



Supplement of

Molecular biomarkers in Batagay megaslump permafrost deposits reveal clear differences in organic matter preservation between glacial and interglacial periods

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Figure S1. Biochemical parameters along the main headwall (profile 1 and 2). Depth in metres measured from top of the headwall. Upper row: total organic carbon (TOC) content, carbon to nitrogen ratio (C/N), concentration of short-chain (*n*-C₁₇ to *n*-C₁₉) *n*-3 alkanes, long-chain (*n*-C₂₀ to *n*-C₃₃) *n*-alkanes, and other alkanes (branched and cyclic alkanes). Bottom row: *n*-alkane proxy average chain length (ACL), concentration of short-chain (*n*-C₁₂ to *n*-C₁₉) *n*-fatty acids (*n*-FAs), and long-chain (*n*-C₂₀ to *n*-C₃₄) *n*-FAs, ratio of *iso* and *anteiso*-branched FA C₁₅ and C₁₇ relative to long-chain *n*-FAs (IA index) and higher-plant fatty-acid (HPFA) index. Stratigraphic units: 1. lower ice complex, 2. lower sand unit, 3. woody layer, 4. upper ice complex and 5. Holocene cover. Grey dots: selected samples for NSO separation. Ice wedge presence is indicated by the blue-grey bar.



Figure S2. Alkane distribution of sediment samples of the main headwall (profile 1 and 2). Depth in metres measured from top of the headwall indicated above graphs, corresponding to stratigraphic units (see Figure S1): 1. 53.1-52.0 m, 2. 51.5-33.5 m, 3. 31.7 m, 4. 30.7-4.2 m and 5. 2.0-0.2 m. Alkane chain length is shown on the x-axis; odd *n*-alkanes are indicated with ticks. Concentrations on the y-axis are expressed in μg g⁻¹ TOC.



Figure S2 (continuation). Alkane distribution of sediment samples of the main headwall (profile 1 and 2). Depth in metres measured from top of the headwall indicated above graphs, corresponding to stratigraphic units (see Figure S1): 1. 53.1-52.0 m, 2. 51.5-33.5 m, 3. 31.7 m, 4. 30.7-4.2 m and 5. 2.0-0.2 m. Alkane chain length is shown on the x-axis; odd *n*-alkanes are indicated with ticks. Concentrations on the y-axis are expressed in μ g g⁻¹ TOC.



Figure S3. Fatty acid distribution of selected sediment samples of the main headwall (profile 1 and 2). Depth in metres measured from top of the headwall indicated above graphs, corresponding to stratigraphical units (see Figure S1): 1. 52.0 m, 2. 49.4-38.4 m, 3. 31.7 m and 4. 26.4-4.2. Fatty acid chain length is shown on the x-axis; even n-fatty acids are indicated with ticks. Concentrations on the y-axis are expressed in µg g⁻¹ TOC.

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Figure S4. Total ion current of the sterols and triterpenoids found in the sediments at 31.7 m bs (profile 1). * indicates *n*-alcohols (*n*-C₂₈, *n*-C₂₉, *n*-C₃₀ and *n*-C₃₂). Numbered peaks are identified in Table 1.





Table S1. Correlation coefficient for alkane concentrations. P-values < 0.01 for all correlations.</th>

			diethylalkanes and
	alkylcyclopentanes	methylalkanes	ethyl-methylalkanes
alkylcyclohexanes	0.997	0.980	0.992
alkylcyclopentanes		0.974	0.986
methylalkanes	0.974		0.994

Table S2. Correlation coefficients between *n*-alkane proxies carbon preference index (CPI), average chain length (ACL) and35aquatic organic matter proxy Paq. P-values < 0.01 for all correlations.</td>

	ACL	Paq
CPI	0.74	-0.7
ACL		-0.94