Electronic Supplementary Material (ESI) for Environmental Science: Processes & Impacts.

SUPPLEMENTARY INFORMATION

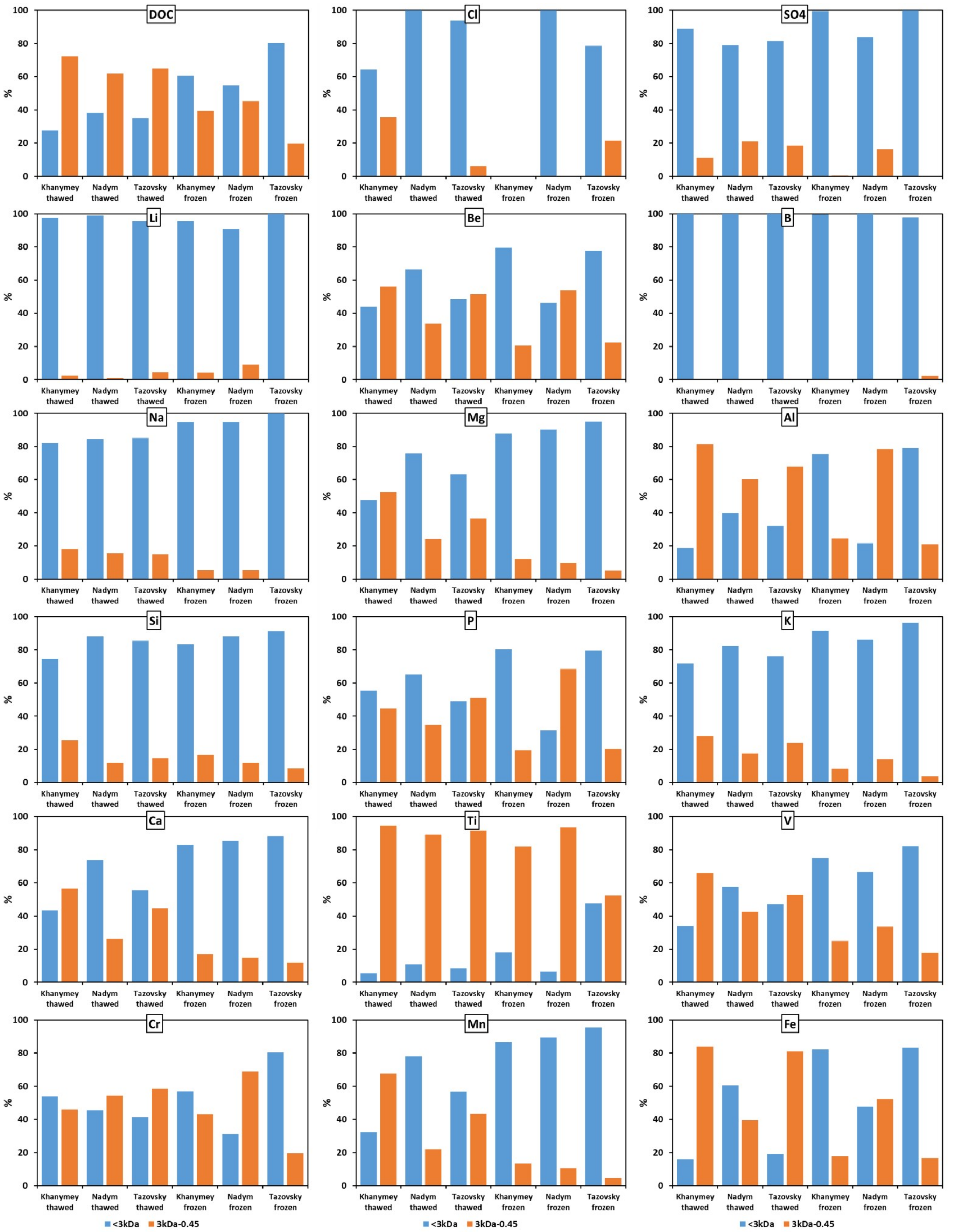

Fig. S1. Percentage distribution colloidal and LMW fractions in peat porewater of the active layer (thawed 0-30 cm) and the permafrost ice (frozen 30-130 cm) in three sampled sites of western Siberia. The northern taiga (Khanymey, 2 cores), forest tundra (Nadym, 2 cores) and southern tundra (Tazovsky, 1 core) correspond to sporadic, discontinuous and continuous permafrost zones, respectively.

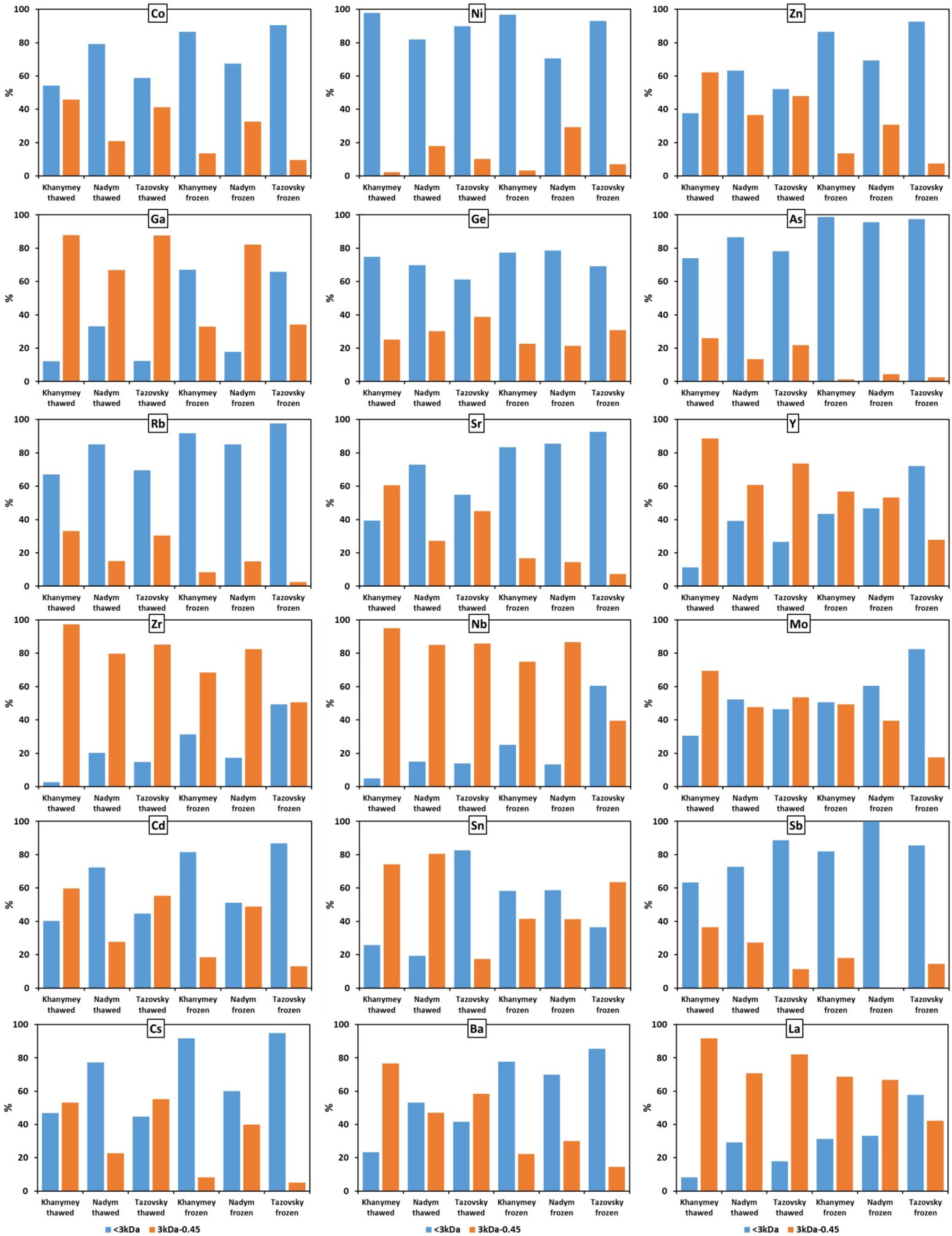

Fig. S1, continued.

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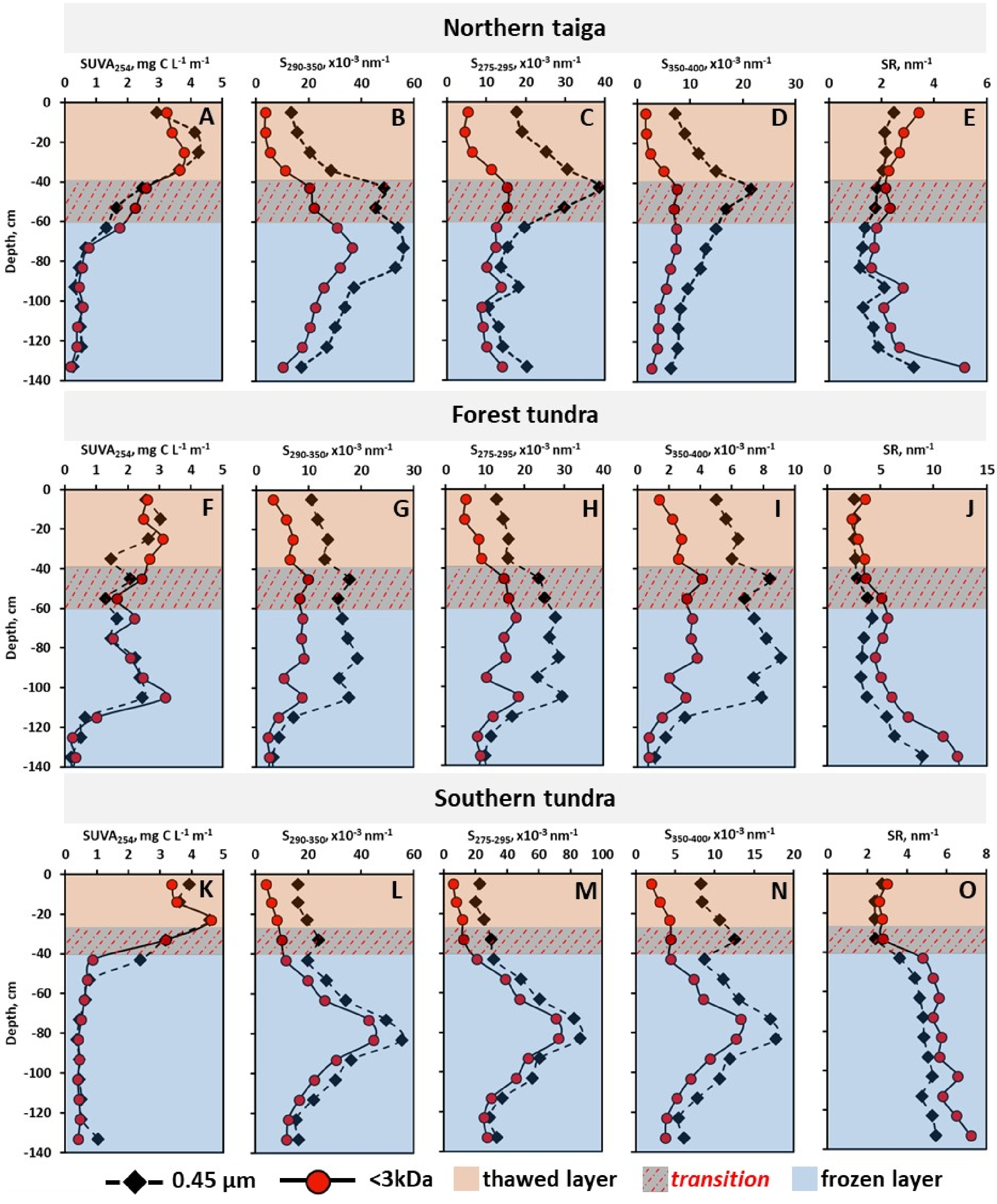

Fig. S2. Profile characteristics and optical properties of the colloidal (0.45µm) and LMW (<3kDa) fraction DOC, Fe, Al, P and Si in peat core on northern taiga (**A, B, C, D, E**), forest tundra (**F, G, H, I, J**) and southern tundra (**K, L, M, N, O**).

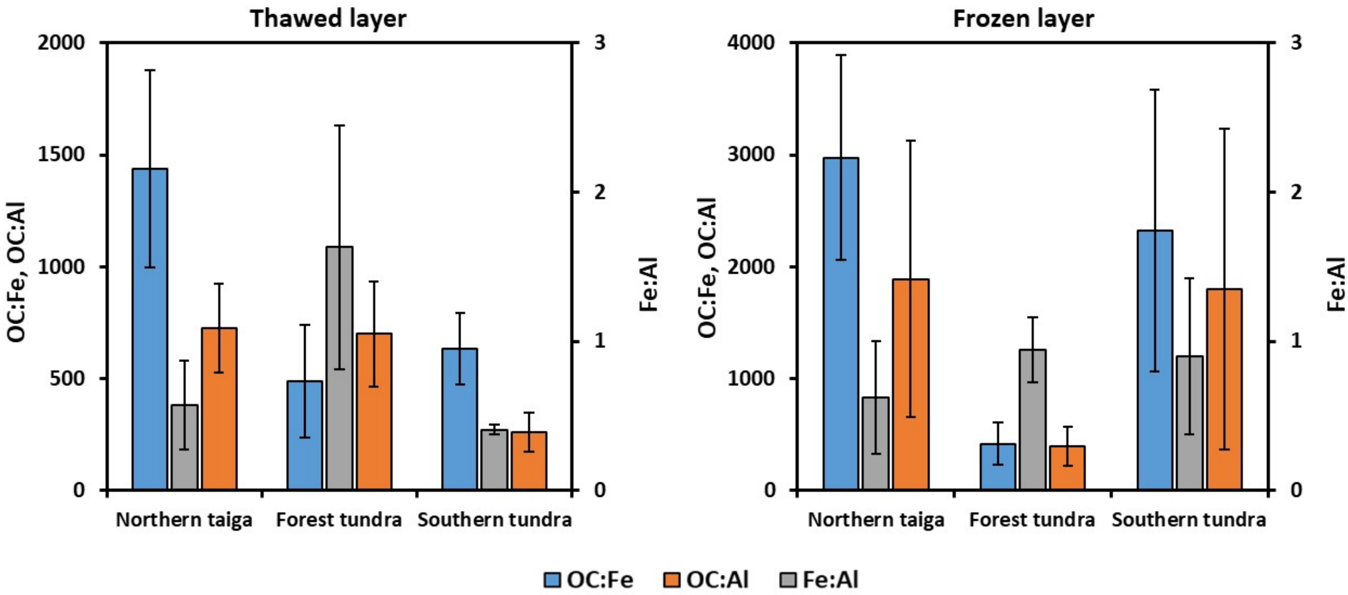

Fig. S3. Mean values (± S.D.) of molar ratios of OC:Fe, OC:Al, Fe:Al in colloids (3 kDa - 0.45 μm) in peat porewater (thawed, 0-30 cm) and ice (frozen, 30-130 cm), averaged across three sampled sites (5 peat cores) in western Siberia Lowland.

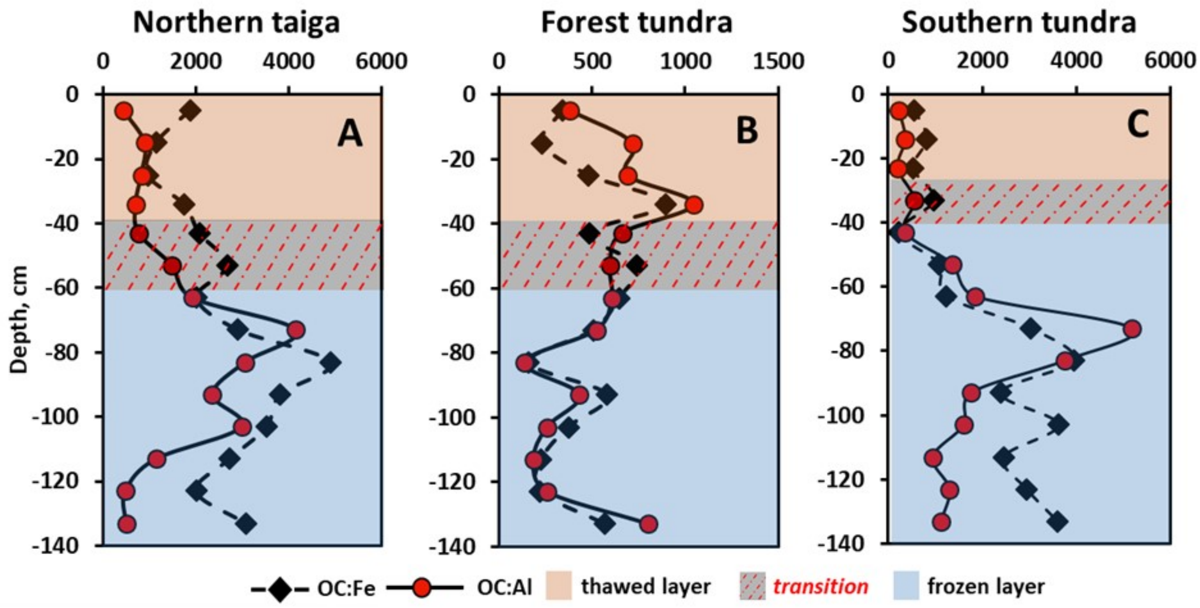

Fig. S4. Vertical distribution of molar OC:Fe and OC:Al ratio in colloidal (3 kDa-0.45µm) fraction of porewater (0-30 cm) and ice (30-130 cm) in peat cores collected in Northern taiga (**A**), Forest tundra (**B**) and Southern tundra (**C**). The transition layer is the one that thaws between the date of sampling (middle of August) and the end of the active season. The northern taiga (Khanymey), forest tundra (Nadym) and southern tundra (Tazovsly) correspond to sporadic, discontinuous and continuous permafrost zones, respectively.

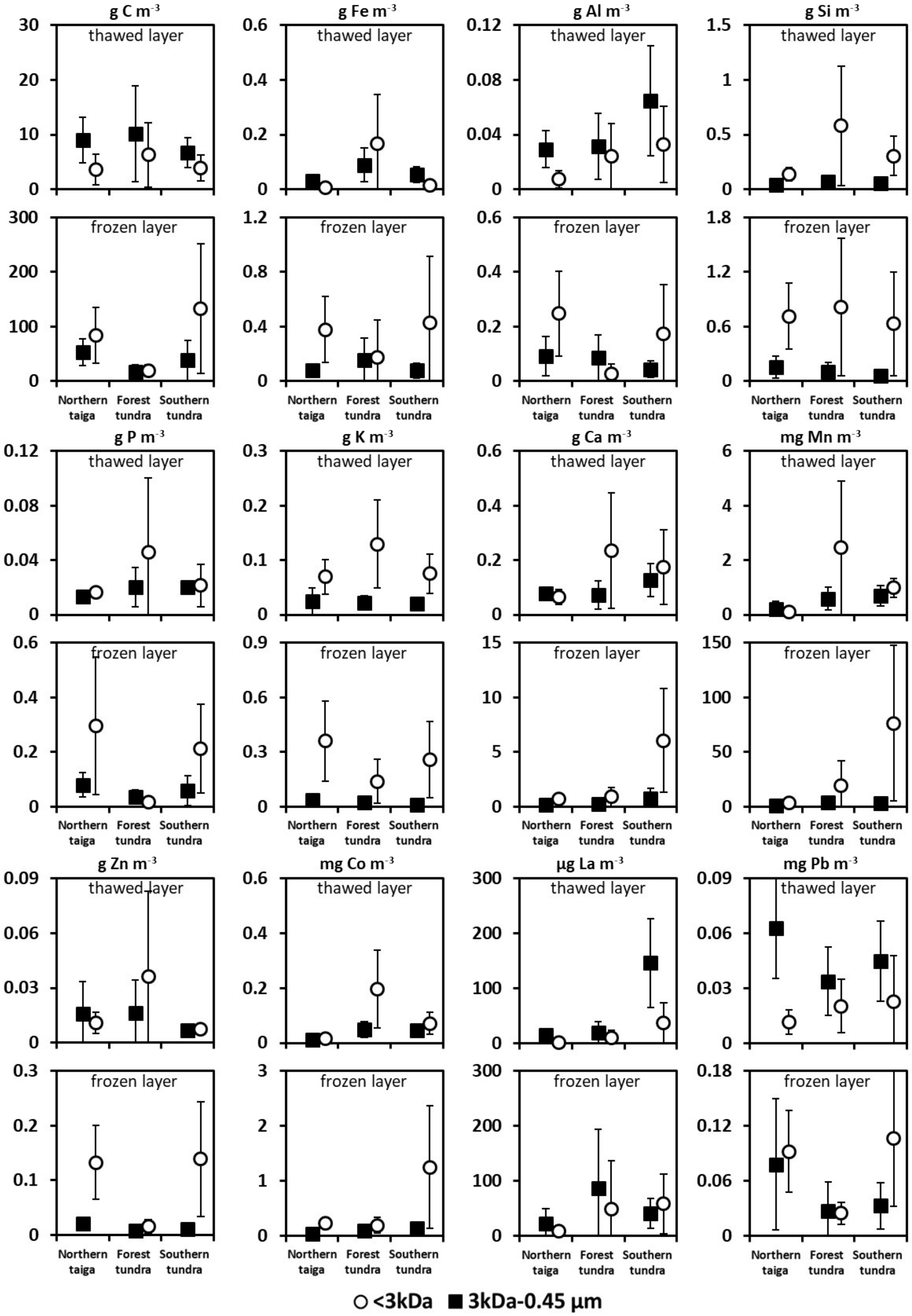

Fig. S5. Depth-integrated, volumetric (per m^3 of peat) pools of colloidal (3 kDa - 0.45 µm, black squares) and LMW (<3 kDa, open circles) fractions of DOC, Fe, Al, Si, P, K, Ca, Mn, Zn, Co, La and Pb in peat porewater of the active layer (thawed 0-30 cm) and the permafrost ice (frozen 30-130 cm) in various permafrost zones of western Siberia. The northern taiga (Khanymey, 2 cores), forest tundra (Nadym, 2 cores) and southern tundra (Tazovsky, 1 core) correspond to sporadic, discontinuous and continuous permafrost zones, respectively.

Table S1. Mean values (±s.d.) of $LMW_{< 3kDa}$ and colloidal (3 kDa - 0.45 µm) form of solutes in peat porewater (thawed, 0-30 cm, 4 to 5 horizons) and ice (30-130 cm, 8 to 10 horizons) in three sampled sites of western Siberia Lowland. The data are averaged across two (Khanymey, Nadym) and one (Tazovsky) cores and different horizons (typically 5-6 thawed layers and 8-10 frozen layers). The DOC, Cl, SO_4^{2-}, Si, Ca, Mg, Na, K, P, Al and Fe concentrations are in mg L^{-1} with all other elements in µg L^{-1}.

	Khanymey, Northern taiga, 2 cores				**Nadym, Forest tundra, 2 cores**				**Tazovsky, Southern tundra, 1 core**			
	3kDa-0.45 µm		**<3kDa**		**3kDa-0.45 µm**		**<3kDa**		**3kDa-0.45 µm**		**<3kDa**	
Elements	**thawed**	**frozen**	**thawed**	**frozen**	**thawed**	**frozen**	**thawed**	**frozen**	**thawed**	**frozen**	**thawed**	**frozen**
DOC	58±12	223±108	22±11	343±182	58±27	78±40	36±15	91±49	45±2	192±191	24±5	657±454
Cl	0.88±0.74	0.7±1.42	1.59±1.76	1.42±0.72	0.22±0.45	0.08±0.17	0.96±0.88	0.56±0.43	0.09±0.07	0.14±0.24	0.93±0.36	0.51±0.19
SO_4^{2-}	0.21±0.19	2.61±3.48	1.45±0.9	4.88±7.02	0.21±0.18	0.26±0.35	0.79±0.68	0.27±0.2	0.27±0.18	0.5±0.21	1.21±0.37	13±11
Li	0.05±0.04	0.15±0.11	0.36±0.05	3.34±2.59	0.04±0.05	0.11±0.06	0.45±0.12	0.96±0.41	0.1±0.07	0.22±0.27	0.66±0.17	6.21±4.05
Be	0.01±0.004	0.01±0.01	0.01±0.002	0.03±0.01	0.01±0.004	0.02±0.01	0.02±0.01	0.01±0.01	0.03±0.01	0.02±0.01	0.02±0.01	0.07±0.03
Na	0.45±0.71	0.16±0.12	2.04±2.43	2.95±1.71	0.28±0.36	0.1±0.08	1.49±0.87	1.19±0.84	0.17±0.15	0.03±0.03	0.98±0.25	1.51±0.5
Mg	0.11±0.09	0.14±0.04	0.1±0.02	1±0.55	0.06±0.04	0.21±0.3	0.2±0.04	1.2±1.47	0.13±0.04	0.23±0.2	0.22±0.1	4.27±2.68
Al	0.2±0.08	0.35±0.22	0.04±0.03	1.07±0.69	0.19±0.07	0.35±0.28	0.13±0.08	0.1±0.1	0.41±0.11	0.22±0.1	0.19±0.08	0.82±0.49
Si	0.3±0.33	0.59±0.37	0.86±0.15	2.94±1.35	0.42±0.2	0.43±0.37	3.15±1.9	3.18±1.87	0.33±0.13	0.3±0.21	1.91±0.71	3±1.43
P	0.09±0.05	0.33±0.17	0.12±0.04	1.34±1.16	0.13±0.04	0.16±0.08	0.24±0.17	0.07±0.08	0.14±0.04	0.31±0.35	0.14±0.05	1.22±0.9
K	0.21±0.26	0.13±0.06	0.53±0.41	1.45±0.75	0.19±0.18	0.1±0.06	0.87±0.41	0.55±0.3	0.16±0.12	0.05±0.03	0.51±0.18	1.25±0.54
Ca	0.54±0.2	0.59±0.23	0.41±0.1	2.86±1.31	0.47±0.15	1.14±1.16	1.32±0.61	5.03±5.73	0.83±0.03	4.05±5.23	1.03±0.38	30±15
Ti	3.47±2.25	6.38±7.79	0.2±0.05	1.41±1.33	3.5±1.55	6.01±6.13	0.43±0.24	0.42±0.3	5.4±2.4	3.19±3.55	0.5±0.21	2.89±4.02
V	0.49±0.38	0.55±0.57	0.25±0.09	1.64±1.03	0.63±0.29	1.17±1	0.86±0.61	2.31±1.72	0.98±0.22	1.09±0.57	0.87±0.45	5.05±3.02
Cr	0.36±0.26	0.52±0.57	0.42±0.42	0.69±0.67	0.43±0.15	0.62±0.53	0.36±0.13	0.28±0.3	0.48±0.28	0.26±0.33	0.34±0.2	1.01±1.16
Mn	1.87±2.95	2.18±0.84	0.9±0.75	14±8.94	3.68±0.95	22±28	13±8.11	115±146	5.59±4.92	17±18	7.29±4.25	369±249
Fe	0.2±0.05	0.34±0.10	0.04±0.02	1.59±0.98	0.57±0.11	0.61±0.47	0.88±0.58	0.56±0.81	0.34±0.07	0.4±0.25	0.08±0.03	2±1.61
Co	0.08±0.02	0.15±0.04	0.09±0.03	0.98±0.45	0.32±0.07	0.38±0.22	1.23±0.39	0.78±0.38	0.31±0.05	0.64±0.33	0.45±0.05	6.06±3.59
Ni	0.17±0.16	0.14±0.12	0.66±0.47	4.04±1.78	0.47±0.26	1.06±0.88	2.12±0.75	2.45±1.06	0.29±0.26	0.91±0.52	1.81±0.66	12±5.82
Zn	136±185	87±44	82±70	554±272	110±113	36±21	190±216	71±40	50±20	58±44	54±17	717±365
Ga	0.07±0.05	0.07±0.08	0.01±0.005	0.14±0.1	0.03±0.02	0.06±0.06	0.02±0.005	0.01±0.01	0.09±0.05	0.05±0.07	0.01±0.01	0.1±0.09
Ge	0.002±0.001	0.003±0.003	0.005±0.003	0.01±0.01	0.003±0.004	0.01±0.004	0.01±0.003	0.02±0.01	0.01±0.01	0.01±0.004	0.01±0.001	0.01±0.01
As	0.25±0.19	0.24±0.46	0.7±0.39	2.07±1.25	0.22±0.04	0.6±0.39	1.42±1.02	9.7±2.95	0.16±0.04	0.19±0.07	0.56±0.26	6.65±3.8
Rb	0.26±0.22	0.56±0.21	0.52±0.18	6.15±3.52	0.41±0.23	0.43±0.26	2.31±0.77	2.34±1.04	0.33±0.2	0.29±0.19	0.76±0.18	12±6.99
Sr	4.93±2.87	5.24±1.92	3.22±0.59	26±12	4.06±1.62	7.46±6.1	11±6.75	32±33	6.07±0.58	13±8.35	7.4±2.14	15±89
Y	0.11±0.1	0.07±0.06	0.01±0.01	0.05±0.02	0.17±0.1	0.41±0.45	0.11±0.13	0.36±0.59	1.08±0.07	0.3±0.14	0.39±0.18	0.77±0.6
Zr	0.23±0.19	0.37±0.39	0.01±0.004	0.17±0.13	0.3±0.12	0.68±0.77	0.08±0.07	0.14±0.21	0.46±0.13	0.8±0.57	0.08±0.07	0.78±0.78
Nb	0.02±0.01	0.03±0.04	0.001±0.001	0.01±0.02	0.02±0.01	0.03±0.04	0.003±0.002	0.01±0.01	0.02±0.01	0.03±0.02	0.004±0.002	0.04±0.05
Mo	0.04±0.01	0.02±0.02	0.02±0.01	0.02±0.01	0.03±0.01	0.05±0.03	0.03±0.01	0.08±0.05	0.06±0.02	0.07±0.07	0.05±0.01	0.31±0.31
Cd	0.02±0.01	0.03±0.01	0.02±0.01	0.11±0.04	0.01±0.01	0.01±0.01	0.04±0.01	0.01±0.01	0.02±0.01	0.03±0.02	0.02±0.01	0.2±0.11
Sn	0.4±0.47	0.03±0.04	0.14±0.14	0.04±0.04	0.02±0.03	0.01±0.01	0.01±0.003	0.01±0.01	0.01±0.01	0.04±0.03	0.02±0.02	0.02±0.01
Sb	0.03±0.03	0.01±0.01	0.05±0.02	0.06±0.02	0.01±0.01	0.01±0.01	0.04±0.01	0.06±0.03	0.02±0.01	0.02±0.03	0.08±0.02	0.12±0.08

Cs	0.01±0.01	0.03±0.03	0.01±0.01	0.39±0.33	0.01±0.01	0.02±0.01	0.05±0.03	0.03±0.04	0.01±0.01	0.01±0.005	0.01±0.004	0.1±0.06
Ba	132±174	29±20	40±25	102±33	74±86	24±15	84±43	50±31	60±48	26±25	43±16	154±77
La	0.1±0.06	0.08±0.09	0.01±0.01	0.04±0.03	0.11±0.06	0.33±0.34	0.05±0.05	0.16±0.29	0.93±0.08	0.21±0.09	0.2±0.12	0.28±0.2
Ce	0.16±0.08	0.14±0.14	0.02±0.01	0.08±0.06	0.25±0.15	0.73±0.83	0.13±0.14	0.47±0.83	1.7±0.19	0.43±0.18	0.47±0.26	0.7±0.5
Pr	0.02±0.01	0.01±0.01	0.003±0.002	0.01±0.01	0.03±0.02	0.09±0.1	0.02±0.02	0.06±0.11	0.19±0.03	0.05±0.02	0.06±0.03	0.1±0.07
Nd	0.07±0.04	0.05±0.05	0.01±0.01	0.04±0.03	0.11±0.08	0.38±0.45	0.08±0.1	0.3±0.49	0.76±0.13	0.23±0.11	0.27±0.14	0.48±0.35
Sm	0.02±0.01	0.01±0.01	0.003±0.002	0.01±0.01	0.06±0.03	0.11±0.1	0.04±0.04	0.08±0.11	0.18±0.02	0.05±0.03	0.07±0.03	0.11±0.08
Eu	0.01±0.02	0.01±0.004	0.004±0.002	0.01±0.004	0.01±0.01	0.02±0.02	0.01±0.01	0.02±0.03	0.05±0.01	0.01±0.01	0.02±0.01	0.04±0.03
Gd	0.02±0.02	0.01±0.01	0.003±0.001	0.01±0.01	0.03±0.02	0.09±0.1	0.02±0.02	0.07±0.11	0.21±0.01	0.05±0.03	0.07±0.04	0.12±0.09
Tb	0.003±0.003	0.002±0.002	0.0003±0.0002	0.001±0.001	0.01±0.003	0.01±0.01	0.002±0.003	0.01±0.02	0.03±0.001	0.01±0.003	0.01±0.01	0.02±0.01
Dy	0.02±0.02	0.01±0.01	0.002±0.001	0.01±0.01	0.03±0.02	0.08±0.08	0.02±0.02	0.06±0.09	0.18±0.01	0.05±0.02	0.06±0.02	0.1±0.08
Ho	0.004±0.005	0.003±0.002	0.0004±0.0002	0.002±0.001	0.01±0.004	0.02±0.02	0.003±0.004	0.01±0.02	0.03±0.003	0.01±0.004	0.01±0.01	0.02±0.02
Er	0.01±0.01	0.01±0.01	0.002±0.001	0.005±0.003	0.02±0.01	0.04±0.05	0.01±0.01	0.04±0.06	0.09±0.01	0.03±0.02	0.04±0.02	0.08±0.06
Tm	0.001±0.001	0.002±0.001	0.0003±0.0002	0.001±0.001	0.003±0.002	0.01±0.01	0.002±0.002	0.01±0.01	0.01±0.002	0.005±0.003	0.01±0.002	0.01±0.01
Yb	0.01±0.01	0.01±0.01	0.001±0.0004	0.01±0.003	0.02±0.01	0.05±0.05	0.01±0.02	0.04±0.07	0.06±0.01	0.03±0.02	0.03±0.01	0.09±0.07
Lu	0.001±0.001	0.002±0.001	0.0004±0.0001	0.001±0.0004	0.003±0.002	0.01±0.01	0.002±0.003	0.01±0.01	0.01±0.001	0.01±0.002	0.01±0.002	0.01±0.01
Hf	0.01±0.01	0.02±0.02	0.001±0.0001	0.01±0.01	0.01±0.004	0.03±0.03	0.004±0.003	0.01±0.01	0.02±0.01	0.03±0.03	0.003±0.005	0.03±0.04
W	0.04±0.04	0.04±0.05	0.02±0.003	0.02±0.01	0.01±0.01	0.02±0.01	0.01±0.01	0.004±0.004	0.06±0.01	0.04±0.02	0.02±0.01	0.03±0.03
Tl	0.004±0.003	0.003±0.002	0.004±0.002	0.03±0.02	0.003±0.001	0.003±0.002	0.02±0.01	0.01±0.004	0.003±0.001	0.002±0.002	0.005±0.0002	0.02±0.01
Pb	0.47±0.34	0.30±0.23	0.07±0.023	0.38±0.18	0.28±0.26	0.10±0.09	0.13±0.03	0.12±0.04	0.35±0.28	0.17±0.13	0.12±0.09	0.55±0.33
Th	0.03±0.01	0.06±0.09	0.002±0.0004	0.01±0.01	0.04±0.02	0.06±0.07	0.01±0.002	0.01±0.01	0.28±0.07	0.04±0.03	0.05±0.05	0.02±0.01
U	0.01±0.004	0.02±0.02	0.001±0.001	0.01±0.01	0.01±0.005	0.02±0.02	0.001±0.001	0.002±0.004	0.07±0.04	0.07±0.07	0.03±0.03	0.09±0.12

Table S2. Mann-Whitney U test of the difference in elemental concentrations between colloidal and LMW fractions in peat porewater of the thawed layer and the permafrost (frozen) ice treated for all five peat cores. Only statistically significant values are presented (at $p < 0.05$).

	3kDa-0.45 µm thawed vs 3kDa-0.45 µm frozen			<3kDa thawed vs <3kDa frozen			3kDa-0.45 µm thawed vs <3kDa thawed			3kDa-0.45 µm frozen vs <3kDa frozen		
Elements	**U**	**Z**	**p-value**	**U**	**Z**	**p-value**	**U**	**Z**	**p-value**	**U**	**Z**	**p-value**
DOC	63	-3.32	<0.01	5	-4.89	<0.01	13	-3.38	<0.01	319	2.27	0.02
Cl	-	-	-	-	-	-	31	2.34	0.02	117	4.69	<0.01
SO_4^{2-}	-	-	-	-	-	-	10	3.55	<0.01	236	2.84	<0.01
Li	103	-2.23	0.03	20	-4.48	<0.01	0	4.13	<0.01	12	6.59	<0.01
Be	-	-	-	77	-2.94	<0.01	-	-	-	222	3.63	<0.01
Na	109	2.07	0.04	-	-	-	15	3.26	<0.01	0	6.76	<0.01
Mg	88	-2.64	<0.01	22	-4.43	<0.01	27	2.57	0.01	70	5.77	<0.01
Al	-	-	-	82	-2.80	<0.01	26	-2.63	<0.01	-	-	-
Si	-	-	-	100	-2.32	0.02	2	4.01	<0.01	3	6.72	<0.01
P	91	-2.56	0.01	110	-2.04	0.04	-	-	-	338	2.00	0.05
K	-	-	-	111	-2.02	0.04	14	3.32	<0.01	0	6.76	<0.01
Ca	102	-2.26	0.02	30	-4.21	<0.01	-	-	-	137	4.83	<0.01
Ti	-	-	-	87	-2.67	<0.01	0	-4.13	<0.01	198	-3.97	<0.01
V	-	-	-	34	-4.10	<0.01	-	-	-	173	4.32	<0.01
Mn	100	-2.32	0.02	49	-3.70	<0.01	-	-	-	167	4.41	<0.01
Fe	-	-	-	92	-2.53	0.01	-	-	-	294	2.62	<0.01
Co	-	-	-	88	-2.64	<0.01	-	-	-	105	5.28	<0.01
Ni	-	-	-	44	-3.83	<0.01	12	3.44	<0.01	38	6.22	<0.01
Zn	-	-	-	78	-2.91	<0.01	-	-	-	131	4.91	<0.01
Ga	-	-	-	76	-2.96	<0.01	7	-3.72	<0.01	-	-	-
Ge	-	-	-	-	-	-	35	2.11	0.04	242	3.35	<0.01
As	-	-	-	25	-4.35	<0.01	2	4.01	<0.01	12	6.59	<0.01
Rb	-	-	-	37	-4.02	<0.01	11	3.49	<0.01	0	6.76	<0.01
Sr	106	-2.15	0.03	30	-4.21	<0.01	-	-	-	94	5.43	<0.01
Zr	-	-	-	86	-2.69	<0.01	7	-3.72	<0.01	299	-2.55	0.01
Nb	-	-	-	81	-2.83	<0.01	0	-4.13	<0.01	300	-2.53	0.01
Mo	-	-	-	89	-2.61	<0.01	-	-	-	325	2.18	0.03
Cd	-	-	-	106	-2.15	0.03	-	-	-	223	3.62	<0.01
Sb	-	-	-	-	-	-	13	3.38	<0.01	30	6.34	<0.01
Cs	-	-	-	78	-2.91	<0.01	-	-	-	163	4.46	<0.01
Ba	67	3.21	<0.01	101	-2.29	0.02	-	-	-	93	5.45	<0.01
La	-	-	-	-	-	-	31	-2.34	0.02	-	-	-
Ce	-	-	-	-	-	-	-	-	-	-	-	-
Dy	-	-	-	-	-	-	32	-2.28	0.02	-	-	-
Hf	-	-	-	84	-2.75	<0.01	13	-3.38	<0.01	-	-	-
W	-	-	-	-	-	-	-	-	-	296	-2.59	<0.01
Tl	-	-	-	75	-2.99	<0.01	16	3.20	<0.01	10	6.62	<0.01
Pb	108	2.10	0.04	59	-3.43	<0.01	12	-3.44	<0.01	291	2.66	<0.01
Th	-	-	-	-	-	-	11	-3.49	<0.01	150	-4.65	<0.01
U	-	-	-	112	-1.99	0.05	22	-2.86	<0.01	330	-2.11	0.03

Table S3. Optical properties (mean±SD) in peat porewater of the thawed layer (0-30 cm) and the permafrost ice (frozen 30-130 cm) in three sampled sites (five cores) of western Siberia for the total dissolved (< 0.45 µm) and low molecular weight (< 3kDa) fractions.

	Khanymey, Northern taiga, 2 cores				**Nadym, Forest tundra, 2 cores**				**Tazovsky, Southern tundra, 1 core**			
	<0.45 µm		**<3kDa**		**<0.45 µm**		**<3kDa**		**<0.45 µm**		**<3kDa**	
Optical properties	**thawed**	**frozen**	**thawed**	**frozen**	**thawed**	**frozen**	**thawed**	**frozen**	**thawed**	**frozen**	**thawed**	**frozen**
$SUVA_{254}$, L mg C^{-1} m^{-1}	3.7±0.6	0.9±0.7	3.5±0.2	1±0.9	2.4±0.6	1.3±0.9	2.7±0.3	1.5±1	4±0.5	1±0.9	3.8±0.7	0.8±0.8
$SUVA_{412}$, L mg C^{-1} m^{-1}	0.5±0.1	0.1±0.1	0.3±0.04	0.1±0.1	0.3±0.1	0.1±0.1	0.3±0.1	0.1±0.1	0.6±0.1	0.1±0.1	0.4±0.1	0.1±0.1
E280/350	2.5±0.1	3.6±0.6	3.4±0.5	5.1±0.6	2.6±0.1	3.3±0.7	2.9±0.2	4.1±1.4	2.4±0.1	3.5±0.5	2.8±0.1	4.1±0.4
E254/365	3.8±0.1	5.7±1	5.1±0.1	8.6±1.8	4.1±0.3	5.4±1.5	4.6±0.5	7.3±3.4	3.7±0.2	6±0.9	4.7±0.3	7.4±1.2
Aromaticity	126±35	179±57	38±18	100±27	88±19	81±40	44±13	83±17	117±15	174±66	43±13	127±61
Humification proxy	6.9±0.5	12±3.2	11±1.2	24±9.8	6.9±1	11±6.8	8.4±1.9	19±22	6.1±0.4	11±2.3	9.2±0.7	16±3.2
Molar absorptivity (MA)	364±60	96±74	333±29	107±89	225±56	123±82	254±25	139±97	384±47	90±90	352±64	71±80
Normalised Molecular weight	1942±240	874±296	1819±116	917±356	1388±225	981±326	1502±99	1044±385	2023±188	851±358	1895±254	772±320
$S_{290-350}$, x10^{-3}, m^{-1}	20±6.7	40±13	5.8±3.6	24±7.7	13±2.7	12±6.6	6.4±2.4	5.9±3	17±2	30±13	6.1±2.1	23±12
$S_{275-295}$, x10^{-3}, m^{-1}	23±6	19±8.6	6.9±3	12±2.4	16±4.1	21±7.9	8.3±4	13±4	23±2.7	50±21	8.5±3	40±20
$S_{350-400}$, x10^{-3}, m^{-1}	11±3.4	12±4.9	2.6±1.6	5.5±1.8	6.3±1.3	5.4±3.2	2.6±1	2.3±1.3	9.1±1.3	11±4	3.1±1.2	7.3±3.4
SR	2.2±0.2	1.8±0.6	2.8±0.5	2.5±1	2.6±0.1	5.0±2.1	3.1±0.6	7.4±3.2	2.5±0.2	4.6±0.9	2.8±0.2	5.6±1.1

Table S4. Correlation matrix of DOC, Al and Fe in the colloidal fraction, based on full dataset for three study sites (5 cores) of western Siberia (at $p<0.05$). Bold are marked $R^2 > 0.7$.

	3kDa-0.45 µm					
	thawed			**frozen**		
Elements	**DOC**	**Al**	**Fe**	**DOC**	**Al**	**Fe**
DOC	-	-	-	-	-	-
Cl	-	-	-0.62	-	-	-
SO_4^{2-}	-	-	-	-	-	-0.52
Li	-	0.61	-	-	0.45	-
Be	-	**0.71**	-	-	0.60	0.66
Na	-	-	-	-	0.49	-
Mg	-	0.68	-	0.57	-	-
Al	-	-	-	-	-	0.65
Si	-	0.64	-	0.46	**0.85**	0.55
P	-	0.61	-	0.66	0.53	0.46
K	-	-	-	-	0.66	-
Ca	-	**0.88**	-	-	-	0.36
Ti	-	**0.90**	-	-	**0.91**	0.57
V	-	**0.84**	-	-	**0.71**	0.54
Cr	-	0.63	-	-	**0.84**	0.61
Mn	-	-	-	-	-	0.40
Fe	-	-	-	-	0.65	-
Co	-	-	0.78	-	-	0.58
Ni	-	-	-	-	0.37	0.65
Zn	-	-	-	-	-	-
Ga	-	0.69	-	0.39	0.89	0.58
Ge	-	0.60	-	-	0.39	0.57
As	-	-	-	-	-	-
Rb	-	-	-	-	0.75	0.59
Sr	-	**0.87**	-	-	-	0.38
Y	-	**0.90**	-	-	0.56	0.67
Zr	-	**0.82**	-	-	**0.72**	0.65
Nb	-	**0.83**	-	-	**0.90**	0.59

Mo	-	**0.88**	-	-	0.39	0.56
Cd	-	-	-	0.63	-	0.38
Sn	-	-	-	-	-	-
Sb	-	-	-	-	0.50	-
Cs	-	0.62	-	-	**0.71**	0.42
Ba	-	-	-	-	0.60	0.62
La	-	**0.95**	-	-	0.67	0.68
Ce	-	**0.97**	-	-	0.64	0.66
Pr	-	**0.95**	-	-	0.59	**0.70**
Nd	-	**0.97**	-	-	0.58	0.63
Sm	-	**0.82**	-	-	0.47	0.65
Eu	-	**0.93**	-	-	0.60	**0.72**
Gd	-	**0.90**	-	-	0.60	**0.74**
Tb	-	**0.90**	-	-	0.53	0.62
Dy	-	**0.92**	-	-	0.54	0.67
Ho	-	**0.84**	-	-	0.58	0.68
Er	-	**0.86**	-	-	0.57	0.68
Tm	-	**0.93**	-	-	0.64	0.61
Yb	-	**0.91**	-	-	0.52	**0.70**
Lu	-	**0.85**	-	-	0.59	0.67
Hf	-	**0.85**	-	-	**0.77**	0.68
W	-	**0.76**	-	-	-	-
Tl	-	-	-	-	0.36	-
Pb	-	-	-	-	-	-
Th	-	**0.71**	-	-	**0.84**	0.67
U	-	**0.94**	-	-	0.47	0.48

Table S5. Areal (land surface - normalized) pools of elements in peat porewater of the active layer (thawed 0-30 cm) and the permafrost ice (frozen 30-130 cm) in three study sites (5 peat cores) of western Siberia.

		Khanymey, Northern taiga				**Nadym, Forest tundra**				**Tazovsky, Southern tundra**			
		3kDa-0.45 µm		**<3kDa**		**3kDa-0.45 µm**		**<3kDa**		**3kDa-0.45 µm**		**<3kDa**	
Elements		**thawed**	**frozen**	**thawed**	**frozen**	**thawed**	**frozen**	**thawed**	**frozen**	**thawed**	**frozen**	**thawed**	**frozen**
C	g m^{-2}	14	208	5.3	301	25	82	15	100	8.3	200	4.7	732
Cl	g m^{-2}	0.2	0.5	0.4	0.8	0.1	0.09	0.3	0.6	0.01	0.2	0.2	0.6
SO_4^{2-}	g m^{-2}	0.06	2	0.4	2.3	0.08	0.3	0.3	0.3	0.05	0.6	0.2	15

Li	mg m^{2}	0.01	0.1	0.09	2.7	0.02	0.1	0.2	1	0.01	0.3	0.1	7.2
Be	µg m^{2}	1.6	9.7	1.2	30	3.8	17	7.7	14	4.5	23	4.6	77
Na	g m^{-2}	0.1	0.2	0.5	2.5	0.1	0.1	0.6	1.2	0.03	0.04	0.2	1.8
Mg	g m^{-2}	0.03	0.1	0.03	0.9	0.02	0.2	0.08	1.4	0.02	0.2	0.05	4.9
Al	g m^{-2}	0.05	0.3	0.01	1	0.08	0.4	0.06	0.09	0.08	0.3	0.04	0.9
Si	g m^{-2}	0.06	0.5	0.2	2.6	0.2	0.4	1.4	3.2	0.07	0.3	0.4	3.5
P	g m^{-2}	0.02	0.3	0.03	1.3	0.05	0.2	0.1	0.07	0.02	0.3	0.03	1.4
K	g m^{-2}	0.05	0.1	0.1	1.2	0.07	0.1	0.4	0.6	0.03	0.06	0.1	1.5
Ca	g m^{-2}	0.1	0.6	0.1	2.6	0.2	1.2	0.6	5.8	0.2	4	0.2	35
Ti	mg m^{-2}	0.8	4.8	0.05	1.2	1.4	6.1	0.2	0.4	1.1	3.5	0.1	3.3
V	mg m^{-2}	0.1	0.4	0.06	1.4	0.3	1.2	0.4	2.4	0.2	1.3	0.2	5.8
Cr	mg m^{-2}	0.08	0.4	0.1	0.6	0.2	0.6	0.1	0.3	0.09	0.3	0.07	1.1
Mn	mg m^{-2}	0.4	2	0.2	12	1.5	23	5.8	133	0.9	18	1.3	418
Fe	g m^{-2}	0.05	0.3	0.01	1.4	0.2	0.6	0.4	0.5	0.07	0.5	0.02	2.3
Co	mg m^{-2}	0.02	0.1	0.02	0.9	0.1	0.4	0.5	0.8	0.06	0.7	0.09	6.9
Ni	mg m^{-2}	0.04	0.1	0.1	3.8	0.2	1.1	0.9	2.6	0.05	1	0.3	13
Zn	g m^{-2}	0.03	0.1	0.02	0.5	0.05	0.04	0.09	0.07	0.01	0.07	0.01	0.9
Ga	µg m^{-2}	17	50	2.4	121	14	61	6.8	13	17	57	2.9	113
Ge	µg m^{-2}	0.4	3	1.1	8.5	1.2	5.5	2.4	16	1	6.4	1.7	13
As	mg m^{-2}	0.05	0.2	0.2	1.8	0.09	0.7	0.6	11	0.03	0.2	0.1	7.8
Rb	mg m^{-2}	0.06	0.5	0.1	5.2	0.2	0.5	0.9	2.4	0.06	0.3	0.1	13.3
Sr	mg m^{2}	1.2	5.1	0.8	23	1.7	7.8	4.9	37	1.1	14	1.5	182
Y	mg m^{2}	0.03	0.05	0.003	0.05	0.07	0.4	0.05	0.4	0.2	0.3	0.09	0.8
Zr	mg m^{2}	0.05	0.3	0.001	0.1	0.1	0.7	0.03	0.1	0.1	0.9	0.02	0.9
Nb	µg m^{-2}	4.5	24	0.2	8.4	6.8	33	1.3	5	4.7	28	0.8	44
Mo	µg m^{-2}	8.4	21	3.6	22	10	56	11	85	11	68	9.8	346
Cd	µg m^{-2}	6	25	4.1	97	5.5	9.0	15	9.1	3.6	35	3.7	228
Sn	µg m^{-2}	84	29	28	35	8.4	11	2.4	12	1.2	38	3.1	25
Sb	µg m^{-2}	6.1	12	11	55	5.2	7.7	16	63	3.6	23	15	135
Cs	µg m^{-2}	2.3	29	2.1	313	5.7	19	21	26	2.5	8.6	2.1	110
Ba	mg m^{-2}	30	30	10	96	28	24	36	53	9.9	27	7.7	178
La	µg m^{-2}	23	66	2	32	47	337	21	164	180	237	46	318
Ce	mg m^{-2}	0.04	0.1	0.005	0.07	0.1	0.7	0.06	0.5	0.3	0.5	0.1	0.8
Pr	µg m^{-2}	4.1	12	0.6	8.7	13	94	8.1	63	37	62	14	115
Nd	µg m^{-2}	16	43	2.8	38	50	392	40	294	151	265	60	536
Sm	µg m^{-2}	4.4	11	0.7	10	25	111	19	84	35	59	14	123
Eu	µg m^{-2}	3.2	4.6	1	9.7	4.7	22	4.5	18	9.5	17	3.7	42
Gd	µg m^{-2}	4.9	10	0.7	8.7	14	89	9.7	68	39	61	16	130
Tb	µg m^{-2}	0.8	1.5	0.07	1.2	2.1	13	1.2	9	6.1	9.2	2.2	18
Dy	µg m^{-2}	4.9	8.9	0.4	7.4	14	77	7.9	56	34	59	12	114
Ho	µg m^{-2}	0.9	2.1	0.09	1.5	2.8	15	1.7	12	5.7	9.8	2.8	26
Er	µg m^{-2}	2.5	5.9	0.5	4.4	7.2	44	6.5	37	17	35	8.1	84
Tm	µg m^{-2}	0.3	1.4	0.07	0.6	1.3	6.6	0.9	5.9	2.1	5.1	1.1	13
Yb	µg m^{-2}	1.9	5.8	0.3	5.3	8.3	45	6.7	43	13	33	7.1	93
Lu	µg m^{-2}	0.2	1.3	0.1	0.6	1.3	6.8	1.2	7.1	1.7	6.1	1.2	15
Hf	µg m^{-2}	1.8	13	0.2	6.8	4.0	27	1.9	6.2	3.4	32	0.9	39
W	µg m^{-2}	9.4	43	5.3	18	5.1	17	3.3	4.8	10	47	3.8	26
Tl	µg m^{-2}	0.9	2.6	1	27	1.1	2.9	6.4	12	0.5	2.7	0.9	24
Pb	mg m^{-2}	0.1	0.3	0.02	0.3	0.1	0.1	0.05	0.1	0.06	0.2	0.03	0.7
Th	µg m^{-2}	7	45	0.4	7.2	17	63	2.7	7	57	51	13	19
U	µg m^{-2}	2.3	12	0.3	7.2	3.3	21	0.5	2.3	17	65	6.6	88