EGU24-3498, updated on 11 May 2024
https://doi.org/10.5194/egusphere-egu24-3498
EGU General Assembly 2024
© Author(s) 2024. This work is distributed under
the Creative Commons Attribution 4.0 License.

Reconstructed global glacier mass change since LIA strongly influenced by the sample of observed glaciers

Anouk Vlug[1], Fabien Maussion[2,3], Paul Leclercq[4,5], Larissa van der Laan[6], Jonathan Carrivick[7], and Ben Marzeion[1,8]

[1]University of Bremen, Institute of Geography , Bremen, Germany
[2]School of Geographical Sciences, University of Bristol, Bristol, UK
[3]Department of Atmospheric and Cryospheric Sciences, University of Innsbruck, Innsbruck, Austria
[4]Department of Geosciences, University of Oslo, Oslo, Norway
[5]currently at Statkraft, Oslo, Norway
[6]Niels Bohr Institute, Copenhagen University, Copenhagen, Denmark
[7]School of Geography and water@leeds, University of Leeds, Leeds, UK
[8]MARUM – Center for Marine Environmental Sciences, University of Bremen, Bremen, Germany

An accurate global reconstruction of glacier mass change since the Little Ice Age (LIA) is of importance for, e.g., glacier mass change attribution studies and constraining the past sea-level budget. However, there are significant inconsistencies between reconstructions of the global LIA volume derived from (i) glacier length change records and (ii) glacier models that include the build-up to the LIA. The inconsistencies are present in both the magnitude and timing of the LIA maximum. Model reconstructions have shown a smaller peak of glacier volume, occurring many decades later than glacier length records indicate. Furthermore, as the maximum LIA volume did not occur synchronously between glaciers, the sampling choice of glaciers from the global population will have an impact on the total reconstructed LIA volume. Here, we tested the effect of different sampling strategies on reconstructed LIA volume, using a model based reconstruction from the Open Global Glacier Model, forced with the Last Millennium Reanalysis, as a surrogate world. Our analysis shows that glaciers for which length change observations prior to 1945 are available (the “real-world sample”) are not representative of the global signal. This shortcoming has the potential to explain large inconsistencies between the model-based reconstructions of glacier mass and reconstructions from observations. While the real-world sample is skewed, it is still a better representation of the global signal than would be expected from a random sample of the same size.