

Climate Dynamics Panel

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Panel overview

The overarching panel's objective is to advance our basic understanding of climate dynamics using observations and models and to determine the role of climate dynamics in shaping climate variability and change on seasonal to centennial time scales. Currently our activities are organized around three areas:

1. Weather-climate interaction across different spatio-temporal scales,
2. Ocean basin to ocean basin and tropical-extratropical teleconnections, and
3. Development of predictive theories of climate dynamics, involving non-linear interactions between the dynamics and physics of the atmosphere and ocean.

The panel had another very active year. The main achievement of the panel was to hold the first CDP annual workshop on *external versus internal variability on decadal and longer time scales*. The workshop spanned a six week period and had around 270 registrants. We aim to organise similar workshops on an annual basis. In addition, panel members co-organized three other workshops and were conveners of seven sessions at international conferences.

Three members will rotate off by the end of 2022. CDP has 13 members at present. With many excellent candidates, including from the open call, CDP has applied to add one more position. Our aim is to recruit early career scientists and outstanding scientists from the less represented countries, especially those from the global south.

Achievements for 2021-2022

Workshops

The first [CLIVAR Climate Dynamics Panel \(CDP\) annual workshop](#) was held online from the 14th of September to the 19th of October 2022. The workshop was on *external versus internal variability on decadal and longer time scales*. It attracted about 270 registrants. The workshop used a webinar-series format, lasting 6 weeks with a 2-hour session per week. The first four sessions consisted of 3 to 4 invited presentations targeting the current research on the workshop's four themes. There was an online poster session during week five. During the sixth week, a summary from the first five sessions was reported by the scientific committee, and followed by a heated panel debate, which involved all the participants. CLIVAR funding was used to purchase a "virtual poster session" that provided an excellent online platform for viewing posters, and all recordings of talks are available via the workshop webpage. This workshop was a major undertaking of the panel, involving about 10 preparation telecon for this workshop and extensive logistic support from the CLIVAR office. A [workshop report](#) provides a full summary, including of a participant survey.

CDP co-organized three other workshops: (1) The workshop on Continental Climate Change: Simple Models to Understand the Future, St Andrews, Scotland, 6-8 June 2022. Mike Byrne was the lead organiser and the workshop was funded by the

Carnegie Trust. (2) The pattern effect workshop, Boulder, CO, USA, 10-13 May 2022. Natalie Burls and Sarah Kang joined the Scientific Organizing Committee; (3) 2022 CFMIP Meeting on Clouds, Precipitation, Circulation, and Climate Sensitivity, Seattle, USA, 19-22 July 2022. Sarah Kang is part of the organising committee.

CDP was involved in organising several conference sessions:

- [Ocean Sciences Meeting 2022, AI04](#) Extratropical climate variability and change associated with air-sea interactions (**Sasaki, Parfitt, Hu, Keenlyside**); **OC04** Mesoscale eddies and their roles in the climate system: characteristics, dynamics, mechanisms, and interactions with the mean flow and the overlying atmosphere (Ding, **Hu**, Lin); **OS1.8** Tropical & Subtropical Ocean Circulation, Equatorial to Mid-Latitude Air-Sea Interactions (Martín-Rey, Brandt, **Keenlyside**, Rodriguez-Fonseca)
- [AOGS 2022, AS23](#) Earth System Predictability, Prediction and Projection (Lee, Alessandri, Chikamoto, **Keenlyside**, Luo)
- [AGU fall meeting 2022, A51](#) Extratropical and High-Latitude Storms, Teleconnections, and Extreme Events in the Context of Air-Ice-Sea Interactions and Rapidly Changing Polar (Zhang, Moore, Overland, **Hu, Keenlyside, Parfitt**)
- [PAGES open science meeting, OSM25](#): Tipping points in the Earth system: Can the past inform us about the future? (Valdes; **Hu**); Side event : **PAGES-Ocean KAN** (Alexandroff, **Hu**, Mette, Pendleton).

[Scientific results from activities](#)

The CDP 2022 workshop synthesised the current understanding on external versus internal variability on decadal and longer time scales in the climate, and identified the current challenges and potential approaches to reduce uncertainties in observations and simulations of external and internal climate variability. The organising committee summarised the [main scientific outcomes](#) from the CDP 2022 workshop and is planning to write a paper on these.

The submission of review on “Towards providing more reliable regional climate change projections” that was planned for 2022 was unfortunately delayed, and is now expected in early 2023.

[Scientific capacity building and career support](#)

CDP has provided career support by including less senior researchers and Early Career Scientists (ECS) and intends to better represent the research community beyond Europe and USA.

CDP has promoted scientific capacity strengthening through the CDP annual workshop. ECS were given the opportunity to showcase their studies through lightning talk sessions and there were four [CLIVAR CDP 2022 Workshop Early Career Scientist Best Poster Award](#). Three judges who are senior experts in relevant fields evaluated each ECS poster.

[Knowledge exchange](#)

CDP has close connections with the other CLIVAR groups, for example, the TBI, AP, and the PRP, co-organizing several activities with them. Next year, CDP will co-

organise a workshop and summer school on the AMOC with TBI, which will further enhance the knowledge exchange within CLIVAR.

Plans for 2023 and beyond

- CLIVAR CDP annual workshop 2023— AMOC in a broad sense: AMOC-weather-climate link on different time scales. A summer school is planned to back to back with the workshop.
- Participate in the 2023 CLIVAR Joint Workshop on Tropical Pacific and Its Inter-basin Interactions, February 13-17, 2023 Melbourne, Australia
- Robert Wills potential future CDP member is leading ForcedSMIP – an initiative to compare statistical approaches to separate forced and internal variability.
- Submit papers based on 2021 and 2022 CDP workshops
- Kang has led a proposal for a CLIVAR RF on cloud-circulation coupling.

Articles published in 2021/22 as part of panel activities (if any)

Keenlyside has contributed two articles to the CLIVAR Exchanges special issue on the Tropical Atlantic Observing System.

Budget and other needs for 2023 (in CHF)

We request 5000 CHF to support the CDP annual workshop— AMOC in a broad sense: AMOC-weather-climate link on different time scales

Aim for a total length of ~2 pages, more is fine, but not necessary

Annex A

Proforma for CLIVAR Research Focus requests for SSG approval for meetings

Note: If your group has approved funds in 2022 that were not used because of Covid19 and any other unexpected issues, and you propose to use them in 2023, they should be included again in this request, in addition to any new request.

1. RF name: Climate Dynamics Panel

2. Title of meeting or workshop:

Atlantic Variability and Tropical Basin Interactions at Interannual to Multi-decadal Timescales: Mechanisms, Drivers and Impacts

3. Proposed venue (or indicate if online):

International Centre for Theoretical Physics (ICTP), Trieste, Italy

4. Proposed dates:

2.5 days in late July or early August (before or after the ICTP Summer school on the same topic)

5. Proposed attendees, including likely number:

We anticipate 40-50 attendees in person, with the potential for additional remote participants. Efforts will be made to ensure diversity in terms of career stage and background.

6. Rationale, motivation and justification, including: relevance to CLIVAR science & WCRP Strategic Plan and Lighthouse Activities, and any cross-panel/research foci links and interactions involved:

The workshop will bring together experts on low-frequency variability and change on the one hand and tropical basin interaction on the other. This should provide fertile ground to advance our understanding of how slowly evolving mean state changes influence interaction among the ocean basins and what long-term implications this has for the predictability of climate variations.

The goals of this workshop are closely linked to the CLIVAR goals of predicting variability of the oceans on a wide range of time scales. It is being organized together with the Tropical Basic Interaction Research Foci.

The workshop goals are also linked to the wider WCRP objectives of better understanding, and reliably projecting, future climate change. Specifically, the workshop should contribute to the goals of the Lighthouse Activity (LHA) Explaining and Predicting Earth System Change (EPESC). We will invite members of this LHA to attend the workshop.

7. Specific objectives and key agenda items:

The workshop will be centered around the following scientific questions:

- 1) How does low-frequency variability, such as the Atlantic Multidecadal Variability (AMV), modulate the linkage among the three tropical basins?**
- 2) What is the role of the Atlantic meridional overturning circulation (AMOC) in setting the spatial patterns and timescales of the AMV?**
- 3) How do climate models simulate low-frequency variability (in particular the AMOC and AMV) and its impact on tropical basin interaction?**
- 4) How will low-frequency variability and tropical basin interaction change under global warming?**

In addition to the scientific presentations, there will also be a Climate Dynamics Panel meeting to discuss the business.

8. Anticipated outcomes (deliverables):

We plan to publish a workshop report in EOS or BAMS. Depending on the progress made at the meeting, we might also aim for a special issue on this topic, e.g., in the Journal of Climate.

9. Format:

Each of the scientific questions will be addressed in a dedicated plenary session. There will be one invited keynote lecture for each plenary session, as well as contributed presentations. In addition, there will be breakout groups for discussing emerging topics, and poster sessions.

10. Science Organizing Committee (if relevant)

Ingo Richter (JAMSTEC, Japan, co-chair), Riccardo Farneti (ICTP, Italy, co-chair), Aixue Hu (NCAR, US, co-chair), Natalie Burls (George Mason University, US), Sarah Kang (Ulsan National Institute of Science and Technology, South Korea), Noel Keenlyside (University of Bergen, Norway), Yuko Okumura (University of Texas at Austin, US), Rhys Parfitt (Florida State University, US)

11. Local Organizing Committee (if relevant)

Riccardo Farneti (ITCP, Italy); TBD

12. Proposed funding sources and anticipated funding requested from WCRP:

Since this workshop will be held back-to-back with the ICTP Summer School on the same topic, we hope that participants of the latter will be able to extend their stay in Trieste to attend the workshop. This would increase the number of participants at low additional cost.

We have also applied to US CLIVAR to fund US-based participants. Furthermore, TBI Member Belen Rodriguez-Fonseca may be able to contribute workshop funding through a Spanish government grant.

In addition to the above funding sources, we would like to request CHF 5,000 from WCRP to support travel costs of international participants, particularly those from low-income countries.