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Supplement of

Brief communication: Inferring Glacier Equilibrium Line Altitudes in the Europe Alps with FROST

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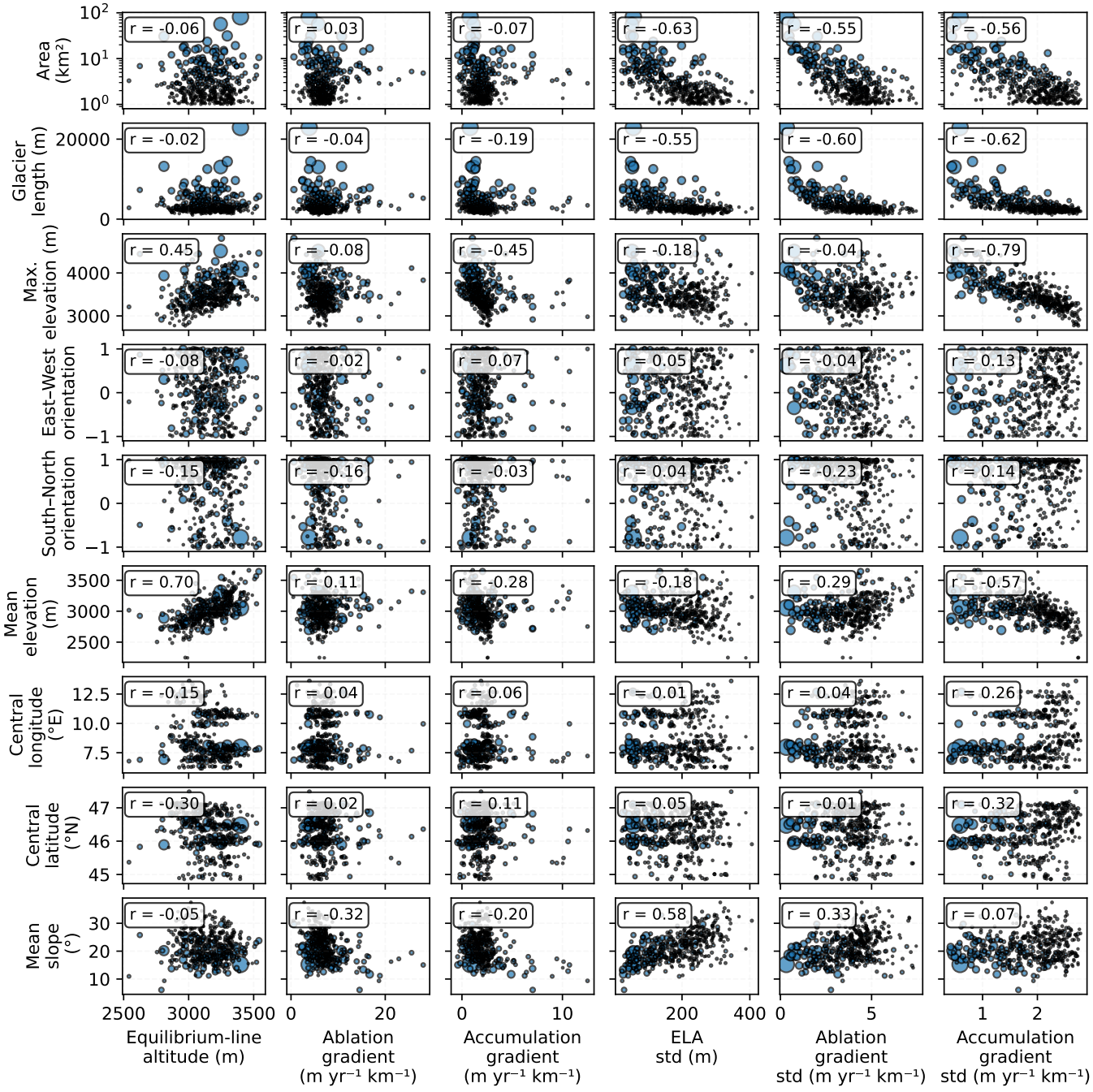

Figure S1. Correlation between surface mass balance parameters (mean and standard deviation) and glacier properties derived from RGI Consortium (2023). The correlation coefficient for each combination is the Pearson correlation coefficient. Marker size represents glacier area.

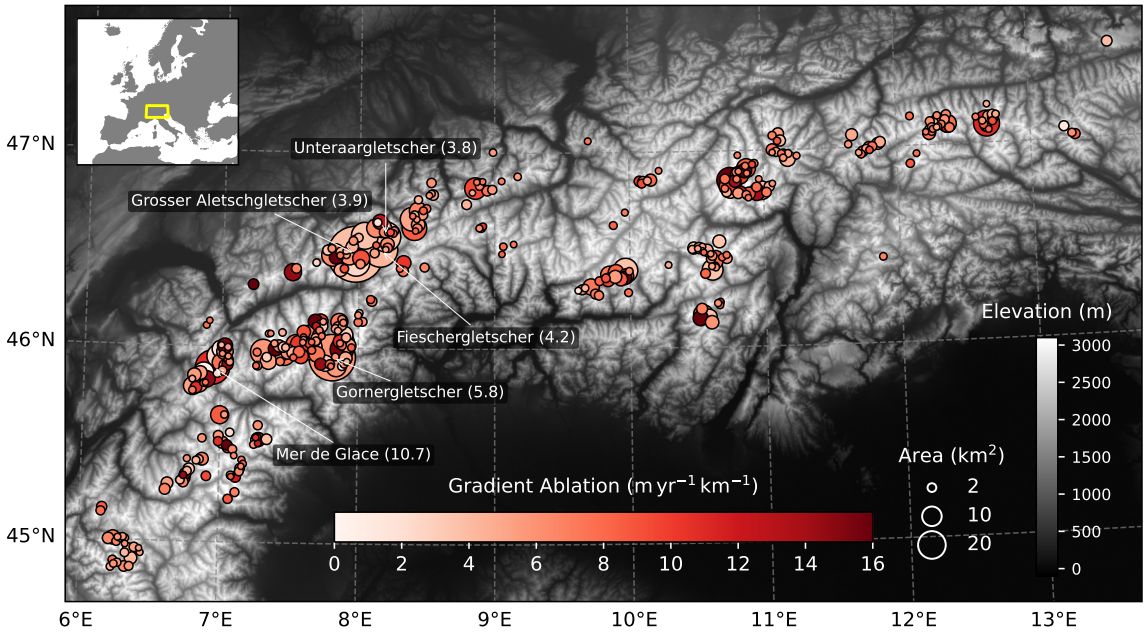

Figure S2. Mean ablation gradient of glaciers in the European Alps for the period 2000–2019, calibrated using FROST. Circle color indicates the ablation gradient, and circle size is proportional to glacier area. Five large glaciers are labeled with their names and the calibrated ablation gradient in parentheses. Background topography © EuroGeographics.

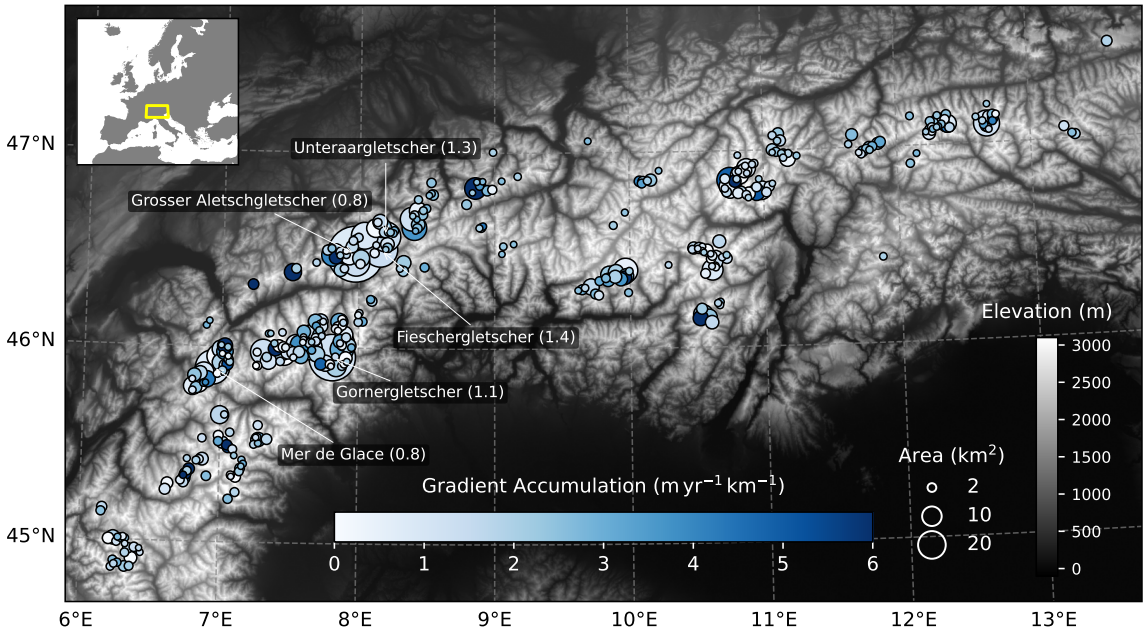

Figure S3. Mean accumulation gradient of glaciers in the European Alps for the period 2000–2019, calibrated using FROST. Circle color indicates the accumulation gradient, and circle size is proportional to glacier area. Five large glaciers are labeled with their names and the calibrated accumulation gradient in parentheses. Background topography © EuroGeographics.

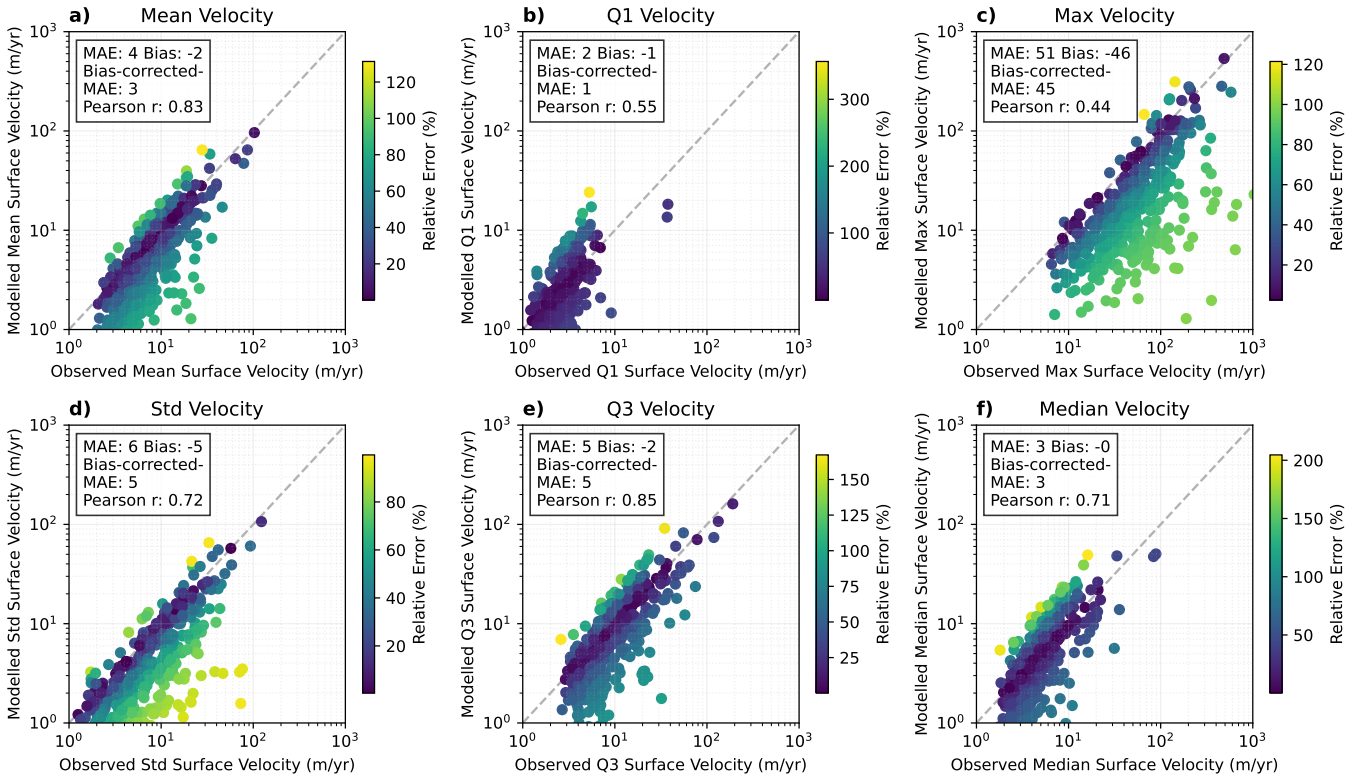

Figure S4. Correlation between six statistical properties of the modeled velocity field after inversion and the observed counterparts from Millan et al. (2022).

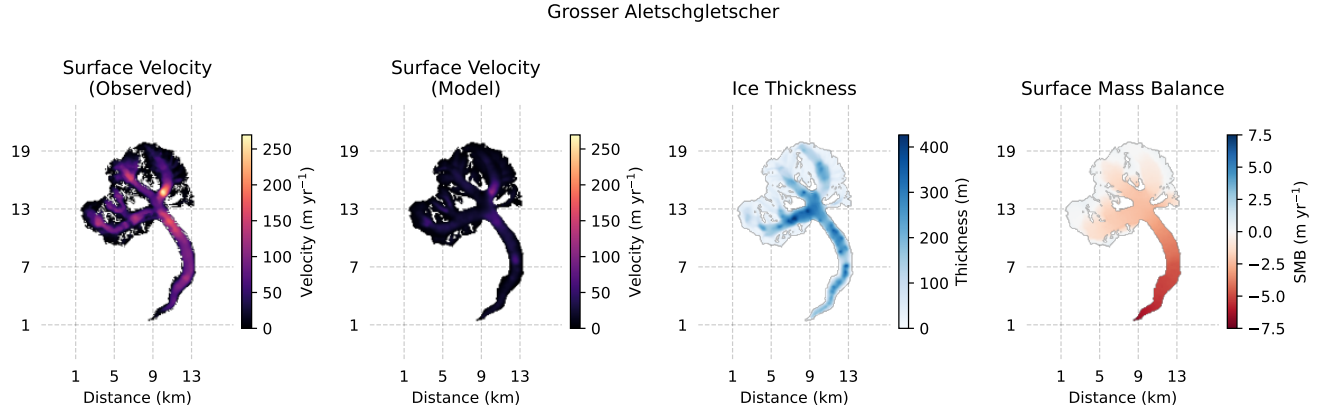

Figure S5. Glacier-specific overview of observations and model results for the Grosser Aletschgletscher. Panels show (a) observed surface velocity (Millan et al., 2022), (b) modeled surface velocity, (c) reconstructed ice thickness, and (d) calibrated surface mass balance along the glacier.

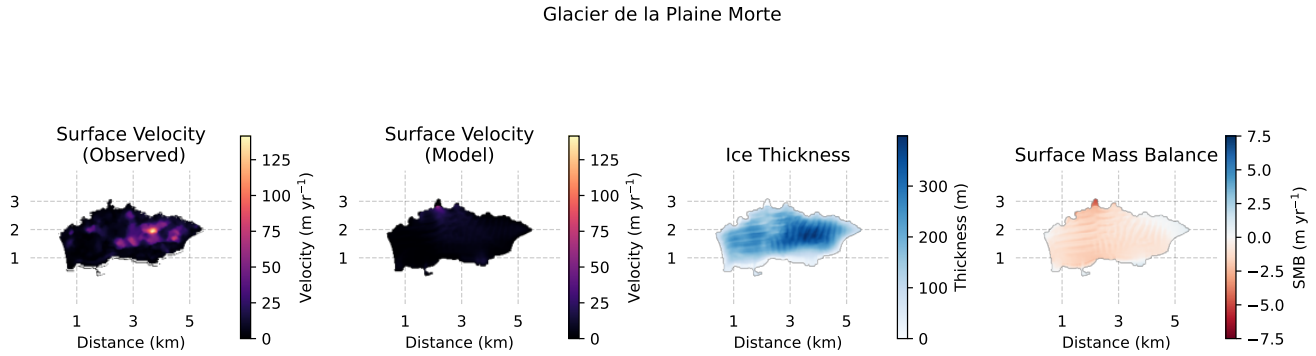

Figure S6. Glacier-specific overview of observations and model results for the Glacier de la Plaine Morte. Panels show (a) observed surface velocity (Millan et al., 2022), (b) modeled surface velocity, (c) reconstructed ice thickness, and (d) calibrated surface mass balance along the glacier.

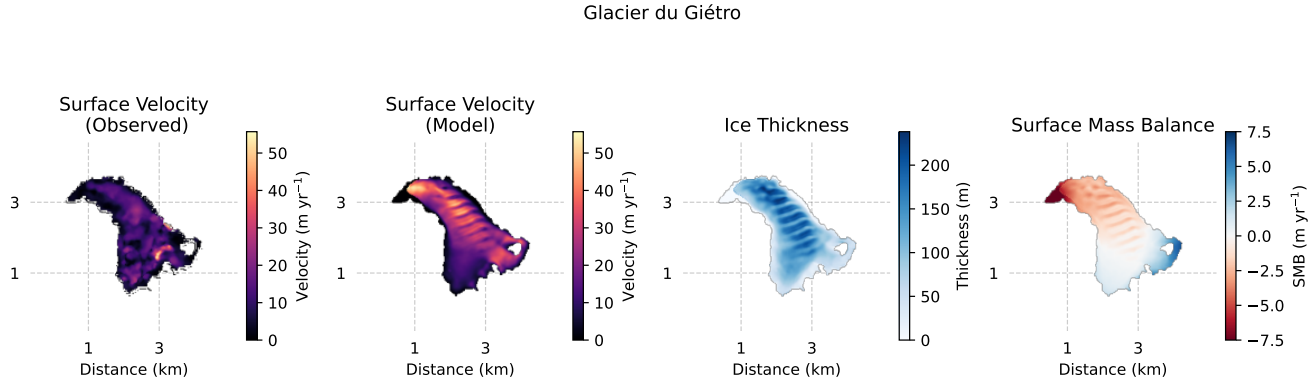

Figure S7. Glacier-specific overview of observations and model results for the Glacier du Gietro. Panels show (a) observed surface velocity (Millan et al., 2022), (b) modeled surface velocity, (c) reconstructed ice thickness, and (d) calibrated surface mass balance along the glacier.

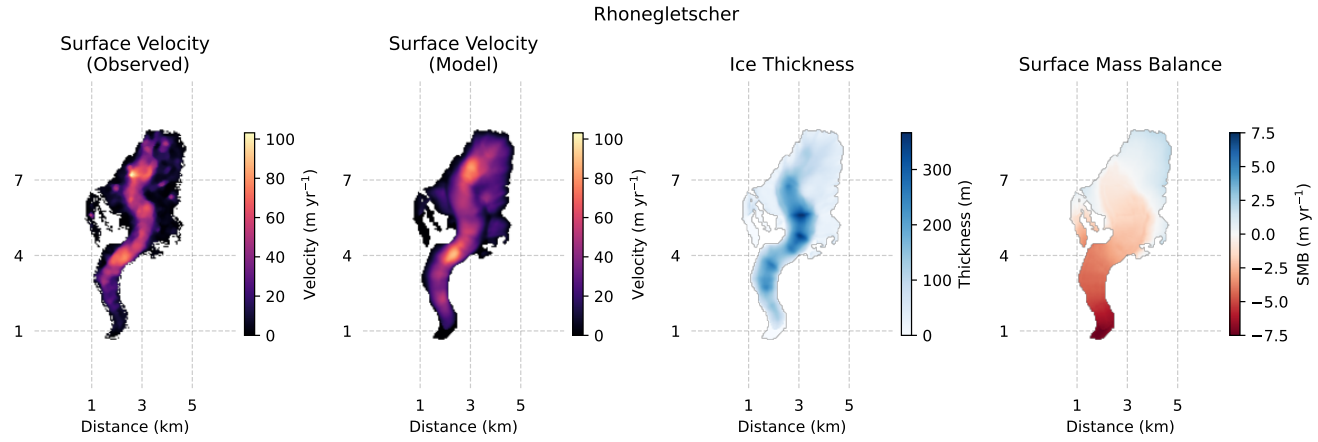

Figure S8. Glacier-specific overview of observations and model results for the Rhonegletscher. Panels show (a) observed surface velocity (Millan et al., 2022), (b) modeled surface velocity, (c) reconstructed ice thickness, and (d) calibrated surface mass balance along the glacier.

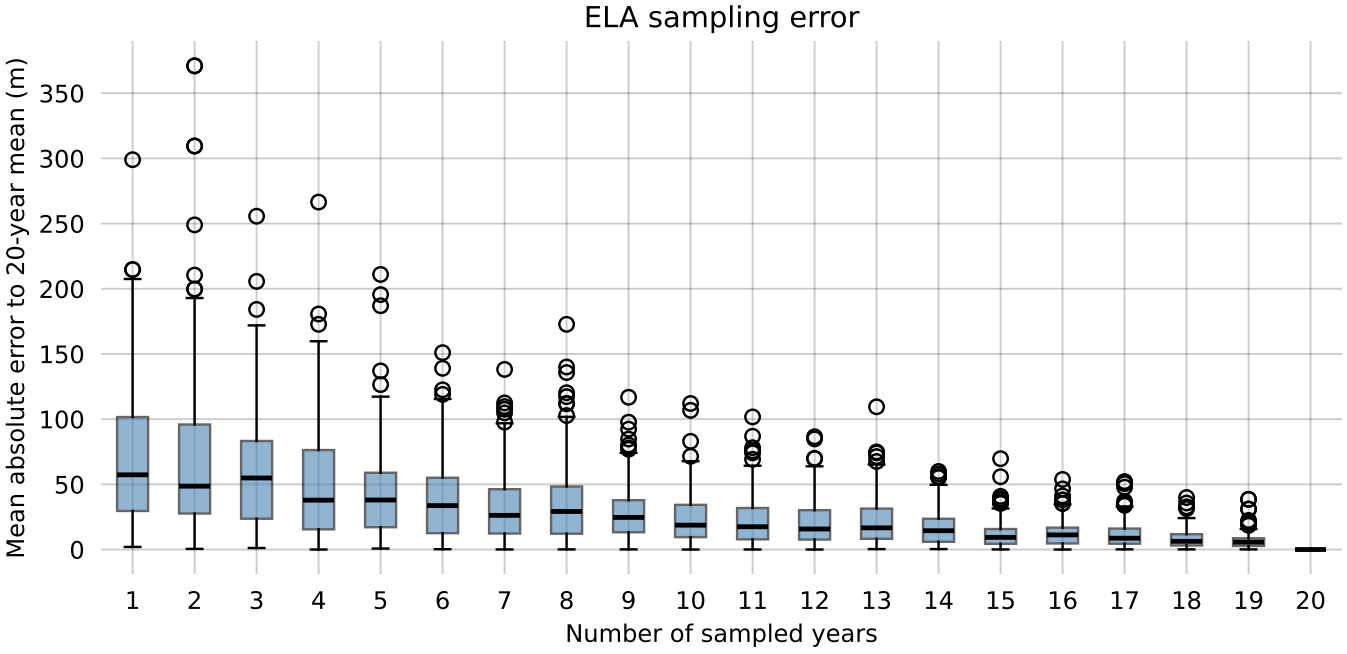

Figure S9. Sampling error of the equilibrium line altitude (ELA) as a function of the number of observed years. For each sample size, ELA values are randomly drawn from the 20-year record from WGMS (2024) and compared to the corresponding 20-year mean.

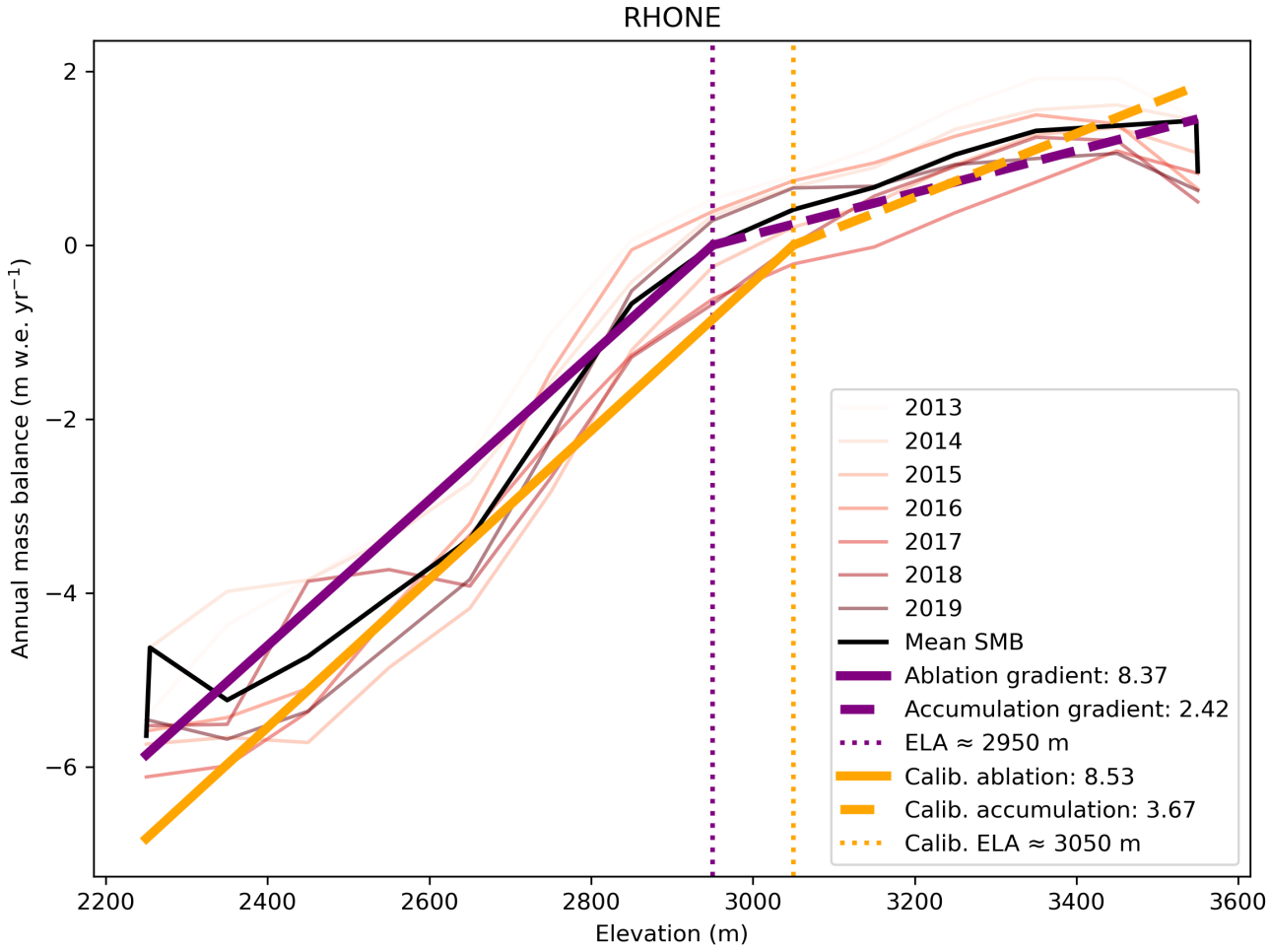

Figure S10. Elevation-dependent surface mass balance of Rhone glacier from WGMS (2024) for multiple years within the period 2000–2019. The mean SMB profile is shown in black, with the fitted gradients in purple. The calibrated SMB profile from this study is shown in orange.

References

Millan, R., Mouginot, J., Rabatel, A., and Morlighem, M.: Ice velocity and thickness of the world's glaciers, Nature Geoscience, 15, 124–129, https://doi.org/10.1038/s41561-021-00885-z, 2022.

RGI Consortium: Randolph Glacier Inventory - A Dataset of Global Glacier Outlines. (NSIDC-0770, Version 7). [Data Set]. Boulder, Colorado USA. National Snow and Ice Data Center., https://doi.org/10.5067/F6JMOVY5NAVZ, 2023.

WGMS: Fluctuations of Glaciers Database. World Glacier Monitoring Service (WGMS), Zurich, Switzerland, https://doi.org/https://doi.org/10.5904/wgms-fog-2024-01, 2024.