Supporting Information to:

Pan-Arctic soil element availability estimations

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1 Sampling locations and Domains

Table S1: List of sampling locations, coordinates, and number of samples per location

Location	Coordinates	n (samples)	Depths organic/mineral/permafrost Layer (cm)
Alaska, Moist non-acidic tundra (MNT)	69.43303°N, 148.67435°W	10	11 / 48 /41
Alaska, Moist acidic tundra (MAT)	69.42540°N, 148.69684°W	12	21 / 16 / 63
Alaska, Coldfoot (CO)	67.23727°N, 150.16176°W	9	30 / 33 / 37
Alaska, Chandalar (CH)	68.06904°N, 149.58072°W	8	10 / 35 / 55
Alaska, Franklin Bluff-Dry (FB)	69.67404°N, 148.72224°W	12	19 / 59 / 22
Canada, Cambridge Bay (CB)	69.23245°N, 104.1938°W	64	8-42 / 12-68 / 20-63
Russia, Chersky (CY)	68.61353°N, -161.35228°W	12	20 / 40 / 40
Russia, Kytalyk (KY)	70.83340°N, -147.45068°W	27	9-26 / 16-31 / 58-60
Russia, Ary-Masa (AM)	72.44968°N, -101.93294°W	34	6 / 63 / 32
Russia, Spasskaya (SP)	62.24558°N, -129.63319°W	26	6 / 94 / 0
Russia, Lena delta, first terrace (FT)	72.37942°N, -126.39018°W	55	16 / 22 / 62
Russia, Lena delta, third terrace (TT)	72.28748°N, -126.22118°W	68	9 / 29 /92
Svalbard (SV)	78.19102°N, -15.85858°W	1	0 / 0 / 100

Svalbard, Adventalen (AD)	78,18347°N, -15.88292°W	78	6 / 14 / 80
Svalbard, Ny-Alesund (NA)	78.92427°N, -11.78364°W	24	7 / 63 / 30
Sweden, Abisko (AB)	68.35595°N, -19.04762°W	13	35 / 35 / 30
Greenland, Zackenberg (ZA)	74.46747°N, 20.55407°W	22	3 / 17 / 80
Greenland, Zackenberg, Ice Wedge (IW)	74.46485°N, 20.57802°W	1	3 / 17 / 80
Greenland, Zackenberg, Infilling FAN (IF)	74.46747°N, 20.55407°W	2	3 / 17 / 80
Greenland, Disko (DI)	69.26474°N, 53.46891°W	25	4-25 / 7-53 / 51-85
Greenland, Nussuaq (NU)	70.29722°N, 52.25667°W	12	100 / 0 / 0
Greenland, Melville Bay (MB)	73.55000°N, 55.51333°W	11	100 / 0 / 0
Greenland, Cass Fjord (CF)	80.09694°N, 63.15444°W	12	100 / 0 / 0
Greenland, Warming Land (WL)	81.53917°N, 51.29139°W	12	100 / 0 / 0
Greenland, Brønlund (BR)	82.22278°N, 40.80944°W	3	100 / 0 / 0

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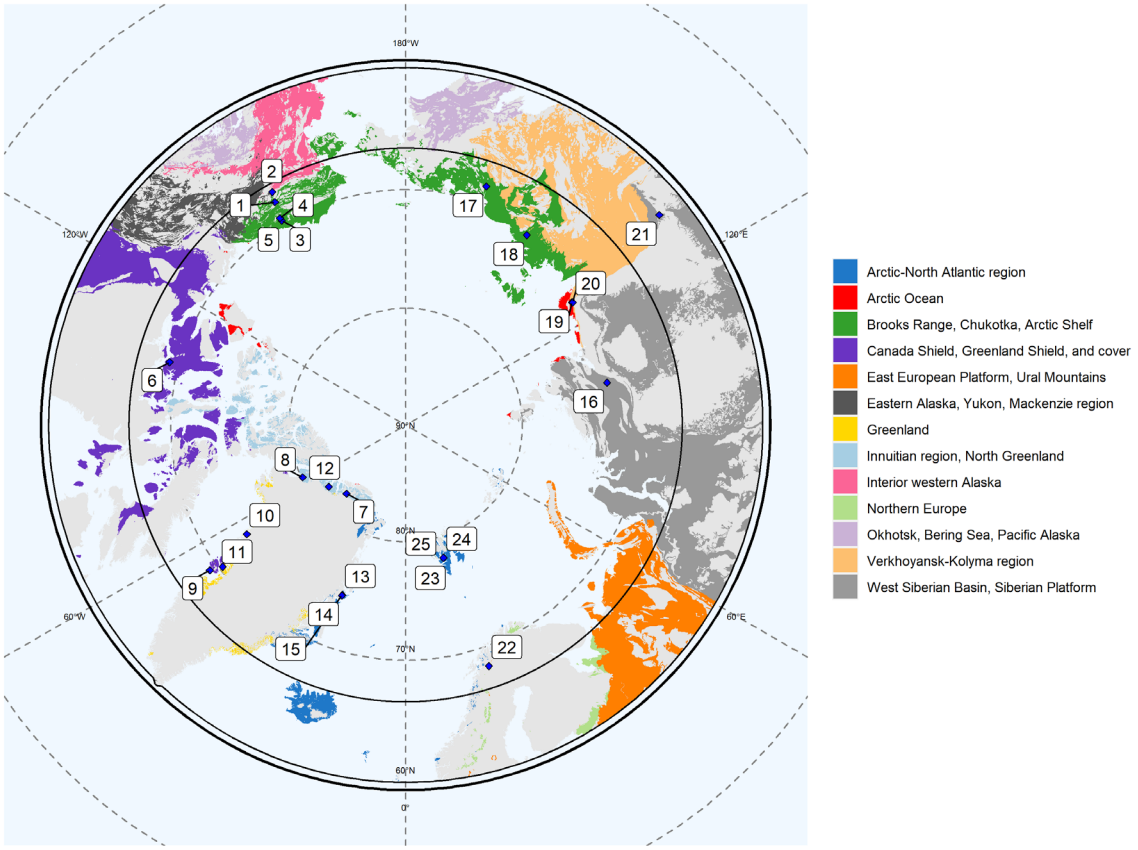

Fig. S1: Map with areas containing modelled element concentrations. The thirteen colors represent geographic domains of the original Geological Map of the Arctic, which are covered by modelled data. For allocation take care of the legend on the right side of the map. Numbers represent sampling locations:1: Alaska, Chandalar; 2: Alaska Coldfoot; 3: Alaska, Franklin Bluff-Dry; 4: Alaska, MAT; 5: Alaska, MNT; 6: Canada; 7: Greenland, Brønlund; 8: Greenland, Cass Fjord; 9: Greenland, Disko; 10: Greenland, Melville Bay; 11: Greenland, Nussuaq; 12: Greenland, Warming Land; 13: Greenland, Zackenberg; 14: Greenland, Zackenberg, Ice Wedge; 15: Greenland, Zackenberg, Infilling FAN; 16: Russia, Ary-Mas; 17: Russia, Chersky; 18: Russia, Kytalyk; 19: Russia, Lena Delta, First terrace; 20: Russia, Lena Delta, Third terrace; 21: Russia, Spasskaya; 22: Sweden, Abisko; 23: Svalbard, Adventalen; 24: Svalbard, Ny-Alesund; 25: Svalbard, Svalbard

Table S2: Number of polygons with modelled element concentrations in the single domains.

Domain	n (Polygons)
Arctic-North Atlantic region	715
Arctic Ocean	90
Brooks Range, Chukotka, Arctic Shelf	835
Canada Shield, Greenland Shield, and cover	669
East European Platform, Ural Mountains	480
Eastern Alaska, Yukon, Mackenzie region	863
Greenland	604
Innuitian region, North Greenland	1502
Interior western Alaska	324
Northern Europe	92
Okhotsk, Bering Sea, Pacific Alaska	552
Verkhoyansk-Kolyma region	977
West Siberian Basin, Siberian Platform	923

Table S3: Original area of the three single maps of the Geological Map of the Arctic ("Canada, Alaska", "Greenland" and "North Europe, Russia") and area of extrapolated polygons in absolute and relative share.

Map	Area GMA (m^2)	Represented (m^2)	Share (%)
Canada, Alaska	$5.42*10^{12}$	$2.22*10^{12}$	40.93
Greenland, no icesheet	$4.10*10^{11}$	$1.79*10^{11}$	43.54
North Europe, Russia	$1.02*10^{13}$	$5.23*10^{12}$	51.45
Sum	$1.77*10^{13}$	$7.63*10^{12}$	43.03

From original 28,483 polygons of the geological map of the arctic 8,626 (30.3%) polygons could be extrapolated due to same lithology like the sampled polygons. In Canada and Alaska 3,912 polygons, in Greenland 1,278 polygon and in northern Europe and Russia 3,436 polygons were extrapolated.

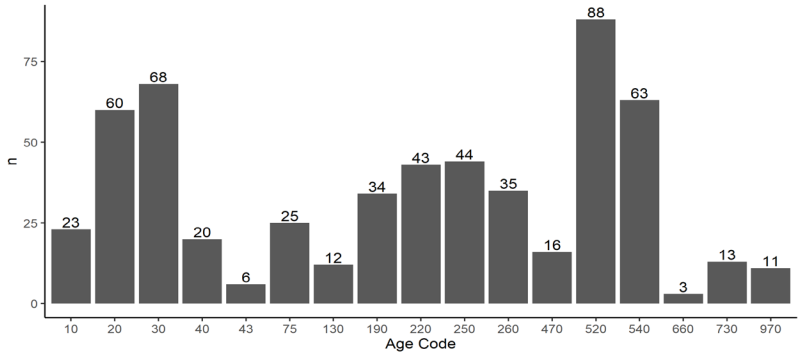

Fig S2: Number of samples per series epoch, represented by age code. 10: Paleogene and Neogene (65.5 - 2.6 Ma); 20: Neogene (23.0 - 2.6 Ma); 30: Pliocene to Holocene (5.3 - 0.0 Ma); 40: Pliocene (5.3 - 2.6 Ma); 43: Miocene (23.0 - 5.3 Ma); 75: Paleocene and Eocene (65.5 - 33.9 Ma); 130: Cretaceous and younger (145.5 - 0.0 Ma); 190: Late Cretaceous (99.6 - 65.5 Ma); 220: Early Cretaceous (145.5 - 99.6 Ma); 250: Late Jurassic and Early Cretaceous (161.2 - 99.6 Ma); 260: Jurassic and Cretaceous (199.6 - 65.5 Ma); 470: Carboniferous and Permian (359 - 251 Ma); 520: Cambrian to Devonian (542 - 359 Ma); 540: Late Devonian (385 - 359 Ma); 660: Neoproterozoic and Cambrian (1000 - 488 Ma); 730: Ediacaran (~635 - 542 Ma); Mesoarchean and Neoarchean (3200 - 2500 Ma).

Table S4: The 14 lithological classes with type, setting, and element concentration (mean and se in mg g-1 DW) that were modelled.

Type	**Setting**	**ID**	**Lithology**	n (samples)	n (polygons)	***ASi***	***Si***	***Ca***	***Fe***	***Al***	***P***
Igneous: extrusive	Extrusive: mafic	1	Basalt, olivine basalt, tholeiite, alkali basalt, basanite, pillow basalt, flood basalt	26	455	6.68 ± 1.17	0.44 ± 0.08	3.65 ± 0.7	0.94 ± 0.18	0.25 ± 0.05	0.0116 ± 0.002
unclassified	Metamorphic: undivided	2	Gneiss, migmatite; reworked amphibolite and granulite facies rocks	11	604	4.11 ± 1.24	0.37 ± 0.11	0.05 ± 0.02	0.7 ± 0.21	0.65 ± 0.2	0.0217 ± 0.007
Sedimentary	Carbonate	3	Limestone, dolostone, shale, evaporites, chalk; carbonate reefs or metamorphosed equivalent	24	561	0.03 ± 0	0.1 ± 0.02	10.73 ± 2.15	0.01 ± 0	0.02 ± 0	0 ± 0
		4	Limestone, dolostone, shale, evaporites, chalk; carbonate reefs; metamorphic grade not identified	58	841	0 ± 0	5.65 ± 0.78	2.56 ± 0.34	2.28 ± 0.32	1.57 ± 0.22	0.3055 ± 0.042
		5	Limestone, dolostone, shale, evaporites, chalk; carbonate reefs	64	1174	1.24 ± 0.14	0.3 ± 0.03	3.79 ± 0.45	0.41 ± 0.05	0.21 ± 0.03	0.0372 ± 0.005
	Clastic: shallow marine	6	Quartz sandstone, siltstone, claystone, limestone, dolostone, conglomerate, tillite	13	92	0 ± 0	6.61 ± 1.83	3.34 ± 0.93	2.49 ± 0.69	2.52 ± 0.7	0.1226 ± 0.034
	Clastic: deltaic and nearshore	7	Sandstone, siltstone, shale, coal; plant fossils; metamorphic grade not identified	68	727	0 ± 0	5.46 ± 0.66	2.21 ± 0.27	2.21 ± 0.27	1.63 ± 0.2	0.1898 ± 0.023
	Sedimentary: undivided	8	Sandstone, siltstone, shale, limestone	38	308	0.28 ± 0	1.72 ± 0.07	8.06 ± 0.36	0.84 ± 0.09	1 ± 0.12	0.0311 ± 0.004
		9	Sandstone, siltstone, shale, limestone; metamorphic grade not identified	39	525	2.01 ± 0.24	0.36 ± 0.05	1.51 ± 0.14	0.83 ± 0.13	0.73 ± 0.1	0.0297 ± 0.003
	Clastic: shallow marine	10	Sandstone, siltstone, shale; marine fossils	91	707	2.06 ± 0.01	2.29 ± 0.03	2.04 ± 0.14	1.65 ± 0.1	0.94 ± 0.06	0.0377 ± 0.002
		11	Sandstone, siltstone, shale; marine fossils; metamorphic grade not identified	60	1362	1.48 ± 0.16	0.39 ± 0.04	2.88 ± 0.32	0.49 ± 0.04	0.26 ± 0.02	0.0171 ± 0.002

	Slope and deep water	13	Shale, chert, iron-formation, greywacke, turbidite, argillaceous limestone, matrix-supported conglomerate	43	0 ± 0	4.51 ± 0.69	1.8 ± 0.27	2.93 ± 0.45	1.5 ± 0.23	0.0701 ± 0.011	0 ± 0
		14	Shale, chert, iron-formation, greywacke, turbidite, argillaceous limestone, matrix-supported conglomerate or metamorphosed equivalent	8	0.11 ± 0.04	0.43 ± 0.15	1.27 ± 0.45	1.88 ± 0.66	1.08 ± 0.38	0.1528 ± 0.054	0.11 ± 0.04
Supracrustal rocks	Sedimentary and/or volcanic: undivided	12	Sedimentary and/or volcanic rock: undivided	21	0.31 ± 0	0.15 ± 0.01	8.77 ± 0.12	1.24 ± 0.14	0.47 ± 0.06	0.0242 ± 0.004	0.31 ± 0

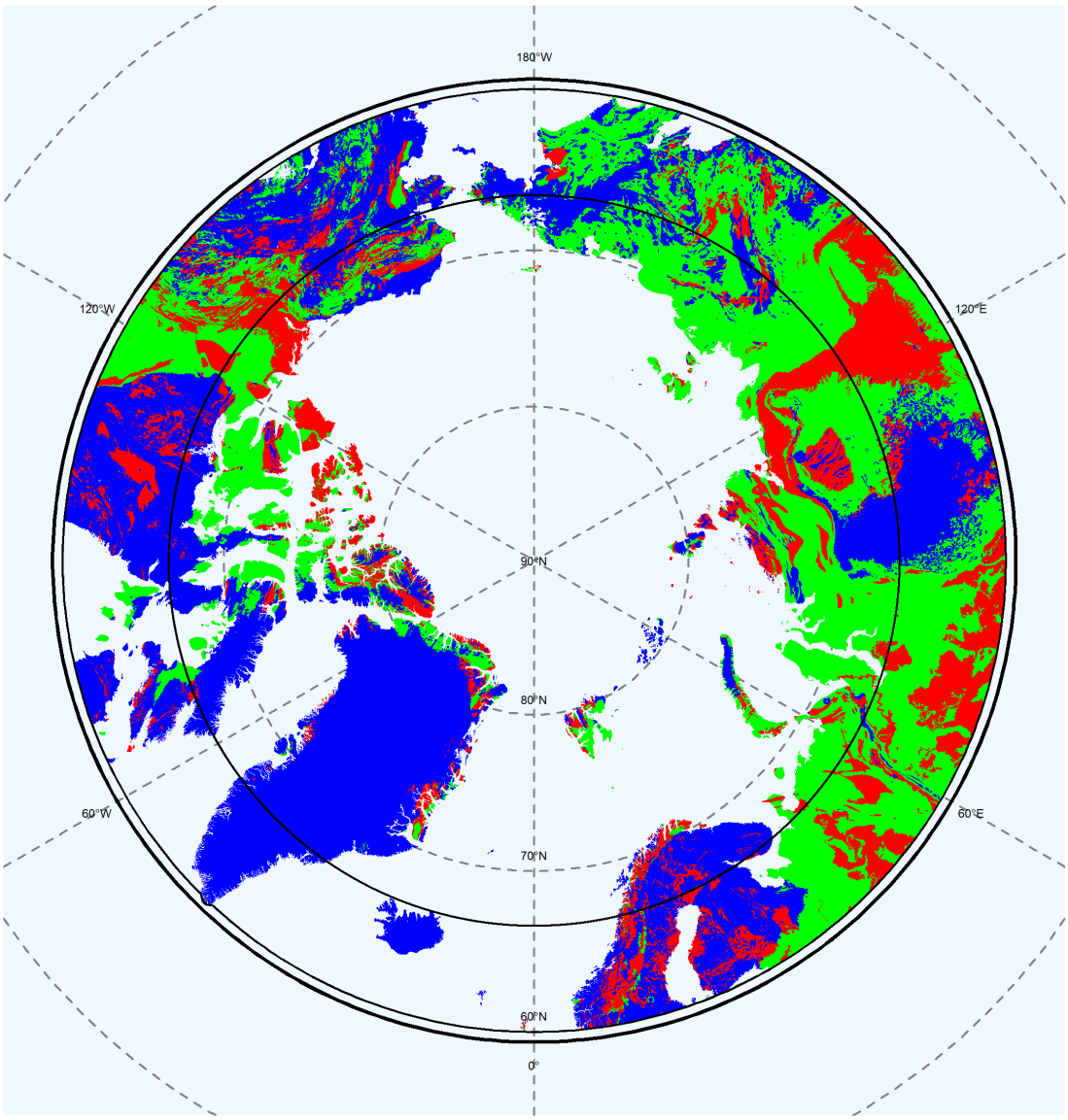

Fig. S3. Distribution of sediments in the arctic. Blue: Complete Geological Map of the Arctic. Red: Lithological classes of the setting type “Sedimentary”. Green: Area represented by data for the lithological classes of the setting type “Sedimentary”.

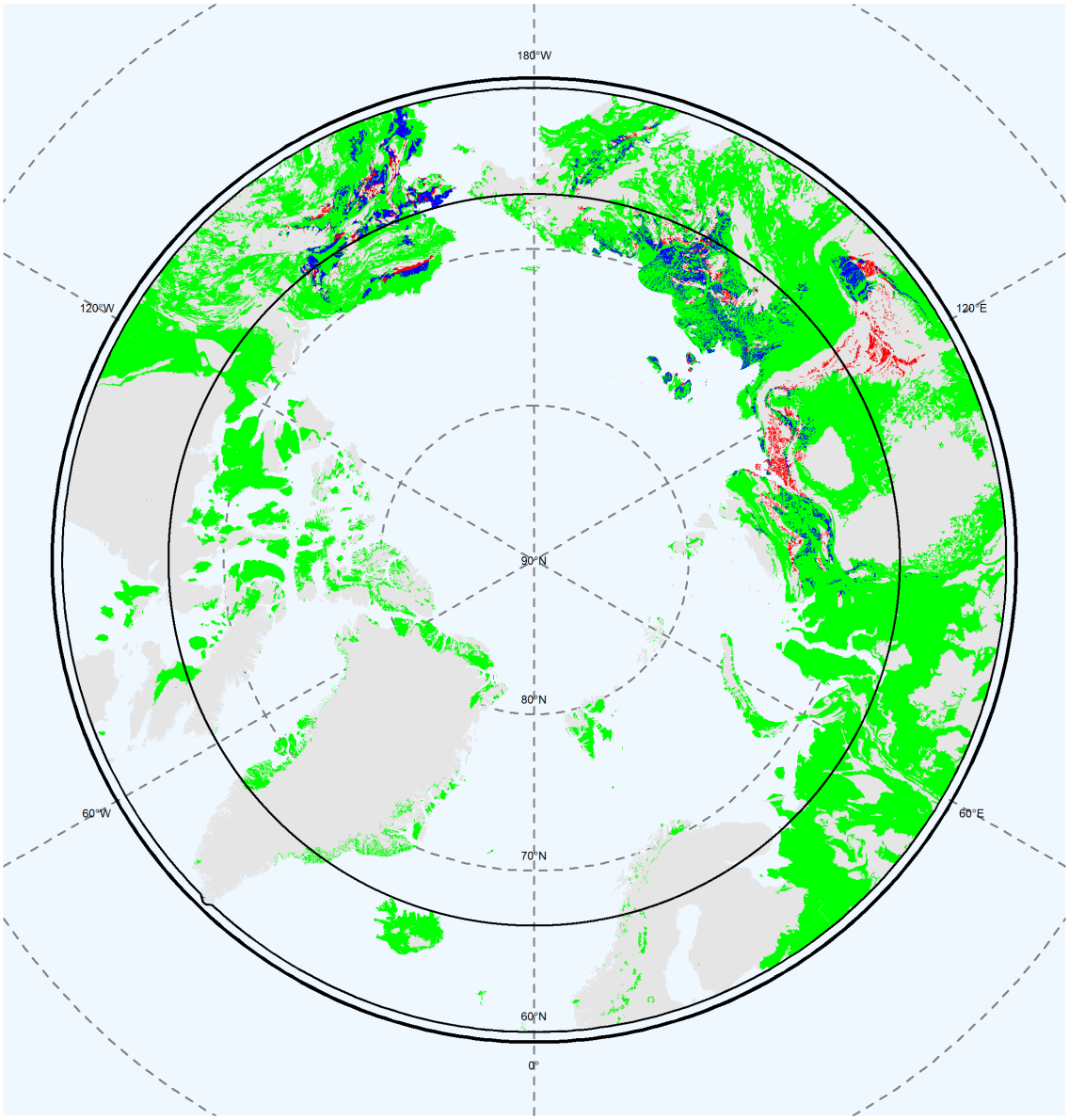

Fig. S4: *Distribution of Yedoma soils in the arctic. Grey: Complete Geological Map of the Arctic. Green: Area represented by data. Blue: Yedoma soils represented by data. Red: Yedoma soils not represented by data. White: Yedoma soils not represented by original Geological map of the Arctic.*

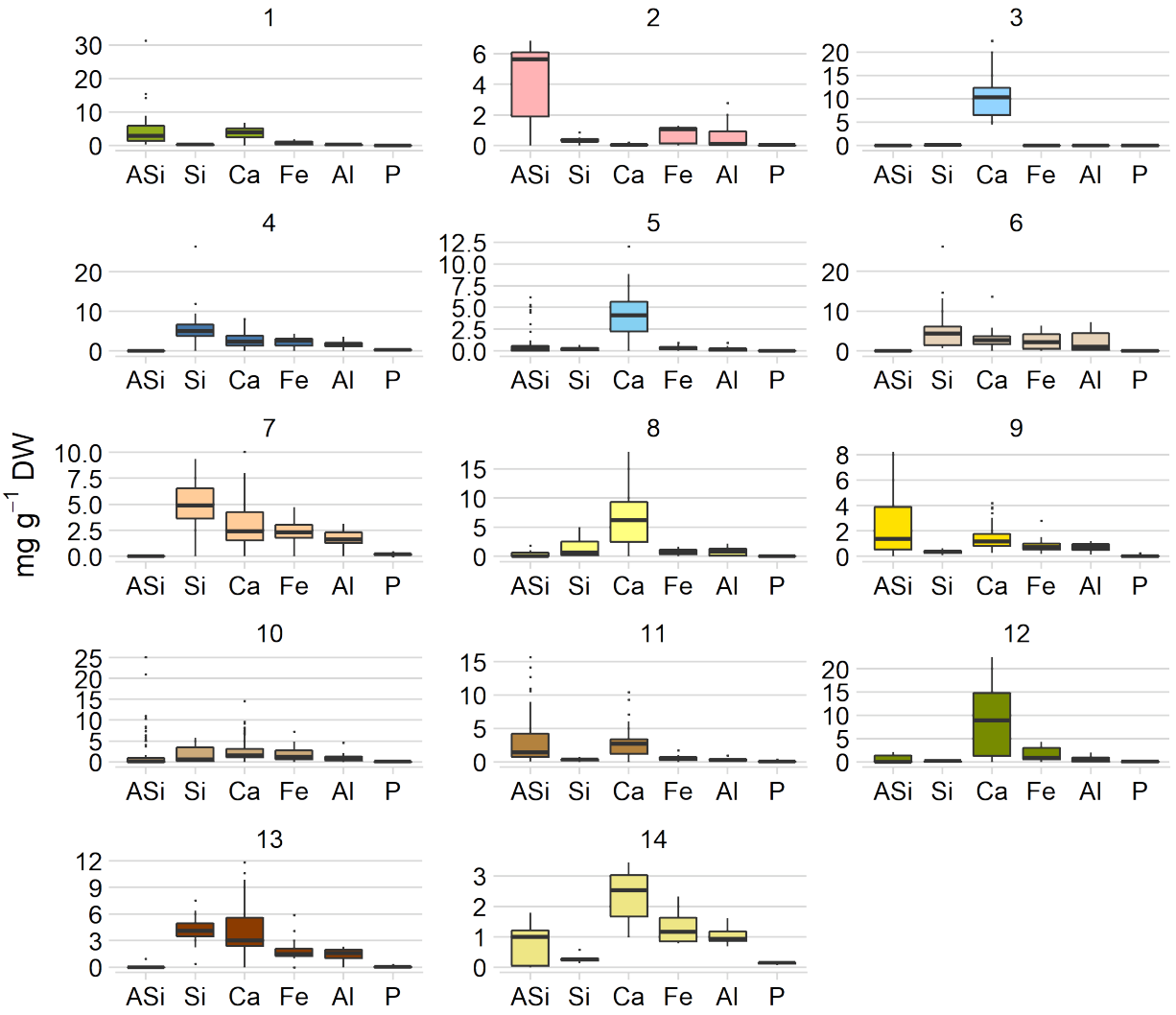

Fig S5: Element concentration in single lithological classes. 1: Basalt, olivine basalt, tholeiite, alkali basalt, basanite, pillow basalt, flood basalt (n=26); 2: Gneiss, migmatite; reworked amphibolite and granulite facies rocks (n=11); 3: Limestone, dolostone, shale, evaporites, chalk; carbonate reefs or metamorphosed equivalent (n=24); 4: Limestone, dolostone, shale, evaporites, chalk; carbonate reefs; metamorphic grade not identified (n=58); 5: Limestone, dolostone, shale, evaporites, chalk; carbonate reefs (n=64); 6: Quartz sandstone, siltstone, claystone, limestone, dolostone, conglomerate, tillite (n=13); 7: Sandstone, siltstone, shale, coal; plant fossils; metamorphic grade not identified (n=68); 8: Sandstone, siltstone, shale, limestone (n=38); 9: Sandstone, siltstone, shale, limestone; metamorphic grade not identified (n=39); 10: Sandstone, siltstone, shale; marine fossils (n=91); 11: Sandstone, siltstone, shale; marine fossils; metamorphic grade not identified (n=60); 12: Sedimentary and/or volcanic rock: undivided (n=21); 13: Shale, chert, iron-formation, greywacke, turbidite, argillaceous limestone, matrix-supported conglomerate (n=43); 14: Shale, chert, iron-formation, greywacke, turbidite, argillaceous limestone, matrix-supported conglomerate or metamorphosed equivalent (n=8).

Table S5: Number of polygons (n) per lithological class per geographic domain.

	Lith.ID	Lithological class	Geographic domain	n
1	1	Basalt, olivine basalt, tholeiite, alkali basalt, basanite, pillow basalt, flood basalt	Arctic-North Atlantic region	311
2	1	Basalt, olivine basalt, tholeiite, alkali basalt, basanite, pillow basalt, flood basalt	Brooks Range, Chukotka, Arctic Shelf	12
3	1	Basalt, olivine basalt, tholeiite, alkali basalt, basanite, pillow basalt, flood basalt	Canada Shield, Greenland Shield, and cover	45
4	1	Basalt, olivine basalt, tholeiite, alkali basalt, basanite, pillow basalt, flood basalt	Eastern Alaska, Yukon, Mackenzie region	27
5	1	Basalt, olivine basalt, tholeiite, alkali basalt, basanite, pillow basalt, flood basalt	Interior western Alaska	41
6	1	Basalt, olivine basalt, tholeiite, alkali basalt, basanite, pillow basalt, flood basalt	Okhotsk, Bering Sea, Pacific Alaska	19
7	2	Gneiss, migmatite; reworked amphibolite and granulite facies rocks	Greenland	604
8	3	Limestone, dolostone, shale, evaporites, chalk; carbonate reefs or metamorphosed equivalent	Arctic-North Atlantic region	77
9	3	Limestone, dolostone, shale, evaporites, chalk; carbonate reefs or metamorphosed equivalent	Brooks Range, Chukotka, Arctic Shelf	97
10	3	Limestone, dolostone, shale, evaporites, chalk; carbonate reefs or metamorphosed equivalent	Canada Shield, Greenland Shield, and cover	11
11	3	Limestone, dolostone, shale, evaporites, chalk; carbonate reefs or metamorphosed equivalent	East European Platform, Ural Mountains	4
12	3	Limestone, dolostone, shale, evaporites, chalk; carbonate reefs or metamorphosed equivalent	Eastern Alaska, Yukon, Mackenzie region	52
13	3	Limestone, dolostone, shale, evaporites, chalk; carbonate reefs or metamorphosed equivalent	Innuitian region, North Greenland	228
14	3	Limestone, dolostone, shale, evaporites, chalk; carbonate reefs or metamorphosed equivalent	Interior western Alaska	48
15	3	Limestone, dolostone, shale, evaporites, chalk; carbonate reefs or metamorphosed equivalent	Okhotsk, Bering Sea, Pacific Alaska	44
16	4	Limestone, dolostone, shale, evaporites, chalk; carbonate reefs; metamorphic grade not identified	Arctic-North Atlantic region	21
17	4	Limestone, dolostone, shale, evaporites, chalk; carbonate reefs; metamorphic grade not identified	Brooks Range, Chukotka, Arctic Shelf	75
18	4	Limestone, dolostone, shale, evaporites, chalk; carbonate reefs; metamorphic grade not identified	Canada Shield, Greenland Shield, and cover	38
19	4	Limestone, dolostone, shale, evaporites, chalk; carbonate reefs; metamorphic grade not identified	East European Platform, Ural Mountains	195
20	4	Limestone, dolostone, shale, evaporites, chalk; carbonate reefs; metamorphic grade not identified	Eastern Alaska, Yukon, Mackenzie region	163
21	4	Limestone, dolostone, shale, evaporites, chalk; carbonate reefs; metamorphic grade not identified	Innuitian region, North Greenland	41
22	4	Limestone, dolostone, shale, evaporites, chalk; carbonate reefs; metamorphic grade not identified	Interior western Alaska	4
23	4	Limestone, dolostone, shale, evaporites, chalk; carbonate reefs; metamorphic grade not identified	Okhotsk, Bering Sea, Pacific Alaska	1
24	4	Limestone, dolostone, shale, evaporites, chalk; carbonate reefs; metamorphic grade not identified	Verkhoyansk-Kolyma region	20

	Lith.ID	Lithological class	Geographic domain	n
25	4	Limestone, dolostone, shale, evaporites, chalk; carbonate reefs; metamorphic grade not identified	West Siberian Basin, Siberian Platform	283
26	5	Limestone, dolostone, shale, evaporites, chalk; carbonate reefs	Arctic-North Atlantic region	41
27	5	Limestone, dolostone, shale, evaporites, chalk; carbonate reefs	Arctic Ocean	2
28	5	Limestone, dolostone, shale, evaporites, chalk; carbonate reefs	Brooks Range, Chukotka, Arctic Shelf	45
29	5	Limestone, dolostone, shale, evaporites, chalk; carbonate reefs	Canada Shield, Greenland Shield, and cover	470
30	5	Limestone, dolostone, shale, evaporites, chalk; carbonate reefs	East European Platform, Ural Mountains	1
31	5	Limestone, dolostone, shale, evaporites, chalk; carbonate reefs	Eastern Alaska, Yukon, Mackenzie region	44
32	5	Limestone, dolostone, shale, evaporites, chalk; carbonate reefs	Innuitian region, North Greenland	568
33	5	Limestone, dolostone, shale, evaporites, chalk; carbonate reefs	Okhotsk, Bering Sea, Pacific Alaska	3
34	6	Quartz sandstone, siltstone, claystone, limestone, dolostone, conglomerate, tillite	Northern Europe	92
35	7	Sandstone, siltstone, shale, coal; plant fossils; metamorphic grade not identified	Arctic-North Atlantic region	27
36	7	Sandstone, siltstone, shale, coal; plant fossils; metamorphic grade not identified	Arctic Ocean	39
37	7	Sandstone, siltstone, shale, coal; plant fossils; metamorphic grade not identified	Brooks Range, Chukotka, Arctic Shelf	90
38	7	Sandstone, siltstone, shale, coal; plant fossils; metamorphic grade not identified	Canada Shield, Greenland Shield, and cover	54
39	7	Sandstone, siltstone, shale, coal; plant fossils; metamorphic grade not identified	East European Platform, Ural Mountains	32
40	7	Sandstone, siltstone, shale, coal; plant fossils; metamorphic grade not identified	Eastern Alaska, Yukon, Mackenzie region	3
41	7	Sandstone, siltstone, shale, coal; plant fossils; metamorphic grade not identified	Okhotsk, Bering Sea, Pacific Alaska	65
42	7	Sandstone, siltstone, shale, coal; plant fossils; metamorphic grade not identified	Verkhoyansk-Kolyma region	200
43	7	Sandstone, siltstone, shale, coal; plant fossils; metamorphic grade not identified	West Siberian Basin, Siberian Platform	217
44	8	Sandstone, siltstone, shale, limestone	Arctic-North Atlantic region	64
45	8	Sandstone, siltstone, shale, limestone	Brooks Range, Chukotka, Arctic Shelf	59
46	8	Sandstone, siltstone, shale, limestone	Canada Shield, Greenland Shield, and cover	12

47	8	Sandstone, siltstone, shale, limestone	Eastern Alaska, Yukon, Mackenzie region	114

	Lith.ID	**Lithological class**	**Geographic domain**	**n**
48	8	Sandstone, siltstone, shale, limestone	Innuitian region, North Greenland	14
49	8	Sandstone, siltstone, shale, limestone	Interior western Alaska	10
50	8	Sandstone, siltstone, shale, limestone	Okhotsk, Bering Sea, Pacific Alaska	35
51	9	Sandstone, siltstone, shale, limestone; metamorphic grade not identified	Arctic-North Atlantic region	1
52	9	Sandstone, siltstone, shale, limestone; metamorphic grade not identified	Arctic Ocean	2
53	9	Sandstone, siltstone, shale, limestone; metamorphic grade not identified	Brooks Range, Chukotka, Arctic Shelf	85
54	9	Sandstone, siltstone, shale, limestone; metamorphic grade not identified	East European Platform, Ural Mountains	25
55	9	Sandstone, siltstone, shale, limestone; metamorphic grade not identified	Eastern Alaska, Yukon, Mackenzie region	45
56	9	Sandstone, siltstone, shale, limestone; metamorphic grade not identified	Interior western Alaska	5
57	9	Sandstone, siltstone, shale, limestone; metamorphic grade not identified	Okhotsk, Bering Sea, Pacific Alaska	150
58	9	Sandstone, siltstone, shale, limestone; metamorphic grade not identified	Verkhoyansk-Kolyma region	33
59	9	Sandstone, siltstone, shale, limestone; metamorphic grade not identified	West Siberian Basin, Siberian Platform	179
60	10	Sandstone, siltstone, shale; marine fossils	Arctic-North Atlantic region	108
61	10	Sandstone, siltstone, shale; marine fossils	Arctic Ocean	28
62	10	Sandstone, siltstone, shale; marine fossils	Brooks Range, Chukotka, Arctic Shelf	92
63	10	Sandstone, siltstone, shale; marine fossils	Canada Shield, Greenland Shield, and cover	15
64	10	Sandstone, siltstone, shale; marine fossils	East European Platform, Ural Mountains	21
65	10	Sandstone, siltstone, shale; marine fossils	Eastern Alaska, Yukon, Mackenzie region	69
66	10	Sandstone, siltstone, shale; marine fossils	Innuitian region, North Greenland	300
67	10	Sandstone, siltstone, shale; marine fossils	Interior western Alaska	63
68	10	Sandstone, siltstone, shale; marine fossils	Okhotsk, Bering Sea, Pacific Alaska	11
69	11	Sandstone, siltstone, shale; marine fossils; metamorphic grade not identified	Arctic-North Atlantic region	6
70	11	Sandstone, siltstone, shale; marine fossils; metamorphic grade not identified	Arctic Ocean	4
71	11	Sandstone, siltstone, shale; marine fossils; metamorphic grade not identified	Brooks Range, Chukotka, Arctic Shelf	88
72	11	Sandstone, siltstone, shale; marine fossils; metamorphic grade not identified	Canada Shield, Greenland Shield, and cover	19

	Lith.ID	Lithological class	Geographic domain	n
73	11	Sandstone, siltstone, shale; marine fossils; metamorphic grade not identified	East European Platform, Ural Mountains	199
74	11	Sandstone, siltstone, shale; marine fossils; metamorphic grade not identified	Eastern Alaska, Yukon, Mackenzie region	35
75	11	Sandstone, siltstone, shale; marine fossils; metamorphic grade not identified	Okhotsk, Bering Sea, Pacific Alaska	43
76	11	Sandstone, siltstone, shale; marine fossils; metamorphic grade not identified	Verkhoyansk-Kolyma region	724
77	11	Sandstone, siltstone, shale; marine fossils; metamorphic grade not identified	West Siberian Basin, Siberian Platform	244
78	12	Sedimentary and/or volcanic rock: undivided	Arctic-North Atlantic region	10
79	12	Sedimentary and/or volcanic rock: undivided	Arctic Ocean	5
80	12	Sedimentary and/or volcanic rock: undivided	Brooks Range, Chukotka, Arctic Shelf	67
81	12	Sedimentary and/or volcanic rock: undivided	Eastern Alaska, Yukon, Mackenzie region	110
82	12	Sedimentary and/or volcanic rock: undivided	Innuitian region, North Greenland	43
83	12	Sedimentary and/or volcanic rock: undivided	Interior western Alaska	53
84	12	Sedimentary and/or volcanic rock: undivided	Okhotsk, Bering Sea, Pacific Alaska	50
85	13	Shale, chert, iron-formation, greywacke, turbidite, argillaceous limestone, matrix-supported conglomerate	Arctic-North Atlantic region	47
86	13	Shale, chert, iron-formation, greywacke, turbidite, argillaceous limestone, matrix-supported conglomerate	Arctic Ocean	10
87	13	Shale, chert, iron-formation, greywacke, turbidite, argillaceous limestone, matrix-supported conglomerate	Brooks Range, Chukotka, Arctic Shelf	72
88	13	Shale, chert, iron-formation, greywacke, turbidite, argillaceous limestone, matrix-supported conglomerate	Canada Shield, Greenland Shield, and cover	5
89	13	Shale, chert, iron-formation, greywacke, turbidite, argillaceous limestone, matrix-supported conglomerate	East European Platform, Ural Mountains	3
90	13	Shale, chert, iron-formation, greywacke, turbidite, argillaceous limestone, matrix-supported conglomerate	Eastern Alaska, Yukon, Mackenzie region	58
91	13	Shale, chert, iron-formation, greywacke, turbidite, argillaceous limestone, matrix-supported conglomerate	Innuitian region, North Greenland	201
92	13	Shale, chert, iron-formation, greywacke, turbidite, argillaceous limestone, matrix-supported conglomerate	Interior western Alaska	29

	Lith.ID	Lithological class	Geographic domain	n
93	13	Shale, chert, iron-formation, greywacke, turbidite, argillaceous limestone, matrix-supported conglomerate	Okhotsk, Bering Sea, Pacific Alaska	90
94	14	Shale, chert, iron-formation, greywacke, turbidite, argillaceous limestone, matrix-supported conglomerate or metamorphosed equivalent	Arctic-North Atlantic region	2
95	14	Shale, chert, iron-formation, greywacke, turbidite, argillaceous limestone, matrix-supported conglomerate or metamorphosed equivalent	Brooks Range, Chukotka, Arctic Shelf	53
96	14	Shale, chert, iron-formation, greywacke, turbidite, argillaceous limestone, matrix-supported conglomerate or metamorphosed equivalent	Eastern Alaska, Yukon, Mackenzie region	143
97	14	Shale, chert, iron-formation, greywacke, turbidite, argillaceous limestone, matrix-supported conglomerate or metamorphosed equivalent	Innuitian region, North Greenland	107
98	14	Shale, chert, iron-formation, greywacke, turbidite, argillaceous limestone, matrix-supported conglomerate or metamorphosed equivalent	Interior western Alaska	71
99	14	Shale, chert, iron-formation, greywacke, turbidite, argillaceous limestone, matrix-supported conglomerate or metamorphosed equivalent	Okhotsk, Bering Sea, Pacific Alaska	41

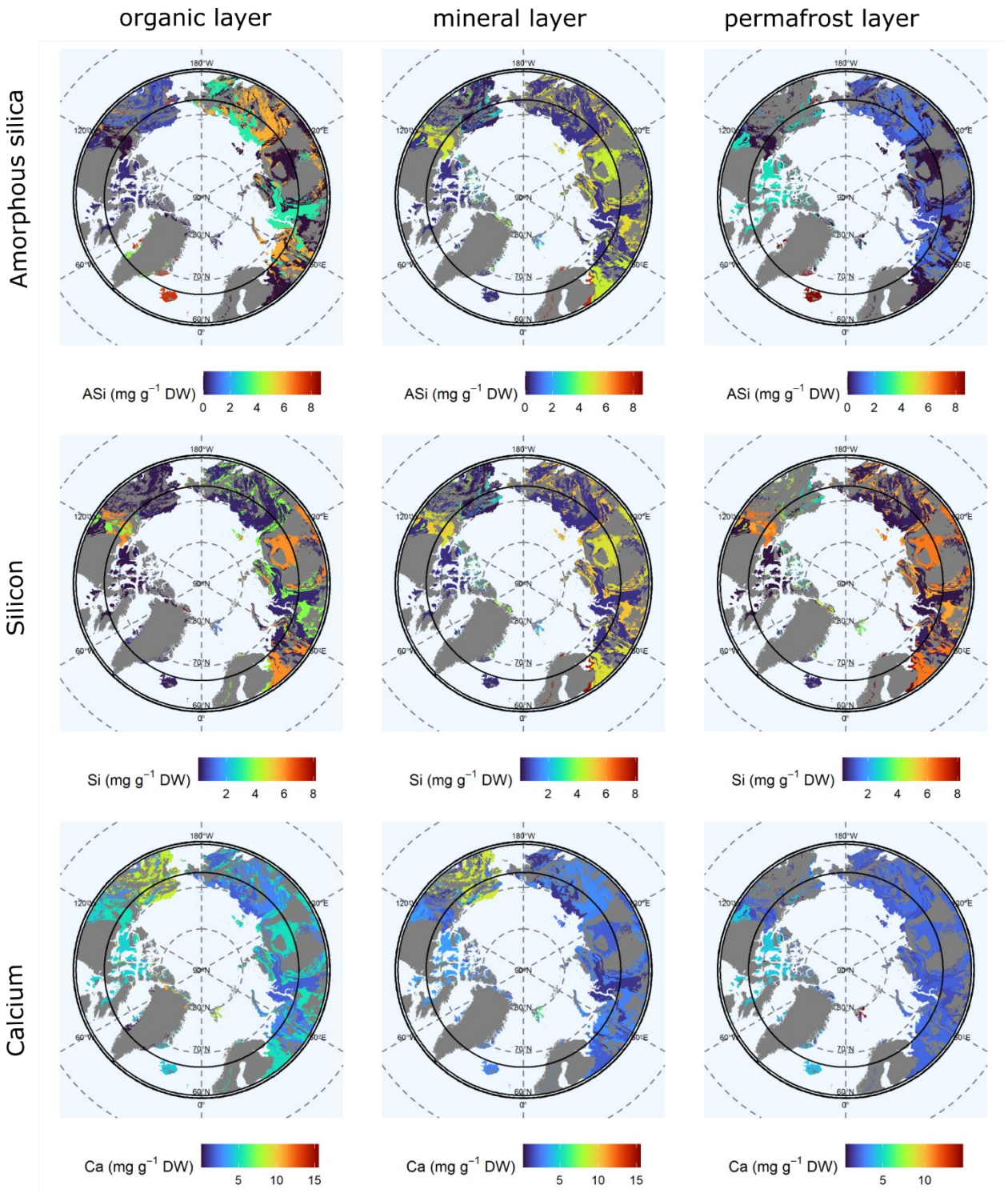

Fig. S6: Element concentrations of ASi, Si and Ca in organic, mineral and Permafrost layer (left to right). Blue color represents low element concentrations, red color represent high element concentrations.

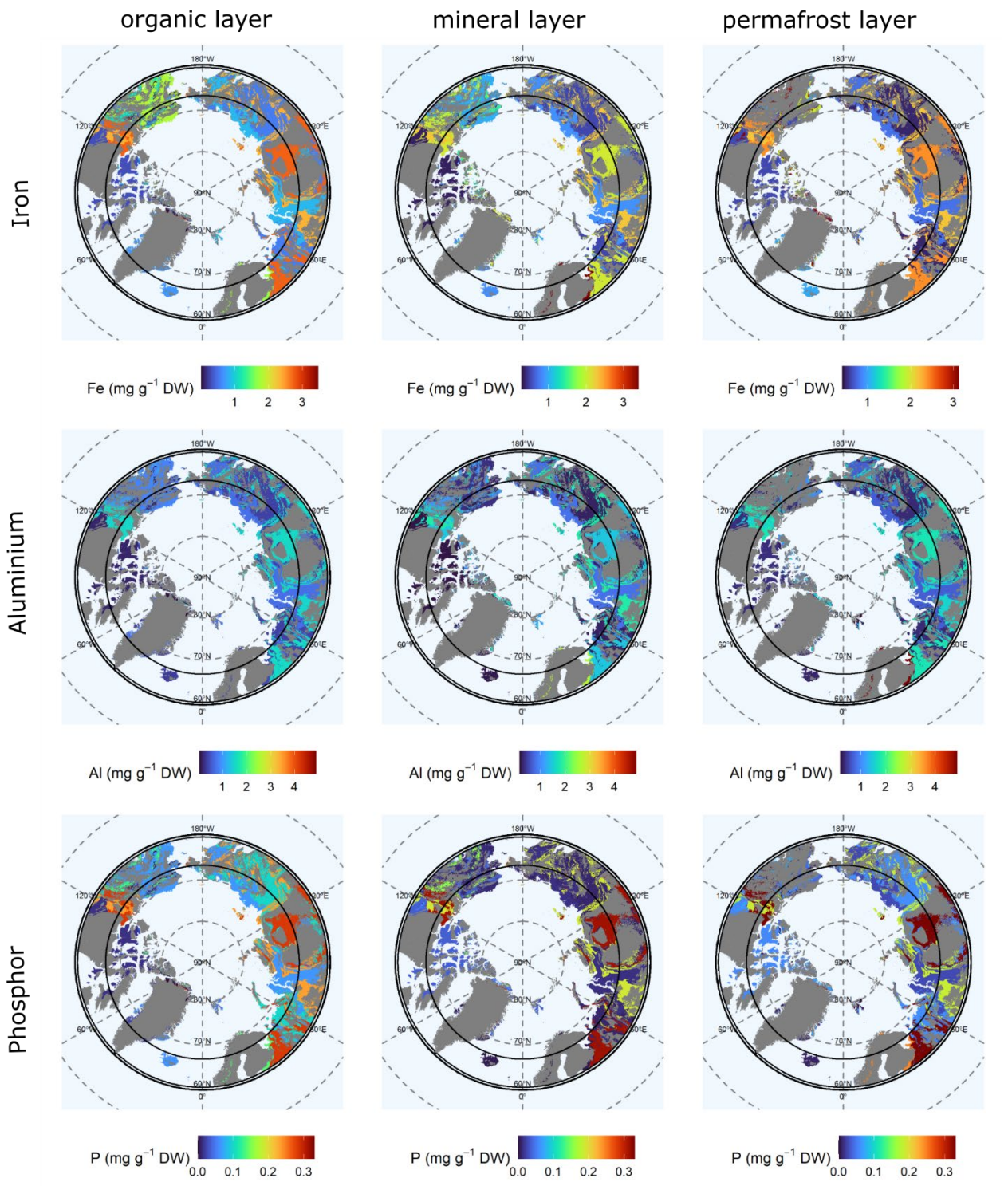

Fig. S7: Element concentrations of Fe, Al and P in organic, mineral and Permafrost layer (left to right). Blue color represents low element concentrations, red color represent high element concentrations.