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Supplement of

Spatially heterogeneous effect of climate warming on the Arctic land ice

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Station	Station altitude [m asl]	MAR altitude [m asl]	Summer bias [°C]	Altitude corrected summer bias [°C]
Hopen	6	11	-0.63	-0.58
Sveagruva	9	244	-4.62	-2.27
Lufthavn	2	298	-5.06	-2.1
Ny-ålesund	8	180	-2.53	-0.81

Table S1. Temperature bias correction example from altitude difference between MAR pixel and AWSs using a fixed 1°C/100m gradient.

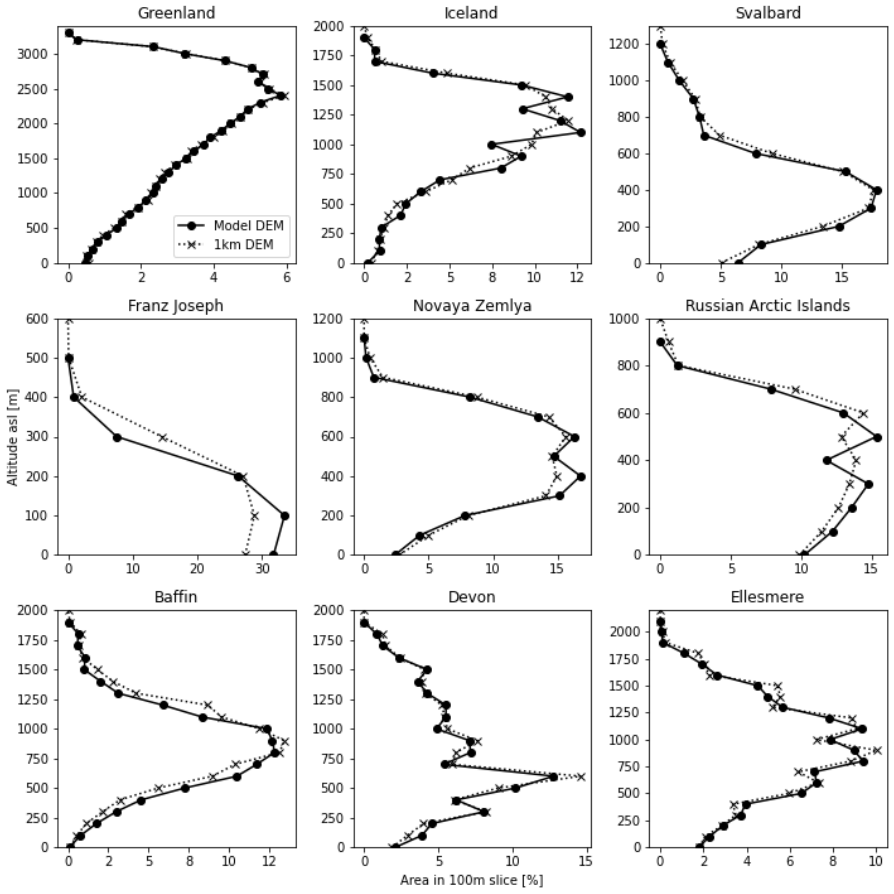

Figure 1. Comparison of the hypsometry of the land ice from the model grids (6 km resolution, in dots, solid line) and of a 1km grid in the same georeferencing system (x marks, dotted line). Both DEMs come from ETOPO01.

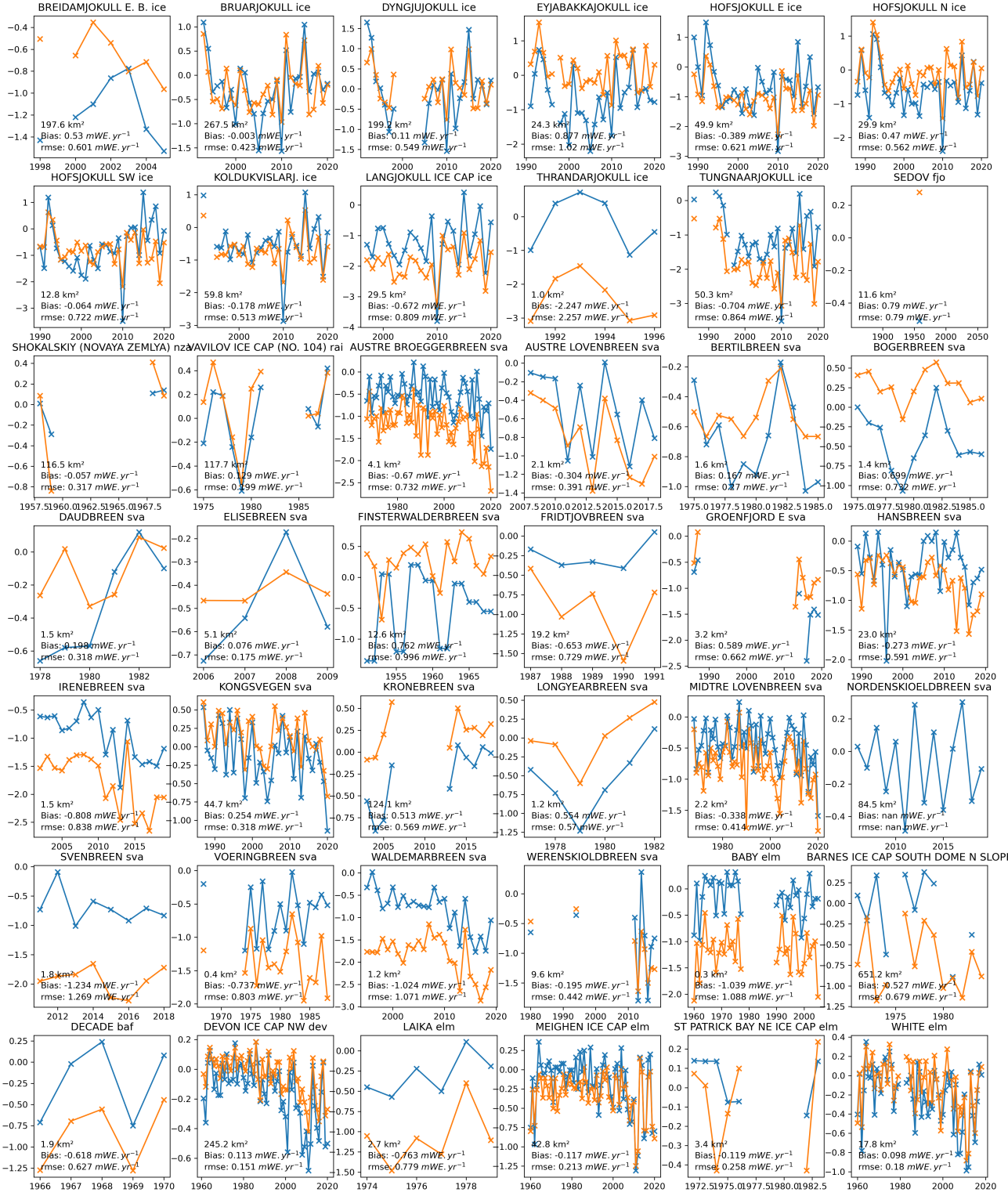

Figure 2. Modelled and observed annual specific mass balance evolution for every relevant glacier of the WGMS dataset.The name of the glacier and its sub region is indicated in the title of each subplot.

Variable	Sub Domain	Mean Observed	Bias	CRMSE	r
P2m [hPa]	Greenland	1006.96	3.35	1.60	0.99
	Russia	1013.75	-4.35	2.15	0.98
	Svalbard	1008.87	0.51	2.45	0.98
	Iceland	1006.46	-5.13	0.95	1.00
	Canada	1005.68	-4.74	2.75	0.96
T2m [°C]	Greenland	-7.49	-1.24	3.07	0.95
	Russia	-10.74	-1.72	3.33	0.96
	Svalbard	-4.58	-2.48	3.59	0.92
	Iceland	4.13	-0.33	1.68	0.96
	Canada	-13.49	0.14	3.33	0.98

Table S2. Evaluation results for the pre-International Geophysical Year period (1950 - 1956)

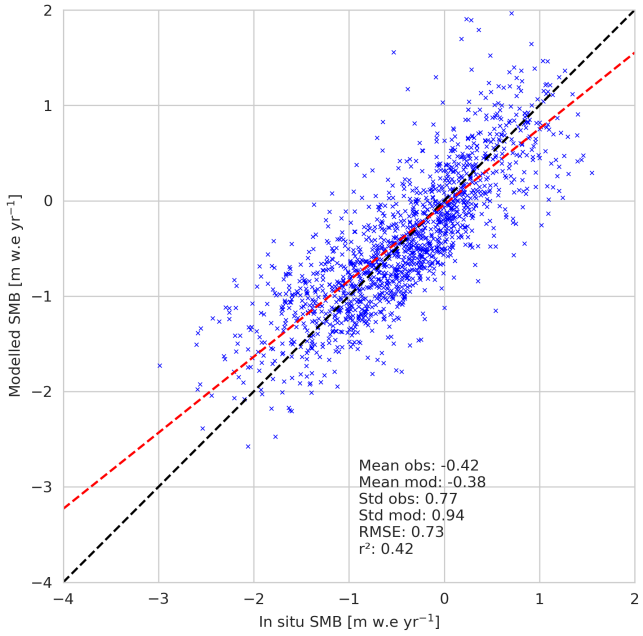

Figure 3. Modelled versus observed SMB annual values using stake data from Noël et al. (2020). The modelled SMB was downscaled using a local SMB altitude gradient with the methodology described in Franco et al. (2012). The observed stake-averaged interannual-variability is 0.34 $mWEyr^{-1}$,the modelled one is 0.25 $mWEyr^{-1}$, and the average SMB correlation on a given stake is 0.69.

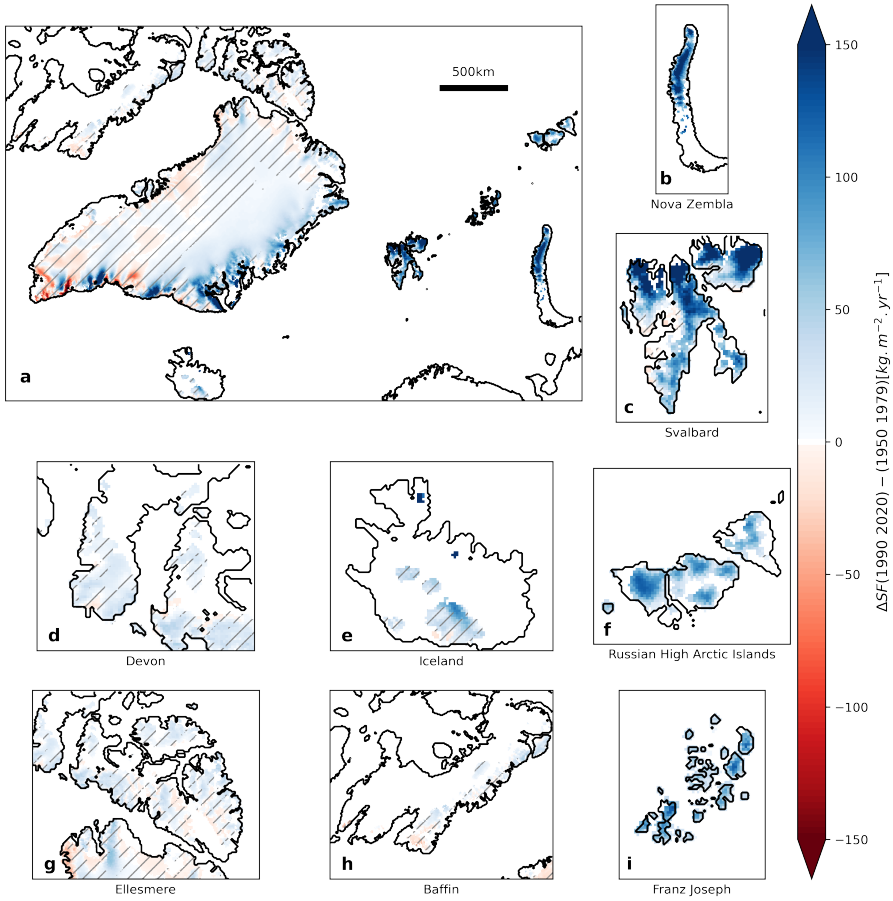

Figure 4. Annual SF anomalies between the (1990-2020) and (1950-1979) periods over (a) the whole Arctic, (b) Nova Zembla, (c) Svalbard, (d) Devon, (e) Iceland, (f) Russian High Arctic Islands, (g) Ellesmere, (h) Baffin and (i) Franz Joseph land. Hashed areas denote where the anomaly has a low significance value regarding its variance (using Student's t-test with 90% p-value