinate our activities.

5.1 US CLIVAR (Gudrun Magnusdottir)

· Making a lot of progress in the past seven years and addressing the five research challenges: Decadal Variability & Predictability, Climate & Extreme Events, Polar Climate Changes, Climate & Carbon/Biogeochemistry, Climate at the Coasts

· Driven by the private satellite data, the agency acquisitions of commercialized data, the limits for research and training purpose, and series WMO workshops and meetings, a US CLIVAR Data Commercialization White Paper is finished and will be published.

· Activities of the panels

a) Phenomena, Observations, and Synthesis (POS) Panel: Air-Sea Interactions WG (2019-2022), Water Isotopes WG (2018-2021), Workshop on Circulation of Arctic Ocean and SubArctic Seas (fall 2021, Seattle), Workshop on the New Global Ocean Biogeochemistry Array (joint w/ OCB) (June 28-30, online), Uncertainty Quantification WG (2020-2023), Workshop on Future of US's Earth System Reanalysis Effort

b) Process Studies & Model Improvement (PSMI) Panel: Provide feedback on process studies, promoting best practices, evaluate success and lessons of previous Climate Process Teams (CPT) and need for future CPTs, expand focus on coupled processes, Evaluate the use of new modeling capabilities.

c) Predictability, Predictions, and Applications Interface (PPAI) Panel: Help improve subseasonal-to-seasonal (S2S) predictions and information products, Advance interannual to decadal predictability and predictions, Workshop on Societally-Relevant Multi-Year Climate Predictions (November 8-10, 2021), Understand climate changes across space and time scales – CMIP and Large Ensembles, Coordinate efforts to evaluate forecast uncertainty Large Ensembles WG (2018-2021)

· Coordination of US CLIVAR with CLIVAR Internationally

a) Promotion of CLIVAR activities and membership calls
b) Sharing of panel meeting reports with US Interagency Group, SSC, and Panels
c) Co-sponsorship of CLIVAR meetings and workshops
d) Coordination with Atlantic Region Panel on initiation of CLIVAR AMOC Task Team
e) Report-outs at annual SSG/SSC meetings and US CLIVAR Summit
f) Quasi-monthly tag-ups of Project Office Directors

Discussion

1. Sonya commented that this new Research Challenges on 'climate at the coast' is very relevant to the LHAs 'My Climate Risk', she wanted to know whether thought about connecting with people in the LHAs. Jan Polcher mentioned this coastal activity would also link to GEWEX.

   - Yes, at the US CLIVAR SSC meeting last week, there was one part discussing the connection with the new 'My Climate Risk' LHA. There will be the second session of the SSC meeting, US CLIVAR expected to have GEWEX representatives there.

2. There was a discussion about the in-person vs. virtual meetings. Inga wanted to know whether most workshops are to wait until it is safe to hold in-person meetings. Gudrun said a lot of them have been proceeded online. All the activities associated with earth system practicable prediction were online, also the precipitation workshop. In what way the workshop will be organized is up to the co-chairs of the workshop. Sonya said while it's beneficial for ECS to be in-person, the ECS would rather have a virtual workshop rather than no workshop for two years. It's still too optimistic for planning a workshop in the northern hemisphere fall under the current situation. Gudrun agreed and she mentioned if the workshop was postponed, we might miss some opportunity, and we might lose some of the invited speakers.

5.2 OOPC (Sabrina Speich)

· *OOPC is Co-sponsored by Global Climate Observing System (GCOS), the Global Ocean Observing System (GOOS), and the World Climate Research Programme (WCRP).*

· *O*versees the ocean component of GCOS, the physical variables for GOOS, defining sustained ocean observing system requirements for WCRP.

· OOPC is for GCOS the panel that brings all ocean climate observations together; while for GOOS the OOPC is the Physics panel, a repository of expert advice and assessment on the physical aspects of ocean observations. This matrix design isn't easy to deal with, and GCOS and GOOS are in dialogue on how to improve that coordination.

· Members, considering the geographic balance and the expertise as well. Also, GCOS and CLIVAR members to strengthen the link with partners.

· Developing requirements for EOV/ECVs. Meet the requirements for different applications.

· The GCOS Status Report, welcome comments from CLIVAR

· Links with the new WCRP, mostly through CLIVAR, needs strong links with the two new WCRP core projects, and CLIVAR-GOOS Observing System Workshop in 2022.

Discussion

1. Antonietta: A lot of the OOPC activities are critical to some CLIVAR activities, especially the new challenge for the US CLIVAR which emphasizes coastal measurements. How do you plan to engage different coastal countries and develop capacity building?

    - There are two other sister programs that GOOS is co-sponsor for the UN Decade, one is CoastPredict which is in line with the US CLIVAR project; the other one is Observing Together, which will enhance capacity building and information exchange. As soon as they are approved by the Ocean Decade coordination group, they will start working.

2. Francois: Are there close links into WMO's data process and forecasting system?

    - Since a couple of years, WMO wanted the ocean to be present in WMO, so it took the link in terms of data observations, and that was through GCOS and therefore OOPC. Right now, GOOS is starting to work in the new implementation plan of GCOS, it is still not clear what time scale should be focused on. GOOS is moving to the scale of the weather system, so WMO is very interested but there is not a very clear link yet.

3. Inga: Lynn Terry suggested SORP must maintain the links with OOPC, it's great to have the dialogue with you. Do you mean the main way that OOPC will enforce the connection with the regional panels is by having formal members?

    - One problem is the travel funding. But under the COVID situation, the video meeting allows people to attend the OOPC meeting. It's important that CLIVAR panels can attend OOPC activities.

4. Cai: Is there any thinking on past data rescue? Such as the quality control of the data we already have particularly for developing countries.

    - Data rescue is really important in the atmospheric site. It has started since a few years ago, we need to translate that for the ocean. Maybe citizen science could do that or with students. They have been successful in the atmosphere site data rescue. We need to be creative and push it.

5.3 IOC (Salvatore Aricò)

The presentation focuses on the ocean carbon, ocean and climate, IOC and CLIVAR.

· The initiative of the Integrated Ocean Carbon-Research (IOC-R) is a platform that brings together current research, observation efforts related to ocean carbon and the ocean component of the climate system. Since 2018, has brought together IMBeR, SOLAS, CLIVAR, Global Carbon Project (GCP), IOCCP and IOC. The idea is to develop a coordinated ocean carbon research/observation agenda that can improve a number of processes both from the research side of equation but also in terms of the policy requirement especially from UNFCCC.

· IOC-R is to identify unresolved emerging questions mainly on the critical knowledge gaps, humans altering the ocean carbon cycle and resulting feedback; the exchanges of carbon between the land-ocean-ice continuum; the role of biology in the ocean carbon cycle and how it is changing; and whether the ocean uptake of anthropogenic CO_2 will continue as primarily an abiotic process. i.

· The IOC-R initiative is also part of what CLIVAR emphasizes, thus it provides a platform for the communities to work in a coordinated way. The approaches to address an integrated ocean carbon research and observation agenda include: a. Strengthen sustained financial support for observing networks; b. Enhance and coordinate the existing suite of carbon observing and synthesis projects; c. Regional priorities; d. New process studies and experiments; e. New technologies to enhance autonomous observations and analyses; f. Integrate models and observations; g. Consider the science of ocean solutions for mitigating climate change and h. Governance for IOC-R programme

· Approaches to address those questions. Put forward an agenda that covers the whole time span of the decade: The Integrated Ocean Carbon Research and Observation Agenda.

· In terms of ocean solutions for climate mitigation, or called ‘geoengineering’, the UN inter-agency group of experts on the ‘Scientific Aspects of Marine Environmental Protection (GESAMP)’ together with IMO, WMO and other UN organizations. Some of those ocean solutions are not only just on the research side, but also on the policy side.

· The global ocean science report enables assessing ocean science capacity globally as a proportion of the research & development envelope, infrastructural capabilities, gender and desegregated data in different branches of ocean science.

· CLIVAR has an important role to play as on the capacity development side, glad to engage with CLIVAR also on the capacity development capacity building aspect of the ocean and climate variability.

Discussion

1. Sparrow: The climate mitigation/intervention issue has been highlighted as an area WCRP (with partners such as SOLAS, IMBeR etc.) should focus on. We are discussing with partners. I will also mention GESAMP later. We should explore how best to do this in future as we go forward. For example, hold a (virtual) workshop with the key partners to see how WCRP should be involved in this issue.

    - Sonya: it might be the role of 'Safe Landing Climate'.

2. Sonya: The Global Ocean science reports with all the information about gender. How does the IOC collect all that information?

    - Proud to say that the global average proportion of females stands at 37%, 10% higher than the global share of female researchers in natural sciences. But when you look up where they end up in terms of different branches of ocean science, as well as different roles of technicians versus scientists on a hierarchy basis, it is an uneven situation that needs to be looked into more carefully and monitored more regularly. For essentially primary data, is through a questionnaire that was sent to IOC member states (150 member states). The second is that we also work with global data sets, including from participants of women in international scientific ocean science conferences, the role that they may have in IOC or other partners, or from international scientific publications.

3. Cai: The Global Ocean science report is very nice, for collecting expenditure worldwide ocean science, how do you do that? Are there any trends that can be learned from this?

    - With this new report compared to the 2017 one, we took a step further in adding some pattern analysis.

    - Strong variations of ocean science investments across nations: only 0.03% of their R&D proportion of the GDP envelope of some countries is used for ocean science. Some countries can reach to 4.2% of the R&D envelope. It is very low comparing to investment to other branches of sciences.

    - In 2015, 20.6% of the scientists in the whole world are located in China.

    - There are no boundaries in the level of the collaborations between national scientists.

    - Would encourage CLIVAR to use that as background to take some strategy, especially with regard to its capacity development.

5.4 CliC (Fiamma Straneo)

· Introduced the mission, focus and structure of CliC. Current activities:

    a) Melting Ice Grand Challenge and Modeling Intercomparison Projects (MIP), including ESM-SnowMIP/LS3MIP, GlacierMIP, MISOMIP2, ISMIP6 and SIMIP

· Introduced core activities, some of them are collaborating with SOLAS, IASC, SCAR and

CLIVAR (NORP and SORP panel).

· CliC is linked to many agencies/communities/projects/groups through endorsed activities, periodic activities, permanent CliC representative, or under the WCRP-CliC research system.

· In the future, CliC will engage with the WCRP LHAs.

· The CliC SSG co-chairs are open to any comments for the development of CliC.

Discussion

1. Mike Sparrow thanked the CliC co-chairs. He mentioned in the last few months CliC was experiencing a very difficult time with the change of project office, and the incoming co-chair Jason had to stand down as he has been put in charge of the Greenland observing system for Denmark. CliC had a small SSG meeting recently. The point 'Establish a fellowship for Early Career Scientists from under-represented cryosphere regions to participate/visit partner institutions or attend conferences' is good as its one way of using the funds in a useful way when we can't spend them on travel.

2. Cai suggested to have some cooperation between CliC and CLIVAR on the ice sheet/ocean interaction. He said one of CliC's research focus, the marine ice sheet/ocean interaction, is an important topic, he was wondering whether CLIVAR ocean scientists and CliC ice sheet modeler could get together to see how we could better handle this issue because this is the biggest uncertainty in climate science at the moment.

3. Torge said his impression from the previous presentation is that US CLIVAR and OOPC are both becoming more focused on the coastal regions. For the Southern Ocean, the coastal region in Antarctica, one common issue is more observation is needed. He wanted to know if this point of ice ocean interaction is also regarded by the other groups of panels as coastal focus regions? Gudrun mentioned US CLIVAR is focused on US coasts and that includes Alaska's coastline. Cai pointed out that from the model point of view, high-resolution (high-res) is needed and it is coming up. Torge mentioned we have high-res models, but for the ice ocean interaction the very long timescales (multi decadal to multi centennial) are needed, so there's still a challenge on the calculation resource. Gokhan said OMDP members are pushing higher and higher resolution although it's not necessarily a focus of OMDP. The 'highres' means 0.1 degree and finer, now some OMDP members are targeting 5-km coupled simulations for short-term climate purposes.

5.5 CORDEX (Irene Lake)

· CORDEX is divided into 14 domains that cover most land and polar areas.

· Introduced the framework for WCRP regional activities, how they can link to the strategic plan, global goals, and the LHAs.

· Overview of CORDEX's progress.

a) For fundamental understanding/long term response, there are the CORDEX CORE, CMIP6 downscaling, moving towards ESMs (hoping to do more on ocean CORDEX), FPSs (for extremes)

b) New simulations on ESGF

c) Overview of the existing combinations of GCM/RCM

· Working with the other groups for the near-term, application-inspired transdisciplinary application: how regional information for society should be structured?

· CORDEX worked with cooperation/partnerships, capacity exchange across regions/disciplines, regional consultations.

· Increased cooperation with WCRP Project Offices.

· CORDEX can help to narrow the gap of the challenges raised by climate change through the FPS.

Discussion

1. There is a discussion on CORDEX to have an ocean region. Antonietta also wondered why there is no coastal area represented in CORDEX. Irene mentioned there has been discussion about the highres pilot projects for small island area, and there was 5*5k resolution simulations for the CORDEX of Southeast Asia, and there is vigorous discussion and strong demand for better information in the coastal regions. But now there isn't a clear plan for this although there's a lot of demand.

2. Irene said for the moment a lot of focus is on getting the coupled models, such as aerosols, hydrology and so on to be coupled to models. Some groups in the Mediterranean are working with ocean coupling. Jan pointed out that the MEDCORDEX couples to the Mediterranean. Mat Collins suggested to have a CCORDEX - Coupled CORDEX. He thought a coupled regional model of one (or more) of the tropical ocean basins would be interesting. Especially if we could get to eddy and convection permitting resolution, but maybe computationally is a problem yet. Gokhan said there are groups such as CESM with such capabilities, the R-CESM. Aurel said there are always the HighresMIP simulations from coupled models at 25km. Many CORDEX RCM's will not go much higher than that.

3. Mike Patterson wanted to know if CORDEX includes downscaling S2S simulations/predictions in addition to climate change simulations/projections. CORDEX could be very valuable for coordinating at international level. Irene confirmed that CORDEX has discussed this topic. But because of the resource problem, maybe only small groups do this but not a general CORDEX plan. Francois said building large ensembles of downscaled seasonal forecasts, given the need to also perform hindcasts, turns out to be computationally more expensive than climate change downscaling - more or less by a factor of 10!

4. Aurel: Data availability on ESGF for LBC from CMIP6 to run RCM's is currently a constraint to run CORDEX regions. Maybe the CORDEX office can help in talking to modelling groups to save and upload sub-daily fields? Do you have the constraint subset of CMIP that can make up the matrix of RCMs with GCMs?

- We have been in contact with the CMIP groups and made a request for data availability, we have the list of groups that would like to provide the data. Will transmit the question to the person who is responsible for this.

5.6 SPARC (Seok-Woo Son)

· Three main science themes of SPARC: Atmospheric Dynamics & Predictability, Chemistry & Climate, Long-term records for climate understanding. The themes are tagged by individual and focused activities, which are organized in a bottom-up approach.

· SPARC is considering the reconstruction. To do this, a strategy task team with 22 members has been assembled.

· Terms that have been discussed for future SPARC: Activity structure works well; SPARC keeps facilitating good climate research; SPARC supports policy-relevant climate sciences. Some other discussions are still on the way

· Show the interest of collaboration with CLIVAR, highlight two themes: Atmospheric Composition & Asian Monsoon, Tropical Convection.

· Atmospheric Composition and Monsoon, directly addresses the Asia monsoon circulation.

· Showed a picture of a field campaign on atmospheric chemistry during the 2017 Asia monsoon season, which might be of interest to Monsoons Panel.

· SATIO-TCS: Stratospheric and Tropospheric Influences on Tropical Convective Systems. Showed the MJO presentation from MJO phase 1-8, and the linear correlation between QBO index vs RMM amplitude

· Showed an idealized model simulation, hinting a *QBO-MJO connection which is much weaker than in the observations.*

· Other activities that CLIVAR may be interested: CCMi - Chemistry-climate modeling (some models with ocean coupling), DynVar - Climate dynamics focusing on the whole atmosphere (to the middle atmosphere and above)

· Other possible collaborations: Jointly work on the common research topics (e.g., climate extremes), Jointly host regional training schools (e.g., ACAM summer school, WCRP training school, etc.)

Discussion

1. Aurel: The Monsoons Panel has been in contact with SPARC; also attended the SPARC SSG, discussing on the connection with Monsoon Circulation and Atmospheric Composition, QBO-MJO, and we would be keen to follow up on this with you. Is there any possibility of running a joint workshop?

    - Aware of the possibility of a joint workshop, really hope we could initiate the strong collaboration.

2. Gudran mentioned that US CLIVAR is also interested in the stratospheric connection and coupling. She wanted to know whether the QBO in the model is realistic or prognostic in the slide showing the modeling studies of QBO-MJO connection.

   - There are several kinds of modeling works at the moment and some models used internally generated QBO, but what was shown in the slide is forced by the troposphere. The QBO structure shown here is based on observations. Those studies prescribe the stratospheric profiles; this means only downward influence. There are more works to work towards this topic.

3. Antonietta: Is SPARC also interested in the influence of ENSO on the stratosphere and impacts through the stratosphere? PRP is also interested in this topic, maybe can have collaboration.

   - SPARC is aware of this issue and glad to have collaboration with PRP. SPARC worked on the connection between ENSO and stratosphere interaction and its impact on sub-seasonal to decadal prediction.

5.7 <u>GEWEX (Xubin Zeng, co-chair of GEWEX SSG)</u>

· Introduced the GEWEX organization, highlighted several cross-cutting activities

· The 32nd SSG was organized at Pasadena CA in January 2020

· One major progress: A GEWEX 'science and applications traceability matrix. The matrix is helpful for scientific planning, for example, to reach the consensus of the GEWEX goals by using it.

· Some examples of activities identified by the matrix

  a) A joint effort among GEWEX, CLIVAR and GCOSON on the Earth Energy Imbalance (EEI).

  b) Precipitation initiative/cross-cutting activities.

· A new GEWEX initiative with applications beyond GEWEX: ISCCP-NG A Major Data Initiative for the Decade

· GEWEX panels

  a) GEWEX Regional Hydroclimate Projects, with an emphasis for grand challenges on food basket by focusing on process understanding.

  b) GLASS panel, which focuses on land surface atmosphere, its activities can be divided into three categories.

· Perspectives on GEWEX-CLIVAR Collaborations: WCRP LHAs, EEI, Monsoons, WCRP WG on extremes, Earth Water Imbalance (to link regional water cycle and ocean salinity and/or sea level rise), S2S predictability, unified turbulence of the Atmospheric Boundary Layer (ABL) and ocean mixed layer.

Discussion

1. Sonya: Agreed about the point 'Unified turbulence of the ABL (over land, ocean, ice) and ocean mixed layer'. Do you have any suggestion to pursue this jointly? Through a joint workshop, or working group, etc.?

    - The idea is if both sides feel this is an exciting topic, we can plan to do something together. Then we will identify something that we really are interested in, point the relevant people from both sides to develop a plan, from which we can move forward.

2. Aurel: GEWEX/CLIVAR Monsoons Panel is naturally linked with GEWEX, last year the GEWEX Quarterly and CLIVAR Exchanges special issue were published, and there are some other activities such as diurnal precipitation etc. Hope Monsoons Panel and GEWEX can focus something and pull through the COVID situation.

3. Jan Polcher (co-chair of GEWEX SSG) mentioned there are a lot of activities on continental hydrology within GEWEX. Hope to see some collaboration between CLIVAR and GEWEX on the coastal processes such as quantifying the total water cycle and its imbalance. This is also connected with the LHA 'My Climate Risk'.

5.8 <u>WMO related activities (Mike Sparrow)</u>

· WMO Focus on the Ocean

    a) Ocean in earth system & seamless services
    b) Ocean-climate
    c) Ocean Monitoring & Data
    d) Ocean Prediction & Services

· The WMO ocean foci in 2021 will focus on building the joint WMO-IOC Strategy, UN Decade Immediate Plan Contributions

· WMO Research Board connects the three WMO programs. WCRP has joint activities with WWRP such as S2S (which has an ocean component), Tropical Cyclones (WWRP Tropical Cyclones group and LHA on Explaining and Predicting….), coastpredict etc.; GAW on atmospheric deposition in oceans for example. The WMO Research Board also links with the Technical Commission and Regional Associations and co-sponsors, international science organizations academia, key partners and private sectors.

· WMO Research Board, there is a big overarch on linking science and services, through delivering the Long-Term Goal 3 of the WMO Strategy 'Advance Targeted Research'.

· Both WMO and IOC are involved in various UN Decade activities, and for example, providing updates to the United Nations Convention on the Law of the Sea (UNCLOS).

· New GESAMP WG 45 on Climate Change and Greenhouse Gas Related Impacts on Contaminants in the Ocean (need physical oceanographer rep)

Discussion

1. How CLIVAR can leverage WMO's interaction with other groups on the ocean aspects to enhance our collaborations with them? (Sonya)

    - Mike: It depends on the topics. I am increasingly asked to provide inputs at various levels to WMO plans on the oceans, what to do with climate, and I will ask Jose for inputs when necessary. There are quite a few opportunities to be involved. I also expect the new WMO-IOC Joint Collaborative Board will come with some overarching areas where WMO and IOC can work more closely together, CLIVAR representing the ocean expertise can be involved with that.

    - Salvatore Arico (IOC) would like to facilitate providing names or experts from the CLIVAR community to some of the WMO groups, such as the newly formed GESAMP 45 WG. Mike Sparrow and Sonya very much appreciate that. Mike has already asked for names from CLIVAR and other communities.

5.9 <u>Wrap-up of public Part of SSG-26</u>

The WCRP Academy LHA can really have purpose for each single group, sub-group and partnership in the WCRP community. The LHA team would really like to hear what people see its role in their own programmes, how the 'WCRP Academy' can serve them, as well as how they could flow into the 'WCRP Academy'. It is better to have this chat earlier rather than later, as the LHA is developing its science plan.

Sonya thanked all participants particularly to those who overcame time zone difficulties and stayed multiple days. It has been useful for the panel co-chairs to hear the overarching activities (e.g., LHAs, the new structure of WCRP, updates from partners). We had a good discussion about the cross-panel activities and the ideas to facilitate those. We also had a lot of discussions about the workshops and meetings, and what to do about virtual versus in-person etc., and these discussions have to be continued. The Meeting report will be provided, and draft guidelines and proposals for workshops and cross-panel activities will be prepared and be circulated to everyone for inputs. I hope individual chairs have gotten ideas to cooperate with other panels, with LHAs, and with our partners projects, and may follow up with in-depth discussion with particular people and make stronger connections with them. The short talks on day four are intended to connect everyone and to provide a full overview of a broad aspect of activities that are related to CLIVAR and WCRP.

The CLIVAR SSG had a closed session afterwards with the ICPO.

APPENDIX A. Participants

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APPENDIX B. Agenda

26th Session of the CLIVAR Scientific Steering Group.
March 8th – 11th, 2021. Online

Agenda

Note: Addition of short breaks may result in each daily session taking a little longer than the expected 3-h period.

Participants: CLIVAR SSG members, CLIVAR Panel/RF representatives, Observers					
Monday. 8th			**Session**	**Presenter - Discussion lead**	**Time**
Chair: Sonya Legg					
Start Time 08:00 EST (NY) 14:00 CET (Paris) 22:00 JST (Tokyo) 13:00 UTC	**1**		**Opening Session**		
		1.1	Welcome and meeting objectives	Sonya Legg/W. Cai	15
		1.2	WCRP presentation	Helen Cleugh	30
		1.3	Discussion on Regional Consultations	Helen Cleugh	30
		1.4	Discussion on LHAs ● My climate Risk ● Explaining and predicting Earth System Change ● WCRP Academy ● Safe Landing Climates ● Digital Earth	Regina Rodrigues Shoshiro Minobe Angela Maharaj Kevin Reed Aneesh Subramanian	60
		1.5	CLIVAR linkages with new "Core Projects/Homes" ● Regional Information for Society ● Earth System Modelling and Observation capabilities	Silvina Solman Susann Tegtmeier	45
Tuesday, 9th			**Session**	**Presenter - Discussion lead**	**Time**
Chair: Wenju Cai					
Start Time 16:00 EST (NY) 22:00 CET (Paris) 06:00 +1day JST (Tokyo) 21:00 UTC	**2**		**Panel Reports**		
		2.1	CLIVAR/IOC-GOOS Indian Ocean Region Panel	Juliet Hermes	20
		2.2	CLIVAR/CliC/SCAR Southern Ocean R. P.	Torge Martin	20
		2.3	Pacific Region Panel	Antonietta Capotondi	20
		2.4	Atlantic Region Panel	Paquita Zuidema	20
		2.5	CLIVAR/CliC Northern Ocean Region P.	Amy Solomom	20
		2.6	Monsoons Panel	Aurel Moise	20
		2.7	Global Synthesis & Observations P.	Steven Jayne	20
		2.8	Ocean Model Development Panel	Baylor Fox-Kemper	20
		2.9	Climate Dynamics Panel	Noel Keenlyside	20
Wednesday, 10th			**Session**		**Time**

				Presenter – Discussion lead	
Chair: Wenju Cai					
Start time 06:00 EST (NY) 12:00 CET (Paris) 20:00 JST (Tokyo) 11:00 UTC	**3**		**Research Foci/GC Reports**		
		3.1	Eastern Boundary Upwelling Systems	Alban Lazar	20
		3.2	Regional Sea Level Change and Coastal Impacts Grand Challenge	Roderik van de Wal	20
		3.3	Tropical basin interaction	Ingo Richter	20
	4		**Other Activities**		
		4.1	ICPO report	Jose Santos	20
		4.2	CLIVAR Summer Schools	Jose Santos	10
		4.3	Discussion: Multi-panel workshop on observations	Weidong Yu	20
		4.4	Discussion on cross-panel activities and model-observational connections	Sonya Legg / W. Cai	30
		4.5	Discussion on UNDecade	Martin Visbeck	40
Thursday, 11th			**Session**	**Presenter – Discussion lead**	**Time**
Chair: Sonya Legg					
Start time 16:00 EST (NY) 22:00 CET (Paris) 06:00 +1day JST (Tokyo) 21:00 UTC	**5**		***Interactions with Other Projects***		
		5.1	US CLIVAR	Gudrun Magnusdottir	20
		5.2	OOPC	Sabrina Speich	20
		5.3	IOC	Salvatore Arico	20
		5.4	Clic	Fiamma Straneo	20
		5.5	CORDEX	Irene Lake	20
		5.6	SPARC	Seok-Woo Son	20
		5.7	GEWEX	Xubin Zeng	20
		5.8	WMO related activities	Mike Sparrow	20
		5.9	Closing of public part of SSG	Sonya Legg/W. Cai	5
	6		***In camera* – SSG and ICPO only**		
			Review of 2021 Meeting proposals and budget	ICPO staff/SSG	20
			Any Other Business/Next SSG		20

APPENDIX C. Acronyms

AR6	Sixth Assessment Report (IPCC)
ASPeCt	Antarctic Sea-ice Processes and Climate (CliC/SCAR)
CliC	Climate and Cryosphere (WCRP)
CLIVAR	Climate and Ocean Variability, Predictability and Change (WCRP)
CMIP	Coupled Model Intercomparison Project
CMIP	Coupled Model Intercomparison Project
CMIP5	CMIP Phase 5
CMIP6	CMIP Phase 6
CORA	Coordination Office for Regional Activities (WCRP)
CORDEX	Coordinated Regional Climate Downscaling Experiment
COVID-19	Coronavirus Disease 2019
ECCOOS	North Pacific Ocean Circulation Experiment
ECS	Early Career Scientists
ECV	Essential Climate Variables
EOV	Essential Ocean Variables
EPESC	LHA Explaining and Predicting Earth System Change Light House Activity
ESGF	Earth System Grid Federation
ESM-Snow	Earth System Model-Snow
GAW	Global Atmosphere Watch Programme
GCP	Global Carbon Project
GESAMP	Group of Experts on the Scientific Aspects of Marine Environmental Protection
GEWEX	Global Energy and Water Exchanges (WCRP)
GlacierMIP	Glacier Model Intercomparison Project
GOOS	Global Ocean Observing System
ICES	The International Council for the Exploration of the Sea
ICMPO	International CLIVAR Monsoon Project Office
IMBeR	Integrated Marine Biogeochemistry and Ecosystem Research
IMBeR	Integrated Marine Biosphere Research
IO	The Indian Ocean
IOCCP	The International Ocean Carbon Coordination Project
IOC-R	Integrated Ocean Carbon-Research
IPCC	Intergovernmental Panel on Climate Change
IQuOD	International Quality controlled Ocean Database
ISMIP6	Ice Sheet Model Intercomparison Project for CMIP6
JRA55	the Japanese 55-year Reanalysis
JSC	Joint Scientific Committee (WCRP)
JSC-41B	Extraordinary Session of the JSC held in November/December 2020
LBC	lateral boundary conditions
LHA	Lighthouse Activity
MISOMIP2	Marine Ice Sheet-Ocean MIP
MOSAiC	Multidisciplinary drifting Observatory for the Study of Arctic Climate
NPOCE	North Pacific Ocean Circulation Experiment
OMIP	Ocean Model Intercomparison Project
OOPC	Ocean Observations Physics and Climate Panel
PICES	North Pacific Marine Science Organization
RCM	Regional Climate Models
S2S	Subseasonal to Seasonal (also S2S Prediction Project (WCRP, WWRP))
SCAR	Scientific Committee on Antarctic Research
SCOR	Scientific Committee on Oceanic Research
SH	Southern Hemisphere

SO	Southern Ocean
SOLAS	Surface Ocean - Lower Atmosphere Study
TAOS	Tropical Atlantic Observing System
TPOS	the Tropical Pacific Observing System
WGNE	Working Group on Numerical Experimentation (WCRP/WMO Research Board)
WMO	World Meteorological Organization
WWRP	World Weather Research Programme
YESS	Young Earth System Scientists
YOPP-SH	Year of Polar Prediction in the Southern Hemisphere
SIMIP	Sea Ice Modeling Intercomparison Project
ESM	Earth System Modelling
FPS	Flagship Pilot Studies
ESGF	Earth System Grid Federation
GCM	Global Climate Model
QBO	quasi-biennial oscillation
RMM	Rainfall Measuring Mission
MJO	Madden-Julian Oscillation
EEI	Earth Energy imbalance
ABL	Atmospheric Boundary Layer
CAFF	Conservation of Arctic Flora and Fauna

The
World Climate Research Programme (WCRP)
facilitates analysis and prediction of Earth system change for use in a range of practical applications of direct relevance, benefit and value to society.