Summary of the WCRP JSC-44 meeting for CLIVAR

You are encouraged to view the documents and presentations for the WCRP JSC-44, which can be found on the WCRP website at https://www.wcrp-climate.org/jsc44-documents.

1. **Feedback on CLIVAR activities**: We had a very good reception to our summary of CLIVAR activities. The JSC seemed particularly impressed by all the workshops, summer schools, and other capacity building activities organized in the past year, as well as review papers and coordinated activities such as SOFIA. Many thanks to everyone for your efforts, and to the ICPO staff. Jose's committed work as outgoing ICPO Director was also specifically acknowledged. One recommendation was to provide the WCRP JSC with a list of science highlights, and make sure publications are communicated to WCRP. Additionally, peer reviewed publications arising from CLIVAR activities should take care to include the role of CLIVAR in their acknowledgements. Moreover, in addition to this systematic reporting, the JSC would like to be informed and 'collect' achievements as these happen - everybody is thus encouraged to advertise events, and report achievements within the CLIVAR panels to the SSG, as these occur.

   We also received some technical questions/suggestions after our presentation. It was suggested that fresh water fluxes into the ocean should feature more prominently in CLIVAR research, and we acknowledged that this is a possible focus area, thinking for example of how such fluxes may lead to ocean stratification. We were asked what the CLIVAR research focus of MHWs entails, and we explained that it is largely about their signature and predictability, and less about their impacts. We also had to explain how our research foci are organized, and we responded that there are open calls from time to time to which anybody can make a proposal. Research foci have to be of an international nature, and focussed on how to coordinate and consolidate research. We were also asked if CLIVAR panels organize research projects, and we mentioned that this differs across panels. We have funding for workshops, and to coordinate research where there are gaps in coordination, but we can't fund research projects or pay research salaries.There was finally a comment on Sea Level Rise, which was initially a CLIVAR research focus that became a Grand Challenge, but it is not clear where it is placed now. It was pointed out that SLR is relevant to the LHAs of 'My Climate Risk' and 'Safe Landing Climates', but that more discussion is needed to ensure it remains very prominent within WCRP.

2. **Interactions between CLIVAR and other WCRP core projects**

CliC: While CliC is a co-sponsor of NORP and SORP, the possibility of improving connections between CliC and the CLIVAR/GEWEX Monsoons panel was discussed. Particularly relevant are connections between the Himalayan cryosphere and Asian monsoons. Impacts of reduced Arctic sea-ice on Asian monsoons is another possible connection.

GEWEX: While we currently collaborate with GEWEX through the Monsoons panel, there are more possibilities for joint interaction. Areas of joint interest include atmospheric rivers, modes of variability which influence precipitation (e.g. through CDP activities), and the impacts of riverine freshwater inputs at the coasts (e.g. connecting particular basin panel activities to the regional hydrology).

SPARC: SPARC is increasing its focus on the lower atmosphere, not only the stratosphere. There are therefore more possibilities for connecting with CLIVAR activities. In particular, Atmospheric Rossby waves, their forcing mechanisms, changes under climate change and role in extreme events is a topic of interest for SPARC which may have some overlap with CDP interests. SPARC is interested in exploring joint workshops on these activities, through its Dynamical Variability (DynVar) activity. SPARC would also like to connect with the CLIVAR Monsoons panel, through its Atmospheric Composition and the Asian Summer Monsoon (ACAM) project. SPARC's Reanalysis Intercomparison Project (S-RIP) may be relevant to GSOP's ongoing state estimation/data assimilation activities.

ESMO: ESMO is one of the new core projects of WCRP, and still in the process of formation. Currently, the ESMO SSG candidate list has been submitted to the JSC, so this will soon be a functioning SSG. ESMO has several new proposed Working Groups on Earth System Reanalysis, AI, and Observations - all of these would benefit from interaction with CLIVAR panels. Currently interaction has largely been with OMDP members, which is encouraged to continue, but GSOP in particular should also get involved.

RIfS: CLIVAR's interaction with RIfS has largely been indirect, through the My Climate Risk ocean hubs. Since RIfS can help connect CLIVAR with social scientists, and assist with co-production of climate science, CLIVAR panels/workshops could invite RIfS members to participate in relevant workshops with a societal focus (e.g. marine heatwaves).

3. Interactions between CLIVAR and Lighthouse activities

Explaining and Predicting Earth System Change (EPESC) LHA: This LHA is focused on annual to decadal/multidecadal circulation change and has 3 working groups focused on different themes, and one cross-theme case study focus:

- WG 1: modeling and observing capabilities
- WG 2: integrated attribution and prediction
- WG 3: hazards
- Case study: summer circulation and heat waves.

While there are numerous people involved in the EPESC WGs with previous CLIVAR experience, ongoing activities would benefit from continued interaction and communication. Areas of particular interest where connections with CLIVAR would be useful include: model-observation integration in WG 1 (OMDP, GSOP), earth's energy imbalance in WG1, annual to decadal variability in the North Atlantic (CDP - including the 2023 workshop, ARP), tropical pacific decadal variability in WG2 (PRP, TPDV WG), and marine heatwaves in WG3 (Marine

heatwave RF). The cross-cutting case study on summer circulation and heat waves may be of interest to CDP.

Safe landing climates LHA:

The main lines of investigation pursued within the SLC LHA are:

1) Influence the design of CMIP7, towards better supporting tipping-element science.

2) Gaming and decisions/scenario exploration: for example, pathways in which things go right, or wrong, for humanity. This line of research was compared at the meeting to 'militaries playing war games'.

3) Water variability impacts (resilience, allocation, green finance, all in the context of greater variability). This relates to regional tipping points, which is part of safe landing climates, but there is still a stronger emphasis on the larger modes of variability impacting regionally.

4) Signposts for sea level rise.

5) High-risk cascading shocks.

6) Connecting across the Integrated Assessment Models/coupled General Circulation Model -impact hierarchy

7) Transient climate response to cumulative carbon emissions (TCRE), including effects of negative emissions.

CLIVAR will be key to lead/support the research on teleconnections, linking the global modes of variability and regional climate consequences. It was suggested that CLIVAR and SLC form direct links/contacts. CDP and the current CLIVAR research focus on tropical basins interactions are directly relevant. The CLIVAR regional panels should consider increasingly exploring what is safe regionally, also in the context of teleconnections. CLIVAR was also mentioned in terms of carbon cycle (TCRE), the monsoon panel's work in Africa, and SLR, marine heat waves, ocean acidification, and algae blooms, all being relevant to SLC.

In the discussion of regionally safe climates, the attendees pondered whether regional ocean and coastal modelling is sufficiently well represented within WCRP, and whether CLIVAR should involve more coastal modelers, for example in OMDP, to make CLIVAR representation in this regard more equitable.

Digital Earths LHA: This lighthouse activity is beginning by focusing on fully coupled km scale models, and there is a clear link to km-scale modelling pursuits within OMDP; mentioned in

particular were simulations that resolve sub-mesoscale eddies. GSOP may also be important to DE, in the context of ocean assimilation.

DE extends from global DEs to 'regional' DEs, that is, to km-scale regional Earth System Modelling. Within this context, a stronger focus on coastal modelling in WCRP, with links to CLIVAR, was once again mentioned. The Baltic Ocean, and Antarctic ocean, were mentioned as two possible hotspots.

My Climate Risk LHA: CLIVAR has a good interaction with MCR via co-sponsored ocean hubs. MCR is focused on developing local hubs and bringing their expertise together in a global network. CLIVAR could find ways to interact with the hubs, where local expertise/input/needs could be relevant to a particular workshop topic etc.

WCRP Academy: The Academy is now transitioning to a long-term sustainable model. Depending on funding, this may include 2 staff members as well as contractors for website development. All CLIVAR training events are encouraged to communicate in advance with the academy, and provide material for archiving after the event. WCRP academy will soon be sending out an email requesting lists of training activities.

4. WCRP Task Teams

GPEX (Global Precipitation Experiment): The science plan of GPEX is focused around a "Year of Precipitation" with activities before and after. CLIVAR has a representative on the GWEX science team (Charlotte DeMott). GPEX would like to work with CLIVAR to organize a dialogue to design precipitation gauges for buoys. The GPEX science plan will soon be made available for comment/input.

Cycles and budgets task team: CLIVAR has past and current activities focused on heat, water and carbon fluxes and cycles, which connect with this task team. A workshop is planned for June 22-23 in Paris. CLIVAR could help connect this activity with the Integrated Ocean Carbon Research (IOC-R) activity sponsored by IOC, on which Annalisa Bracco is the CLIVAR representative. Currently the carbon component of the workshop invitee list is small.

Climate Intervention task team: This task team has produced a report (to be made available soon) recommending that WCRP draft a statement on "climate intervention" (e.g. negative carbon emissions, such as marine carbon dioxide removal, as well as solar radiation intervention). Lots of vigorous discussion ensued, focusing on the need for WCRP to be impartial and provide critical assessment, not endorsement.

5. WCRP business

WCRP science and implementation plan: CLIVAR, along with all other core projects, has previously provided information to this plan. All core projects will now make revisions to reflect discussions at the JSC meeting, including connections and collaborations.

WCRP carbon footprint guidelines: A draft set of guidelines for reducing WCRP's carbon footprint by 75% compared to 2023 levels (not including the open science conference) can be found at https://www.wcrp-climate.org/JSC44/Documents/WCRP%20Travel%20Carbon%20Calculation%20Guidelines-v7.pdf. Please send feedback to Pierre Friedlingstein (P.Friedlingstein@exeter.ac.uk). From a CLIVAR perspective, we continue to encourage virtual activities where feasible; panels should plan to alternate in-person and virtual annual meetings; all in-person meetings should allow hybrid access; in-person activities should prioritize early career and capacity building.

6. External partners

Many non-WCRP partners gave short presentations. CLIVAR has existing interactions with several, and there is room for closer cooperation with additional partners. In particular:

Future Earth: CLIVAR has had past interactions with Future Earth networks **SOLAS** (Surface Ocean-Lower Atmosphere Study), **IMBeR** (Integrated Marine Biosphere Research), and **PAGES** (Past Global Changes). PAGES in particular would like to reconnect, and the PAGES working group on Climate Variability Across Scales is especially relevant to CLIVAR (e.g. CDP). CLIVAR activities relevant to marine biogeochemistry and carbon cycle should connect with IMBeR and SOLAS. Another Future Earth network of relevance to CLIVAR is the **Ocean KAN** (Knowledge Action Network) - connecting with them may help us reach out to on-the-ground partners around the world.

GOOS and OOPC: CLIVAR continues to work with OOPC, and all activities focused on the ocean observing system are encouraged to collaborate with OOPC. A draft mind map for the potential cooperation between CLIVAR and OOPC has been developed.