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## 12th Meeting of the World Climate Research Programme (WCRP)'s Climate and Cryosphere (CLIC) Project Scientific Steering Group

Meeting Report: 2 – 4 February 2016  
Center for Ice and Climate, Copenhagen, Denmark



Photo credit: Ekaterina Uryopova

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## Introduction

The Scientific Steering Group of the World Climate Research Programme (WCRP)'s Climate and Cryosphere (CliC) Project met for its 12<sup>th</sup> session from February 2 to 4, 2016. The meeting was hosted at the Center for Ice and Climate (CIC) of the University of Copenhagen, co-organized by the CliC International Project Office (IPO) and CIC, and co-sponsored by WCRP, CliC IPO, Norwegian Polar Institute (NPI), and CIC.

Thirty-seven participants from seventeen different countries attended the meeting (twenty-nine in person; eight remotely). The meeting was chaired by CliC Co-Chairs Gerhard Krinner and Greg Flato. WCRP Director Dave Carlson and CliC SSG member Dorthe Dahl-Jensen (host) welcomed the participants. WCRP Joint Planning Staff Liaison Mike Sparrow and new CliC Director Lawrence Hislop were introduced to the CliC community.

## Summary of Presentations, Discussions, and Action items

### Day 1, Feb 2<sup>nd</sup>

#### 1. Interactions between Cryospheric Elements

Rob Massom, CliC SSG member from Australian Antarctic Division, presented an update on the targeted activity on Interactions Between Cryosphere Elements which raises awareness and better understanding of linkages between different elements of the high-latitude Cryosphere.

Actions and follow-up:

- Need to strengthen engagement with related modelling activities.
- There is identified linkage and potential overlap with MISOMIP (formerly WAGOM (West Antarctica Glacier-Ocean Modeling), Southern Ocean Region Panel (SORP), and West Antarctic Ice Sheet (WAIS) activities.
- Strengthen ECS involvement.
- Request **CliC IPO to build a section on the CliC website to promote this activity.**
- Interest to create a sub-network of young scientists interested in this topic within CliC/APECS.
- **CliC IPO to follow up and report back no later than next SSG.**

#### 2. Antarctic Sea Ice Processes & Climate (ASPeCt)

Marilyn Raphael from University of California gave an update on the SCAR/CliC Antarctic Sea Ice Processes & Climate (ASPeCt) which aims to improve the understanding of Antarctic sea ice through field programs, remote sensing, and modeling, and coordination of in situ sea ice observations.

Actions and follow-up:

- Explore possible connection with Global Cryosphere Watch (GCW).
- Explore possible connection with the International Ice Charting Working Group (IICWG).
- **M. Raphael to follow up and report back no later than next SSG.**

### 3. Sea Ice & Climate Modeling Forum

Dirk Notz from the Max Planck Institute for Meteorology (Germany) provided an update on the understanding of climate models, combining insights from models and observations via identification of key processes.

Actions and follow-up:

- Strengthen ties with other WCRP ocean, atmosphere, and land activities.
- There is strong interest to hold a workshop bringing together different projects that are working on air-sea-ice interactions.
- **D. Notz and A. Jahn to follow up and report back no later than next SSG.**

### 4. CliC-SOLAS Sea Ice Biogeochemistry Forum (BEPSII)

Martin Vancoppenolle gave an overview of the CliC-SOLAS Sea Ice Biogeochemistry Forum, follow up to BEPSII (SCOR Working Group), which aims at collecting data on marine ecosystems and identifying the feedbacks between biogeochemical and physical processes at the ocean-ice-snow-atmosphere interfaces and within the sea-ice.

Actions and follow-up:

- This is a newly approved CliC Forum.
- Important to make clear connections with the Biogeochemistry Grand Challenge. **M. Vancoppenolle to talk to the lead of the Biogeochemistry Grand Challenge about this connection.**
- Need to clarify the roles of SOLAS vs. CliC. **G Krinner to follow up on this.**
- Activity leads should develop an initial 5-year work plan that includes some specific deliverables.
- **M. Vancoppenolle to provide draft work plan to CliC IPO and SSG co-chairs by Fall 2016.**

### 5. Permafrost Carbon Network (PCN):

Kazuyuki Saito from the Japan Agency for Marine-Earth Science and Technology (JAMSTEC) presented the Permafrost Modelling Forum which is a joint activity of the Permafrost Carbon Network and CliC. The forum will help improve the modeling of permafrost and carbon dynamics in the northern permafrost region.

Actions and follow-up:

- It was noted that this is an important part of the Melting Ice & Global Consequences Grand Challenge, and that it should be strengthened in the draft work plan.
- The link between the PCN and involvement of CliC in GlobPermafrost needs to be clarified.
- The link to the new Grand Challenge on Biogeochemistry also has to be clarified.
- **G. Flato, G. Krinner and K. Saito to follow up and report back on initial progress after the WCRP JSC meeting in April.**
- **K. Saito and G. Krinner to check whether a coordinated offline permafrost carbon feedback analysis using CMIP6 output, ahead of AR6, could be a worthwhile activity for the modeling forum.**

## **6. Submarine Permafrost Mapping Action Group (SuPerMaG)**

Joining remotely, Paul Overduin from AWI presented an update on SuPerMAG and mentioned that parametrization over long-time frames and lack of validation data were current challenges for this group.

Actions and follow-up:

- **P. Overduin to evaluate potential for involvement of a larger community and to report back no later than next SSG.**

## **7. CliC/AMAP/IASC Arctic Freshwater Synthesis**

An update on the Arctic Freshwater Synthesis was presented by Arvid Bring (University of Stockholm, Sweden).

Actions and follow-up:

- Cite results, as appropriate, in the Melting Ice Grand Challenge report and the Permafrost Carbon Network activities.
- Explore potential of strengthening links between hydrology and permafrost carbon feedbacks with the PCN.
- Consider finding researchers in the CliC network who are interested in working on cross-platform/cross-area research.
- **G. Flato and G. Krinner to follow up with GEWEX community, particularly the CCRN investigators in Canada, and report back no later than next SSG.**

## **8. SCAR/IASC/CliC Ice Sheet Mass Balance and Sea Level (ISMASS)**

Xavier Fettweis from University of Liege (Belgium) presented details on ISMASS and showcased recent work on constraining uncertainty in the Greenland Ice Sheet surface mass balance model output and in situ validation.

Actions and follow-up:

- Explore potential links to Polar CORDEX.
- There was encouragement for CliC to participate in a Sea Level conference, July 2017, in New York, and link this generally to the WCRP Sea Level Grand Challenge.
- **X. Fettweis and A. Rinke to discuss potential CORDEX link; A. Payne and D. Holland to ensure suitable CliC engagement in sea-level conference. All to report back no later than next SSG.**

## **9. Greenland Ice Sheet-Ocean interactions (GRISO)**

Updates on GRISO/GrIOOS were presented by Gordon Hamilton from University of Maine, USA. An International Symposium on Interactions of Ice Sheets and Glaciers with the Ocean is planned to be held in La Jolla, California, U.S.A., in July 2016.

Actions and follow-up:

- GRISO is encouraged to link more closely to ISMASS, the Arctic Freshwater Synthesis, and the SWIPA process.
- **CliC IPO to send e-mail to leadership of these activities encouraging connections,**

**and report back to SSG at a suitable leadership teleconference not later than June, 2016.**

### **10. Linkages between Arctic Climate Change and Mid-latitude Weather Extremes**

The linkages activity updates were presented by James Overland (NOAA, USA). He stressed an urgent need for both case studies and models with concentration on improving probabilistic forecasts by increasing Arctic observations and improving Arctic-specific physics in the models.

Actions and follow-up:

- There is a need for clarification/strengthening of connections with the WCRP SPARC project.
- This activity should also connect with the GC on Climate Extremes.
- **J. Overland and E. Hanna to continue communication with SPARC and CLIVAR colleagues to ensure suitable connections are made. They are to report back at a suitable leadership teleconference prior to the next CliC SSG meeting.**

### **11. CLIVAR/CliC/SCAR Southern Ocean Region Panel (SORP)**

Kenichi Matsuoka from the Norwegian Polar Institute, gave an overview of SORP and related links with CLIVAR/CliC activities. Panel priorities include: the Year of Polar Prediction (YOPP) planning, interaction with the Southern Ocean Observing System (SOOS), input to a SCAR-OSC sessions, and links with the WCRP MIPs.

Actions and follow-up:

- Try to clarify CliC involvement at biannual teleconference planned for March 2016.
- Southern Ocean MIP (SOMIP) should be linked under the WCRP Ocean MIP.
- **CliC IPO to follow up with SORP leadership and report back no later than next SSG.**

### **12. Polar CORDEX**

The project was presented by Annette Rinke from the Alfred Wegener Institute in Germany. She provided updates on simulations from 1979-2014 that have been carried out, and explained that CMIP5-GSM-driven simulations are projected for 2006-2100 time period.

Actions and follow-up:

- There are potential connections with SIMIP, Sea Ice Climate Forum, and ASIWG to learn from each others
- There is a possible role of Arctic CORDEX Regional Climate Models (RCMs) in the Regional Sea Level Rise and Coastal Impacts GC and ISMIP ice sheet models.
- Explore links with the Arctic Freshwater Synthesis and the GC on Climate Extremes.
- If there is still opportunity a link should be made to the Arctic Council AACA circum-Arctic report.
- Polar CORDEX would like to continue being closely linked with the CliC project and not spun out on its own.
- Antarctic CORDEX should be reactivated and a link to users should be made.

- **G. Krinner and G. Flato to work with A. Rinke to compose an email to be sent to potential Antarctic participants to encourage activity and explore how CliC might help re-energize this community; to report back to SSG by June, 2016. A. Rinke to continue communication and outreach regarding Arctic CORDEX and report back at next SSG.**

### **13. CliC Contribution to the Year of Polar Prediction (YOPP)**

A summary of the YOPP implementation plan was provided by CliC co-chair Gerhard Krinner and included specific suggestions on how CliC could contribute from mid-2017 to mid-2019.

Actions and follow-up:

- Future CliC contribution to YOPP was encouraged to focus within existing CliC activities
- It was suggested that no specific new activity should be started in this context.
- CliC timescales relating to YOPP might be different as WWRP projects are not planned through the same period as the WCRP projects.
- **CliC IPO to continue engagement with YOPP and report back as appropriate. CliC Fellows to produce an action plan for CliC's contribution to YOPP and to report to CliC IPO.**

### **14. Polar Climate Predictability Initiative (PCPI)**

Updates on PCPI were presented by Marilyn Raphael, who noted the main aims of the initiative are to advance understanding of the sources of polar climate predictability on timescales ranging from seasonal to multi-decadal.

- It was suggested to strengthen links to WWRP Polar Prediction Project (PPP), ASPeCt, SPARC, SORP, and the Sea Ice Prediction Network (SIPN).
- **As a key participant in many of these groups, M. Raphael is to continue communication and outreach and report back at next SSG.**

### **15. Arctic Sea Ice Working Group (ASIWG)**

Don Perovich from Cold Regions Research and Engineering Laboratory in the USA remotely presented an update on the CliC Arctic Sea Ice Working Group. The group is continuing its efforts in integrating observations, establishing observing protocols, and fostering modeling efforts.

Actions and follow-up:

- It was recommended that the ASIWG lead begins putting together a list of 5 people to start scoping a review/synthesis paper on sea-ice thickness observations in both Arctic and Antarctic.
- **G. Flato to follow up with D. Perovich and report back to SSG before June, 2016**

### **16. Association of the Polar Career Scientists (APECS)**

Ekaterina Uryupova provided an update on APECS links and opportunities with CliC and the wider WCRP community.

Actions and follow-up:

- The CliC community is encouraged to meet with relevant APECS members at upcoming meetings/workshops e.g. Arctic Science Summit Week 2016 (Fairbanks, Alaska), SCAR Open Science Conference 2016 (Kuala Lumpur, Malaysia), Young Researchers Workshop at the International Permafrost Conference 2016 (Potsdam, Germany), etc.
- Reminder of potential collaboration during International Polar Weeks (March & September 2016).
- CliC partners are encouraged to participate in the Arctic Snapshots webinars series/other webinars.
- **Action to all, with CliC IPO to follow up and report back no later than next SSG.**

#### **Additional end of Day 1 discussion items:**

- It was suggested that CliC workshops should be grouped and organized by themes.
  - There is still a need to clarify how permafrost Carbon feedbacks link in the Biogeochemistry Grand Challenge.
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#### **Day 2, Feb 3<sup>rd</sup>**

The second day of the CliC SSG was dedicated to discussions on Model Intercomparison Projects (MIPs), Grand Challenges, linkages between CliC and the other WCRP projects (SPARC, GEWEX, CLIVAR), SWIPA update, and future conferences.

#### **1. MIP/CMIP Updates**

The following presentation were made covering updates from 2015 and plans for 2016:

- Tony Payne - Ice Sheet Model Intercomparison Project 6 (ISMIP6)
- Gerhard Krinner - Land Surface, Snow and Soil Moisture Model Intercomparison Project & Earth System Model-Snow MIP) (LS3MIP & ESM-SnowMIP)
- Dirk Notz - Diagnostic Sea Ice Model Intercomparison Project (SIMIP)
- David Holland and Xylar Asay-Davis - Marine Ice Sheet-Ocean Model Intercomparison Project (MISOMIP) (remotely)
- Ben Marzeion - GlacierMIP

Actions and follow-up:

- The group highlighted that a lot of progress has been made and that CliC/WCRP is well positioned for when CMIP6 is rolled out.
- The wider team should emphasize that CMIP6 is one of the most impactful stories of WCRP and should be publicized as such.
- There is however a general funding concern related to many of the CMIP6 activities and one possible solution mentioned includes the Belmont Forum.
- Convincing the donor countries of the importance of these modelling activities should be an easy marketing activity although it was emphasized that the main role of CliC is mainly to make CMIP6 modelling activities happen and not necessarily to directly tell the countries to increase their national programmes.
- Data observation networks were noted as an important component of CMIP as well.
- CliC should encourage a Permafrost-MIP in conjunction with the GC, PCN, and the

- Permafrost Climate & Modeling Forum.
- After CMIP6, there could be a dedicated plan linked to the permafrost Carbon feedback within CliC or the Melting Ice & Global Consequences / Biogeochemistry Grand Challenges.
- **G. Flato, G. Krinner and L. Hislop to discuss communication plan and materials to highlight CliC role and to help WCRP convey message of importance/relevance of its activities to IPCC and the climate impact and user communities. Progress to be reported regularly at leadership teleconferences.**

## 2. Grand Challenges

Melting Ice and Global Consequences GC:

Greg Flato, CliC co-chair provided an update on the strategy and progress of the GC.

The current goals are to have community-led papers summarizing recent GC results. Current activities are aimed directly at filling gaps identified in the IPCC Lessons Learnt workshop from 2015, and to provide clearly traceable WCRP-led contributions to moving science forward in areas of clear societal relevance.

Mike Sparrow, WCRP Joint Planning Staff, highlighted linkages between CliC and other Grand Challenges, particularly Sea Level and Biogeochemistry.

The emphasis of the related GC's includes regional sea-level change and coastal impacts (an integrated approach to paleo time scale sea level estimates, quantifying the contribution of land ice to near-future sea level rise, causes of contemporary regional sea level variability and change, predictability of regional sea level, and sea level science for coastal zone management.

Actions and follow-up:

- **Melting Ice and Global Consequences GC:** A timeline for this Grand Challenge should be put together including expected results after each year. There is also a need for a more concrete forward looking plan.
- **Regional Sea Level Rise and Coastal impacts GC:** A good connection with CliC already exists and should be continued and expanded where possible.
- **Water Availability and Climate Extremes GC:** This is certainly relevant to CliC but currently there is no direct connection.
- **Clouds, Circulation, and Climate Sensitivity GC:** There are currently only limited connections with CliC's subgroups, but there seems to be potential for more linkages.
- **G. Flato to revise Melting Ice – Global Consequences GC document and circulate for comment prior to JSC meeting. Further revisions as necessary after JSC meeting, with updated document to be made visible on CliC and WCRP websites within a month after the JSC meeting.**
- **G. Flato, G. Krinner and L. Hislop to pursue opportunities to strengthen connections to other GCs as they arise and report back to leadership teleconferences throughout the year.**
- **G. Flato to lead preparation of a short article outlining the Melting Ice – Global Consequences GC to communicate more broadly the aims and objectives. This to be written and submitted prior to the next SSG meeting.**



Two new GCs were also highlighted and may have future ties with CliC:

- Near term climate prediction
- Biogeochemistry

General discussion points:

The place of the Permafrost Carbon Network within the Melting Ice or Biogeochemistry GC still needs to be clarified – it was recommended that it should potentially belong to both.

**This is covered by earlier action items.**

### **3. Linkages between CliC and the other WCRP projects (CLIVAR, GEWEX, SPARC)**

The following presentations were made covering WCRP activities from 2015, plans for 2016 and potential opportunities to link more closely with CliC.

- Neil Harris - SPARC & CliC
- Peter van Oevelen - GEWEX & CliC
- Mike Sparrow - CLIVAR & CliC

Actions and follow-up:

- It was encouraged that communication amongst WCRP chairs and directors should happen on a more regular basis.
- SPARC is interested in the CliC-SOLAS Sea Ice Biogeochemistry Forum
- SPARC noted that WCRP's lead is sought by all 4 core projects in terms of capacity development – there should be a point of contact on capacity development at WCRP and core projects.
- The connections between CliC and GEWEX exist informally and it was emphasized that there is no need to formalize this any more.
- GEWEX suggested to have a shared article in the projects various newsletters, to share the lead on potential new activities of common interest and to establish mutual desired outcomes (not just for each individual project).
- GEWEX is interested in working together with CliC on a 3<sup>rd</sup> pole environment project
- GEWEX and CliC Co-chairs should consider any relevant connections at the IPO level and project level e.g. MOUNTERRAIN. Ideally there should be a common list of activities in the Himalayas inventory (together with GEWEX).
- **G. Flato and G. Krinner to continue pushing for more regular cross-WCRP communication, particularly following up with D. Carlson and G. Brasseur at the upcoming JSC meeting.**
- **G. Flato and G. Krinner to ask S. Kang, D. Trombotto and B. Marzeion to develop a one or two page outline of potential enhanced activities that could be pursued relative to the 3<sup>rd</sup> pole environment, and then organize a teleconference with suitable GEWEX colleagues (to be identified by P. van Oevelen). Initial progress to be reported during the year, with more tangible proposal for activities available at the next SSG meeting.**

Additional discussion items:

- There is a need to clarify the role of CliC in permafrost activities and link to GEWEX – and a more general decision whether CliC should include activity in the hydrology cycle, and not only Carbon related issues.
  - It is important to ensure that the Mid-latitude-extremes activity does not duplicate with SPARC. There is potential for collaboration however.
  - CliC has technical activities related to observations, protocols for recording, etc. on sea ice – however, it was mentioned that the Global Cryosphere Watch may be the home for these activities? Maybe those activities are not directly relevant to CliC?
  - Should CliC be thinking about gaps in the linkages between cryosphere and climate forcers? AMAP WG on black Carbon and methane is already looking at those issues but should CliC be involved?
  - The visibility of WCRP should be raised in general and branded closely with CliC activities.
  - Antarctic CORDEX should be re-engaged and the links to users should be made.
  - There is a general need for an improved marketing/outreach packages for CliC, in print and on the internet / social media. Suggestions were also made for different outputs for different audiences.
  - A paper on the Melting Ice GC should be compiled with the input of the wider CliC community.
  - IMBIE: CliC should follow up on the invitation to partner in this initiative – ISMASS and IMBIE could then be linked (**Tony Payne, Gerhard Krinner, and Andrew Shepherd are encouraged to get in touch**).
  - A connection to the global development, adaptation and vulnerability communities could be made to inform them about our activities, science and relevance for development.
  - Shichang Kang and Ben Marzeion were charged to put together a few bullet points on the data gaps in the Himalaya region relevant to glacier mass balance.
  - Review papers are encouraged to be produced ahead of IPCC AR 6, focusing on river lake ice, ISMASS, and Sea Ice thickness.
  - A link to GEWEX should be made on permafrost, high latitudes, and 3<sup>rd</sup> pole related activities.
  - CliC should try and link with the AMAP WG on black carbon and methane to see if there are gaps that CliC could fill.
  - **The CliC IPO should generally work on fundraising and look for opportunities to partner in projects.**
  - There is a need to follow up on a potential workshop focusing on South-American glaciers. **CliC IPO to follow up with SSG member Sebastian Mernild.**
  - There is a continuous need to find ways of funding publications that would feed into the IPCC AR6 process.
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## Day 3, Feb 4<sup>th</sup>

### 1. Closed Session – CliC SSG, IPO, and WCRP JPS Only

Greg Flato and Gerhard Krinner, CliC Co-chairs, provided a general update on the SSG, membership, expectations and opportunities for 2016.

Decisions and follow up actions include:

- The 2016 budget was approved with small modifications to the draft.
- James Renwick, WCRP Joint Scientific Committee-CliC Liaison, was appointed CliC Co-chair to replace Greg Flato starting in January 2017, for three years.
- In order to reduce the size of the CliC SSG because of economic constraints, SSG member Dorthe Dahl-Jensen will not be replaced at the end of her term in December 2016.
- The CliC-SOLAS- Sea Ice Biogeochemistry Forum was approved:
  - deliverables should be clearly identified
  - the role of SOLAS within this activity still needs to be clarified
  - the primary affiliation is for one year
  - a letter of confirmation from the co-chairs should say that it was approved but the exact outcome should be discussed and the role of SOLAS should be clarified.**Gerhard Krinner to follow-up with SOLAS in February and address this issue.**
- SSG members will be tasked to occasionally lead thematically relevant leadership calls. **CliC IPO to schedule the next Leadership calls and assign responsibilities.**
- Marketing materials explaining what CliC and WCRP are/do should be produced and made available for CliC leadership to present and use at conferences and other public forums.
- SSG members were encouraged to 'promote' CliC in their presentations at meetings, focusing on impact activities and links to IPCC and related processes.
- The WCRP logo should be profiled on all CliC products.
- When CliC activities are approved should also have an indicated end date – this could be a topic of discussion during a leadership calls - **IPO and Co-chairs should produce a one-page document on the lifetime of the TAs before the next call.**
- General support to ECRs was reiterated as a priority
- **The Co-chairs and IPO should have a final look at the CliC implementation plan 2015-2020, approve it, and post it online, as well as the updated GC strategies.**
- **A targeted proposal to get more CliC/APECS funding should be produced by the IPO.**
- The GMD papers on ESM-SnowMIP, SIMIP, ISMIP and the Southern Ocean Satellite Requirements paper publication costs will be covered directly by WCRP. **CliC IPO to follow up with WCRP by April 2016.**
- The next SSG meeting is tentatively scheduled to be in Wellington, NZ, in conjunction with the Cryosphere in a Changing Climate Conference. SSG members and project leads should try to secure funding for their travels from host institutions: CliC IPO and co-chairs will encourage SSG members to submit abstracts in order to get their travels funded independent of CliC.
- In general, terrestrial activities should be encouraged more within the CliC network.
- SSG members in Latin America should look for an opportunity for CliC to engage in glacier and/or permafrost related research under the CliC umbrella in the region.

- SSG members from the Eurasia region should help identify relevant research and published peer reviewed materials that link to CliC's priorities and the needs/gaps identified in the IPCC review process.
- **G. Flato to prepare updates to CliC Implementation Plan (2016-2020) and circulate for comment, and then have it posted on the CliC website prior to the upcoming JSC meeting in April.**