

CLIVAR REPORT

Climate and Ocean: Variability, Predictability, and Change



Meeting report

The 1st Session of the CLIVAR/CliC Northern Ocean Region Panel

15 – 16 June, 2018 Davos, Switzerland

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ACTION ITEMS

1. Merge with already existing OceanObs19 abstract (Patrick):
2. Organize an EGU session (Celine)
3. Submit a proposal for a 2019 Aspen Global Change Institute Workshop (Amy)
4. Submit an abstract on NORP activities to the upcoming FAMOS meeting (Arild)
5. Early-career hands-on workshop with scientist mentors. For example, role of fresh water input on variability (not included in reanalyses). Potential IASC, APECS, Nordic Research funding? (Ruth)
6. Develop a white paper on sea-ice ocean metrics for lower-latitude-Arctic interactions for CMIP diagnostics (need to check PCMDI defined metrics) (Dorotea/Amy)
7. Contact national representatives to enquire about support for Arctic ocean-sea ice state estimates (members actively involved in reanalyses)
8. Organize a workshop on distinguishing internal and forced variability in the Arctic coupled system (John/Dirk)
9. GL ice sheet – ocean interactions: Advocate for inclusion in CMIP7 and Sea level call in Horizon2020 (Ruth/Patrick)
10. Coordinate archiving/mirroring of past/future campaign/in-situ data for assimilation and analysis: Coordinate with CLIVAR Global Synthesis and Observations Panel (Laurent/Sheldon)

1. Introduction

The 1st session of CLIVAR/CliC Northern Ocean Region Panel (NORP) was held on 15-16 June 2018, at Congress Centre Davos, Switzerland. NORP-1 took place alongside with the POLAR2018 conference, a joint event from SCAR and IASC (International Arctic Science Committee). Since the 13th session of the CLIVAR/CliC/SCAR Southern Ocean Region Panel (SORP) also occurred in Davos on 14-15 June, a joint session between SORP and NORP was convened on the afternoon of 15 June.

2. Joint session of SORP/NORP

During the joint session with SORP, co-chairs from both panels briefed the meeting on their terms of reference. Many research aspects of common interests were identified in the open discussion from the panel members:

1. North/South Pole variability/processes:
 - a) Ocean State Estimates (OSE): lack of observations is a common issue to both Southern Ocean and Arctic interior,
 - b) Need to extend studies to capability and trends (polar ORA in works),
 - c) Summer-season variability on sea ice increases in Arctic and Southern Ocean,
 - d) How to bring in process perspectives.
2. Joint interests on research topic:
 - a) Sea ice;
 - b) CMIP6 metrics (unifying metrics across CMIP models, CORE-II and OSE worlds),
 - c) Overturning circulation (hundreds of years timeframe for water to move from north to south);
3. Outstanding polar issues:
 - a) Role of fresh water input on variability (which are not included in the reanalyses);
 - b) Inability of models to simulate impact of synoptic variability on sea ice and ocean (rapid sea ice change);
 - c) Polar mid-latitude linkages (Parallel modelling exercises for Northern Ocean and Southern Ocean, which could be a good place for both panels to work together). PA-MIP (Polar Amplification Model Intercomparison Project) studies the impact of Arctic and Antarctic sea ice on mid-latitudes.

The role of the tropics on the polar regions, comparison of sea ice behaviour at both polar, and bipolar see-saw were also recognized as interesting points to work on.

It was desirable to seek possible interactions and synergies among SORP and NORP task teams, in aspects such as the link with CLIVAR Climate Dynamics Panel, projects on observing system design (future design of buoy and radiosonde) in the Antarctic and Arctic (MOSAIC, the Multidisciplinary drifting Observatory for the Study of Arctic Climate in the Arctic and SOOS in the Southern Ocean).

The next proposed joint activity from SORP and NORP is the 2021 CLIVAR/CliC summer school or workshop supported by ICTP in Trieste, Italy. Topic and location are yet to be determined by the panel co-chairs.

3. Reports from other partnership projects/programs

During the meeting, some important partnerships were identified, which include, for example, ASOF (Thomas Haine); FAMOS (Andrey Prosuntinsky); SORP (Inga Smith); IASC (John Fyfe); PCPI (Marilyn Raphael), SEARCH (Marika Holland); PPP (Matthieu Chevallier); CDP (Olga Zolina); MOSAiC (Amy Solomon), and more, with the liaison person in the parenthesis.

Discussion concerning the cooperation with CLIVAR Climate Dynamic Panel identified several research challenges relevant to both panels, which are:

- Arctic storm tracks responses to the diabatic signals (specifically fluxes associated with sea ice changes – melting/freezing vs drift)
- Arctic Ocean sources for local evaporation and surface fluxes – reduce uncertainties
- North Atlantic – Arctic interactions: storm tracks + atmospheric rivers
- Arctic climate feedbacks – revisited

IASC MWG report

Lee Cooper, chair of the Marine Working Group (MWG) of IASC, gave an introduction on the MWG, which is composed of 32 members from 21 countries (23 countries are members of IASC). MWG's 5-year plan that has been adopted in 2017 is:

- Improve the engagement of working group members in actions of the Marine Working Group between face-to-face meetings.
- Encourage and facilitate two-way communication between working group members and their national science constituencies.
- Improve lines of communication and cooperation with terrestrial, cryospheric, atmospheric and social scientists where appropriate, as with researchers focused on parallel southern hemisphere scientific questions.
- Promote transparency in Marine Working Group decisions that support international cooperation in Arctic marine research.
- Support of early career scientists for involvement in international research coordinated by IASC member countries, including expanding roles for IASC Fellows in Marine Working Group tasks.

MWG proposed several cross-cutting themes, i.e. scientific questions that are interdisciplinary and extend beyond the interests of individual working groups, and are meant to expand or cross the boundaries of traditional research disciplines. Those questions include:

- How will the diminishing ice cover affect the carbon cycle in the Arctic and what are the impacts?
- How does the variability of different components of the Arctic system impact the heat and momentum exchanges between ocean, ice, atmosphere and space in a changing climate?
- How will changes in the hydrological cycle impact various components of the Arctic system?

The IASC cross-cutting proposals in 2018 have been listed:

- Network on Arctic Glaciology (Thorben Dunse, Renate Degen)
- T-MOSAiC (João Canário, Warwick Vincent)
- YOPP Arctic Science Workshop (Thomas Spengler)
- RATIC (Vladimir Romanovsky)
- Permafrost on all Channels (Julie Sansoulet, Frédéric Bouchard, Michael Fritz)

- Snow Winter School 2018 (Martin Schneebeli)
- Synoptic Arctic Survey (Jackie Grebmeier)
- Societal Relevance of Polar Research (Michał Łuszczuk)
- Applying Justice (Corinne Wood-Donnelly)
- High Latitude Dust (Outi Meinander)

And many of the proposals above request MWG involvements.

There has been already good interactions between MWG and NORP: NORP members are involved in the MWG business, for example, John Fyfe is recently appointed Canadian member of MWG, also on NORB (Northern Oceans Regional Board); Sheldon Bacon (NORB) is a former member of the MWG and has familiarity with it. Amy Solomon provided a presentation at MWG's 2017 meeting in Prague.

IASC working group funding process could help support international workshops and initiatives, particularly in multidisciplinary areas (e.g. atmosphere-ocean interactions) in conjunction with Atmospheric Working Group of IASC. IASC Fellowship program makes available early career scientists who could potentially help take advantage of synergies.

MOSAiC report

Amy Solomon introduced the MOSAiC project (Multidisciplinary drifting Observatory for the Study of Arctic Climate), which is a major international research initiative to improve the representation of Arctic coupled processes in weather forecast and climate models. The overarching goal of MOSAiC is to build a testbed for model verification and hypothesis testing, to improve the understanding of coupled atmosphere-ice-ocean-ecosystem processes in the Central Arctic to support improved sea ice forecasting, regional weather forecasting, and climate predictions. It has received commitments from institutions of the pan-Arctic countries:

- AWI: Polarstern for 13 months
- AWI: Ice, Ocean, Bio, Eco science contributions
- US DOE ARM: Atmospheric Facility
- TROPOS: Atmospheric Facility
- Norway: Dedicated funding call
- China/PRIC: Xuelong for resupply
- Russia/AARI: Akademik Federov for install
- NOAA-PSD/CIRES: Planning support

A rich inventory of measurements is made for the MOSAiC observations. For the atmosphere, the measurements include,

- ABL/Atmos. Structure: 4-times daily radiosondes, 10-20 m met. tower, UAV
- Dynamics: Doppler lidar, sodar;
- Clouds/precip: Radar, lidar, IR/microwave, precip. gauges, etc.
- Aerosols: Air sampling of CN, CCN, composition, IN

For the ocean, the measurements include,

- Ocean structure: heat, salinity/freshwater, periodic deep ocean profilers, frequent upper ocean, CTD profiling
- Heat flux: flux buoys
- Dynamics: current profiler (ADCP), turbulence mast/profiler
- Spatial transects: Gliders
- Opportunistic: Lead structure, ocean surface

- Large-scale: Pan-Arctic network of ocean profilers

There are also measurements planned for sea-ice including

- Surface type distribution (pond, lead): Manual and aerial surveys, vis/IR cameras, SAR
- Ice thickness / snow depth: Ice mass balance, manual surveys, EM surveys
- Thermodynamics: IMBs, manual freeboard,
- Radiative properties/optics: Radiometers, albedo surveys, ROV

4. Panel business

As the 1st ever panel meeting of NORP, one of the panel co-chairs, John Fyfe gave background on the formation of the NORP. The NORP aims to:

- Be a forum for coordinating activities on the role of the Arctic Ocean and neighboring seas in the global coupled climate system
- Facilitate progress in developing new tools and methods to observe and model the Arctic Ocean and neighboring seas

The panel discussed Arctic and mid latitude linkages. Part of this will be taking on the legacy of US CLIVAR WG (noting also other activities such as CliC, APPLICATE etc.)

Regarding the question whether the panel should cover biogeochemistry and so on, the discussion of the panel concluded that it shouldn't get too broad but focus on the physical climate system.

Task teams

The NORP is based around the formation of six task teams:

1. Arctic ocean reanalyses
2. Arctic ocean in Arctic amplification
3. Arctic midlatitude linkages
4. Anthropogenic and natural forcing
5. Model errors in Arctic projections
6. GL ice sheet – ocean interactions

These initial ideas have been thoroughly discussed and restructured during the meeting with the updated tasks and action items in below.

1. Effort to coordinate archiving/mirroring of past/future campaign/in-situ data for assimilation and analysis
 - A. Identify key data gaps
 - B. Define formats and protocols (start with ocean physics data)
 - C. Coordinate with CLIVAR Global Synthesis and Observations Panel (GSOP)
 - D. Links to Arctic Council
 - E. Write up position paper first
2. Arctic ocean-sea ice state estimates (reanalyses)
 - A. Inconsistent treatment of sea ice, atmospheric forcing, assimilation schemes, and observational uncertainty
 - B. Seek EU funding
 - C. Need to make statements to promote this activity

- D. Coordinate with CLIVAR GSOP
 - E. National representatives contact Copernicus
 - F. Coordinate with CLIVAR Ocean Model Development Panel (OMDP) (suggest a high-latitude focus)
 - G. Ask OMDP member to present during telecon
3. The changing Arctic Ocean (including sea ice)
 - A. Changing processes and impacts (including ocean turbulent mixing; impacts on SST, sea ice; dense water formation)
 - B. Changing exchanges between Arctic and (1) adjacent seas / oceans, (2) land (river runoff, ice sheet), (3) atmosphere (energy and moisture transport)
 4. Arctic amplification and global linkages
 - A. Local processes and forcings
 - B. YOPP/MOSAiC data and other current campaigns
 - C. Remote processes and forcings
 - D. Metrics for atmo/ocean/sea ice system for CMIP runs and reanalyses to assess midlatitude-Arctic interactions (not included in PA-MIP)
 - E. Change in climate state
 - F. Change in climate variability
 - G. Process diagnostics (ocean/atmosphere/ice)
 - H. Impacts on extremes
 5. Distinguishing internal and forced variability in the Arctic coupled system
 - A. Workshop planned
 - B. US CLIVAR Working Group on Large Ensembles (advise on Arctic assessment)
 - C. New methods for assessments of models and real-world variability
 6. Process-based assessment of model biases in Arctic forecasts and projections
 - A. Use high resolution coupled models to simulate atmospheric synoptic variability and the coupling with sea ice and ocean, validate with observations (such as from the MOSAiC and coordinated campaigns) to then assess climate model simulations
 - B. Coordinate with GEWEX polar cloud working group
 7. Greenland ice sheet – ocean interactions
 - A. National boundaries limit progress
 - B. Advocate for inclusion in CMIP7
 - C. Sea level call in Horizon2020
 - D. What is the impact of Greenland run off on the ocean?

5. AGENDA

AGENDA:

1st Session of the CLIVAR/CliC Northern Oceans Region Panel

Friday, 15 June 2018

8am – 5pm

Room A Dischma, Congress Centre Davos, between Davos Dorf and Davos Platz. The main entrance and the parking lots can be reached from the Talstrasse.

Note that Friday 15 June 2018, 2:30 - 5pm is a combined meeting with the CLIVAR/CliC/SCAR Southern Ocean Region Panel.

Saturday, 16 June 2018

8am – 1pm

Room B Rinerhorn, Congress Centre Davos, between Davos Dorf and Davos Platz. The main entrance and the parking lots can be reached from the Talstrasse.

Dates:

15-16 June 2018

NORP-1

(Chairs: Amy Solomon and John Fyfe)

Friday 15 June 2018

[NORP-1 solo in the morning, joint with SORP-13 in the afternoon after 2:30pm]

Day 1 (8am-5pm)

08:00-09:00: Member introductions (1-2 slides max)

09:00-10:00: Discussion of Task Teams core activities; discussion points, emerging challenges, deliverables

10:00-10:30: Arctic-mid-latitude linkages [Sheldon Bacon and Xiangdong Zhang]

10:30-11:00: Coffee Break

11:00-11:45: Discussion of Task Teams core activities; discussion points, emerging challenges, deliverables

11:45-12:00: Discussion with Olga Zolina (Member, Climate Dynamics Panel); overlaps, synergies, opportunities

12:00-13:30: Lunch

13:30-14:00: Discussion of potential restructuring of Task Teams and Panel

14:00- 14:30: Discussion with Lee Cooper (Chair, IASC Marine Working Group); overlaps, synergies, opportunities

14:30 SORP-13 and NORP-1 joint session

14:30 NORP introduction; history, goals, structure (10 min) [Fyfe/Solomon]

14:40 SORP introduction; history, goals, structure (10min) [Smith/Farneti]

14:50 NORP/SORP Chairs introduce cross-panel (NORP/SORP/CDP/ARP/OMDP) task teams and discuss NP/SP variability/processes, joint interests, outstanding polar issues (20 min) [Fyfe/Solomon/ Smith/Farneti]

15:10 Panel member introductions (~24 members, 1-2 min each, 30 min total (see below))[All]

15:30 Break [complimentary refreshments served in the hallway]

16:00 Panel member introductions continued (~24 members, 1-2 min each, 30 min total) [All]

16:10 Potential joint projects, e.g., 2020 CLIVAR/CliC summer school in Trieste and white paper; cross-panel task teams will organize sessions around mutual scientific questions (20 min) [Farneti/Fyfe]

16:30 Open discussion (30min + if room is available after 5pm) (Suggested topics include: NORP and SORP Task Teams: common goals and possible interactions and synergies. For example, a recommendation from the last CLIVAR SSG Meeting (November 2017) is for SORP to strengthen links with the Climate Dynamics Panel. This could be relevant for NORP too. MOSAiC (The Multidisciplinary drifting Observatory for the Study of Arctic Climate, <http://www.mosaicobservatory.org/>). Project on observing system design in the Antarctic and Arctic, such as future design of buoy and radiosonde (a Horizon-2020 EU project), with SOOS in the Southern Ocean [Massonnet]. Discussion on CMIP6 activities related to SORP/NORP). [All]

17:00 End of day

18:00 Working dinner in the evening

Saturday 16 June 2018

Day 2 (8am-1pm)

08:00-09:30: Cross-Task Team projects (prioritize activities) [Solomon]

09:30-10:00: How do we fit into the CMIP world? Host NORP/SORP MOSAiC-CMIP6 Diagnostic Workshop

10:00-10:30: Coordination with YOPP activities: Ben/Amy (MOSAiC), Ruth (Arctic CORDEX)

10:30-11:00: Coffee Break

11:00-12:00: What is THE NORP Initiative?

12:30-13:00: Open discussion and wrap-up

13:00 End of meeting