Table S1. Studied ice wedges.

Photograph	**Ice-wedge features**
Ice wedge B17-IW1 **Batagay megaslump – lower sand unit**	
	Width: ~0,5 m Visible vertical extension: ~1 m Colour: dirty grey Ice veins: partly detectable, width up to 1 cm Sediment content: very little to little Organic content: very little Bubble content: very high; very small bubbles (<0.5 mm); often rather cloudy; following the ice veins Remarks: truncated; upper left part partly degraded → shoulder + pool ice

Ice wedge B17-IW6

Batagay megaslump – upper Ice Complex

Width: ~0.5 m
Visible vertical extension: ~ 1.5 m
Colour: grey
Ice veins: clearly detectable, up to 1 cm wide
Sediment content: high (sandy ice wedge)
Organic content: very little
Bubble content: very little to medium; some spherical bubbles up to 2 mm in diameter; some elongated bubbles up to 2 cm long and 1-2 mm in diameter; very small bubbles in centre of veins

Ice wedge B17-IW5

Batagay megaslump – upper Ice Complex

Width: ~1.6 m
Visible vertical extension: > 5 m
Colour: clear, grey ice
Ice veins: clearly detectable, partly with sediment inclusions, about 1 cm wide
Sediment content: little to medium
Organic content: very little
Bubble content: medium to high; spherical bubbles 2-3 mm in diameter, elongated bubbles up to 1 cm long and 1-2 mm in diameter; very small cloud-like bubbles in centre of veins
Remarks: none

Composite wedges B17-IW2 (left) and B17-IW3 (right)

Batagay megaslump – upper sand unit

Width: 0.2-0.3 m (left) and 0.2m (right), respectively

Visible vertical extension: ~3m

Colour: grey

Ice veins: partly detectable; up to 0.5-1 cm wide, very thin sand veins

Sediment content: high to very high (composite wedges)

Organic content: not detectable

Bubble content: very little; very small bubbles

Remarks: truncated; both wedges unite downwards into one wedge.

Ice wedge B17-IW4 (Batagay megaslump – upper sand)

Width: ~0.4 m

Visible vertical extension: ~2 m

Colour: grey

Ice veins: clearly detectable, partly with sediment in the centre, width 0.5-1 cm; very thin sand veins

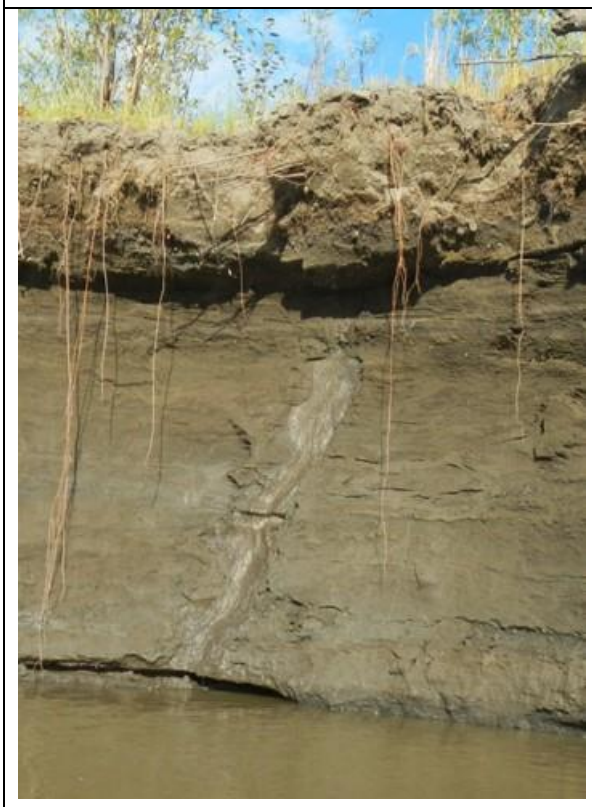
Sediment content: little to medium

Organic content: very little

Bubble content: medium to high; elongated bubbles up to 2 cm long and about 1mm in diameter; very small bubbles in centres of ice veins

Remarks: cut ~45° to growth direction

Ice wedge A17-IW3 (Adycha river – Late Holocene river bank)



Width: ~0.3 m

Visible vertical extension: ~3m

Colour: milky white

Ice veins: clearly detectable, up to 1 cm wide

Sediment content: little

Organic content: little

Bubble content: very high; some spherical bubbles up to 1 mm in diameter; many small, partly elongated bubbles along ice veins

Remarks: Cut about 45° to growth direction

Table S2. Stable isotope data of Marine Isotope Stage 3 ice wedges in northeastern Siberia showing mean values of $\delta^{18}O$, δD and d excess and respective standard deviations.

Site ID.	Site	°N	°E	Age [ka ^{14}C BP]	$\delta^{18}O$ [‰]	δD [‰]	d excess [‰]	N	Reference	profile ID
1	Western Laptev Sea, Mamontov Klyk	73.6	117.1	27.2	-30.5±0.7	-241.5±6.2	2.2±0.6	4	Magens (2005)	MAK-IW-18
2	Lena Delta, Nagym	72.9	123.2	>54.5 to 44.2	-29.3±0.3	-228.2±3.1	5.8±0.9	12	Schirrmeister et al. (2003)	Nag6-20-I
3	Lena Delta, Khardang	73.0	124.2	>52.1 to 28.1	-30.1±1.3	-239.3±9.0	1.6±2.2	10	Schirrmeister et al. (2011)	Kha-3-I
4	Lena Delta, Kurungnakh	72.3	126.3	41.3 to 31.9	-31.8±0.5	-248.3±3.2	5.8±0.5	7	Wetterich et al. (2008)	Bkh IW II
5	Lena Delta, Sobo Sise	72.5	128.3	47.7 to 26.9	-29.7±1.1	-230.7±8.7	7.2±0.9	16	Opel (unpublished)	SOB14-IW3
6	Central Laptev Sea, Bykovsky	72.0	129.3	50 to 30	-30.4±1.6	-239.6±11.9	3.7±1.5	48	Meyer et al. (2002)	MKh 3, upper horizontal transect
7	Central Laptev Sea, Muostakh	71.6	130.0	46.8 to 28.3	-32.6±07	-256.2±5.8	4.9±0.2	37	Meyer/Opel (unpublished)	MUO12-IW8
8	Central Laptev Sea, Buor Khaya	71.6	132.2	>48.0 to 30.1	-31.3±0.9	-245.8±5.9	4.6±0.7	20	Schirrmeister et al. (2017)	Buo-04
9	New Siberian Islands, Belkovsky	75.4	135.6	47.7 to >39.8	-31.3±0.3	-243.9±3.4	6.6±0.9	20	Schirrmeister (unpublished)	BEL-IW-1
10	New Siberian Islands, Stolbovoy	74.1	136.1	>50.0 to >40.8	-31.8±0.3	-249.5±2.5	4.7±0.6	14	Schirrmeister (unpublished)	STO-IW-1
11	New Siberian Islands, Kotel'ny	74.7	138.5	52.8 to 35.4	-29.8±1.0	-232.4±9.7	5.6±2.5	17	Schirrmeister (unpublished)	KYS-IW-1
12	New Siberian Islands, Bol'shoy Lyakhovsky	73.3	141.5	53.8 to 29.0	-31.0±0.4	-242.8±3.9	5.4±1.2	25	Wetterich et al. (2014)	L7-18
13	Dmitry Laptev Strait, Oyogos Yar	72.7	143.5	48.5 to 32.2	-31.5±0.6	-246.7±4.1	5.2±1.0	34	Opel et al. (2017)	Oy7-08 IW1
14	New Siberian Islands, Novaya Sibir	75.1	146.7	>51.7 to >38.3	-33.5±0.6	-260.7±6.2	7.0±1.4	5	Schirrmeister (unpublished)	NSI-IW-4
15	Lower Kolyma, Duvanny Yar	68.6	159.1	>46.7 to 32.2	-32.6±1.00	-256.9±9.9	3.7±2.0	9	Strauss (2010)	DY-01, DY-05
16	Yana Highlands,	67.6	134.8	47.6 to 24.9	-34.9±0.9	-271.0±6.4	8.1±0.9	12	this study	B17-IW5

	Batagay									
16	Yana Highlands, Batagay	67.6	134.8	undated	-35.7	-276.0	9.2	59	Vasil'chuk et al. (2017)	IW no. 2
17	Central Yakutia Aldan River, Tanda	63.3	131.7	undated	-30.5±0.3	-234.4±2.6	9.5±0.5	10	Schirrmeister (unpublished)	Tan-I
18	Central Yakutia, Aldan River, Mamontova Gora	63.0	134.0	46.7 to 34.0	-30.5±0.6	-236.6±4.8	7.6±0.6	18	Popp et al. (2006)	MGO-I

Figure S1. Erosional contact between lower Ice Complex and lower sand.

Figure S2. Transition of lower sand unit to upper Ice Complex showing different kinds of ice-wedge toes.

Figure S3. Transition from upper Ice Complex to upper sand showing the upward tapering of the wide syngenetic ice wedges, the subvertical and downslope orientation of the narrow syngenetic composite wedges, as well as complexity of wedge shoulders, thaw unconformities and narrowing ice wedges.

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