

CLIVAR/CliC Northern Oceans Region Panel

Co-chairs: Amy Solomon (Amy.Solomon@noaa.gov)
Ruth Mottram (rum@dmi.dk)

Panel overview

NORP serves as an international forum for coordinating and strategizing activities on the role of the Arctic Ocean in the context of the global climate system from a coupled perspective. NORP facilitates progress in the development of tools and methods to monitor and assess climate variability and change, and evaluate climate predictability of the ocean-atmosphere-ice system in the Arctic and Subarctic Ocean. NORP coordinates efforts to enhance the ability to monitor the coupled system, understand the driving mechanisms of the system change from a coupled process perspective, and predict the evolution of the emerging New Arctic climate. NORP plays a central role in coordinating, monitoring, and evaluating the progress of such activities during and beyond the Year of Polar Prediction.

Membership Update

Two new members joined in 2021: Qi Shu (FIO, China) and Vladimir Ivanov (AARI, Russia). Two members rotated off the panel; Jun Inoue (NIPR/Japan) and Dirk Notz (MPI/Germany). All other members renewed their terms. Ten members will have to rotate off in 2022 and there is currently an effort to involve ECSs to join the Panel.

Achievements for 2020-2021

- Workshops and meetings
 - Sessions at vEGU 2021: OS1.3 Changes in the Arctic Ocean, sea ice and subarctic seas systems: Observations, Models and Perspectives
 - The 2nd Session of the CLIVAR/CliC Northern Oceans Region Panel <https://www.clivar.org/news/2nd-session-clivarcliC-northern-oceans-region-panel-took-place-online>
- Scientific results from activities
- Solomon is serving on the EU H2020 CRiceS (Climate relevant interactions and feedbacks: the key role of sea ice and snow in the polar and global climate system research project) and PolarRES (Polar Regions in the Earth System) International Advisory Committees.
- Scientific capacity building and career support

Solomon did a virtual site visit to Pennsylvania State University and meet with the Department of Meteorology graduate students to provide feedback on their research and careers on April 21, 2021.

- Knowledge exchange
Solomon presented on model experiments on coupled atmosphere-sea ice-ocean interactions during the MOSAiC campaign to the US CLIVAR PSMI Panel on Feb 23, 2021.

Plans for 2022 and beyond

1. Arctic Processes in CMIP6 bootcamp, Oct 5-21, Helgoland, Germany
2. NORP/SORP Workshop on sources, pathways and impacts of fresh water in northern and southern polar seas, planned for April 2022 (supported by IASC and potentially WWRP/PPP)
3. Sessions at 2022 AGU and EGU annual meetings
4. Review paper on seasonality of the Arctic freshwater
5. Review paper on Arctic Ocean heat flux

Articles published in 2020/21 as part of panel activities (if any)

Solomon, A., Heuzé, C., Rabe, B., Bacon, S., Bertino, L., Heimbach, P., Inoue, J., Iovino, D., Mottram, R., Zhang, X., Aksenov, Y., McAdam, R., Nguyen, A., Raj, R. P., and Tang, H.: Freshwater in the Arctic Ocean 2010–2019, *Ocean Sci.*, 17, 1081–1102, <https://doi.org/10.5194/os-17-1081-2021>, 2021.

Budget and other needs for 2022 (in CHF)

Please keep in mind that the overall budget of CLIVAR is limited and this needs to be distributed between all activities and the SSG meeting.

10K CHF to support the lodging and meals for the participants.

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

Annex A

Proforma for CLIVAR Panel requests for SSG approval for meetings

Note: If your group has approved funds in 2021 that were not used because of Covid19 and other unexpected issues, and you propose to use them in 2022, they should be included again in this request, in addition to any new request.

1. **Panel name:** Northern Oceans Region Panel
2. **Title of meeting or workshop:** Arctic Processes in CMIP6 bootcamp
3. **Proposed venue (Or indicate if online):** Helgoland, Germany
4. **Proposed dates:** Oct 5-21, 2022
5. **Proposed attendees, including likely number:**
20 students and 10 instructors
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:**

CMIP6 has produced a lot of output which the analysis is not enough. It's critical to conduct the analysis for the climate research. We plan to gather some outstanding PhD students and Postdocs together, ideally somewhere remote, who will conduct the analyses with us over 2-3 weeks.

Although there could be some lectures as well, focused on the topics of study (e.g. on modelling and/or CMIP and/or the Arctic Ocean processes), it's good to have ECRs focus on "grand challenges" and to try to move the science forward using the tools and experience within their small groups as well as the advice and experience of the senior scientist mentors.

From this bootcamp, we hope to learn/improve big data management skills, from writing the algorithm to visualizing the results, to develop capabilities for cloud processing of complex datasets, to get an Earth system perspective by working with students from a different topic, to improve critical skills (know why models are not perfect and how to detect biases), to give an introduction to the MIPs and SSPs, and to provide intensive introduction to processes important in the Arctic and Northern Oceans.

The topics will include:

- freshwater fluxes;
- comparison with MOSAiC observations;
- comparison with MOSAiC-specific modelling results;

- polar amplification in CMIP6 (compared to CMIP5?) (and potentially a mechanistic analysis looking at near surface stratification, cloud phase, sea ice thickness)
- The new Copernicus Arctic Reanalysis - very high resolution reanalysis as an evaluation dataset for CMIP6
- Validation of cloud phase/frequency (and impact on boundary layer structure and surface energy balance) in reanalyses and CMIP6 models
- CORDEX and regional models - downscaled from CMIP6
- Model skill, process studies and connections between observations and numerical
- Ocean- ice interactions in coupled models

7. **Specific objectives and key agenda items:**

The objective is to have ECRs focus on “grand challenges” and to try to move the science forward using the tools and experience within their small groups as well as the advice and experience of the senior scientist mentors.

The bootcamp will last for 2-3 weeks. The detailed agenda will come soon.

8. **Anticipated outcomes (deliverables):**

Learning outcomes for students:

- Learn/improve big data management skills; from writing the algorithm to visualizing the results;
- Get an Earth system perspective by working with students from different topics;
- Improve critical skills: know why models are not perfect and how to detect biases;
- Introduction to MIPs and SSPs - these datasets will be used for next 5-7 years to provide climate service information + analyses scientific results

Bootcamp deliverables: Short study reports from the students to be published in the CLIVAR EXCHANGES.

9. **Format:**

The bootcamp will last 2-3 weeks and will be held at the Alfred Wegner Institute facilities on Helgoland (a remote German island in the North Sea), which can be useful for the participants focusing on moving forward the science. The trainers and trainees will live and study together to have a fully communication. We also plan to invite some remote lectures considering the reduction of carbon emission.

10. **Science Organizing Committee (if relevant)**

Organizing Committee: NORP members

Mentors: NORP members, Alexandra Jahn (University of Colorado, Boulder), AWI scientists, and others.

11. **Proposed funding sources and anticipated funding requested from WCRP:**

The total budget for the lodging will be about 20K EUR and the travel expenses will be about 20K. We apply for 10K CHF from CLIVAR to support the lodging. In addition, we hope CliC, USCLIVAR, H2020 projects, and local funding agencies

can allocate funding to support travel costs for some mentors and young researchers. We hope ICPO can provide supports for logistics and promotion.