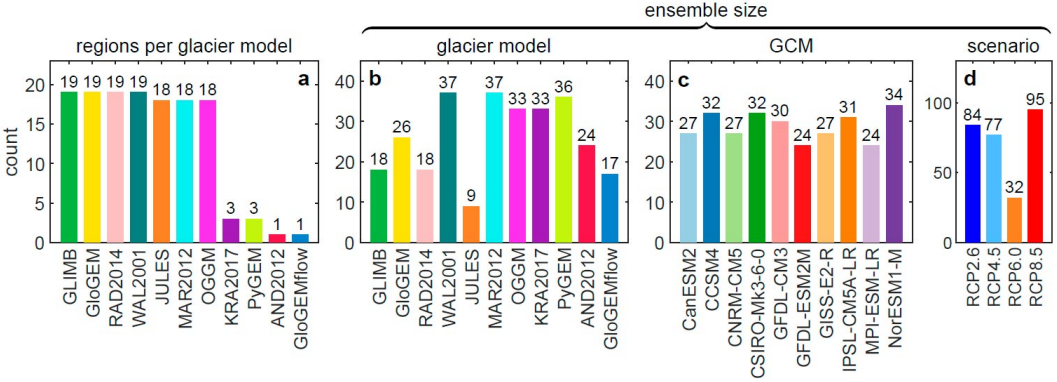
Partitioning the Uncertainty of Ensemble Projections of Global Glacier Mass Change: Results from the Second GlacierMIP Experiment

Ben Marzeion
Regine Hock, Brian Anderson, Andrew Bliss, Nicolas Champollion, Koji Fujita, Matthias Huss, Walter Immerzeel, Philip Kraaijenbrink, Jan-Hendrik Malles, Fabien Maussion, Valentina Radić, David R. Rounce, Akiko Sakai, Sarah Shannon, Roderik van de Wal, Harry Zekollari

April 21, 2020

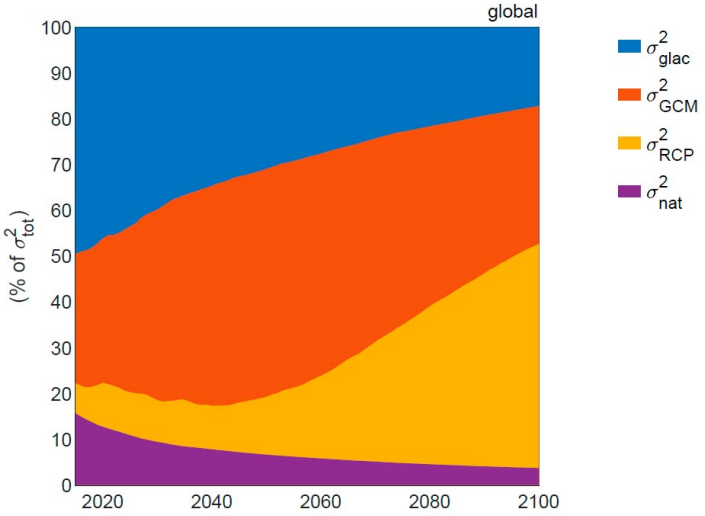
GlacierMIP2: Large, Coordinated Ensemble



Marzeion et al. (2020, in press)

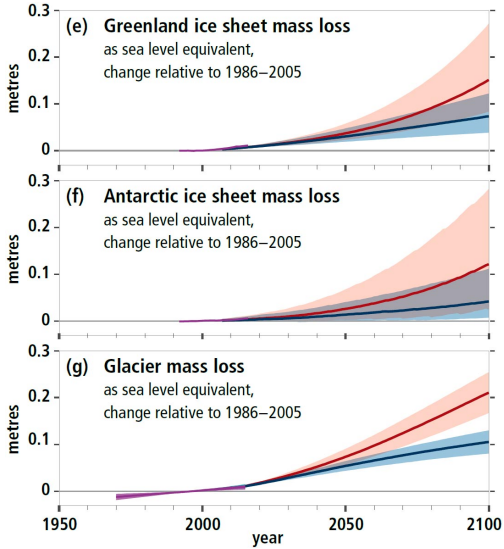
data set available at https://doi.pangaea.de/10.1594/PANGAEA.914503

Relative Contributions of Uncertainty to Accumulated Mass Change



Marzeion et al. (2020, in press)

Cryospheric Contributions to Sea-Level Rise

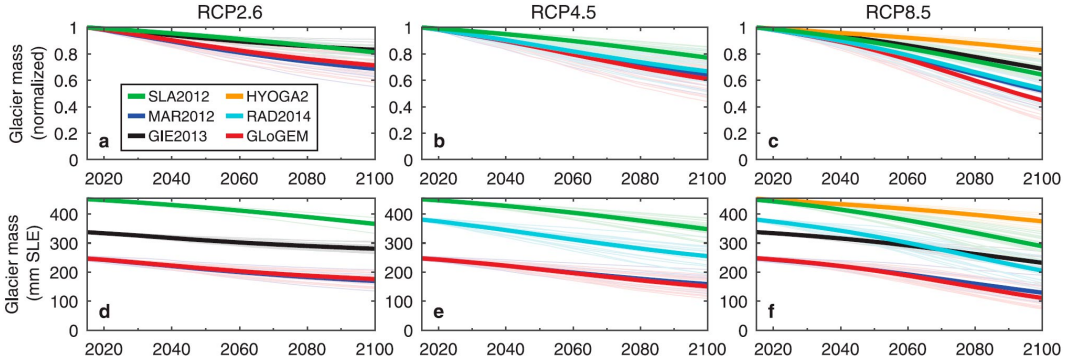


RCP8.5, 2081-2100

Greenland: 0.12 (0.05 - 0.24) m
Antarctica: 0.10 (0.02 - 0.23) m
glaciers: 0.16 (0.09 - 0.23) m

IPCC SROCC

GlacierMIP 1 – Opportunistic MIP



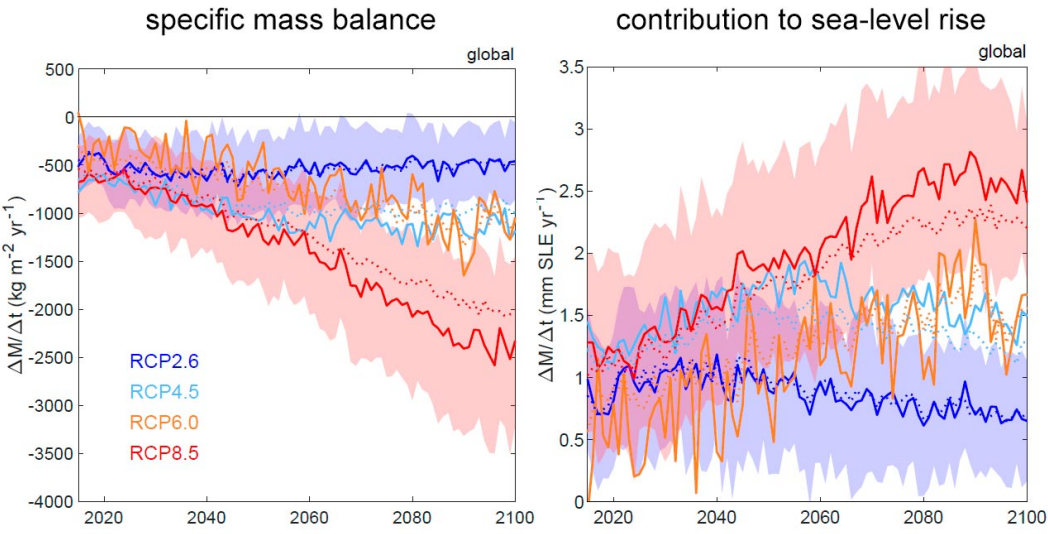
Hock et al. (2019)

- 214 ensemble members, but different initial conditions
- very few ensemble members using identical GCM-RCP combinations

GlacierMIP 2 – Dedicated Experiments

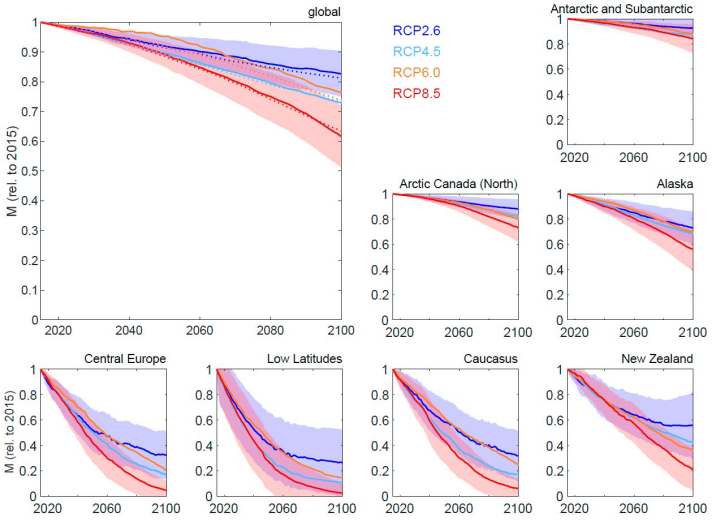
- RGIv6.0 prescribed as initial condition, initial ice thickness updated from Huss & Farinotti (2012), if needed
- 10 GCMs prescribed as boundary conditions
- RCP2.6 and RCP8.5 prioritized
- entire RGI regions necessary, global coverage not needed to participate

Global Mass Change Rates



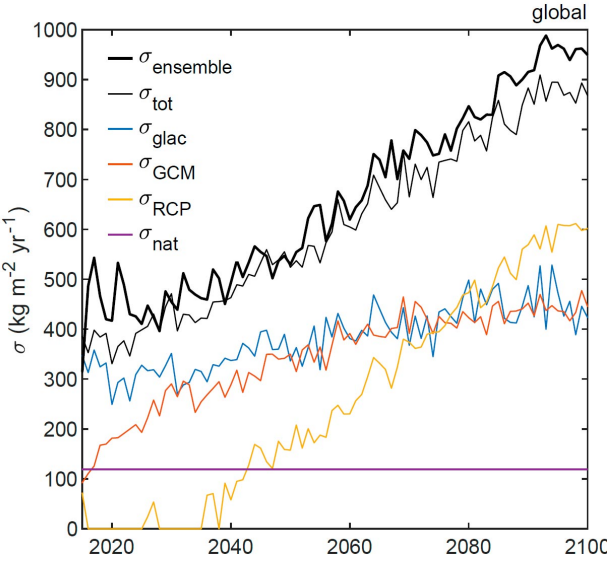
Marzeion et al. (2020, in press)

Mass Relative to 2015 – Examples of Regional Differences



Marzeion et al. (2020, in press)

Contributions to Ensemble Uncertainty

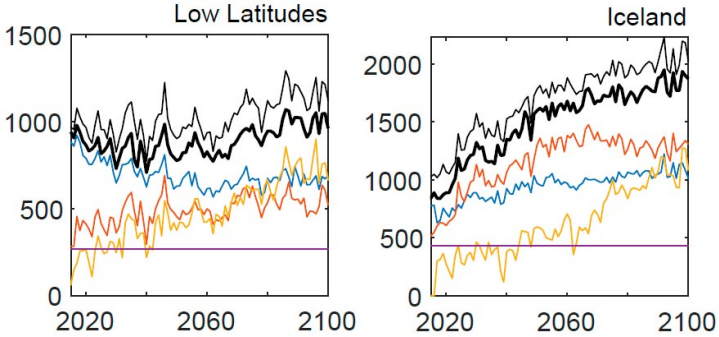


assumptions/approximations

- no interaction between different sources of uncertainty
- natural variability constant in time

Marzeion et al. (2020, in press)

Contributions to Ensemble Uncertainty – Examples of Regional Differences



Marzeion et al. (2020, in press)

Conclusions

- glaciers are important contributors to sea-level rise and will remain important throughout the 21st century
- independent of emissions, they will continue to lose mass throughout the century
- overall, GlacierMIP 2 results agree very well with previous projections
- disagreement between glacier models is greatest source of uncertainty until mid of the 21st century
- scenario uncertainty dominates at the end of the 21st century
- great regional differences in structure of projection uncertainty