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Dissolved organic carbon and major and trace elements in peat porewater of sporadic, discontinuous, and continuous permafrost zones of western Siberia

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Table S1. Correlation matric (Pair Pearson coefficients) of elements in peat porewaters. Significant positive correlations (R > 0.60) are highlighted in pink. Latitude, specific conductivity, DIC, SO4, B, K, Ti, Cu, Ga, Rb, Cd, Cs, Tl, Pb did not exhibit significant correlation with any other element.

	pH	DOC	Cl	Li	Na	Mg	Al	Si	Ca	V	Cr	Mn	Fe	Co	Ni	Zn	As	Sr	Zr	Nb	Mo	Sb	Ba	La	Ce	Yb	Hf	Th	U
pH	1.00	-0.26	0.04	0.20	0.07	0.43	0.26	0.22	0.46	0.32	-0.01	0.60	0.24	0.54	0.36	-0.21	0.22	0.34	0.25	0.13	-0.33	-0.22	-0.30	-0.08	-0.02	0.12	0.24	-0.06	-0.08
DOC	-0.26	1.00	0.04	-0.02	0.03	0.02	0.23	0.00	-0.02	0.10	0.24	-0.13	0.23	0.15	0.28	0.05	-0.01	0.16	0.11	0.12	0.16	0.09	0.19	0.08	0.08	0.06	0.12	0.07	0.06
Li	0.20	-0.02	0.38	1.00	0.68	0.53	0.35	0.74	0.11	0.45	0.72	0.17	0.61	0.53	0.51	0.07	0.37	0.20	0.67	0.74	-0.05	0.10	0.09	0.34	0.45	0.48	0.68	0.35	0.39
B	-0.14	-0.14	-0.12	-0.09	-0.11	-0.11	-0.10	-0.09	-0.10	-0.08	-0.08	-0.09	-0.14	-0.12	-0.10	0.04	-0.12	-0.06	-0.02	-0.05	0.14	-0.04	0.12	0.20	0.17	0.12	-0.04	0.18	0.19
Na	0.07	0.03	0.57	0.68	1.00	0.32	0.21	0.53	0.08	0.21	0.43	0.02	0.41	0.33	0.31	0.36	0.33	0.07	0.36	0.44	-0.06	0.34	0.13	0.23	0.29	0.26	0.37	0.24	0.29
Mg	0.43	0.02	-0.04	0.53	0.32	1.00	0.65	0.58	0.57	0.71	0.54	0.69	0.53	0.73	0.67	0.20	0.55	0.66	0.65	0.54	-0.14	0.32	-0.11	0.18	0.27	0.44	0.66	0.23	0.16
Al	0.26	0.23	-0.02	0.35	0.21	0.65	1.00	0.44	0.49	0.79	0.48	0.42	0.51	0.63	0.77	0.08	0.48	0.69	0.64	0.51	-0.09	0.13	-0.10	0.24	0.31	0.45	0.64	0.24	0.15
Si	0.22	0.00	0.11	0.74	0.53	0.58	0.44	1.00	0.17	0.57	0.71	0.18	0.72	0.53	0.55	-0.09	0.44	0.27	0.78	0.84	-0.11	0.02	0.05	0.39	0.52	0.57	0.79	0.40	0.38
K	-0.02	-0.03	0.80	0.29	0.35	-0.06	0.02	0.00	0.03	-0.04	0.08	-0.06	-0.02	-0.03	0.18	0.30	-0.04	0.01	-0.03	0.00	0.15	0.11	0.00	0.00	-0.01	-0.04	-0.03	0.02	0.01
Ca	0.46	-0.02	-0.03	0.11	0.08	0.57	0.49	0.17	1.00	0.44	0.16	0.61	0.26	0.43	0.51	0.15	0.53	0.68	0.30	0.12	-0.01	0.14	-0.06	0.05	0.07	0.22	0.34	0.08	0.01
Ti	0.02	0.28	-0.08	0.29	0.31	0.40	0.51	0.24	0.21	0.31	0.41	0.07	0.42	0.41	0.42	0.24	0.55	0.30	0.26	0.26	0.16	0.38	0.03	0.14	0.17	0.20	0.25	0.16	0.16
V	0.32	0.10	-0.02	0.45	0.21	0.71	0.79	0.57	0.44	1.00	0.62	0.48	0.51	0.62	0.74	-0.06	0.53	0.78	0.84	0.69	-0.07	0.08	-0.03	0.36	0.46	0.64	0.81	0.39	0.31
Cr	-0.01	0.24	0.13	0.72	0.43	0.54	0.48	0.71	0.16	0.62	1.00	0.11	0.68	0.50	0.61	0.05	0.50	0.37	0.85	0.87	0.27	0.23	0.34	0.55	0.65	0.69	0.85	0.54	0.57
Mn	0.60	-0.13	-0.04	0.17	0.02	0.69	0.42	0.18	0.61	0.48	0.11	1.00	0.19	0.68	0.47	-0.07	0.30	0.63	0.33	0.10	-0.07	-0.07	-0.15	0.01	0.04	0.24	0.31	0.05	0.01
Fe	0.24	0.23	0.09	0.61	0.41	0.53	0.51	0.72	0.26	0.51	0.68	0.19	1.00	0.70	0.77	-0.08	0.60	0.32	0.68	0.72	0.03	0.02	0.03	0.32	0.44	0.50	0.69	0.33	0.33
Co	0.54	0.15	0.03	0.53	0.33	0.73	0.63	0.53	0.43	0.62	0.50	0.68	0.70	1.00	0.82	-0.13	0.42	0.61	0.64	0.53	-0.07	-0.06	-0.08	0.22	0.31	0.44	0.61	0.26	0.25
Ni	0.36	0.28	0.14	0.51	0.31	0.67	0.77	0.55	0.51	0.74	0.61	0.47	0.77	0.82	1.00	-0.04	0.57	0.69	0.71	0.60	0.09	0.00	-0.03	0.30	0.38	0.51	0.71	0.32	0.28
Zn	-0.21	0.05	0.28	0.07	0.36	0.20	0.08	-0.09	0.15	-0.06	0.05	-0.07	-0.08	-0.13	-0.04	1.00	0.04	0.02	-0.08	-0.04	0.03	0.84	0.01	0.00	-0.01	-0.04	-0.07	0.02	-0.03
As	0.22	-0.01	0.04	0.37	0.33	0.55	0.48	0.44	0.53	0.53	0.50	0.30	0.60	0.42	0.57	0.04	1.00	0.43	0.49	0.43	0.14	0.19	0.03	0.21	0.27	0.36	0.54	0.23	0.22
Sr	0.34	0.16	-0.09	0.20	0.07	0.66	0.69	0.27	0.68	0.78	0.37	0.63	0.32	0.61	0.69	0.02	0.43	1.00	0.53	0.27	0.15	0.16	0.15	0.30	0.31	0.50	0.49	0.33	0.27
Zr	0.25	0.11	0.07	0.67	0.36	0.65	0.64	0.78	0.30	0.84	0.85	0.33	0.68	0.64	0.71	-0.08	0.49	0.53	1.00	0.93	0.06	0.04	0.18	0.61	0.73	0.82	0.98	0.63	0.59
Mo	-0.33	0.16	0.03	-0.05	-0.06	-0.14	-0.09	-0.11	-0.01	-0.07	0.27	-0.07	0.03	-0.07	0.09	0.03	0.14	0.15	0.06	-0.03	1.00	0.09	0.75	0.60	0.51	0.43	0.02	0.58	0.65
Sb	-0.22	0.09	0.12	0.10	0.34	0.32	0.13	0.02	0.14	0.08	0.23	-0.07	0.02	-0.06	0.00	0.84	0.19	0.16	0.04	0.07	0.09	1.00	0.16	0.10	0.10	0.10	0.03	0.11	0.10
Cs	-0.24	0.42	-0.02	-0.04	0.00	-0.11	0.04	-0.07	-0.07	-0.05	0.15	-0.11	0.12	-0.01	0.08	-0.05	0.19	-0.02	-0.03	-0.02	0.37	0.02	0.18	0.00	-0.02	-0.05	-0.02	-0.03	0.03
Ba	-0.30	0.19	0.01	0.09	0.13	-0.11	-0.10	0.05	-0.06	-0.03	0.34	-0.15	0.03	-0.08	-0.03	0.01	0.03	0.15	0.18	0.11	0.75	0.16	1.00	0.75	0.68	0.58	0.12	0.71	0.76
La	-0.08	0.08	0.03	0.34	0.23	0.18	0.24	0.39	0.05	0.36	0.55	0.01	0.32	0.22	0.30	0.00	0.21	0.30	0.61	0.51	0.60	0.10	0.75	1.00	0.98	0.92	0.54	0.98	0.96
Ce	-0.02	0.08	0.05	0.45	0.29	0.27	0.31	0.52	0.07	0.46	0.65	0.04	0.44	0.31	0.38	-0.01	0.27	0.31	0.73	0.65	0.51	0.10	0.68	0.98	1.00	0.96	0.66	0.97	0.94
Nd	0.01	0.08	0.05	0.49	0.30	0.33	0.35	0.57	0.10	0.53	0.70	0.09	0.49	0.36	0.44	-0.02	0.31	0.36	0.78	0.70	0.47	0.11	0.64	0.96	0.99	0.98	0.72	0.95	0.93
Dy	0.03	0.08	0.03	0.48	0.29	0.36	0.38	0.56	0.14	0.56	0.69	0.13	0.48	0.37	0.45	-0.02	0.33	0.41	0.79	0.69	0.48	0.12	0.64	0.96	0.98	0.99	0.72	0.95	0.92
Yb	0.12	0.06	0.00	0.48	0.26	0.44	0.45	0.57	0.22	0.64	0.69	0.24	0.50	0.44	0.51	-0.04	0.36	0.50	0.82	0.69	0.43	0.10	0.58	0.92	0.96	1.00	0.74	0.92	0.88
Hf	0.24	0.12	0.10	0.68	0.37	0.66	0.64	0.79	0.34	0.81	0.85	0.31	0.69	0.61	0.71	-0.07	0.54	0.49	0.98	0.95	0.02	0.03	0.12	0.54	0.66	0.74	1.00	0.55	0.51
Th	-0.06	0.07	0.04	0.35	0.24	0.23	0.24	0.40	0.08	0.39	0.54	0.05	0.33	0.26	0.32	0.02	0.23	0.33	0.63	0.52	0.58	0.11	0.71	0.98	0.97	0.92	0.55	1.00	0.95
U	-0.08	0.06	0.08	0.39	0.29	0.16	0.15	0.38	0.01	0.31	0.57	0.01	0.33	0.25	0.28	-0.03	0.22	0.27	0.59	0.50	0.65	0.10	0.76	0.96	0.94	0.88	0.51	0.95	1.00

Table S2. Statistical differences in elements concentration between different forms of microrelief for each key sites. p-values are determined by Mann–Whitney U test (1st line) and Kruskal–Wallis test (2nd line) for each component. Note that Kogalym and Pangody sites present only Mann–Whitney U test because they have only two forms of microrelief (mound and hollow).

Component	Kogalym	Khanymey			Pangody	Urengoy			Tazovskiy		
	mound – hollow	mound – hollow	mound – permafrost subsidence	hollow – permafrost subsidence	mound – hollow	mound – hollow	mound – permafrost subsidence	hollow – permafrost subsidence	polygon – hollow	polygon – frost crack	hollow – frost crack
Cond	**0.035**	**0.032**	0.441	0.083	0.107	**0.034**	0.564	**0.029**	0.387	0.544	0.302
		H = 6.20; **p = 0.045**				H = 6.11; **p = 0.047**			H = 0.879; p = 0.644		
pH	0.519	0.114	0.685	0.312	0.693	**0.050**	**0.048**	0.355	0.592	0.130	0.302
		H = 2.57; p = 0.277				H = 6.3; p = **0.043**			H = 2.257; p = 0.324		
Cl^-	0.086	0.292	0.465	0.564	0.294	0.724	0.564	0.729	0.435	0.182	0.121
		H = 1.492; p = 0.474				H = 0.278; p = 0.87			H = 2.038; p = 0.361		
SO_4^{2-}	0.238	**0.028**	**0.015**	0.072	**0.038**	**0.034**	**0.028**	0.749	**0.016**	**0.018**	**0.025**
		H = 9.21; **p = 0.01**				H = 6.975; p = **0 .031**			H = 15.568; **p = 0.0004**		
DOC	**0.043**	**0.023**	0.283	**0.049**	0.082	**0.037**	**0.048**	**0.046**	**0.027**	**0.033**	0.535
		H = 6.291; **p = 0.043**				H = 6.475; **p = 0.039**			H = 8.206; **p = 0.017**		
DIC	0.643	0.194	0.626	**0.017**	**0.031**	0.485	0.718	0.157	0.093	0.140	0.180
		H = 6.103; **p = 0.047**				H = 0.078; p = 0.962			H = 1.492; p = 0.474		
Ca	0.479	**0.043**	0.256	**0.017**	0.304	0.067	**0.042**	**0.043**	0.195	0.124	0.540
		H = 6.66; **p = 0.036**				H = 6.475; **p = 0.039**			H = 0.37; p = 0.831		
Mg	0.542	**0.029**	0.639	**0.044**	0.641	**0.048**	**0.045**	**0.041**	0.730	0.390	0.530
		H = 6.315; **p = 0.042**				H = 6.291; **p = 0.043**			H = 0.877; p = 0.645		
K	0.157	0.271	0.631	0.164	0.132	0.097	**0.036**	**0.049**	0.320	0.210	0.180
		H = 0.083; p = 0.959				H = 5.468; **p = 0.047**			H = 3.531; p = 0.171		
Al	**0.046**	**0.047**	0.517	**0.043**	0.082	**0.047**	**0.048**	0.157	**0.049**	0.058	0.540
		H = 6.9; **p = 0.032**				H = 6.3; **p = 0.043**			H = 5.468; **p = 0.047**		
Fe	**0.048**	**0.046**	**0.043**	0.234	0.634	**0.039**	**0.048**	**0.031**	**0.048**	**0.029**	**0.042**
		H = 6.568; **p = 0.038**				H = 6.737; **p = 0.034**			H = 7.606; **p = 0.022**		
Si	**0.039**	0.283	0.221	0.308	**0.045**	**0.04**	0.363	**0.043**	0.554	**0.032**	**0.048**
		H = 1.636; **p = 0.44**				H = 6.275; p = **0.043**			H = 6.522; **p = 0.038**		
Li	**0.029**	0.192	0.746	0.564	0.638	**0.047**	0.818	0.050	**0.045**	0.054	0.053
		H = 1.15; p = 0.563				H = 6.112; **p = 0.047**			H = 6.44; **p = 0.038**		
B	**0.038**	**0.039**	**0.029**	0.386	0.221	–	–	–	**0.023**	0.098	0.074
		H = 7.01; **p = 0.03**				–			H = 10.258; **p = 0.006**		
Na	0.397	0.194	0.265	0.248	0.063	0.289	0.083	0.064	0.102	0.506	0.202
		H = 2.01; p = 0.367				H = 2.8; p = 0.247			H = 1.509; p = 0.47		
Ti	**0.031**	0.441	0.156	0.083	0.453	0.157	0.248	0.355	0.654	0.066	0.091
		H = 2.56; p = 0.278				H = 4.54; p = 0.103			H = 0.959; p = 0.619		
V	0.086	0.570	0.330	0.083	0.267	**0.037**	**0.026**	0.443	0.134	0.467	0.302
		H = 1.977; p = 0.372				H = 7; **p = 0.03**			H = 1.324; p = 0.516		
Cr	0.053	0.521	0.465	0.172	0.221	0.157	0.564	0.064	0.676	0.544	0.339

		H = 0.438; p = 0.803				H = 2.5; p = 0.286			H = 0.641; p = 0.726		
Mn	0.091	**0.046**	**0.044**	0.064	**0.031**	**0.037**	**0.048**	0.095	0.108	0.476	0.239
		H = 6.78; **p = 0.034**				H = 6.051; **p = 0.048**			H = 2.177; p = 0.337		
Co	0.283	0.144	**0.043**	0.386	0.307	0.480	0.564	0.165	0.532	0.090	0.121
		H = 6.283; **p = 0.043**				H = 1.94; p = 0.378			H = 3.188; p = 0.203		
Ga	0.053	0.05	0.775	**0.021**	**0.041**	0.289	0.083	0.355	0.053	0.052	**0.046**
		H = 6.23; **p = 0.044**				H = 3.3; p = 0.192			H = 6.05; **p = 0.048**		
As	0.190	**0.022**	0.023	0.148	0.074	0.624	**0.046**	0.101	0.312	0.115	0.058
		H = 6.131; **p = 0.047**				H = 6.05; **p = 0.048**			H = 3.548; p = 0.169		
Rb	0.043	0.072	0.808	0.564	**0.041**	0.480	**0.038**	**0.046**	**0.049**	0.052	0.614
		H = 0.823; p = 0.663				H = 6.14; **p = 0.046**			H = 5.968; **p = 0.050**		
Zr	**0.032**	0.570	0.256	0.149	0.053	0.706	0.148	0.063	0.095	0.467	0.108
		H = 2.044; p = 0.359				H = 0.811; p = 0.666			H = 1.23; p = 0.54		
Nb	**0.048**	0.168	0.746	0.564	0.414	0.527	0.564	0.455	0.284	0.782	0.210
		H = 1.817; p = 0.403				H = 1; p = 0.607			H = 0.964; p = 0.618		
Mo	**0.042**	0.317	0.144	0.441	0.579	0.724	0.585	0.643	0.272	**0.037**	**0.020**
		H = 2.38; p = 0.311				H = 0.1 p = 0.95			H = 6.48; **p = 0.039**		
Cd	**0.032**	0.105	**0.037**	0.342	**0.044**	**0.029**	**0.023**	0.052	**0.044**	0.132	0.233
		H = 6.568; p = **0.038**				H = 7; **p = 0.03**			H = 6.05; **p = 0.048**		
Ni	0.147	**0.044**	0.162	0.381	0.732	0.057	0.560	0.408	0.446	0.467	0.089
		H = 6.045; **p = 0.0487**				H = 1.34; p = 0.511			H = 2.128; p = 0.345		
Cu	**0.035**	**0.028**	0.268	**0.018**	0.641	0.485	**0.028**	**0.027**	0.128	**0.029**	**0.036**
		H = 7.408; **p = 0.025**				H = 6.437; **p = 0.038**			H = 6.737; **p = 0.034**		
Zn	0.479	0.372	0.372	0.734	**0.021**	0.720	**0.038**	**0.037**	0.270	0.740	0.250
		H = 1.373; p = 0.503				H = 7; **p = 0.03**			H = 1.648; p = 0.439		
Sr	0.358	0.516	0.424	0.712	0.571	0.512	0.183	0.094	**0.047**	0.762	0.345
		H = 1.54; p = 0.463				H = 2.24; p = 0.326			H = 6.05; **p = 0.049**		
Sb	0.519	0.224	0.746	0.248	0.480	0.480	**0.048**	**0.040**	0.176	0.808	0.302
		H = 1.788; p = 0.409				H = 6.141; **p = 0.046**			H = 1.991; p = 0.369		
Cs	0.667	0.681	0.685	0.773	0.307	0.289	0.564	0.255	0.052	**0.018**	**0.012**
		H = 0.21; p = 0.9				H = 1.61; p = 0.447			H = 9.9; **p = 0.007**		
Ba	0.083	0.675	0.426	0.703	0.105	0.089	**0.048**	0.155	0.781	0.225	0.197
		H = 0.053; p = 0.974				H = 6.112; **p = 0.047**			H = 1.684; p = 0.431		
La	0.133	**0.046**	**0.041**	0.386	0.130	**0.045**	**0.041**	0.307	0.091	0.544	**0.039**
		H = 6.278; **p = 0.043**				H = 6.141; **p = 0.046**			H = 6.275; **p = 0.043**		
Ce	**0.048**	0.685	0.685	0.386	0.414	**0.046**	**0.038**	0.343	0.176	0.587	0.097
		H = 0.391; p = 0.823				H = 6.475; **p = 0.039**			H = 2.31; p = 0.316		
Pr	**0.043**	0.165	0.246	0.106	**0.044**	0.157	0.248	0.543	0.108	0.674	0.071
		H = 0.716; p = 0.699				H = 1.84; p = 0.398			H = 3.681159 p = 0.1587		
Nd	**0.032**	0.208	0.226	0.386	0.540	**0.034**	0.053	0.073	0.094	0.875	0.121
		H = 0.246; p = 0.884				H = 5.97; **p = 0.051**			H = 3.29; p = 0.193		
Sm	**0.032**	0.417	0.146	0.248	0.535	0.289	0.248	0.556	0.105	0.853	0.097
		H = 0.94; p = 0.625				H = 1.84; p = 0.398			H = 3.29; p = 0.193		

Eu	**0.043**	0.064	0.087	0.328	0.838	0.289	0.232	0.643	**0.043**	0.396	**0.047**
		H = 0.744; p = 0.689				H = 1.84; p = 0.398			H = 6.112; **p = 0.047**		
Gd	0.133	0.685	0.113	0.248	0.540	0.089	**0.038**	0.243	**0.046**	0.822	0.197
		H = 0.378; p = 0.828				H = 6.475; **p = 0.039**			H = 6.141; **p = 0.046**		
Tb	0.086	**0.042**	**0.015**	0.128	0.414	0.089	**0.048**	0.343	**0.043**	0.716	0.107
		H = 8.229; **p = 0.016**				H = 6.051; **p = 0.049**			H = 5.967; **p = 0.05**		
Dy	**0.048**	0.385	0.187	0.248	0.221	0.128	**0.042**	0.720	**0.046**	0.628	0.057
		H = 0.378; p = 0.828				H = 6.05; **p = 0.049**			H = 6.395; **p = 0.041**		
Ho	0.086	0.771	0.372	0.473	0.540	0.359	**0.048**	0.643	0.053	0.828	0.067
		H = 0.011; p = 0.99				H = 1.42; **p = 0.049**			H = 3.758; p = 0.153		
Er	**0.043**	0.775	0.871	0.128	0.783	0.480	0.068	0.533	0.108	0.628	0.065
		H = 0.244; p = 0.885				H = 1.34; p = 0.51			H = 3.165; p = 0.21		
Tm	0.086	0.062	0.187	0.248	0.740	0.480	0.098	0.546	0.148	0.889	0.121
		H = 0.172; p = 0.92				H = 1.34; p = 0.511			H = 3.29; p = 0.193		
Yb	0.053	0.626	0.708	0.248	0.767	0.512	**0.037**	0.146	0. 51	0.808	0.302
		H = 0.599; p = 0.74				H = 6.522; **p = 0.038**			H = 3.548; p = 0.169		
Lu	0.086	0.111	0.181	0.386	0.844	0.724	0.248	0.494	0.128	0.840	0.097
		H = 0.083; p = 0.959				H = 1; p = 0.607			H = 2.794; p = 0.247		
Hf	**0.032**	**0.029**	0.292	0.563	0.414	0.562	0.091	0.147	0.399	0.467	0.121
		H = 7.335; **p = 0.026**				H = 1; p = 0.607			H = 1.592; p = 0.45		
W	0.519	0.716	0.372	0.423	0.556	**0.048**	**0.021**	**0.024**	0.612	0.220	0.079
		H = 0.637; p = 0.727				H = 7.336; **p = 0.026**			H = 0.732; p = 0.694		
Tl	0.378	0.042	0.746	0.564	0.683	0.157	0.265	0.064	0.838	**0.025**	**0.039**
		H = 0.744; p = 0.689				H = 4.2; p = 0.123			H = 6.467; **p = 0.039**		
Pb	**0.048**	0.082	0.081	0.264	0.093	**0.048**	**0.038**	**0.046**	0.615	**0.039**	**0.035**
		H = 0.117; p = 0.943				H = 6.144; **p = 0.046**			H = 6.467; **p = 0.039**		
Th	0.053	0.072	0.087	0.248	0.827	0.096	0.056	0.130	0.076	0.399	0.121
		H = 1.103; p = 0.576				H = 1.11; p = 0.574			H = 3.766; p = 0.152		
U	0.667	0.094	0.087	0.248	**0.044**	**0.046**	0.064	0.063	0.351	0.467	0.302
		H = 0.186; p = 0.91				H = 6.395; **p = 0.041**			H = 2.379; p = 0.304		

Table S3. Statistical differences of element concentration between one given site and all other, more northern sites, in peat soil solutions within different micro-landscapes. The p-value is determined by Wilcoxon-Mann Whitney test.

Study site	Chemical elements																									
	DOC	DIC	Ca	Mg	K	Na	Si	Al	Fe	Zn	Li	Cu	Ni	Sr	Mn	Rb	As	Co	Cd	Pb	Ba	La	Nd	Yb	Th	U
Mound/polygon																										
Kogalym																										
Khanymey	**0.035**	0.315	**0.033**	0.516	**0.009**	**0.044**	**0.042**	0.277	**0.041**	0.461	0.074	0.646	**0.048**	0.570	**0.029**	0.052	**0.033**	0.746	0.256	0.570	0.224	0.626	0.212	0.516	0.516	0.57
Pangody	**0.028**	0.081	**0.012**	0.231	0.395	0.534	0.256	**0.018**	0.234	0.496	0.092	0.645	**0.017**	**0.011**	0.071	**0.032**	0.396	**0.017**	0.097	0.497	0.734	0.308	0.079	0.396	**0.049**	0.234
Urengoy	**0.043**	0.634	**0.047**	**0.028**	**0.033**	0.053	**0.023**	**0.047**	**0.034**	0.367	**0.044**	**0.045**	0.475	0.684	0.324	**0.034**	**0.034**	0.157	**0.048**	**0.034**	0.480	0.077	**0.031**	0.180	0.087	0.089
Tazovskiy	**0.047**	0.084	**0.026**	0.258	**0.018**	**0.048**	**0.021**	**0.021**	**0.025**	**0.047**	0.115	0.331	**0.045**	**0.045**	**0.01**	**0.042**	0.703	**0.011**	**0.011**	**0.048**	0.396	0.115	0.090	**0.042**	**0.039**	0.146
Khanymey																										
Pangody	0.061	0.253	**0.013**	**0.013**	**0.007**	0.067	**0.005**	**0.015**	**0.006**	0.794	**0.005**	0.731	**0.004**	**0.024**	**0.004**	0.143	0.243	**0.01**	0.113	**0.042**	**0.047**	0.559	0.516	0.330	0.144	0.746
Urengoy	**0.044**	0.084	**0.039**	0.117	0.387	**0.037**	**0.008**	**0.035**	**0.012**	0.748	**0.031**	0.702	0.104	**0.043**	**0.047**	0.138	**0.044**	0.363	**0.037**	**0.038**	**0.024**	0.662	**0.045**	0.473	0.299	**0.044**
Tazovskiy	**0.017**	0.076	**0.049**	**0.037**	**0.022**	**0.026**	0.612	**0.017**	**0.019**	**0.028**	0.089	0.612	**0.004**	**0.046**	**0.002**	0.316	0.075	**0.002**	**0.033**	**0.043**	**0.005**	0.394	0.073	**0.045**	**0.043**	0.374
Pangody																										
Urengoy	**0.047**	**0.045**	**0.039**	**0.046**	**0.014**	**0.033**	**0.016**	0.631	**0.014**	**0.041**	**0.014**	0.706	**0.041**	**0.024**	0.068	**0.021**	**0.023**	**0.014**	**0.033**	**0.066**	**0.043**	0.783	**0.031**	0.061	**0.307**	**0.036**
Tazovskiy	**0.016**	**0.036**	**0.039**	0.408	**0.004**	**0.021**	**0.028**	0.169	**0.044**	0.364	**0.002**	0.537	0.396	**0.048**	**0.001**	0.076	0.347	**0.043**	**0.045**	0.280	0.280	0.643	0.440	**0.044**	0.67	0.077
Urengoy																										
Tazovskiy	0.094	**0.048**	**0.031**	**0.039**	**0.047**	0.094	**0.030**	0.506	**0.009**	0.053	**0.009**	0.885	**0.048**	**0.038**	**0.009**	0.147	**0.014**	**0.014**	0.312	0.131	0.470	0.785	**0.041**	**0.030**	0.573	**0.014**
Hollow																										
Kogalym																										
Khanymey	**0.022**	0.795	**0.049**	**0.035**	**0.036**	0.255	**0.024**	**0.041**	0.051	0.253	0.144	**0.045**	**0.044**	**0.022**	**0.034**	**0.045**	0.355	0.165	0.443	**0.045**	**0.042**	**0.043**	**0.034**	**0.045**	**0.045**	0.065
Pangody	**0.016**	0.343	**0.048**	**0.016**	**0.038**	0.643	**0.034**	**0.016**	**0.035**	**0.007**	0.143	**0.029**	**0.014**	**0.041**	0.155	0.096	0.305	**0.024**	**0.034**	0.355	0.065	**0.024**	**0.014**	**0.034**	**0.032**	**0.024**
Urengoy	**0.038**	**0.048**	**0.046**	0.064	**0.026**	**0.035**	**0.013**	**0.019**	**0.047**	**0.034**	**0.035**	**0.014**	0.147	**0.032**	0.095	**0.045**	**0.034**	**0.045**	**0.024**	**0.044**	**0.045**	0.243	0.443	0.355	0.165	0.443
Tazovskiy	**0.044**	0.379	**0.037**	**0.037**	**0.040**	**0.041**	**0.045**	**0.031**	0.055	**0.024**	0.570	**0.048**	**0.014**	**0.044**	**0.021**	0.570	0.245	**0.019**	**0.03**	0.612	0.092	0.093	**0.048**	**0.040**	**0.040**	0.343
Khanymey																										
Pangody	**0.028**	**0.046**	**0.035**	**0.046**	**0.037**	0.149	**0.021**	**0.036**	**0.016**	**0.025**	**0.021**	**0.024**	**0.048**	**0.038**	0.364	**0.048**	0.564	**0.021**	**0.039**	0.149	0.573	**0.033**	0.248	0.248	**0.033**	**0.032**
Urengoy	**0.021**	0.386	**0.045**	0.248	**0.026**	**0.048**	**0.035**	**0.021**	**0.019**	**0.046**	0.248	**0.020**	0.056	**0.047**	**0.021**	0.051	**0.021**	0.564	**0.021**	**0.021**	**0.043**	0.673	**0.048**	0.564	0.673	**0.049**
Tazovskiy	**0.037**	**0.026**	**0.042**	0.085	**0.023**	**0.048**	**0.041**	**0.026**	**0.048**	**0.047**	**0.045**	**0.046**	0.057	0.085	**0.008**	0.571	0.695	**0.038**	**0.014**	**0.048**	**0.048**	0.750	0.062	0.345	0.450	0.705
Pangody																										
Urengoy	**0.008**	0.752	**0.048**	0.248	**0.021**	0.03	**0.022**	**0.020**	**0.019**	**0.048**	**0.043**	0.051	**0.032**	**0.044**	**0.043**	0.564	**0.021**	**0.021**	**0.021**	**0.043**	**0.021**	**0.021**	**0.021**	**0.043**	**0.021**	**0.043**
Tazovskiy	**0.020**	0.449	**0.047**	0.055	**0.008**	0.014	**0.020**	0.185	**0.045**	**0.043**	0.245	**0.046**	**0.048**	**0.048**	**0.008**	0.105	0.624	0.145	**0.014**	0.571	**0.023**	**0.038**	**0.048**	0.571	**0.049**	**0.038**
Urengoy																										
Tazovskiy	0.128	0.386	**0.036**	**0.045**	**0.020**	0.257	**0.044**	**0.018**	**0.023**	**0.044**	**0.035**	**0.034**	0.185	0.051	**0.025**	**0.045**	**0.014**	**0.032**	0.631	**0.023**	0.605	0.186	0.059	**0.048**	0.186	0.250
Permafrost subsidence/frost crack																										
Khanymey																										
Urengoy	**0.045**	**0.048**	**0.046**	**0.046**	**0.034**	**0.044**	**0.047**	0.164	**0.045**	**0.040**	0.089	0.327	0.354	**0.022**	**0.042**	**0.03**	**0.034**	0.164	**0.022**	**0.033**	**0.03**	**0.048**	**0.044**	**0.033**	**0.048**	**0.03**
Tazovskiy	**0.046**	0.804	**0.036**	**0.044**	0.354	0.386	0.672	**0.035**	**0.046**	**0.025**	0.523	0.386	**0.043**	**0.048**	**0.01**	0.503	**0.026**	**0.02**	**0.043**	0.673	**0.043**	0.264	0.086	**0.048**	0.603	0.564
Urengoy																										
Tazovskiy	**0.036**	**0.035**	**0.044**	**0.036**	**0.038**	0.505	**0.026**	**0.042**	**0.016**	**0.036**	**0.046**	**0.016**	**0.046**	**0.026**	**0.006**	**0.018**	**0.016**	**0.016**	**0.048**	**0.026**	0.505	**0.036**	**0.024**	**0.03**	**0.036**	**0.026**

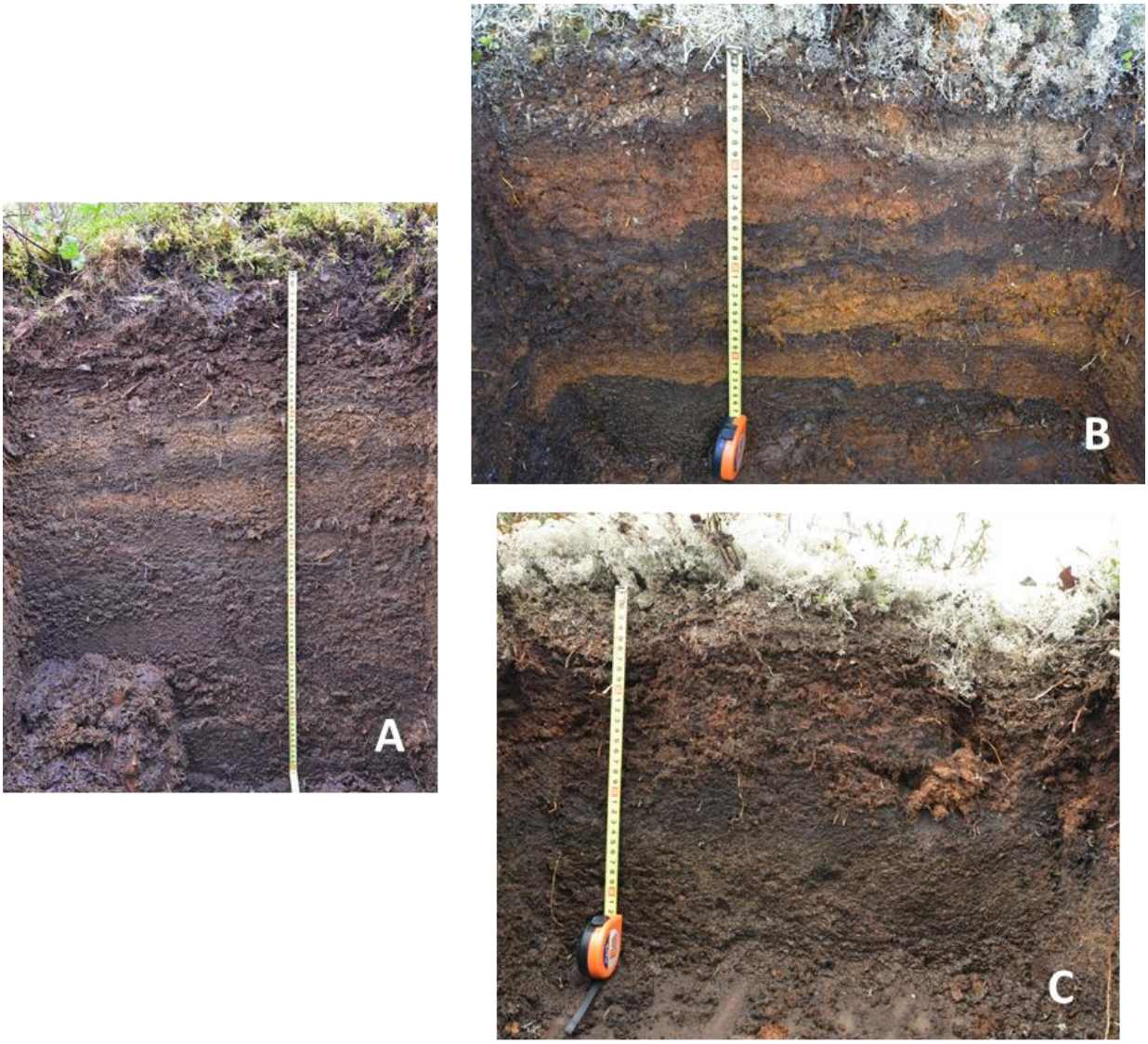

Figure S1. Examples of peat soil profiles studied in this work. **A**, Fibric Histosols (Hyperorganic) on the ridge (Kogalym); **B**, Dystric Hemic Epicryic Histosols on the mound (Khanymey); **C**, Dystric Hemic Epicryic Histosols on the mound (Pangody).

Figure S1, continued. **D**, Dystric Hemic Histosols (Gelic) on depression (Khanymey); **E**, Dystric Hemic Histosols (Gelic) on depression (Pangody); **F**, Dystric Epifibric Histosols of hollow (Khanymey); **G**, Gleyic Histic Entic Podzols (Turbic) of hollow (Khanymey).

Figure S1, continued. H, Dystric Hemic Epicryic Histosols (Hyperorganic) on the polygon (Tazovsky); **I**, Dystric Epifibric Hemic Cryic Histosols (Hyperorganic) subsidence on the polygon (Tazovsky).

Figure S2. Typical photo of peat soil solution extraction using porous cups and polypropylene collectors.

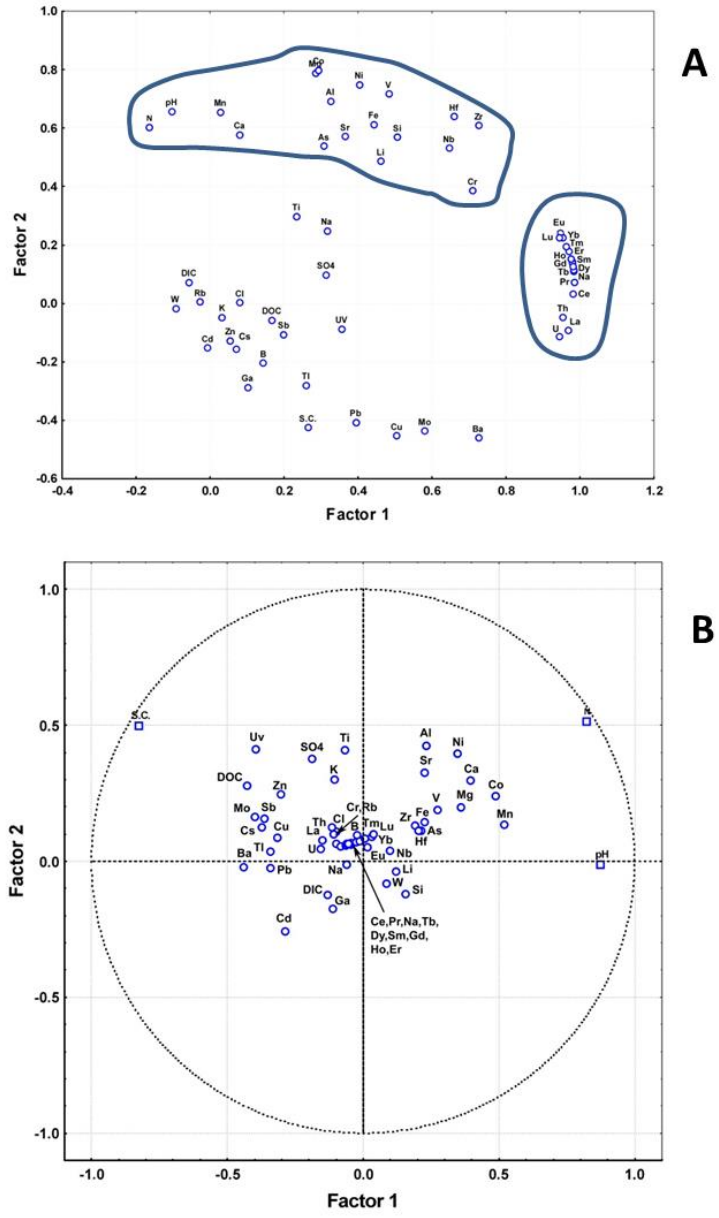

Figure S3. A PCA scattering (**A**) and loading (**B**) plots of peat soil water components (all data treated together). Two circled areas on Fig. S3 A correspond to two factors separated by PCA treatment. The first factor explains a greater variance in heavy element hydrolysates such as REEs, Cr, Nb, Zr, Hf, Th and U whereas the second factor was pronounced for soluble and biogenic elements (Mn, Co, Ni, V, Si, Ca, Mg, Sr), pH and latitude but also included Al and Fe, presumably due to organic complexation (see text).

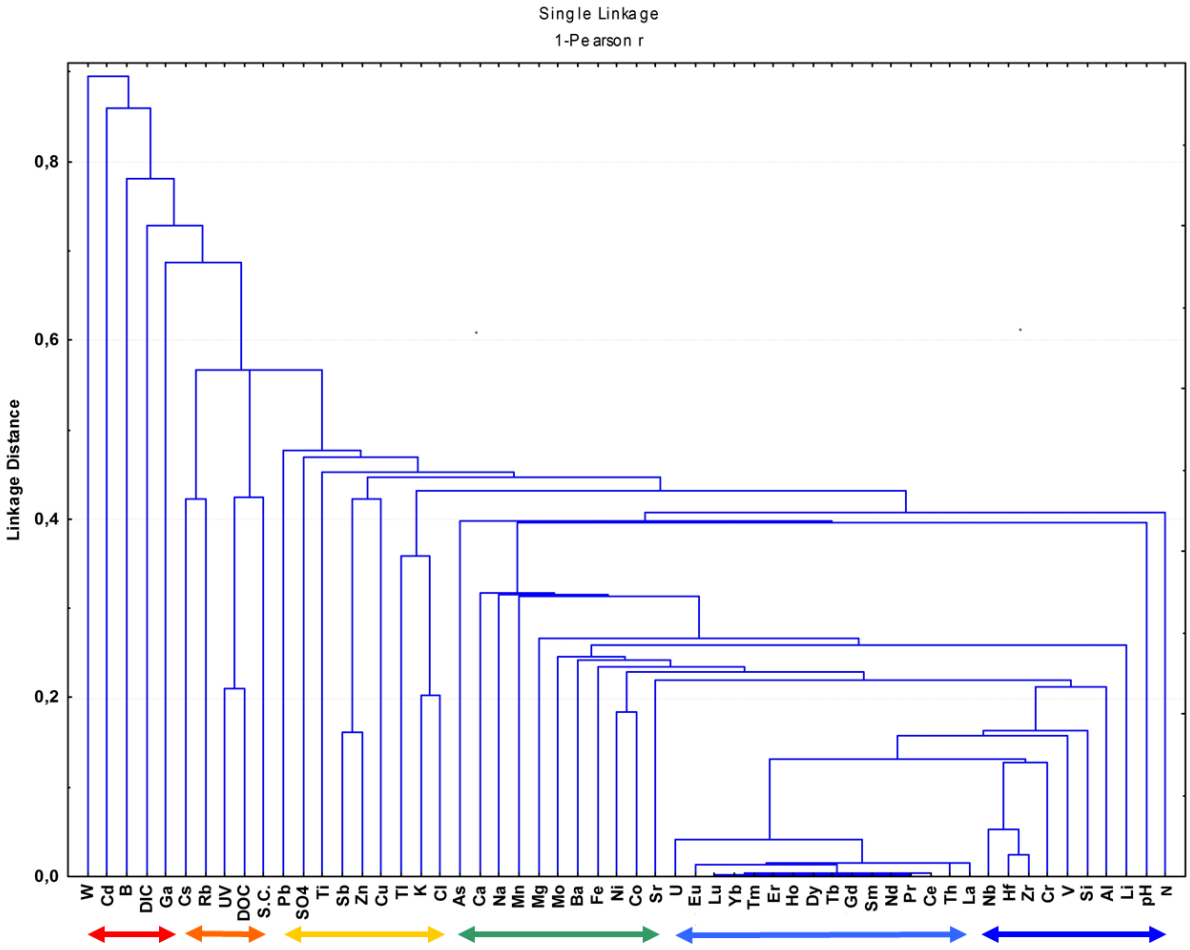

Figure S3 (C). Dendrogram of a hierarchical cluster performed on ell componenets of peat porewaters collected in this work using Pearson correlation distance as distance measure and Ward's method for the linkage rule. The colored arrows on this plot refer to 6 different group of elements. N is for latitude and S.C. stands for specific conductivity. There is a strong correlation of Si with insoluble, low-mobile elements including REEs. W, Cd and B do not exhibit any clear link to other elements. We interpret this behavior as due to important atmospheric loading of W, Cd and B as confirmed by mass balance analyses of atmospheric snow deposition in the WSL (Shevchenko et al., 2016). As a result, these elements are not influenced by intra-soil processes and not affected by mobilization either from peat or from underlaying mineral deposits.

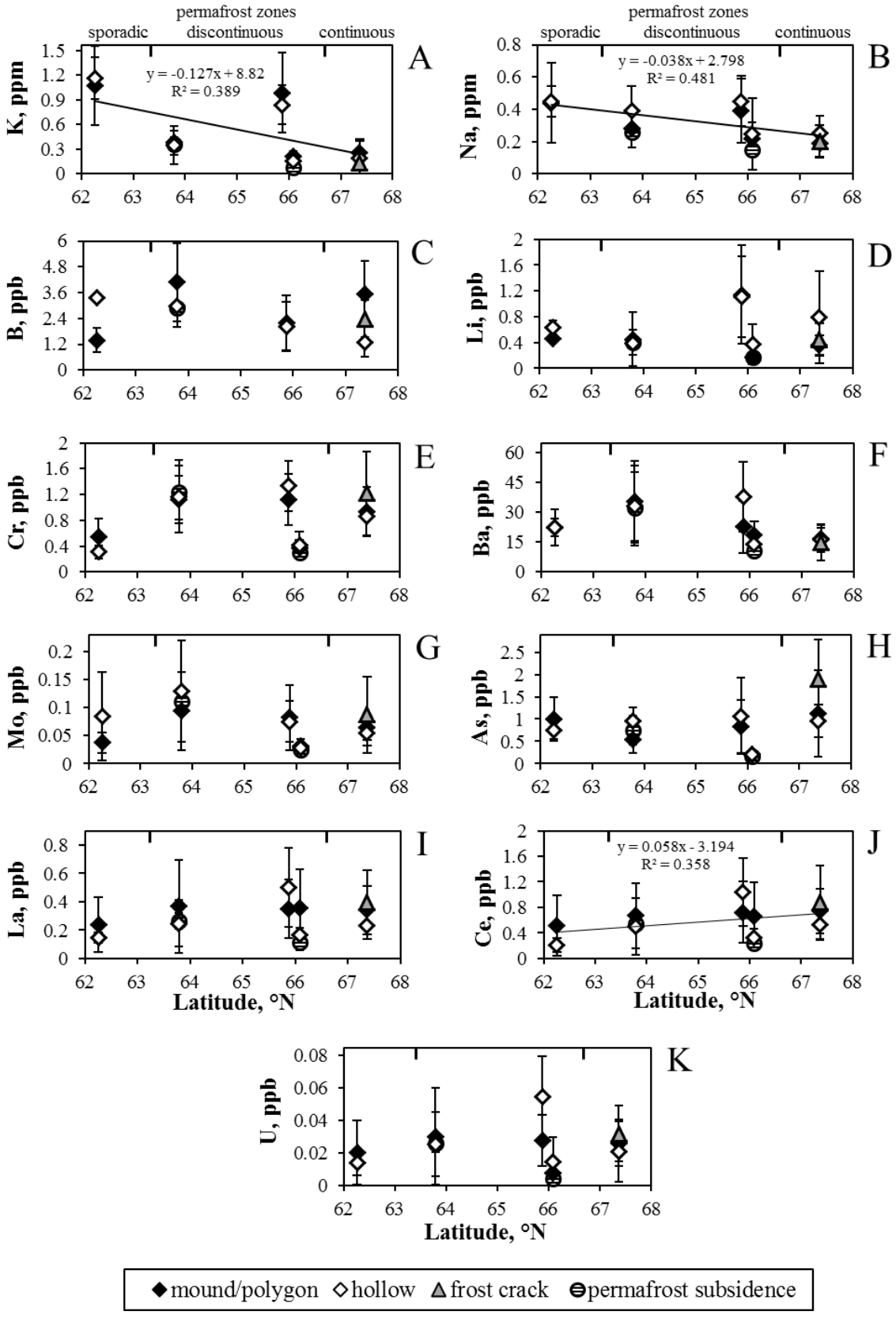

Figure S4. Mean concentrations of K (A), Na (B), B (C), Li (D), Cr (E), Ba (F), Mo (G), As (H), La (I), Ce (J) and U (K) as a function of latitude for mound and polygons (solid diamonds), hollow (open diamonds), frost crack (grey triangles) and permafrost subsidence/depression (hatched circles). The solid line is a linear fit to all data with the regression equation given on each graph.

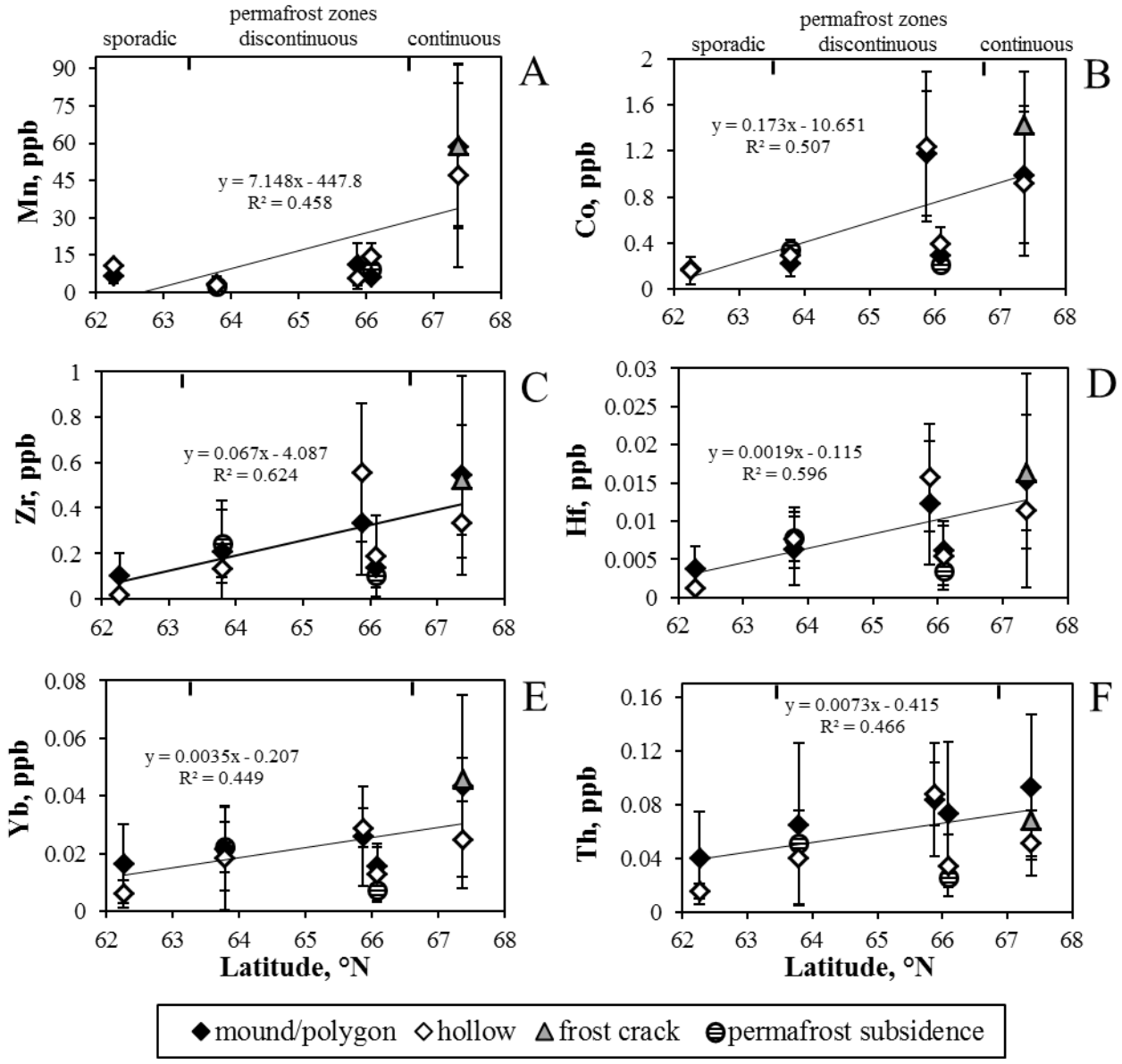

Figure S5. Mean concentrations of Mn (A), Co (B), Zr (C), Hf (D), Yb (E), and Th (F) as a function of latitude for mound and polygons (solid diamonds), hollow (open diamonds), frost crack (grey triangles) and permafrost subsidence/depression (hatched circles). The solid line is a linear fit to all data with the regression equation given on each graph.