

Climate and Cryosphere Project (CliC) of the World Climate Research Programme (WCRP)

Understanding the changing cryosphere and its climate connections

Helene Seroussi, James Renwick,
Fiamma Straneo, Mike Sparrow, Gwen Hamon

GEWEX SSG 32
January 27, 2020
Pasadena, CA, USA



Host

Tromsø
2003 – 2018



CliC will have a new host in 2020 (awaiting funding confirmation). G. Hamon (Executive Officer) hired as consultant to ensure continuity.



Sponsor

Geneva

WMO / UNESCO-IOC / ISC



WCRP Officer In Charge, Mike Sparrow: WCRP-CliC Liaison

The Organization

- CliC is a core project of the WCRP and is overseen by a Scientific Steering Group (SSG) responsible for overall direction and planning. The Scientific Steering Group typically meets once per year.

SSG starting January 2020
James Renwick, Co-Chair, Victoria University of Wellington, NZ (Dec 2020)
Fiamma Straneo, Co-Chair, Scripps, UCSD, USA (Dec 2021)
Lars H. Smedsrud, University of Bergen, Norway (Dec 2021)
Helene Seroussi, NASA JPL, USA (Dec 2022)
Martin Vancoppenolle, CNRS LOCEAN, France (Dec 2022)
Jason Box, Geological Survey of Denmark and Greenland (Dec 2023)
Amy Lovecraft, University of Alaska Fairbanks, USA (Dec 2023)
Tingjun Zhang, Lanzhou University, China (Dec 2023)
Shin Sugiyama, Hokkaido University, Japan (Dec 2023)
Hanne Christiansen, University Centre in Svalbard, Norway (Dec 2023)
Camille Lique, IFREMER, France (Dec 2023)

- The International CliC Project Office (ICPO -- hosted by the Norwegian Polar Institute until December 2018) serves as the administrative home for the project under the leadership of the CliC Director. The Director and Project Office staff are responsible for the operation of the project. Currently, one WMO consultant, based in Geneva.

CliC in 2019

- 1 WCRP Grand Challenge – Melting Ice and Global Consequences
- 5 MIPs
- 11 active Activities
- 16 funded workshops
- 57 funded participants from 24 countries including 26 Early Career Scientists
- Sponsor of major conferences:
 - ESA Living Planet Symposium, 13-17 May 2019, Milan, Italy
 - IGS Sea Ice Symposium, 18-23 August 2019, Winnipeg, Canada
- Sponsor of a major school:
 - MOSAiC School, 15 September – 26 October 2019, onboard
- Input to other major conferences:
 - EGU General Assembly, 7-12 April 2019, Vienna, Austria
 - 27th IUGG General Assembly, 8-18 July 2019, Montreal, Canada
 - OceanObs'19, 16-20 September 2019, Hawaii, USA
 - International Conference on Regional Climate-CORDEX 2019, October 14-18, 2019, Beijing, China
 - AGU Fall Meeting, 9-13 December 2019, San Francisco, USA
- **GoToMeeting** ≈ 80+ online project meetings
- **Social Media**  Facebook >2100 likes  Twitter >3100 followers

CliC Science (Action) Plan

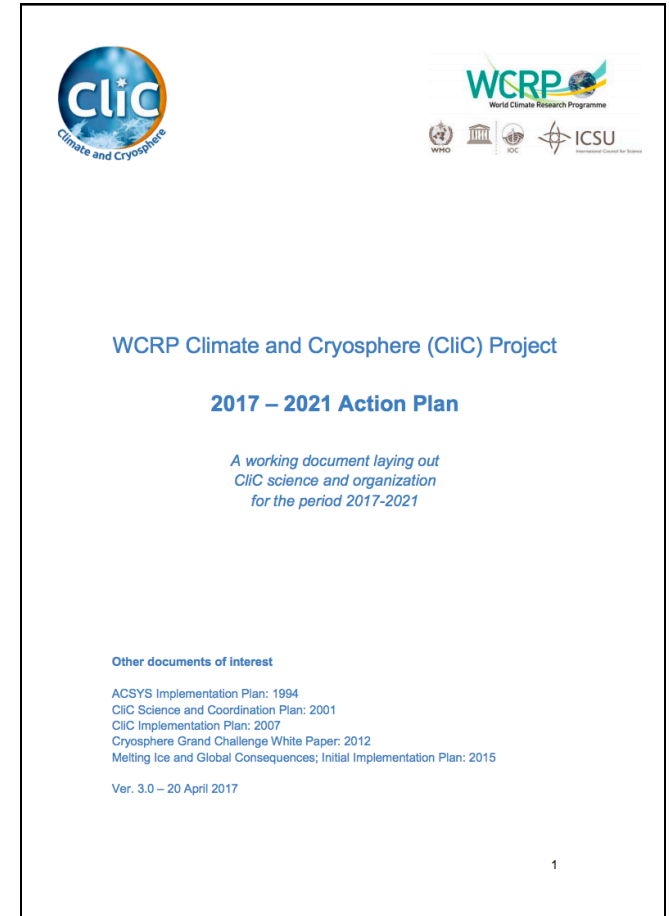
Four General Science Themes that provide the broad framework within which CliC activities are developed.

- **Observing** the Cryosphere
- Physical **Processes** and Dynamical Understanding
- **Modelling** the Cryosphere
- Global and Regional **Prediction** and Predictability

Describes the overarching research needs and themes that guide CliC activities, the structure of CliC and its main activities

Meant to be a living document:

- Will be updated by WCRP JSC 41 in May
- 4-year timescale – From 2017-2021 to 2020-2024



Cross cutting with GEWEX...



Changes in the cryosphere



Changes in the water/energy cycle

Cross cutting with GEWEX... in the Action Plan



Observing the Cryosphere:

- What are the magnitudes, patterns and rates of change in terrestrial cryosphere regimes on seasonal-to-century time-scales? What are the associated changes in the *water cycle* and carbon cycles?

Physical Processes and Dynamical Understanding:

- What is the role of terrestrial cryospheric processes in the spatial and temporal variability of the *water, energy* and carbon cycles of cold climate regions?

Modelling the Cryosphere:

- How can interactions between terrestrial cryospheric processes and *water, energy* and carbon cycles of cold climate regions best be parameterized in models, over a range of time and space scales?

CliC Structure

At its last SSG meeting in December 2019, CliC decided to simplify its structure by keeping only 2 categories for its projects and groups:

- the Modelling Intercomparison Projects
- the Activities

CliC MIPs: Modelling Intercomparison Projects

- Ice Sheet MIP for CMIP6 (ISMIP6)*
- Marine Ice Sheet-Ocean MIP (MISOMIP)*
- Diagnostic Sea Ice MIP (SIMIP)*
- GlacierMIP*
- Earth System Model-Snow MIP (ESM-SnowMIP) (tightly linked to Land Surface, Snow and Soil Moisture MIP (LS3MIP))* *completed in 2019*

Activities

- Polar Climate Predictability Initiative (PCPI) *(joint with SPARC)*
- Southern Ocean Region Panel *(joint with CLIVAR and SCAR)*
- Northern Oceans Region Panel *(joint with CLIVAR)*
- BEPSII - Biogeochemical exchange processes at Sea Ice Interfaces *(joint with SCAR, SCOR and SOLAS)*
- Antarctic Sea Ice Processes & Climate (ASPeCt) *(joint with SCAR)*
- Arctic Sea Ice Working Group
- Sea Ice & Climate Modelling Forum (coordinates SIMIP)
- Ice Sheet Mass Balance and Sea Level (ISMASS) *(joint with SCAR and IASC)*
- Polar Coordinated Regional Downscaling Experiment (Polar CORDEX)
- Earth Observations and Arctic Science Needs *(long-lasting collaboration with ESA through conferences sponsorship)*
- Linkage Between Arctic Climate Change and Mid-Latitude Weather Extremes
- Permafrost Carbon Network *(SEARCH/NSF/IPA/ US Dep. Of Energy/ IASC/ USGS)**
- Permafrost & Climate Modelling Forum *(not currently active)*

*Activities that are part of the WCRP Grand Challenge – Melting Ice and Global Consequences lead by CliC and chaired by Tim Naish

WCRP Grand Challenge on Melting Ice and Global Consequences

- **Chair:** Tim Naish, Victoria University of Wellington, NZ
- **Science question:** How will melting ice respond to, and feedback on, the climate response to increasing greenhouse gases, and what will the impacts be?
- **3 Themes:**
 - Permafrost and the global carbon cycle
 - Ice sheets, glaciers and rising sea level
 - Sea ice and snow interacting with a changing climate
- Initial **Implementation Plan** in 2016
- Initial cut off date: IPCC AR6 Publication
- **6 Activities:** ISMIP6, SIMIP, ESM-SnowMIP, MISOMIP, GlacierMIP, Permafrost Carbon Network – all success stories
 - **Ice Sheet Model Intercomparison Project for CMIP6 (ISMIP6)**
A model intercomparison to fully explore the sea level rise contribution from the Greenland and Antarctic ice sheets
 - **Marine Ice Sheet-Ocean Model Intercomparison Project (MISOMIP)**
Ensemble of simulations that project the future of the West Antarctic Ice Sheet
 - **Sea Ice Model Intercomparison Project (SIMIP)**
An endorsed diagnostic MIP for CMIP6 that defines a list of variables to understand the evolution of sea ice in any experiment using the sea ice model as part of CMIP6.
 - **Earth System Model-Snow Model Intercomparison Project (ESM-SnowMIP)**
A targeted action on the intercomparison and improvement of snow modules of large-scale climate models
 - **Glacier Model Intercomparison Project (GlacierMIP)**
A framework for a coordinated intercomparison of global-scale glacier mass change models to foster model improvements and reduce uncertainties in global glacier projections.
 - **Permafrost Carbon Network (PCN) (SEARCH/NSF/CliC/IPA/ US Dep. Of Energy/ IASC/ USGS)**
Synthesizing existing research about permafrost carbon and climate in a format that can be assimilated by biospheric and climate models, and that will contribute to future assessments of the Intergovernmental Panel on Climate Change (IPCC).



CliC Activities

- **The Polar Climate Predictability Initiative (PCPI)**    
Aims to advance understanding of the sources of polar climate predictability on timescales ranging from seasonal to multi-decadal
- **Arctic Sea Ice Working Group (CASIWG)**
Improved coordination between sea-ice observation and modelling communities to establish protocols for standardizing and archiving data across the different national and international activities
- **Antarctic Sea ice Processes and Climate (ASPeCt)** 
Expert group on multi-disciplinary Antarctic sea ice zone research within the SCAR Physical Sciences program
- **WCRP CLIVAR/CliC/SCAR Southern Ocean Region Panel (SORP)**   
Forum for the discussion and communication of scientific advances in the understanding of climate variability and change in the Southern Ocean.
- **WCRP CLIVAR/CliC Northern Oceans Region Panel (NORP)**  
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
- **Polar (Arctic+Antarctic) CORDEX**  
Coordinated Regional Downscaling Experiment
- **Biogeochemical Exchanges at Sea Ice Interfaces (BESPII)**   
Open forum that aims to quantify the role of sea ice in polar ecosystem services – from biodiversity impacts to climate change – and communicate these globally-relevant issues
- **Ice Sheet Mass Balance and Sea Level (ISMAL)**  
Expert group to promote the research on the estimation of the mass balance of ice sheets and its contribution to sea level
- **Linkage Between Arctic Climate Change and Mid-Latitude Weather Extremes**
Assessment of the potential for recent Arctic changes to influence broader hemispheric weather

CliC- GEWEX Interactions

GEWEX Co-Chair Jan Polcher participated in CliC SSG 15, in December in San Francisco and discussed the following points:

- CliC and GEWEX have the water and energy cycles in common.
- Greenland seems to be a good case where a collaboration could advance our process understanding and contribute to WCRP objective #1 *Fundamental understanding of the climate system*.
- In other GEWEX activities, CliC could help bring a high latitude or high altitude expertise

From CliC's perspective:

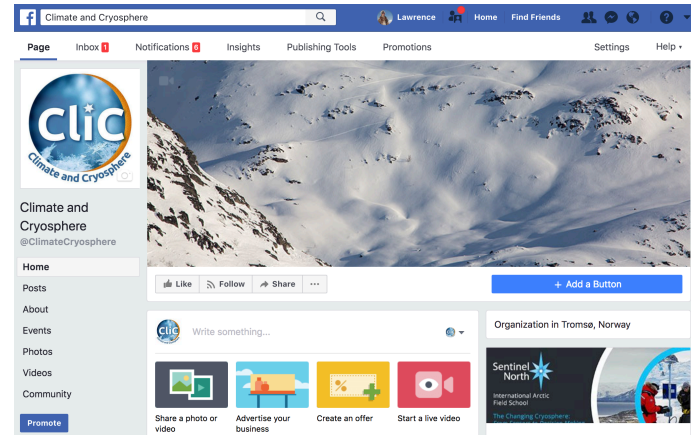
- E.g. Interest in GlacierMIP?
 - In 2020
 - update current results to CMIP6 for consideration in AR6
 - 1 day workshop at 'Cryosphere 2020' to coordinate next experiment cycle with ISMIP6, IACS groups for RGI and ice thickness estimation
 - Over the longer term
 - quantify mass change commitments and include reconstructions
 - better understand causes of uncertainties related to choice of glacier model, enable quantification of past model performance
 - include detection & attribution experiments
 - request monthly output and fractions of runoff, ice melt, snow melt etc.
 - enable analysis of glacier impact on water availability etc.
 - exact definition of experiments, provision of boundary and initial conditions, validation data, output variables, etc. in 2021
 - production of new ensemble(s) in 2022

CliC Communications

Web

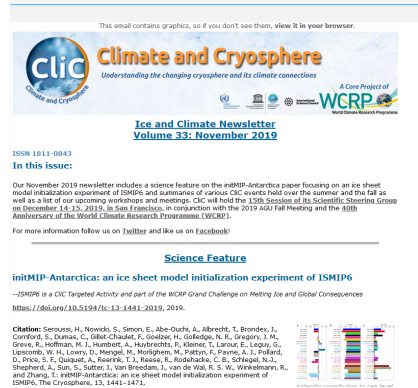


Facebook

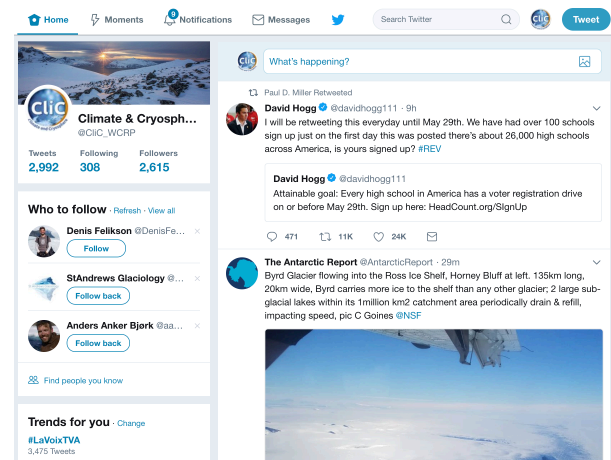


Newsletter

CliC Newsletter - Ice and Climate No. 33



Twitter



Thank you



www.climate-cryosphere.org