Supplementary material for “Substantial spatial heterogeneity in growing season dynamics across northern environments”

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Table S1. Median, absolute maximum and absolute minimum values of the growing season variables. The values are derived from the full dataset, covering the period 2020–2024. GDD is calculated with the 5 °C threshold.

	GS_{beg}			GS_{end}			GSlen			GDD (°C days)		
	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max
KIL	3 Jun	9 May	6 Jul	12 Sep	24 Aug	30 Sep	96	61	133	542	250	1005
RAS	3 Jun	10 May	4 Aug	12 Sep	28 Aug	20 Sep	95	41	126	517	104	986
VÄR	24 May	8 May	10 Jun	20 Sep	31 Aug	11 Oct	120	90	147	823	461	1229

Table S2. Slopes and p-values of the predictors for Kilpisjärvi. Statistically significant (at 5 % level) relationships are bolded.

	GS_{beg}		GS_{end}		GDD	
	Slope	P-value	Slope	P-value	Slope	P-value
DEM	**0.014**	0	**-0.025**	0	**-0.497**	0
PISR9	**-0.001**	0.001	**0.001**	0	**0.022**	0
TPI-50	0.003	0.766	0.01	0.118	**-0.33**	0.001
SWI-16	0.001	0.128	0.001	0.083	-0.011	0.155
WE500	-0.01	0.243	**0.019**	0	**0.289**	0
MBI	**-0.004**	0	0	0.37	0.01	0.195
CC	-0.018	0.501	-0.025	0.115	**-0.549**	0.031
SMT	**0.448**	0	**0.063**	0	**-1.371**	0

Table S3. Slopes and p-values of the predictors for Rásttigáisá. Statistically significant (at 5 % level) relationships are bolded.

	GS_{beg}		GS_{end}		GDD	
	Slope	P-value	Slope	P-value	Slope	P-value
DEM	**0.026**	0.007	**-0.017**	0	**-0.607**	0
PISR9	-0.001	0.418	0.001	0.071	0.013	0.39
TPI-50	**0.16**	0.002	0.017	0.347	0.092	0.819
SWI-16	-0.003	0.342	-0.001	0.265	-0.007	0.789
WE500	**-0.086**	0.007	-0.007	0.541	0.202	0.44
MBI	0	0.842	-0.001	0.341	0.002	0.909
SMT	**0.717**	0	0.008	0.662	**-2.943**	0

Table S4. Slopes and p-values of the predictors for Värriö. Statistically significant (at 5 % level) relationships are bolded.

	GS_{beg}		GS_{end}		GDD	
	Slope	P-value	Slope	P-value	Slope	P-value
DEM	**0.017**	0.03	**-0.05**	0.002	-0.518	0.076
PISR9	**-0.002**	0.001	**0.002**	0.023	**0.047**	0.017
TPI-50	0.009	0.738	0.001	0.983	0.979	0.326
SWI-16	0.001	0.198	**-0.005**	0.024	**-0.094**	0.013
WE500	-0.014	0.119	0.007	0.68	-0.065	0.842
MBI	0	0.791	0.001	0.686	**0.09**	0.011
CC	0.017	0.478	-0.085	0.085	-1.75	0.06
SMT	0.112	0.122	0.067	0.634	1.625	0.537

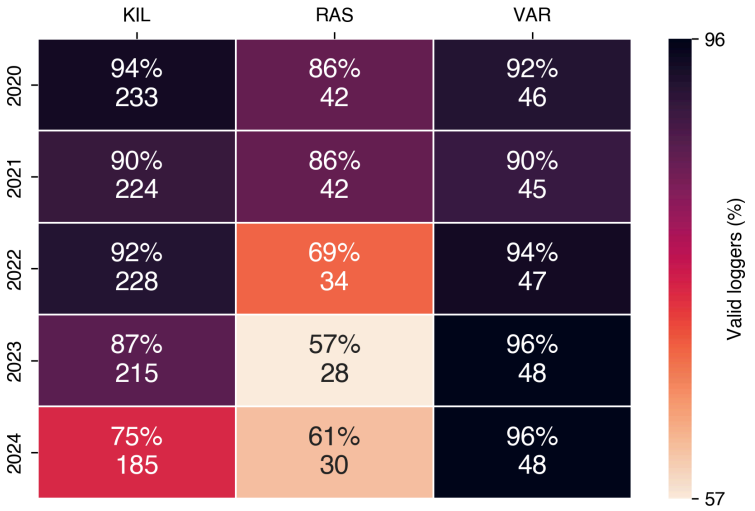

Figure S1. Heatmap showing the percentage and the actual number of loggers with less than 5 % imputed data at each area in 2020–2024.

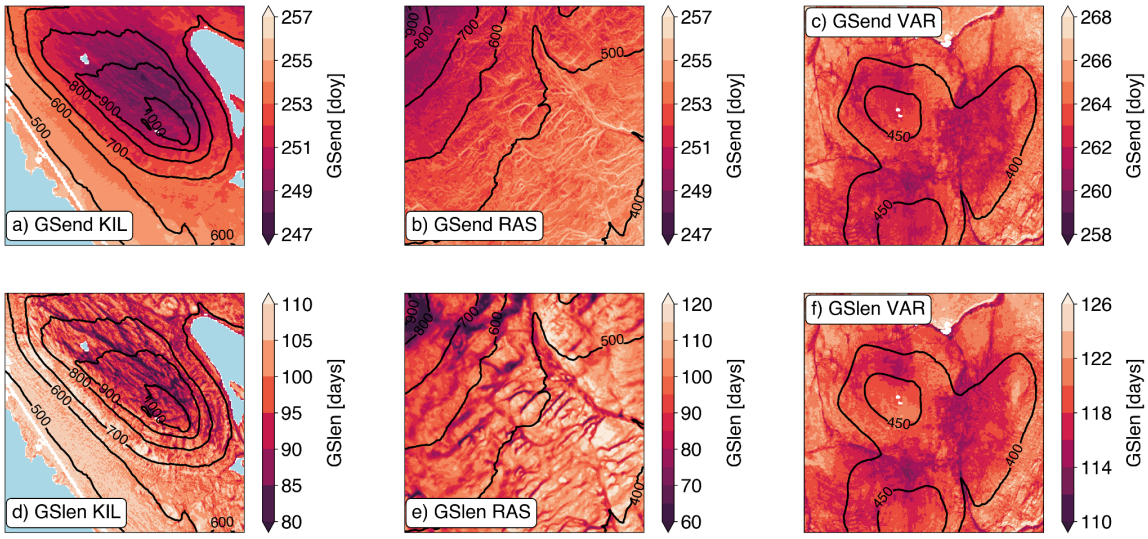

Figure S2. Predicted spatial variability in the average GS_{end} (a-c) and GSlen (d-f) in Kilpisjärvi (left), Rásttigáisá (middle) and Värriö (right). GS_{end} is based on the linear model at 10 m x 10 m resolution. GSlen is calculated as the difference between GS_{end} and GS_{beg}. Black contours show the elevation every 100 metres. The domains are 3 km x 3 km, and their locations in the landscape are shown in Fig. 1.

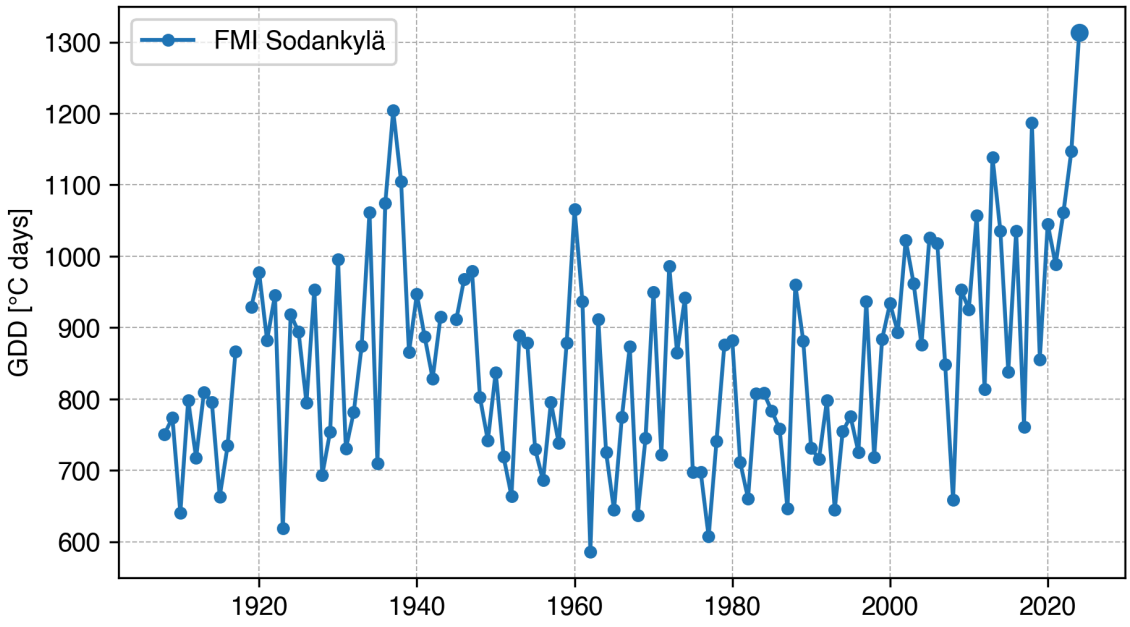

Figure S3. Century-scale context of growing seasons in northern Fennoscandia. The graph shows GDD from FMI Sodankylä Tähtelä weather station in 1908–2024.

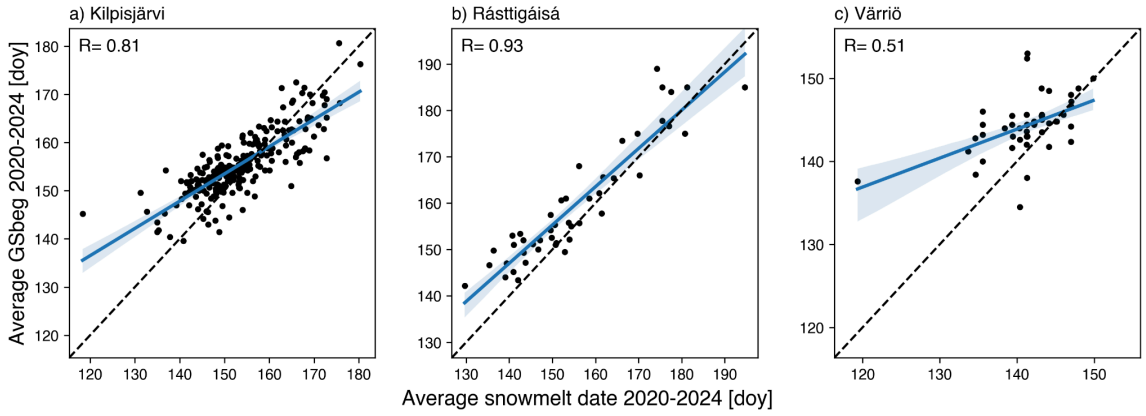

Figure S4. Relationship between snowmelt timing and the onset of the growing season. The x-axis shows the average snowmelt date and the y-axis shows the average GS_{beg} date. The values are averages over five years 2020–2024. The black dashed line marks 1:1 line, and blue line the least squares regression with 95 % confidence interval as shading.