

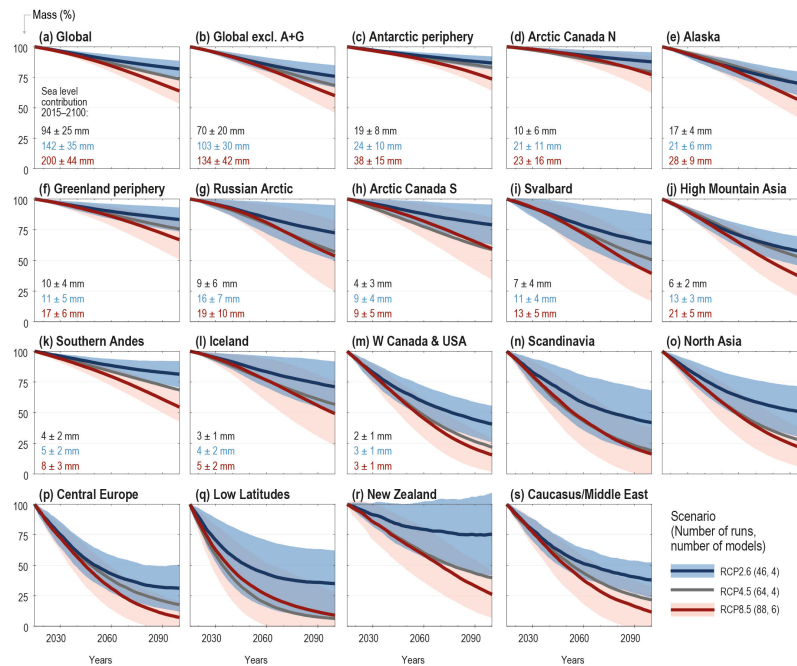
World Climate Research Programme JOINT SCIENTIFIC COMMITTEE (JSC) 41st online session

Grand Challenge on Melting Ice and Global Consequences Report (draft 1)

1. Highlights for JSC

• Highlight 1

GlacierMIP has coordinated two intercomparisons of global-scale glacier projections. The results of the first comparison of glacier models from six modeling groups (Hock et al., 2019) have directly been used in the recent IPCC SROCC (Hock et al.). A second study including >250 glacier projections coordinated through GlacierMIP focused on partitioning of uncertainties and results have been submitted to Earth's Future (Marzeion et al., 2020).



References:

- Marzeion, B., R. Hock, B. Anderson, A. Bliss, N. Champollion, K. Fujita, M. Huss, W. Immerzeel, P. Kraaijenbrink, J.-H. Mallets, F. Maussion, Valentina Radic, D. R. Rounce, A. Sakai, S. Shannon, R. van de Wal, H. Zekollari, 2020. Partitioning the Uncertainty of Ensemble Projections of Global Glacier Mass Change. Earth's Future. Submitted
- Hock, R., B. Marzeion, A. Bliss, R. Giesen, H. Hirabayashi, M. Huss, V. Radic and A. Slangen, 2019. GlacierMIP - A model intercomparison of global-scale glacier mass-balance models and projections. Journal of Glaciology, 65(251), 453-467. [doi:10.1017/jog.2019.22](https://doi.org/10.1017/jog.2019.22).
- [Hock, R., G. Rasul, C. Adler, B. Cáceres, S. Gruber, Y. Hirabayashi, M. Jackson, A. Käb, S. Kang, S. Kutuzov, Al. Milner, U. Molau, S. Morin, B. Orlove, and H. Steltzer, 2019: High Mountain Areas. In: IPCC Special Report on the Ocean and Cryosphere in a Changing Climate \[H.-O. Pörtner, D.C. Roberts, V. Masson-Delmotte, P. Zhai, M. Tignor, E. Poloczanska, K. Mintenbeck, A. Alegria, M. Nicolai, A. Okem, J. Petzold, B. Rama, N.M. Weyer \(eds.\)\]](#)

- Highlight 2
The Ice Sheet Modelling Intercomparison Project for CMIP6 team produced the [ISMIP6 special issue in The Cryosphere](#). ISMIP6 is the primary activity within CMIP6 focusing on modeling the evolution of the Greenland and Antarctic ice sheets. The ISMIP6 experimental design relies on forcing from CMIP climate models and includes, for the first time within CMIP, coupled ice-sheet-climate models as well as standalone ice sheet models. ISMIP6 provides a basis for investigating the feedbacks, impacts, and sea-level changes associated with dynamic ice sheets and for quantifying the uncertainty in ice sheet contribution to sea-level change. The goal of this special issue is to build an evolving volume of refereed and high-quality contributions focusing on both standalone ice sheet models and coupled ice sheet-climate models, as well as new developments to improve the representation of external forcings used by ice sheet models. Such a volume will serve as a unique open reference to the rapidly evolving field of numerical modeling of ice sheet flow of the Greenland and Antarctic ice sheets. It contains the first CMIP forced ice sheet model projections for both Antarctica and Greenland and will serve as an important baseline for future iterations.

2. Primary science issues (looking ahead, 3 to 5 years)

The overarching question of the GC is: How will melting ice respond to, and feedback on, the climate response to increasing greenhouse gases, and what will the impacts be? To address this question, the plan of the GC was to consolidate historical observations from a range of sources, and focus effort on better representing the shrinking cryosphere in climate models used to make quantitative projections that underpin the IPCC ARs. The GC activities target three areas:

- 1) Quantifying the amount of carbon available in permafrost areas, evaluating the potential for release of this carbon, and improving our capability to simulate the response of permafrost, and its connection to the global carbon cycle, under a warming climate.
- 2) Assembling glacier and ice sheet models for use in projecting melt rates and corresponding sea-level rise.
- 3) Assembling the most reliable observational data on sea-ice and snow and using these data to evaluate and improve climate model simulations of the remarkable changes that have already been observed and to enhance confidence in future projections.

The IPCC AR6 publication was the initial cut-off date and the GC implementation plan needs to be updated. The various activities of the GC are all success stories and will be continued.

3. Issues and challenges, for example:

- How you work with other WCRP activities
The activities of the Melting Ice and Global Consequences Grand Challenge are coordinated by the CliC IPO. Some of them have strong connections with other Grand Challenges such as ISMIP6 with the Sea Level Grand Challenge or other WCRP Core Projects such as ESM-SnowMIP through LS3MIP. However, the lack of communication between the GCs has been emphasized, especially when the link is obvious like between the Sea Level and Melting Ice GCs.
- How you see your community evolving - See CliC report.
- How you work with partners outside of WCRP - See CliC report.
- How the current funding affects your community, your activities, your service
The GC receives funding from WCRP. CliC has been providing funding from its core budget to the GC activities for the past few years to ensure that the MIPs have enough funding to hold their workshops. The Melting Ice GC has 6 components and the WCRP allowance has not been sufficient on its own for 6 meetings.
- The Melting Ice and Global Consequences Grand Challenge started as a set of independent activities, mainly MIPs, which are all very successful. The issues that has been identified is that the GC remained as such and its activities do not

necessarily identify as being part of the GC. It has therefore always been difficult to present the GC as a whole.
