Supplementary Material for

Reconstructing permafrost sedimentological characteristics and post-depositional processes of the Yedoma stratotype Duvanny Yar, Siberia

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Denis Shmelev[1*], Maria Cherbunina[2], Victor Rogov[3], Sophie Opfergelt[4], Arthur Monhonval[4], and Jens Strauss[5]

[1]Institute of Physicochemical and Biological Problems in Soil Science, Russian Academy of Sciences, Pushchino, Russia;

[2]Geology Department, Lomonosov Moscow State University, Moscow, Russia;

[3]Geography Department, Lomonosov Moscow State University, Moscow, Russia;

[4]Earth and Life Institute, Université catholique de Louvain, Louvain-la-Neuve, Belgium

[5]Permafrost Research Section, Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research, Potsdam, Germany

Supplementary Figure

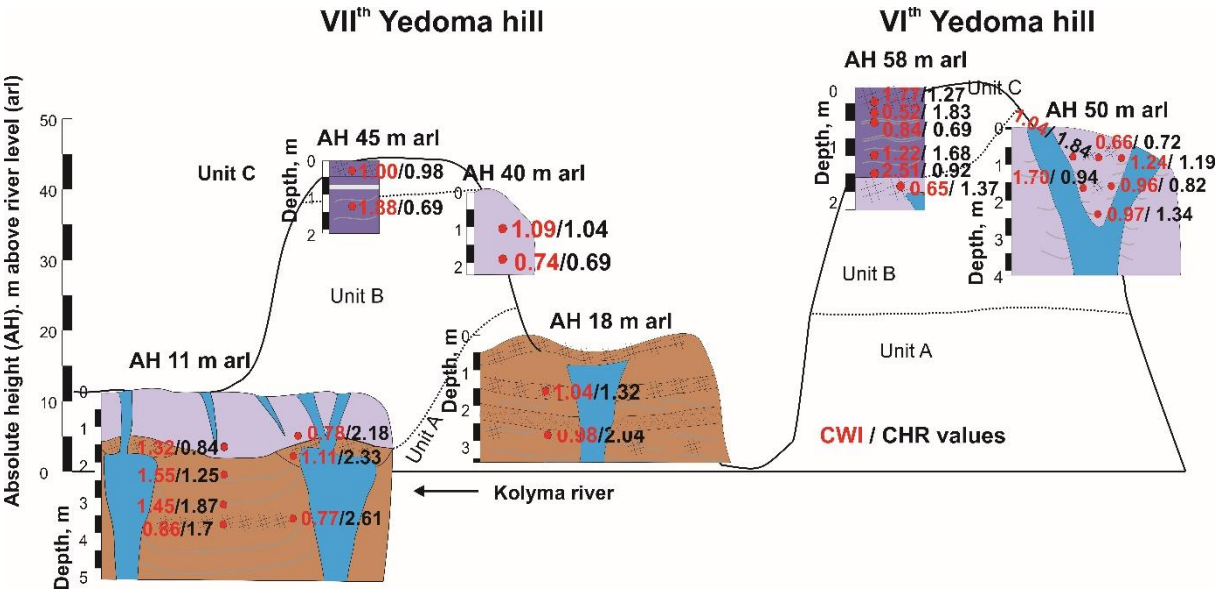

Figure S1. Sketch of Duvanny Yar according to Figure 3, but with details on the sampling positions (proximity to ice wedges). The colored sketcher are not to scale, thus the absolute height (AH) of the top of each sampled profile is given. The CWI values are given in red, the CHR in black numbers.

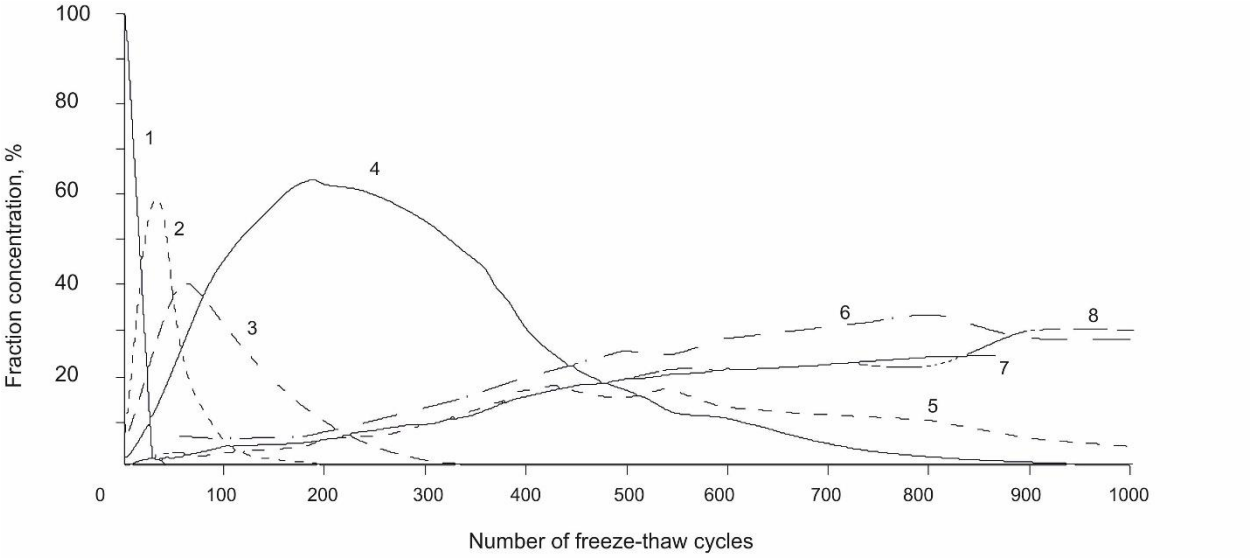

Figure S2. The change in the grain-size composition of granite fragments (size fragments is 10 mm) after of the numerous freezing-thawing cycles. Fraction sizes: 1: 1-10 mm; 2: 10-5 mm; 3: 5-3 mm; 4: 3-1 mm; 5: 1-0,5 mm; 6: 0,5-0,25 mm; 7: 0,25-0,1 mm; 8 – less than 0.1 mm (Voronkov and Ushakova, 1966)

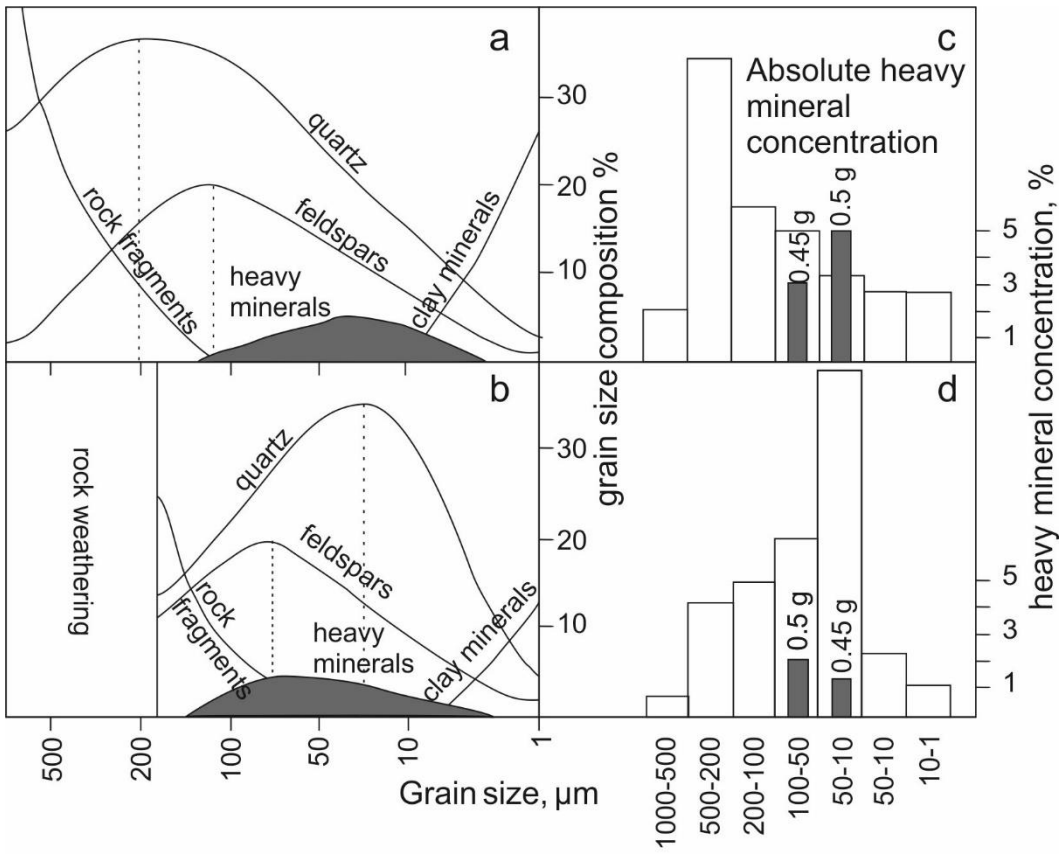

Figure S3. Reconstruction of the distribution of the main mineralogical parameters by the grain-size fraction spectrum during the cryogenic weathering (Konishchev, 1981). a: qualitative scheme for distribution of the contents of the main mineral components by grain-size fraction for the source rock, b: qualitative scheme for distribution of the main mineral components after cryogenic weathering. c: quantitative scheme for the source rock with a sedimentogenic type of distribution of the heavy fraction; d: quantitative scheme for deposits after cryogenic weathering with hypergenic type of heavy mineral distribution

Supplementary tables

Table S1. General site description of the studied sites

NO. IN FIGURE 1	SITE	LATITUDE	LONGITUDE	ABSOLUTE ALTITUDE	SAMPLE DEPTHS	SITE DESCRIPTION	SAMPLE DESCRIPTION	SAMPLES	REMARKS
1	Malchikovskaya channel	68.5167	161.4333	10m	10, 20, 40, 60 cm	Kolyma floodplain under wet low shrubs and forbs	Upper 10 cm - vegetable soil and plant tow, below - turf and loam with turf.	Malch 20, Malch 45, Malch 60	R20 CALM site
2	Lake Akhmelo	68.8333	161.0333	10m	10, 20, 50, 80 cm	Sandy plain with lakes under larch forest-tundra	Thawed silty and medium sand	Akhmelo 10, Akhmelo 20, Akhmelo 50, Akhmelo 80	R21 CALM site
3	Mouth of the Omolon	68.7333	158.9000	40m	20, 30, 40 cm	Larch forest at the Yedoma hill	Thawed water-saturated loam with organic	Omolon 20, Omolon 30, Omolon 40	R35 CALM site
4	Mt Rodinka, slope	68.7355	161.5575	274m	upper 0-10 cm	Bottom part of slope, Larch forest-tundra	Silty loam with gravel and boulders	Rodinka down	
5		68.7387	161.5588	308m	upper 0-10 cm	Middle part of slope, kurum (boulder river)	Silt with boulders	Rodinka middle	
6		68.7387	161.5607	349m	upper 0-10 cm	Top of mountain, center of boulder ring	Coarse sand with gravel and boulders	Rodinka top	
7	Duvanny Yar exposure	68.6301	159.1495	18m	12-13 m below edge of exposure	Lower part of exposure, lower than baidzerakhs	Unit A - ice-rich and organic rich silt, sandy layer	Duv 8, Duv 10,	7th Yedoma hill
8		68.6295	159.1520	45m	0-3 m below edge of exposure	Upper edge of exposure. Yedoma surface under larch forest	Unit C. Active and cover layer. Ice-rich loam.	Duv 12, Duv 15	7th Yedoma hill
9		68.6296	159.1521	40m	7-9 m below edge of exposure	baidzerakh and MIS-3 buried soil	Unit B. Ice-poor silt with roots	Duv 16, Duv 17,	7th Yedoma hill
10		68.6313	159.0937	58m	0-1,5 m below edge of exposure	Upper edge of exposure. Yedoma surface under larch forest	Unit C. Active and cover layer. Ice-rich loam.	Duv 25, Duv 28	6th Yedoma hill
11		68.6318	159.0960	50m	5-5,5 m below edge of exposure	baidzerakh remnants above 20 m at Kolyma level/ thin ice wedges	Unit B. Ice-poor silt with roots	Duv 31, Duv 36	6th Yedoma hill
12		68.6296	159.1700	11m	4,5-8,0 m below edge of exposure	Low-center polygon deposit, mineral part between ice wedges	Unit A (ice and organic-rich silt) and Unit B (ice-poor silt)	Duv 18 - Duv 24	7th Yedoma hill

Table S2. Data summary table.

NO. IN FIGURE 1	SITE	SAMPLE NAME	SAMPLE DEPTH [cm]	CATEGORIE/UNIT	CLOSE TO ICE WEDGE	CWI	CHR	GRAIN SIZE MEAN [μm]	SORTING	ROUNDNESS, MEAN VALUE
1	Malchikovskaya channel	malch 10	10	active layer	na	0.70	na	**missing**		na
1	Malchikovskaya channel	malch 20	20	active layer	na	1.05	na	19.59	3.171	na
1	Malchikovskaya channel	malch 45	40	active layer	na	0.55	na	10.19	3.400	na
1	Malchikovskaya channel	malch 60	60	active layer	na	1.23	na	13.82	3.455	na
2	Lake Akhmelo	akhmelo 10	10	active layer	na	1.39	na	104.8	2.910	na
2	Lake Akhmelo	allhmelo 20	20	active layer	na	1.35	na	134.5	1.633	na
2	Lake Akhmelo	akhmelo 50	50	active layer	na	0.90	na	92.63	2.884	na
2	Lake Akhmelo	akhmelo 80	80	active layer	na	0.47	na	68.29	4.301	na
3	Mouth of the Omolon River	omolon 20	20	active layer	na	0.44	0.89	19.12	4.038	na
3	Mouth of the Omolon River	omolon 30	30	active layer	na	1.12	1.25	23.51	3.941	na
3	Mouth of the Omolon River	omolon 40	40	active layer	na	0.70	1.34	19.68	3.277	na
4	Mt Rodinka, downslope	Rodinka down	5	active layer	na	0.45	2.76	19.60	3.357	na
5	Mt Rodinka, midldle	Rodinka middle	5	active layer	na	1.61	1.63	16.79	3.928	na
6	Mt Rodinka, ridge	Rodinka up	5	active layer	na	0.59	1.14	196.6	8.820	na
7	Duvanny Yar exposure	Duv8-2	**110**	A	3-5 m from ice wedge	1.05	1.32	27.94	2.579	2,46
7	Duvanny Yar exposure	Duv10-2	**200**	A	3-5 m from ice wedge	0.98	2.04	29.16	2.510	1,79
8	Duvanny Yar exposure	Duv12-2	**50**	C	na	1.00	0.98	21.09	3.737	na
8	Duvanny Yar exposure	Duv15-2	**115**	C	na	1.88	0.69	12.41	3.024	2.58
9	Duvanny Yar exposure	Duv16-2	**500**	B	no (baydzerakh)	1.09	1.04	32.05	2.651	2.08
9	Duvanny Yar exposure	Duv17-2	**550**	B	no (baydzerakh)	0.74	0.69	30.36	2.783	na
9	Duvanny Yar exposure	Duv18-2	**500**	B	5-6 m from ice wedge	1.32	0.84	35.24	2.519	2.3
10	Duvanny Yar exposure	Duv19-2	**500**	A	above head of ice wedge	0.78	2.18	20.66	3.621	na
10	Duvanny Yar exposure	Duv20-2	**570**	A	5-6 m from ice wedge, center of mineral block	1.55	1.25	15.31	3.500	1.92
10	Duvanny Yar exposure	Duv21-2	**630**	A	5-6 m from ice wedge, center of mineral block	1.45	1.86	16.59	3.521	2.00
10	Duvanny Yar exposure	Duv22-2	**700**	A	5-6 m from ice wedge, center of mineral block	0.86	1.71	20.18	3.147	na
10	Duvanny Yar exposure	Duv23-2	**600**	A	close to ice wedge (0,5-1,0 m)	1.11	2.33	20.36	3.797	na
10	Duvanny Yar exposure	Duv24-2	**800**	A	close to ice wedge (2,0 m)	0.77	2.61	20.21	2.616	na
11	Duvanny Yar exposure	Duv25-2	**50**	C	na	1.78	1.28	21.29	4.111	2.25
11	Duvanny Yar exposure	Duv26-2	**70**	C	na	0.52	1.83			na
11	Duvanny Yar exposure	Duv27-2	**85**	C	na	0.84	0.69			na
11	Duvanny Yar exposure	Duv28-2	**140**	C	na	1.22	1.68	25.93	3.469	na
11	Duvanny Yar exposure	Duv29-2	**190**	C	na	2.51	0.92			na
12	Duvanny Yar exposure	Duv30-2	**250**	B	above head of ice wedge	0.64	1.37	21.11	3.358	1.85

12	Duvanny Yar exposure	Duv31-2	**420**	B	between ice wedges (close to ice wedges, 0,5-1,0 m)	0.97	1.34	29.13	2.535	na
12	Duvanny Yar exposure	Duv32-2	**380**	B	close to ice wedges (0,5-1,0 m)	0.96	0.94	36.42	2.315	na
12	Duvanny Yar exposure	Duv33-2	**380**	B	close to ice wedges (0,5-1,0 m)	1.70	0.82	35.28	2.398	2.15
12	Duvanny Yar exposure	Duv34-2	**300**	B	close to ice wedge (0,5-1,0 m)	1.05	1.84	27.06	2.840	no
12	Duvanny Yar exposure	Duv35-2	**300**	B	between ice wedges (1,5-2,0 m from ice wedges)	0.66	0.72	29.93	2.609	2.45
12	Duvanny Yar exposure	Duv36-2	**300**	B	close to ice wedge (0,5-1,0 m)	1.24	1.19	31.78	2.473	2.19

Table S3. Temperature conditions of cryogenic weathering in the active layer in northeast Yakutia according to Shmelev, 2015, $T_{m.an}$: mean annual temperature of the day surface of soils, °C;
τ_{col}: duration of the cold period with mean diurnal temperature of the day surface of soils less than 0 °C, day;
A_{max}: maximum range of temperature on the day surface of soils, recorded in the observation period, °C;
$T_{.av.m}$: annual (within the observation period) average monthly temperatures of the most warmest and coldest months, °C;
μ_{ef}: number of effective freeze/thaw cycles on the day surface of soils (from -2 C to + 2 C);
μ: transitions across 0 °C threshold;
ALB: bottom of the active layer

Study area	**Years of observations**	**Characteristics of the daylight surface of soils**				**μ_{ef}**	**μ**		
		$T_{m.an.}$	**$\tau_{col.}$**	**A_{max}**	**$T_{av.m.}$**		**0 cm**	**20 cm**	**ALB**
Bykovsky (Yedoma, tundra)	2008–2011	–9.5	250	58.1	+6.5 (July)/–23.8 (Feb.)	5	22	2	3
Bykovsky (alas, tundra)	2009–2010	–9.4	254	39.8	+8.3 (July)/–22.6 (Feb.)	3	4	1	1
Allaikha (Yedoma, tundra)	2008–2013	–9.3	246	66.3	+9.6 (July)/–25.3 (Feb.)	5	32	3	4
Omolon mouth (Yedoma, forest)	2008–2010; 2012–2013	–3.4	233	40	+7.0 (July)/–14.9 (Feb.)	5	15	8	14
Akhmelo (tundra)	2012–2013	–5.3	246	43.6	+8.8 (July)/–23.3 (Feb.)	5	14	2	1
Chukochi Cape (Yedoma, tundra)	2006–2010	–8.8	250	60.6	+5.8 (July)/–23.9 (March)	3	31	6	3

Supplementary references

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