

Climate and Cryosphere (CliC) Report

1. Highlights for JSC

Highlight 1 – International Symposium on the Cryosphere in a Changing Climate.

This was the first international symposium to bring together three of the leading international organizations in the field of cryospheric research: the International Glaciological Society (IGS), the International Association of Cryospheric Sciences (IACS), and the Climate and Cryosphere (CliC) project. The theme of the conference, ‘The Cryosphere in a Changing Climate’, was global in scope with a focus on physical processes within the cryosphere and interactions between the cryosphere and the climate system. More than 300 participants attended the symposium which consisted of plenary presentations, side events and breakout sessions.

Highlight 2 - Cryosphere modelling to support the CMIP6 process: CliC is leading the cryosphere modelling work that contributes to round 6 of the Coupled Model Intercomparison Project. The work covers snow, sea ice, ice sheets, and glaciers and allows for targeted analysis of coupled model performance over these domains globally as well as more structured analysis of uncertainty in their projections. These activities are expected to contribute directly to the IPCC 6th Assessment Report and to the IPCC’s Special Report on the Oceans and Cryosphere.

2. Primary science issues (from CliC science plan)

- Improved understanding and quantification of the role of the cryosphere in the global climate system, its variability and change.
- Improved utilization of cryospheric observations as indicators of global and regional climate change.
- Improved understanding of the physical, chemical and other processes that govern behaviour of the cryosphere, and the representation of these processes in Earth System Models.
- Improved ability to make quantitative predictions and projections of the cryosphere in a changing climate.

3. Issues and challenges

The global climate and cryosphere community has expanded rapidly in recent years and this situation presents both opportunities and risks for CliC going forward. CliC’s network has expanded across all cryosphere domains as well as geographically throughout the Polar Regions and high mountain areas. Many complimentary research activities are being led in other organisations and it is important that CliC continues to partner and work with our community on these topics. There is a sustained need for the CliC network to be observant in ensuring that the focus of our future work remains at the forefront of climate and cryosphere research and finding synergies with other related programs, while not duplicating efforts of others.

- **How you work with other CPs**

CliC has a number of ongoing collaborations with the other WCRP Core Projects and has participated in the CLIVAR and GEWEX annual SSG meetings. CliC and CLIVAR both support the Southern Ocean Region Panel (SORP) as well as the newly formed Northern Oceans Regional Panel (NORP). Both of these panels serve as forums for the discussion and communication of scientific advances in the understanding of climate variability and change in these ocean regions. CliC and GEWEX jointly provide input to the Land Surface, Snow and Soil Moisture Model Intercomparison Project (LS3MIP) which assesses the performance of current land surface modules of Earth System Models and quantifies land surface feedbacks in a changing climate. CliC also supports the ESM-SnowMIP which is tightly linked to LS3MIP. The Polar Climate Predictability Initiative (PCPI) is an activity that both CliC and SPARC lead together, addressing the seasonal to multi-decadal component of the GIPPS (Globally Integrated Polar Prediction System) and also supports the Melting Ice and Global Consequences Grand Challenge. Finally, CliC has been supporting the Polar-CORDEX project (Arctic and Antarctic Domains) which consists of regional climate model simulations with hindcast and scenario simulations.

- **How do you work with CMIP and the modelling groups (vis-à-vis WMAC)**

CliC representative and former co-chair Gerhard Krinner is a member of the WCRP Modelling Advisory Council and provides strategic links between the data needs of CliC, WMAC and related initiatives.

- **How do you address observations/data requirements (vis-a-vis WDAC)**

CliC representative Ben Galton Fenzi (ACE CRC) has been participating in WDAC meetings, highlighting the needs for data access across all cryosphere domains. There are increasing requirements for quality-controlled (ideally gridded) data sets, with quantified uncertainty, to be used in evaluating model output, improving model physics, and potentially integrating with CMIP models, especially ISMIP6, MISOMIP, SIMIP and ESM-SnowMIP.

CliC's sea ice observation project (CASIWG) also provides input to WDAC through its ongoing efforts to help standardise and integrate sea ice observations at existing monitoring sites (Barrow, Tiksi, Ny Alesund, CHARS, Cape Baranov, etc.) The project has developed protocols which are used in ASSIST/IceWatch – software to record ship observations of sea ice following WMO protocols.

- **How you work with Grand Challenges**

CliC has a lead role in implementing the Grand Challenge on Melting Ice – Global Consequences. This GC has focused on mobilising the cryosphere research community's engagement with CMIP6 and will produce core inputs that will underpin the next round of reports being prepared by the IPCC. The following CliC-supported projects are part of the Grand Challenge, namely: ISMIP6, SIMIP, ESMSnowMIP, GlacierMIP, and the Permafrost Carbon Network (PCN).

- **How you see your community evolving**

There is increasing activity and focus on the Antarctic cryosphere which is likely to continue into the future. New developments include the beginnings of routine seasonal prediction of Antarctic sea ice extent via the Sea Ice Prediction Network South, improved modelling of Antarctic sea ice and the role of ocean surface waves, and research on interactions between components of the Antarctic cryosphere: sea ice, glaciers and ice shelves, and the ice sheets.

The “green cryosphere” is another developing area, on the interactions of biological processes and the cryosphere and their role in the carbon cycle. Examples include BEPSII (Biogeochemical Exchange Processes at Sea-Ice Interfaces), a working group of SCOR, and the Permafrost Carbon Network.

- **How you work with WCRP**

CliC mainly works with WCRP through Mike Sparrow in the Joint Planning Staff (JPS). We hold regular on-line coordination meetings between the CliC IPO, co-chairs and JPS to review activities, plan events and communicate ongoing issues. While the JPS need to balance many demands from WCRP and WMO they are always very helpful in advising on process and protocols, strategic issues linked to the CliC SSG, as well as guidance on allocations of resources and emerging priorities in the WCRP.

- **How the current funding affects your community, your activities, your service**

With limited funding CliC has managed to sponsor 20 workshops and related events in the past year. While our projects could use additional funds to engage more participants and broaden their events, the current funding still allowed for substantial activity in 2017. The specific activities that CliC undertakes are intended to address particular scientific issues that have been identified and for which international coordinated effort will yield tangible progress.
