

Supplementary Material

1 SUPPLEMENTARY TABLES AND FIGURES

Here, we provide supplementary figures and tables.

Table S1. Dates of ablation stake measurements during student field courses on Fürkeleferner. Note that not all stakes were measured every day as not all stakes were installed on the same day.

	Dates	Number of stakes
	16.08.2016 - 19.08.2016	16
	21.08.2017 - 24.08.2017	6
	27.08.2018 - 31.08.2018	7
	26.08.2019 - 30.08.2019	14
	30.08.2021 - 03.09.2021	9
Total	22 days	52 stakes



Figure S1. Mean monthly temperature of the atmospheric forcing used for the study (46.45° N, 10.65° E, 2905 m a.s.l) and for the closest grid point of ERA5 (46.4° N, 10.65° E, 1954 m a.s.l.)



Figure S2. Mean monthly total precipitation of the atmospheric forcing used for the study (46.45° N, 10.65° E, 2905 m a.s.l.) and for the closest grid point of ERA5 (46.4° N, 10.65° E, 1954 m a.s.l.).



Figure S3. Frequency of annual climatic mass balances resulting from the sensitivity experiment concerning model parameters. Bins have a width of 0.05 m w.e. The red line displays the reference simulation with 100 m resolution.



Figure S4. Frequency of annual climatic mass balances resulting from the sensitivity experiment with glacier-wide offsets and scaling factors (depending on input variable). Bins have a width of 0.1 m w.e. The red line displays the reference simulation with 100 m resolution.



Figure S5. Frequency of annual climatic mass balances resulting from the sensitivity experiment with variable lapse rates. Bins have a width of 0.1 m w.e. The red line displays the reference simulation with 100 m resolution.



Figure S6. Simulated and measured ice albedo (instrument: Campbell NR01-05) during the field study 2016 and 2017. Observed ice albedo during the field period at AWS1 ranges from 0.34 to 0.40 (2016) and from 0.23 to 0.30 (2017). For the same periods, the simulated ice albedo is constantly 0.3, as this is the constant value set for bare glacier ice in COSIPY. Simulated and measured ice albedo thus agree well, with maximum deviations of 0.1 (2016) and 0.07 (2017).



Figure S7. Simulated annual cumulative mass balances.

Year	Winter balance [mm w.e.]	Glaciername
2013	942	Fürkeleferner
	1482	Careser
	1372	Hintereisferner
	1213	Langenferner
	1842	Weißenbrunnferner
	1358	La Mare Glacier*
2014	1344	Fürkeleferner
	1576	Careser
	1367	Hintereisferner
	1642	Langenferner
	1196	Weißenbrunnferner
	1509	La Mare Glacier*
2015	555	Fürkeleferner
	878	Careser
	948	Hintereisferner
	932	Langenferner
	1083	Weißenbrunnferner
	755	La Mare Glacier*
2016	594	Fürkeleferner
	930	Careser
	892	Hintereisferner
	951	Langenferner
	999	Weißenbrunnferner
	971	La Mare Glacier*
2017	77	Fürkeleferner
	597	Careser
	1207	Hintereisferner
	731	Langenferner
	-	Weißenbrunnferner
	635	La Mare Glacier*

Table S2. Comparison of measured winter balances with simulated winter balances of Fürkeleferner. The measured values are from Careser (WGMS, 2022a), Hintereisferner (WGMS, 2017, 2020), Langenferner (University of Innsbruck, 2019), Weißenbrunnferner (WGMS, 2022b), and La Mare Glacier (WGMS, 2022b) *The winter balance for La Mare Glacier refer to the southern unit of the glacier, as measurements were only taken in this part of the glacier.

REFERENCES

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