



Climate and Cryosphere

Understanding the changing cryosphere and its climate connections



World Climate Research Programme



International
Science Council

Mission: Promote and facilitate collaborative research related to the cryosphere and climate, including its communication to society, policy makers and other users.

CliC Focus: Climate related research addressing polar, mountain and snow/permafrost covered regions, including their residents, and their interaction with the climate system.



cliC Structure



Co-Chairs – Fiamma Straneo (Scripps-UCSD, USA), James Renwick (VUW, NZ)

Scientific Steering Group SSG:

Hanne H. Christiansen (UNIS, NO); Camille Lique (IFREMER, FR); Amy Lovecraft (UAF; USA); Helene Seroussi (JPL-NASA, USA); Lars H. Smedsrud (UiB, NO); Shin Sugiyama (Hokkaido U.; JP); Martin Vancoppenolle (IPSL, FR); Tingjun Zhang (Lanzhou U., CN)

WCRP Grand Challenge Melting Ice: Tim Naish (VUW, NZ)

WCRP Joint Science Committee Liaisons: Jens H. Christensen, Igor Shkolnik

International Project Office: Beatriz Balino (Bjerknes Center, UiB, NO)

Ex Officio Members: T. Furevik (UiB); R. Bradley and R. DeConto (UMASS, USA).



CliC Activities Current



Melting Ice Grand Challenge and Modeling Intercomparison Projects (MIP)

- **Earth System Model-Snow (ESM-SnowMIP/LS3MIP)** – Gerhard Krinner (CNRS, FR)
Evaluation of current snow schemes (including those in ESM) against observations tied to CMIP6
- **Glacier Model Intercomparison Project (GlacierMIP)** – Ben Marzeion (U. Bremen, DE).
Global-scale glacier mass change models
- **Marine Ice Sheet-Ocean MIP (MISOMIP2)** – N. Jourdain (U. Grenoble, FR)
Ice sheet/ocean interactions aimed at reducing sea level rise from land-ice loss uncertainties.
- **Ice Sheet Model Intercomparison Project for CMIP6 (ISMIP6)** – S. Nowicki (U. Buffalo, NY)
Ice sheet scale simulations for Antarctica and Greenland forced by CMIP6 offline
- **Sea Ice Modeling Intercomparison Project (SIMIP)** – A. Jahn (NCAR, USA)
Sea-ice in climate model simulations



CliC Activities Current



CliC Core Activities and Projects

- **SOLAS/CliC/IASC/SCAR Biogeochemical Exchanges at Sea Ice Interfaces – BEPSII – J. Stefels (NL)**
Biogeochemical processes at the sea-ice interface – polar ecosystems services
- **Arctic Sea Ice Working Group (ASIWG) – M. Webster (UAF, USA)**
Coordination of sea-ice observations and modeling
- **Polar Coordinated Regional Downscaling Exp. (Arctic and Antarctic) CORDEX – R. Mottram (DMI, DK)**
Generation of regional scale projections over the Arctic and Antarctic
- **Northern Oceans Regional Panel (NORP) Joint with CLIVAR – A. Solomon (NOAA, USA)**
- **Southern Ocean Regional Panel (SORP) Joint with CLIVAR/SCAR – I. Smith (U Otago, NZ)**



CliC Activities Current



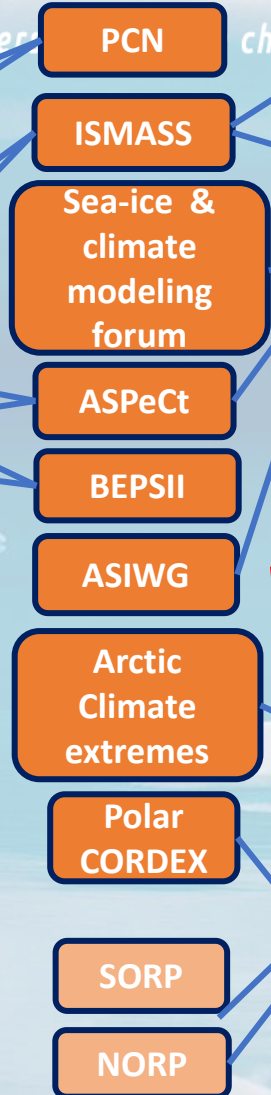
CliC Core Activities and Projects

- **Polar Climate Predictability Initiative – PCPI – M. Raphael (UCLA, USA)**
- **Antarctic Sea Ice Processes & Climate (ASPeCt) Joint with SCAR – M. Raphael (UCLA, USA)**
- **Ice Sheet Mass Balance and Sea Level (ISMASS) – Joint with SCAR/IASC – H. Goelzer (NO)**
- **Permafrost Carbon Network – T. Schuur (NAU, USA)**
- **Southern Ocean Regional Panel (SORP) Joint with CLIVAR/SCAR – E. Sikes (Rutgers, USA)**

Links through endorsed activities



CLiC Activities



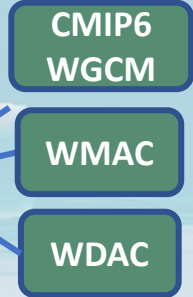
CLiC MIPS



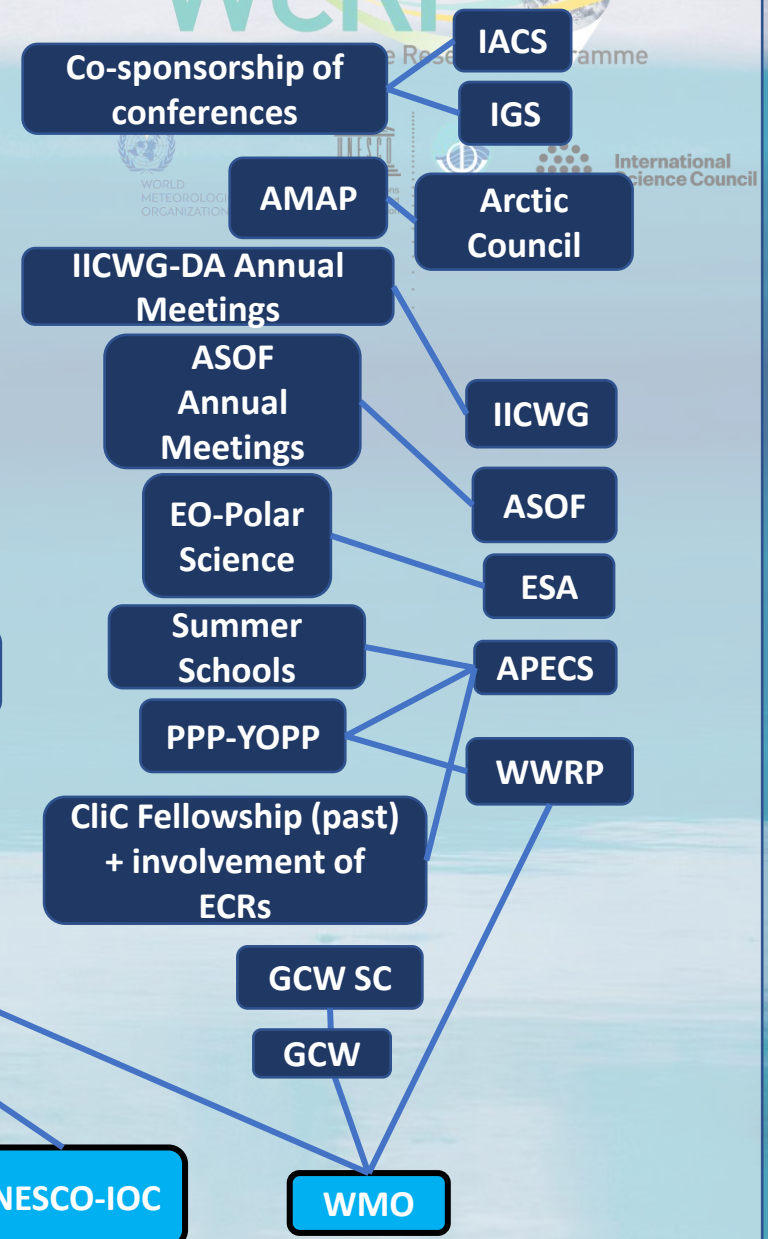
WCRP - Grand Challenges



WCRP Core Projects



Continuous links through periodic activities, or permanent CLiC representative



WCRP-CLiC Research System





Future CLIC – WCRP Lighthouse Activities



Title / Objective	CLIC representatives / Expertise
<p><i>My Climate Risk</i></p> <p>To develop a new framework for assessing and explaining regional climate risk to deliver climate information that is meaningful at the local scale.</p>	<p><u>Hanne Christiansen</u> University Centre in Svalbard, Norway/ Permafrost dynamics and geohazards Additional Nomination submitted for a member of the Association of Early Career Scientists submitted to WCRP.</p>
<p><i>Digital Earths</i></p> <p>To develop a digital and dynamic representation of the Earth system, optimally blending models and observations, to enable an exploration of past, present, and possible futures of the Earth system.</p>	<p><u>Camille Lique</u>, Laboratoire d’Océanographie Physique et Spatiale (LOPS), France / Arctic Ocean dynamics <u>Helene Seroussi</u>, JPL, CalTech, USA/ Modelling of ice sheets and sea level rise; ISMIP6</p>
<p><i>Explaining and Predicting Earth System Change</i></p> <p>To design, and take major steps toward delivery of, an integrated capability for quantitative observation, explanation, early warning, and prediction of Earth System Change on global and regional scales, with a focus on multi-annual to decadal timescales.</p>	<p><u>Patrick Heimback</u> University of Texas Austin, USA/ Ocean and ice sheet dynamics, variability and interactions; CLIVAR/CLIC NORP</p>
<p><i>Safe Climate Landings</i></p> <p>To explore the routes to climate-safe landing 'spaces' for human and natural systems, on multi-decadal to centennial timescales; connecting climate, Earth system, and socio-economic sciences. Explore present-to-future “pathways” for the achievement of key SDGs</p>	<p><u>Heiko Goelzer</u> NORCE AS & Bjerknes Centre for Climate Research, Norway/ Ice sheets modelling and contribution to sea-level rise; ISMIP6 <u>James Renwick</u> University of Wellington, New Zealand.</p>
<p><i>WCRP Academy</i></p> <p>To establish one or more targeted capacity exchange climate programmes, working with one or more of the other lighthouses and established climate education providers, including universities</p>	<p><u>Amy Lovcraft</u> University of Alaska Fairbanks & Center for Arctic Policy Studies, International Arctic Research Center/ Bridging science, policy, and civic life in social-ecological systems to explore the dynamics of climate change and development uncertainties in the Arctic</p>



Future of CliC – Some ideas from SSG Meetings



CliC role: to provide a global umbrella, helping link the wide range of regional activities and facilitating communication with cryosphere researchers worldwide

1. Open call for new ideas for working groups or projects
2. Increase diversity, participation of under-represented nations in cryosphere science: Establish a fellowship for Early Career Scientists from under-represented cryosphere regions to participate/visit partner institutions or attend conferences
3. Alignment with WCRP new strategic plan
4. Increase engagement with stakeholders



WORLD
METEOROLOGICAL ORGANIZATION



UNITED NATIONS
EDUCATIONAL, SCIENTIFIC
AND CULTURAL ORGANIZATION



INTERNATIONAL
COMMISSION ON SNOW
AND ICE



INTERNATIONAL
SCIENCE COUNCIL