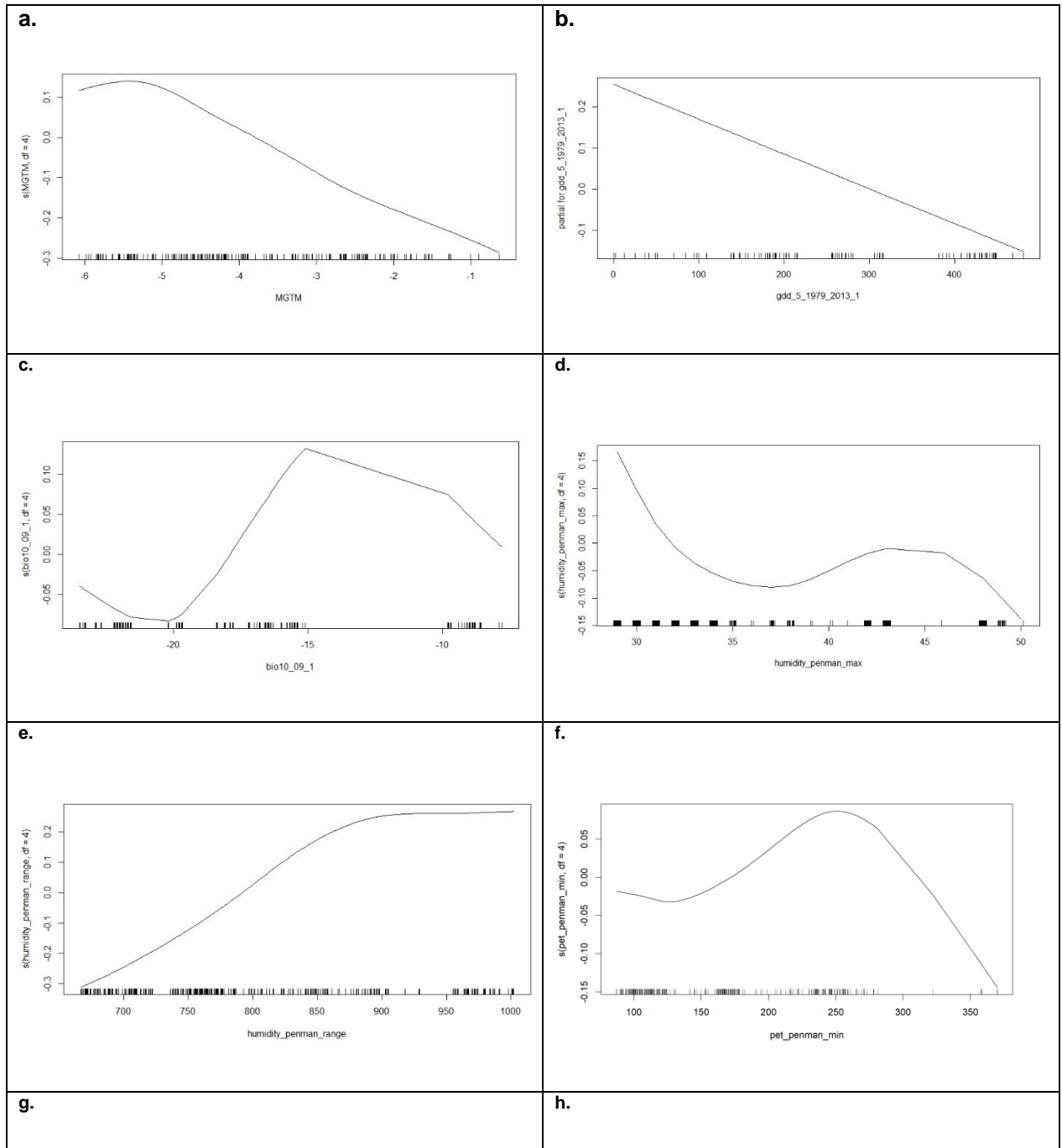
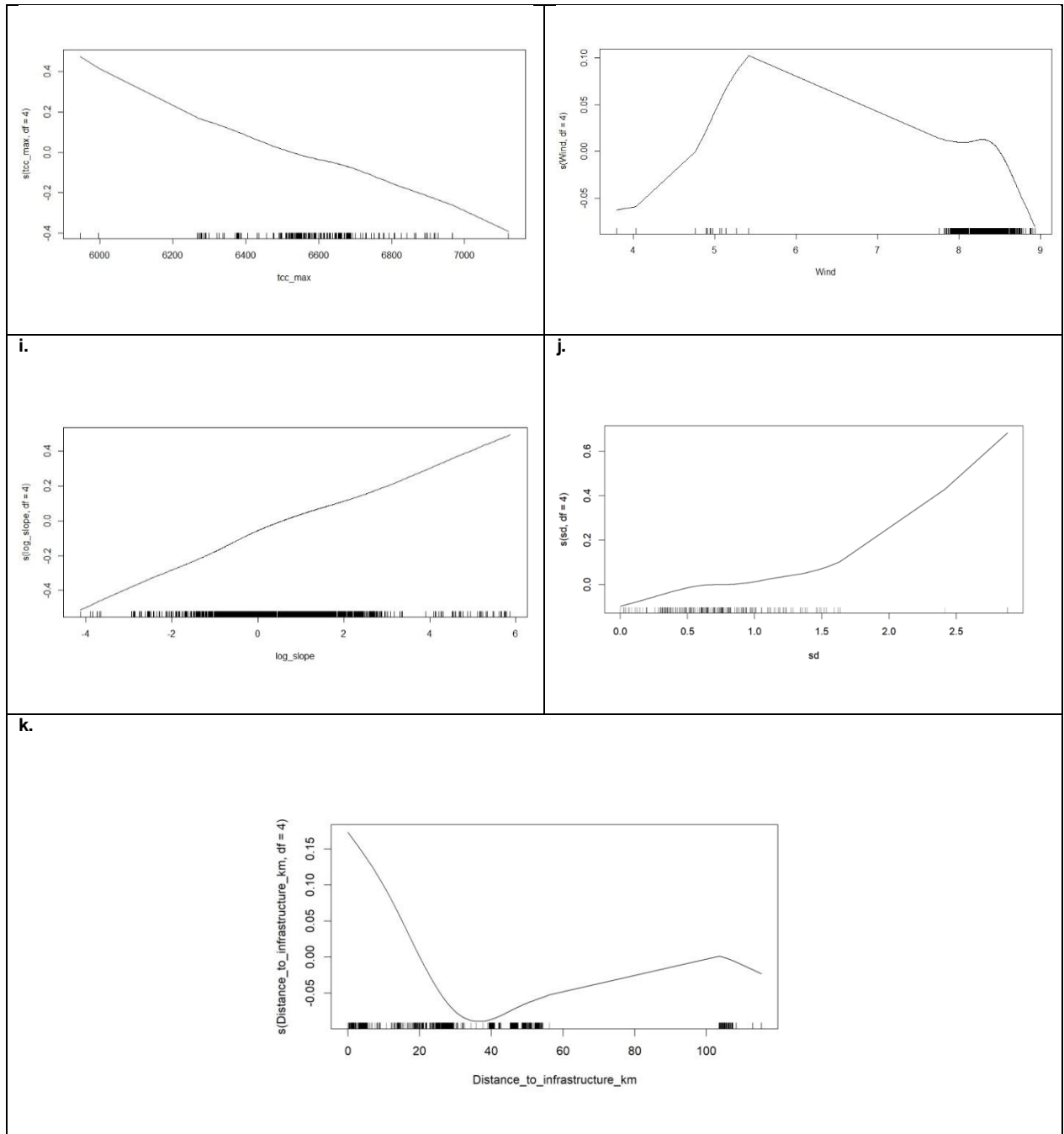


1 **Supplementary Material & Appendices**

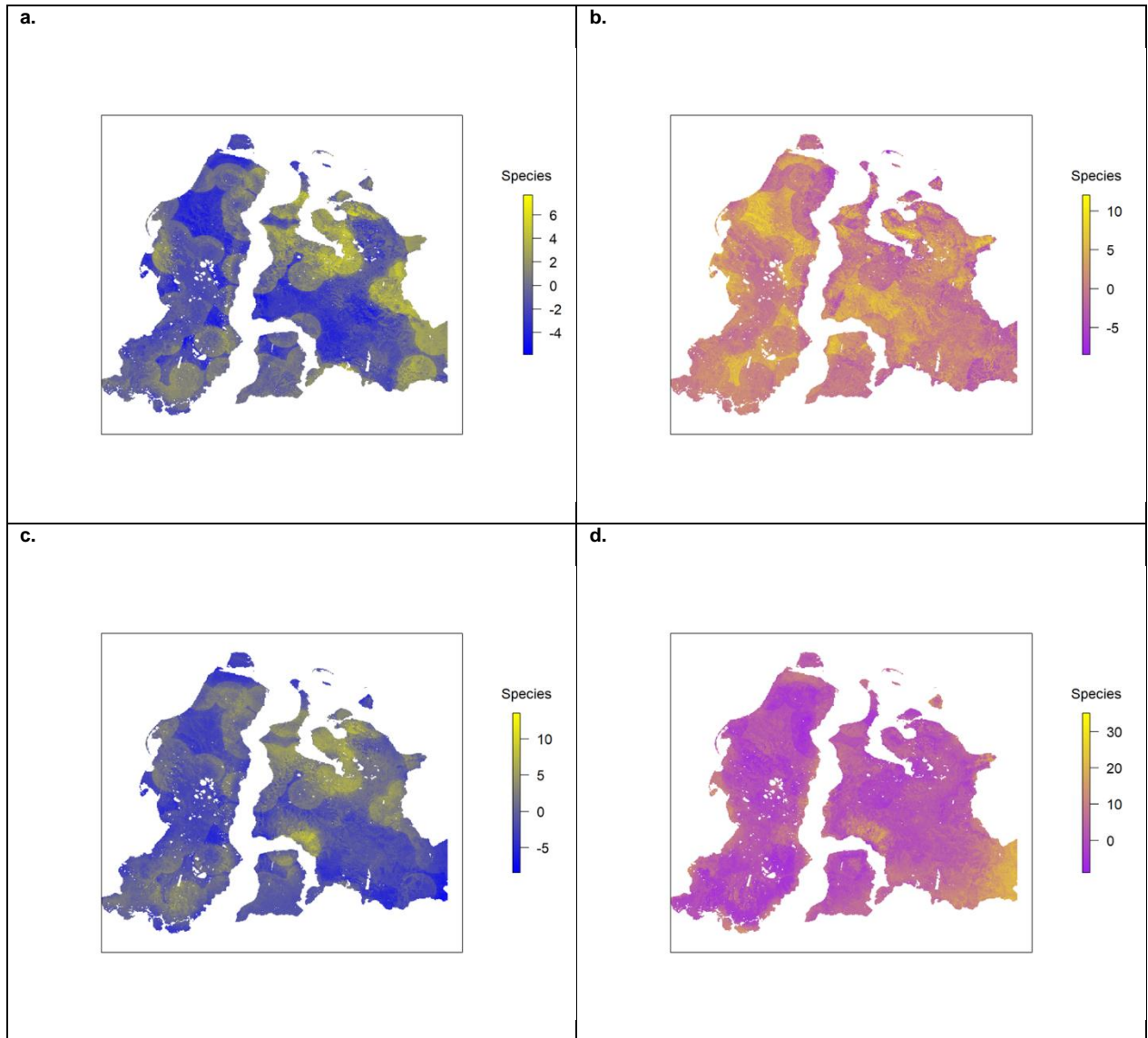


2
3 **Appendix Figure 1: Distance to infrastructure (km) map**





Appendix Figure 2: Response curves for all predictors used in the GAM model of community-level plant species richness of the Western Siberia Arctic region. Response curves are for **a.** 'Mean annual ground temperature' (MGTM) (°C); **b.** 'Growing degree days heat sum above 5°C' (°C); **c.** 'Mean daily mean air temperatures of the driest quarter' (°C); **d.** 'Climate moisture index max' (kg m⁻² month⁻¹); **e.** 'Climate moisture index range' (kg m⁻² month⁻¹); **f.** 'Potential evapotranspiration (min)' (kg m⁻²); **g.** 'Cloud area fraction'; **h.** 'Mean wind speed' (m/s); **i.** 'Mean wind speed' (m/s); **j.** 'Altitude standard deviation'; **k.** 'Distance to infrastructure' (km).



Appendix Figure 3: Additional distance to infrastructure test results. **a.** Model disagreement map indicating maximum difference in species number between 'environmental only' and 'actual distance to infrastructure' map projections. **b.** Model disagreement map indicating maximum difference in species number between 'environmental only' and 'actual distance to infrastructure' disagreement map projections. **c.** Model disagreement map indicating maximum difference in species number between 'actual distance to infrastructure' and hypothetical "zero human impact" projection (the predictor 'distance to infrastructure' set to the maximum value (115.285 km)). **d.** Model disagreement map indicating maximum difference in species number between 'actual distance to infrastructure' and hypothetical "zero human impact" disagreement map projection (the predictor 'distance to infrastructure' set to the maximum value (115.285 km)).

Appendix Table 1: Full list of tested predictors (green color and bold font shows selected predictors, red color - predictors omitted because of their low predictive power, black color – left out due to high correlation with selected predictors). High correlation (>0.7-0.8) with other predictors indicated only for predictors with predictive power higher than 5%.

N	Predictor	Predictive power (%)	High correlation with other predictors	Original resolution	Source
1	Longitude	21.0	Mean January temperature (negative), distance to infrastructure (0.72), temperature seasonality (0.72), climate moisture index range, potential evapotranspiration min (negative)	-	-
2	Mean monthly precipitation amount of the warmest quarter (bio10_18)	20.8	Growing degree days heat sum above 5°C, mean July temperature, MGTm, mean potential evapotranspiration, mean daily maximum air temperature of the warmest month, mean daily mean air temperatures of the warmest quarter (0.74), mean daily mean air temperatures of the wettest quarter, precipitation amount of the wettest month, annual precipitation amount, precipitation seasonality, mean monthly precipitation amount of the warmest quarter; latitude (negative)	1000	CHELSEA Bioclim (Karger et al., 2016)

3	Mean annual air temperature (bio10_01)	20.1	Mean July temperature, GMTM, mean potential evapotranspiration, mean daily minimum air temperature of the coldest month, mean daily mean air temperatures of the wettest quarter, mean daily mean air temperatures of the coldest quarter, annual precipitation amount, precipitation amount of the wettest month, mean monthly precipitation amount of the wettest quarter, mean monthly precipitation amount of the warmest quarter; latitude (negative)	1000	CHELSEA Bioclim (Karger et al., 2016)
4	Mean annual ground temperatures (GMTM)	18.9	Mean annual air temperature, mean July temperature, mean potential evapotranspiration, mean daily minimum air temperature of the coldest month, mean daily mean air temperatures of the wettest quarter, mean daily mean air temperatures of the coldest quarter, annual precipitation amount, precipitation amount of the wettest month, mean monthly precipitation amount of the wettest quarter, mean monthly precipitation amount of the warmest quarter; latitude (negative)	1000	Global Permafrost project (Obu, et al., 2019)

5	Mean monthly precipitation amount of the wettest quarter (bio10_16)	17.9	Growing degree days heat sum above 5°C, mean July temperature, MGTM, mean potential evapotranspiration, mean daily maximum air temperature of the warmest month, mean daily mean air temperatures of the warmest quarter, mean daily mean air temperatures of the	1000	CHELSEA Bioclim (Karger et al., 2016)
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			wettest quarter, precipitation amount of the wettest month, annual precipitation amount, precipitation seasonality, mean monthly precipitation amount of the warmest quarter; latitude (negative)		
6	Precipitation amount of the wettest month (bio10_13)	17.6	Mean annual air temperature, growing degree days heat sum above 5°C, mean July temperature, MGTM, mean potential evapotranspiration, mean daily maximum air temperature of the warmest month, mean daily minimum air temperature of the coldest month, mean daily mean air temperatures of the warmest quarter, mean daily mean air temperatures of the wettest quarter, annual precipitation amount, precipitation seasonality, mean monthly precipitation amount of the wettest quarter, mean monthly precipitation amount of the warmest quarter	1000	CHELSEA Bioclim (Karger et al., 2016)

7	Potential evapotranspiration min (pet_penman_min_1981.2010)	16.6	Longitude (negative)	1000	CHELSEA new (Brun et al., 2022)
8	Precipitation seasonality (bio10_15)	16.1	Precipitation amount of the wettest month, mean monthly precipitation amount of the wettest quarter, mean monthly precipitation amount of the warmest quarter and MGTM (0.7); Mean daily mean air temperatures of the driest quarter (negative)	1000	CHELSEA Bioclim (Karger et al., 2016)
9	Latitude	15.0	Negative: mean annual air temperature, growing degree days heat sum above 5°C, mean July temperature, MGTM, mean potential evapotranspiration, mean daily maximum air temperature of the warmest month, mean daily mean air temperatures of the wettest quarter, mean daily mean air temperatures of the warmest quarter, annual precipitation amount, precipitation amount of the wettest month, mean monthly precipitation amount of the wettest quarter, mean monthly precipitation amount of the warmest quarter		-

10	Mean July temperature (Ist_july)	14.7	Mean annual air temperature, MGTM, mean potential evapotranspiration, mean daily mean air temperatures of the wettest quarter, annual precipitation amount, precipitation amount of the wettest month, mean monthly precipitation amount of the wettest quarter, mean monthly precipitation amount of the warmest quarter; longitude (negative)		MODIS derived 2000-2019 (MOD11A2 MODIS/Terra Land Surface Temperature /Emissivity 8-Day L3 Global 1km SIN Grid V006 [Data set])
11	Mean daily mean air temperatures of the coldest quarter (bio10_11)	14.1	Mean annual air temperature, MGTM	1000	CHELSA Bioclim (Karger et al., 2016)
12	Climate moisture index max (humidity_penman_max_1981.2010)	14.0	Climate moisture index mean	1000	CHELSA new (Brun et al., 2022)
13	Mean daily mean air temperatures of the driest quarter (bio10_09) -	13.9	precipitation seasonality (negative)	1000	CHELSA Bioclim (Karger et al., 2016)
14	Mean daily minimum air temperature of the coldest month (bio10_06)	12.9	Mean annual air temperature, MGTM, mean daily mean air temperatures of the coldest quarter, precipitation amount of the wettest month	1000	CHELSA Bioclim (Karger et al., 2016)

15	Mean daily mean air temperatures of the wettest quarter (bio10_08)	12.8	Mean annual air temperature, growing degree days heat sum above 5°C, mean July temperature, MGTM, mean potential evapotranspiration, mean daily mean air temperatures of the warmest quarter, annual precipitation amount, precipitation amount of the wettest month, mean monthly precipitation amount of the wettest quarter, mean monthly precipitation amount of the warmest quarter; longitude (negative)	1000	CHELSEA Bioclim (Karger et al., 2016)
16	Mean January temperature (lst_january)	12.6	Longitude (negative), climate moisture index range (0.7)		MODIS derived 2000-2019 (MOD11A2 MODIS/Terra Land Surface Temperature /Emissivity 8-Day L3 Global 1km SIN Grid V006 [Data set])
17	Annual precipitation amount (bio10_12)	12.4	Mean annual air temperature, growing degree days heat sum above 5°C, mean July	1000	CHELSEA Bioclim (Karger et al., 2016)

			temperature, MGMT, mean potential evapotranspiration, mean daily maximum air temperature of the warmest month, mean daily mean air temperatures of the wettest quarter, mean daily mean air temperatures of the warmest quarter, precipitation amount of the wettest month, mean monthly precipitation amount of the driest quarter, mean monthly precipitation amount of the wettest quarter, mean monthly precipitation amount of the warmest quarter; latitude (negative)		
18	Climate moisture index range (humidity_penman_range_1981.2010)	11.1	Longitude, temperature seasonality	1000	CHELSA Bioclim (Karger et al., 2016)
19	Mean daily maximum air temperature of the warmest month (bio10_05)	10.8	Growing degree days heat sum above 5°C, mean potential evapotranspiration, mean daily mean air temperatures of the warmest quarter, annual precipitation amount, precipitation amount of the wettest month, mean monthly precipitation amount of the wettest quarter, mean monthly precipitation amount of the warmest quarter, mean monthly precipitation amount of the wettest quarter, mean monthly precipitation amount of the warmest quarter; latitude (negative)	1000	CHELSA Bioclim (Karger et al., 2016)

20	Distance to infrastructure	10.8	Longitude	-	OSM based (https://www.openstreetmap.org/)
21	Growing degree days heat sum above 5°C (gdd_5_1979_2013)	10.7	Mean July temperature, mean monthly precipitation amount of the warmest quarter, mean potential evapotranspiration, mean daily maximum air temperature of the warmest month, mean daily mean air temperatures of the warmest quarter, mean daily mean air temperatures of the wettest quarter, mean daily mean air temperatures of the warmest quarter, annual precipitation amount, precipitation amount of the wettest month, mean monthly precipitation amount of the wettest quarter; longitude (negative)	1000	CHELSA new (Brun et al., 2022)
22	Isothermality (bio10_03)	10.3	Cloud area fraction (negative, -0.72)	1000	CHELSA Bioclim (Karger et al., 2016)
23	Log transformed slope	9.6	-	10	ArcticDEM based (Morin et al., 2016)

24	Mean potential evapotranspiration (pet_penman_mean_1981.2010)	9.3	MGTM, mean annual air temperature, growing degree days heat sum above 5°C, mean July temperature, mean daily maximum air temperature of the warmest month, mean daily mean air temperatures of the wettest quarter, mean daily mean air temperatures of the warmest quarter, annual precipitation amount, precipitation amount of the wettest	1000	CHELSEA new (Brun et al., 2022)
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			month, mean monthly precipitation amount of the wettest quarter, mean monthly precipitation amount of the warmest quarter		
25	Mean daily mean air temperatures of the warmest quarter (bio10_10)	9.3	Mean monthly precipitation amount of the warmest quarter, latitude, growing degree days heat sum above 5°C , mean, max and range potential evapotranspiration; latitude (negative)	1000	CHELSEA Bioclim (Karger et al., 2016)
26	Climate moisture index mean (humidity_penman_mean_1981.2010)	9.2	Climate moisture index max, site water balance	1000	CHELSEA new (Brun et al., 2022)
27	Site water balance (swb_1981.2010)	8.4	Climate moisture index mean	1000	CHELSEA new (Brun et al., 2022)

28	Cloud area fraction (tcc_max_1981.2010)	7.1	Isothermality	1000	CHELSA new (Brun et al., 2022)
29	Mean monthly precipitation amount of the driest quarter (bio10_17)	6.1	Annual precipitation amount	1000	CHELSA Bioclim (Karger et al., 2016)
30	Standard deviation of altitude	5.6	Standard deviation of altitude	10	ArcticDEM based (Morin et al., 2016)
31	Slope	5.4	Mean wind speed	10	ArcticDEM based (Morin et al., 2016)
32	Mean wind speed	5.1	Slope	100	Global Wind Atlas (https://globalwindatlas.info/)
33	Temperature seasonality (bio10_04)	5.1	Climate moisture index range, longitude, mean daily minimum air temperature of the coldest month, mean daily mean air temperatures of the coldest quarter	1000	CHELSA Bioclim (Karger et al., 2016)
34	Incidence angle raster map	4.7		10	ArcticDEM based (Morin et al., 2016)
35	Beam irradiance	3.5		10	ArcticDEM based (Morin et al., 2016)
36	Mean monthly precipitation amount of the coldest quarter (bio10_19)	3.3		1000	CHELSA Bioclim (Karger et al., 2016)

37	Mean diurnal air temperature range (bio10_02)	3.3		1000	CHELSA Bioclim (Karger et al., 2016)
38	Diffuse irradiance	3.2		10	ArcticDEM based (Morin et al., 2016)
39	Global (total) irradiance	2.7		10	ArcticDEM based (Morin et al., 2016)
40	Precipitation amount of the driest month (bio10_14)	2.6		1000	CHELSA Bioclim (Karger et al., 2016)
41	Terrain wetness index	2.6		1000	High-resolution global topographic index values (Marthews et. al., 2015)
42	NDVI	1.8		1000	Sentinel derived (JuneAugust 2019-2020)
43	pet_penman_max_1981.2010	1.7		1000	CHELSA new (Brun et al., 2022)
44	Topographic position index	1.6		10	ArcticDEM based (Morin et al., 2016)

45	pet_penman_range_1981.2010	1.3		1000	CHELSA new (Brun et al., 2022)
46	Annual range of air temperature (bio10_07)	1.0		1000	CHELSA Bioclim (Karger et al., 2016)
47	Climate moisture index min (humidity_penman_min_1981.2010)	0.9		1000	CHELSA new (Brun et al., 2022)
48	modcf_intraannualsd_1	0.9		1000	CHELSA Bioclim (Karger et al., 2016)
49	Aspect	0.2		10	ArcticDEM based (Morin et al., 2016)
50	Altitude	0.0		10	ArcticDEM based (Morin et al., 2016)
Paleoclimatic predictors (predictive power (PP) is given for the time period 12,100 years ago (highest PP tested))					
1	Mean annual temperature	24.6	MGTM, paleo precipitation	1000	CHELSA TraCE21k dataset (Karger et al., 2021)
2	Mean annual precipitation	17.6	MGTM, paleo temperature	1000	CHELSA TraCE21k dataset (Karger et al., 2021)

3	Distance to land ice	12.1	MGTM, paleo temperature	1000	CHELSA TraCE21k dataset (Karger et al., 2021)
4	Altitude	3		1000	CHELSA TraCE21k dataset (Karger et al., 2021)
5	Maximum year in time-series where the location was covered by land ice	-		1000	CHELSA TraCE21k dataset (Karger et al., 2021)