

Supplementary Information for

**Precisely dated records of pre-aged terrestrial organic matter
release to the western Laptev Sea during the last deglaciation**

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Supplementary Figures 1 to 4

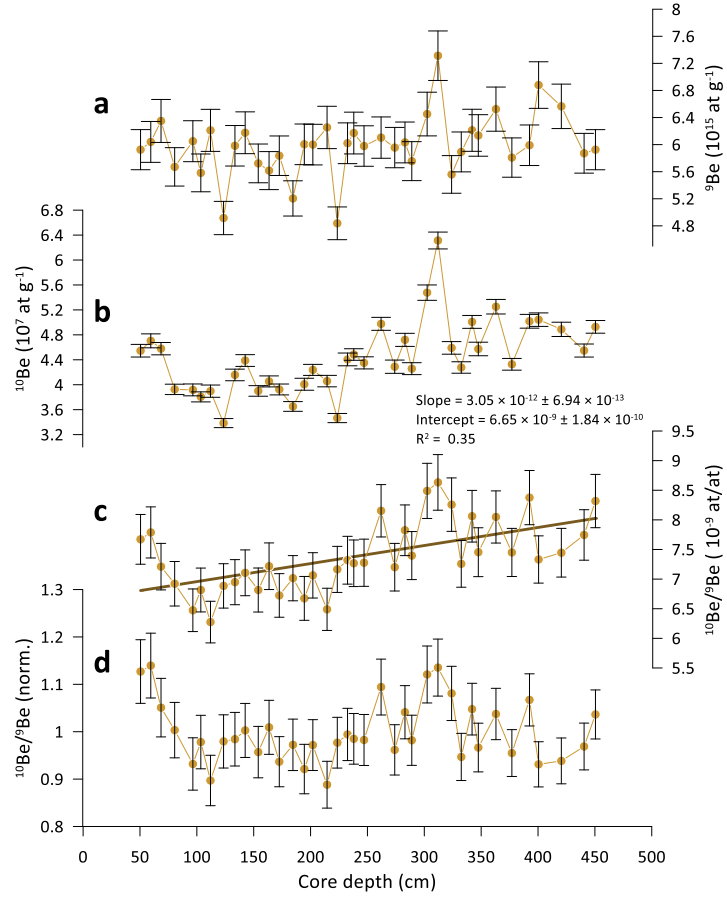


Figure S1. (a) Authigenic ^9Be and (b) authigenic ^{10}Be concentrations in core PS51/154. (c) $^{10}\text{Be}/^9\text{Be}$ ratios of core PS51/154, along with the linear regression trend. (d) Normalized $^{10}\text{Be}/^9\text{Be}$ ratios in core PS51/154 relative to the linear trend shown in panel c.

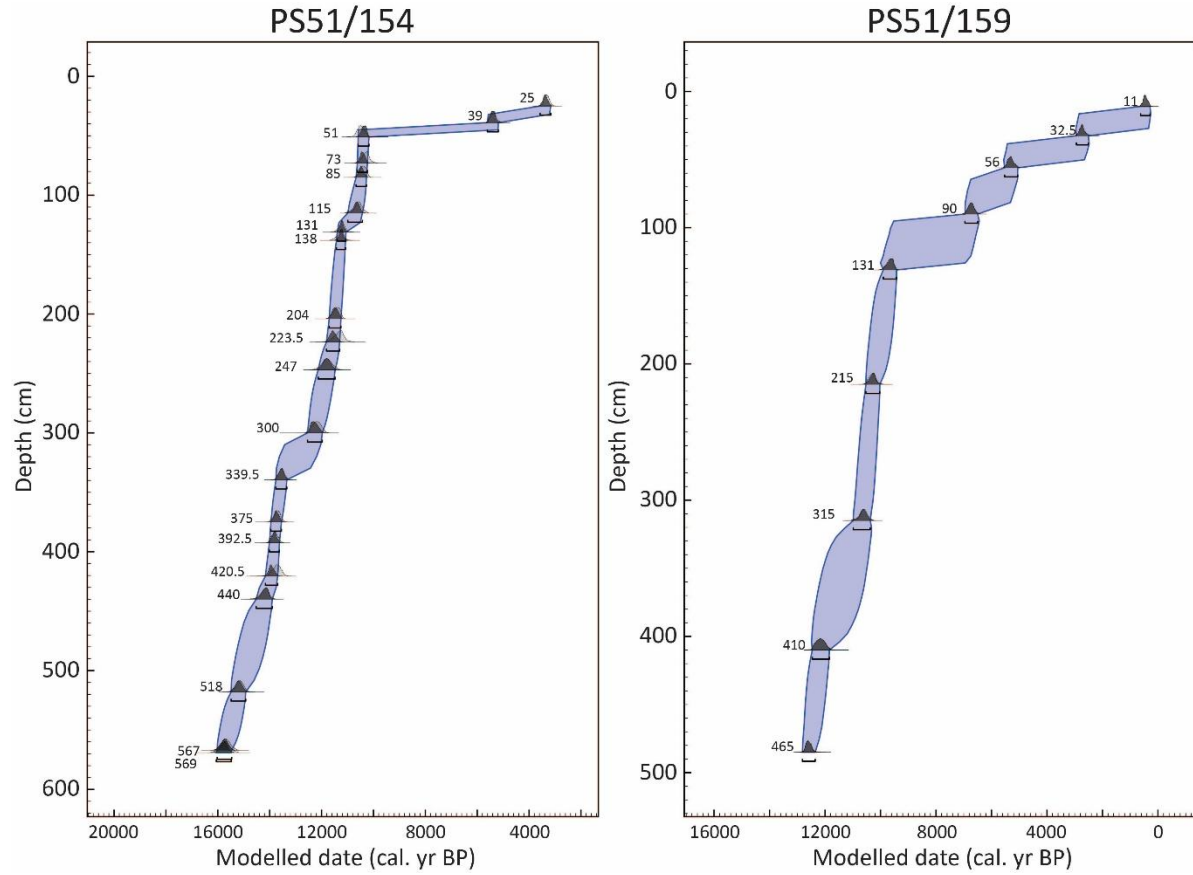


Figure S2. Age-depth models for cores PS51/154 and PS51/159, using the $^{10}\text{Be}/^9\text{Be}$ derived $\Delta R = -164 \pm 56$ yr. Radiocarbon age control points were adopted from Lin et al. (2025), with radiocarbon measurements published in previous studies (Bauch et al., 2001; Taldenkova et al., 2010; Hörner et al., 2016; Lin et al., 2025). Age models for both cores were constructed using OxCal 4.4 software (Bronk Ramsey, 2009), with the Marine20 calibration curve (Heaton et al., 2020). The numbers next to the age probabilities denote the average sample depths. Purple bands indicate the 95.4% age probability range. This figure was generated using OxCal 4.4 and subsequently modified.

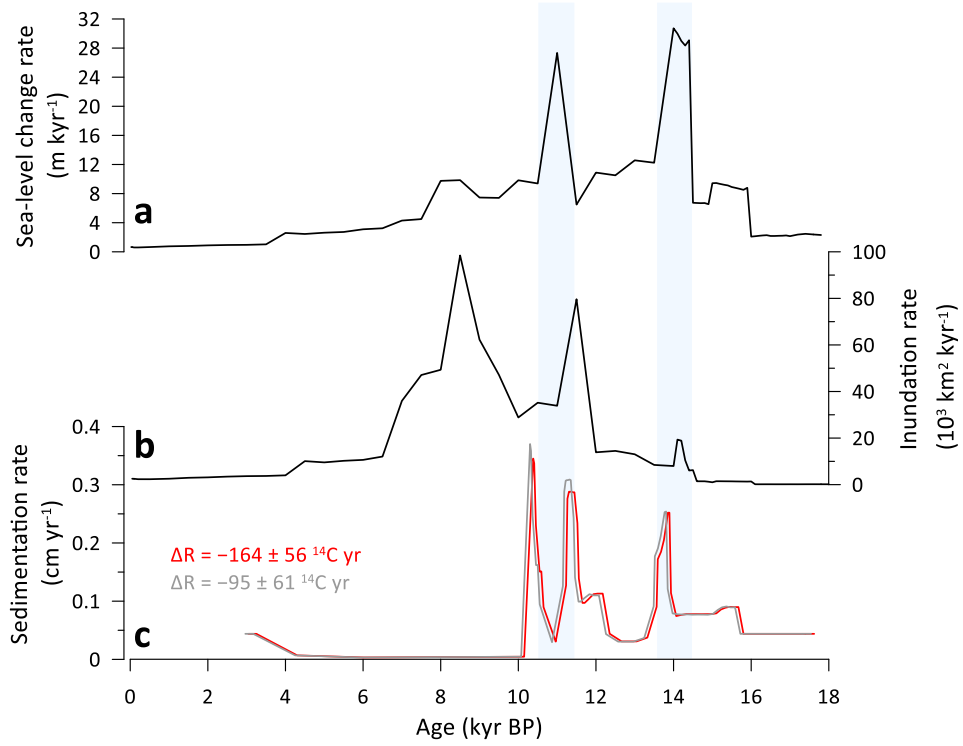


Figure S3. (a) Rate of sea-level change in the Laptev Sea during the last deglaciation and the Holocene (Klemann et al., 2015). (b) Inundation rate of the western Laptev Sea shelf, calculated from sea-level variation reconstructed by Klemann et al. (2015) and bathymetric data from the International Bathymetric Chart of the Arctic Ocean (IBCAO; Jakobsson et al., 2012). (c) Sedimentation rate changes in core PS51/154 based on different ΔR values, including the previously applied ΔR (gray) in Lin et al. (2025), and the updated ΔR derived from $^{10}\text{Be}/^9\text{Be}$ ratios (red).

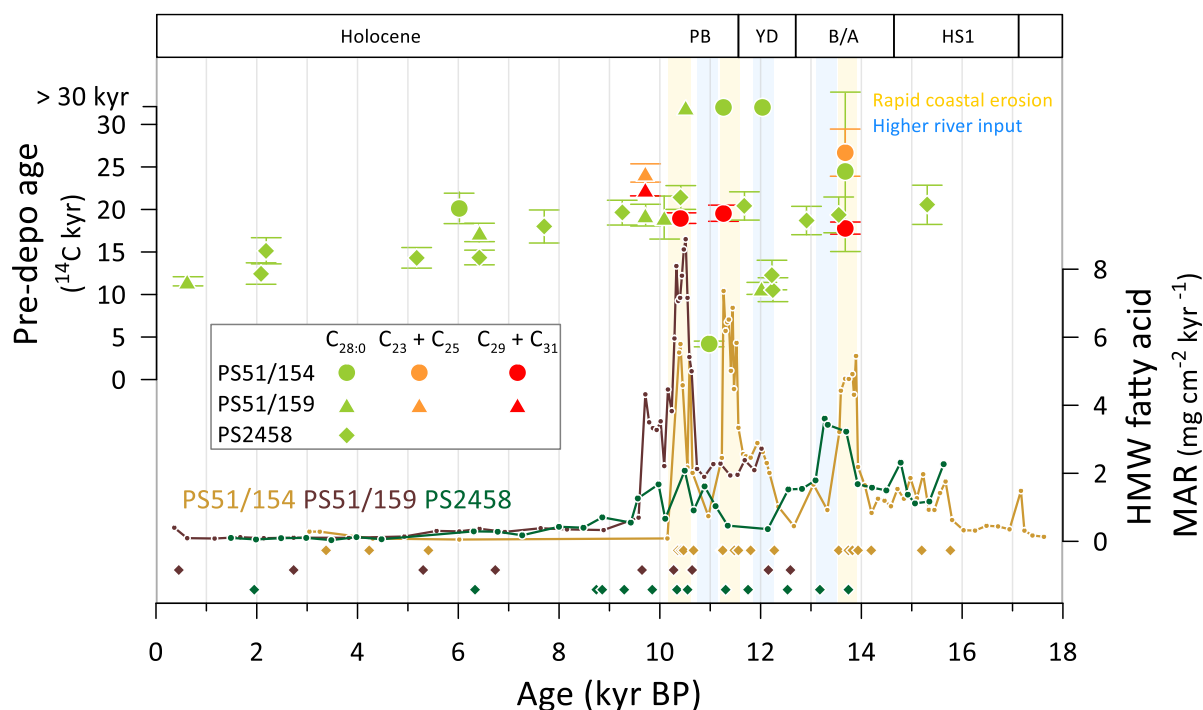


Figure S4. Comparison between HMW fatty acids ($\text{C}_{24:0} + \text{C}_{26:0} + \text{C}_{28:0} + \text{C}_{30:0}$) mass accumulation rates (MAR) and pre-depositional ^{14}C ages (pre-depo age) of $\text{C}_{28:0}$ fatty acids, $\text{C}_{23} + \text{C}_{25}$ *n*-alkanes, and $\text{C}_{29} + \text{C}_{31}$ *n*-alkanes in cores PS51/154 (light brown. Lin et al., 2025; this study), PS51/159 (dark brown. Lin et al., 2025; this study), and PS2458 (green. Nicolas et al., 2025). Blue bars indicate periods of enhanced river inputs in the western Laptev Sea shelf, recorded by river-affected (river-proximal and river-intermediate) benthic foraminifera in core PS51/154 (Taldenkova et al., 2012), and yellow bars highlight the peak periods of HMW fatty acids MAR in the western Laptev Sea. Dimond dots show the age-depth model control points from radiocarbon dating of cores PS51/154 (light brown) and PS51/159 (dark brown) (Bauch et al., 2001; Taldenkova et al., 2010; Hörner et al., 2016; Lin et al., 2025) as well as from core PS2458 (green. Nicolas et al., 2025). Acronyms denote different paleoclimate periods defined according to ages derived from the NGRIP $\delta^{18}\text{O}$ record: HS1: Heinrich Stadial 1, B/A: Bølling-Allerød, YD: Younger Dryas, PB: Preboreal (Rasmussen et al., 2006; Hodell et al., 2017).

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