Description of Methods

Data submission group name: UIOcryogrid

1. Method Reference

The climatic mass balance CMB is computed using an energy-balance approach, combined with a detailed subsurface scheme to account for meltwater refreezing, see descriptions by Westermann et al. (2023, https://doi.org/10.5194/gmd-16-2607-2023) and has been applied to all glaciers in Svalbard (RGI region #7) by Schmidt et al. (2023, https://doi.org/10.5194/tc-17-2941-2023) and Schuler et al. (2025, https://doi.org/10.1073/pnas.2503806122) as well as to all glaciers in Franz-Josef-Land and Novaya Zemlya (part of RGI region #9) by Schmidt et al. (2025, 10.1017/jog.2024.97). The model is forced by meteorological fields of the high-resolution (2.5 km) Copernicus Arctic Regional ReAnalysis (CARRA) at steps of 3 hrs, for the period starting 1 Jan 1991 and continuously updated.

2. Summary of Method

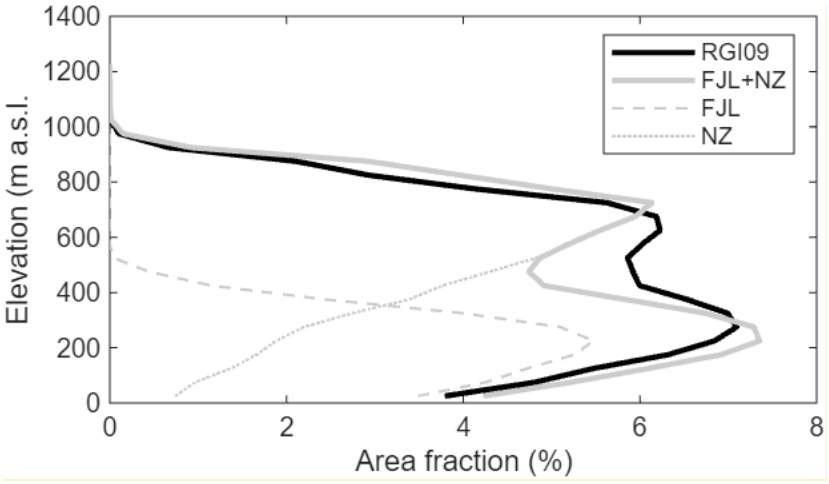
The climatic mass balance CMB is computed using an energy-balance approach, combined with a detailed subsurface scheme to account for meltwater refreezing. The model is forced by meteorological fields of the high-resolution (2.5 km) Copernicus Arctic Regional ReAnalysis (CARRA) at steps of 3 hrs, for the period starting 1 Jan 1991 and continuously updated.

3. Summary of Data Coverage

RGI #7: all glaciers in Svalbard 1/1-1991 – 30/11-2025

RGI #9: all glaciers in FJL and NZ.

as shown in previous conversation by email, the hypsometric distributions of FJL+NZ combined are close to the hypsometric distribution of the entire RGI region 9.



The above plot indicates that the subsample (FJL+NZ) gives a good representation of the hypsometric distribution of the entire region.

4. Summary of Uncertainty Estimation

Uncertainties have been assessed by Schmidt et al (2023) using in-situ glaciological measurements (point level) as well as the estimates by Hugonnet et al. (2021, https://doi.org/10.1038/s41586-021-03436-z). over the entire assessed period the RMSE (68% confidence level) has been determined to 0.39 m w.e. a-1 but it has been discussed that the model performance is transient and improving towards the end of the period. As a conservative estimate, we have applied this uncertainty equally over the entire period (divided by 12 to obtain monthly values) and take it as representative for the entire Barents regions (Svalbard, Franz-Josef-Land and Novaya Zemlya).

5. References

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