APPENDIX

This appendix consists of a modern and glacial sample comparison (GC-FID; Fig.S2) with illustrative selected ion mode (SIM) chromatograms obtained from the GC-MS analyses executed for this study (Fig.S3-7). Supplemental figure 1 represents the model used to determine the age of both gas and liquid chromatography analysed samples.

Supplemental figure 2 represents instead the comparison between a paleo foraminifera sample from the last glacial maximum and the modern foraminifera sample also presented in figure 3. Both Holocene and glacial samples underwent the same treatment and GC-FID analysis (Fig.S2). According to the study of Auderset et al. (2022), this method is applicable to samples older than 50 million years. However, it must be considered that the amount of organic material inside the sample is a discriminating factor.

Supplemental figures 3 to 6 show replicates data used to calculate the 'average' chromatograms shown in figure 4. As represented in figures S3 to S6, no peaks related to alkyl lipids (m/z 85), TMS ethers (m/z 103) of fatty alcohols, TMS esters (m/z 117) of fatty acids or sterane derivatives (m/z 207) were detected. Considered together, our results suggest that lipids are not present inside FBOM.

Supplemental figure 7 shows an m/z 85 trace of a TLE from a representative marine sediment sample of the Brazilian Margin (GC 04) with the occurrence of some common n-alkyl lipid homologues. Although n-alkanes are supplied to marine sediments from both aquatic (shorter chains) and terrestrial sources (long chains), no aquatic n-alkanes were observed in FBOM (Fig.4). GC-MS analysis of GC 04 confirms that the absence of n-alkanes in our FBOM are unlikely to be related to instrument detection (Fig.S7). Whilst in the chromatogram of the Brazilian Margin sediment several peaks can be observed and they all appear in a schematic and periodic structure, in the FBOM chromatograms peaks are barely detectable or presented as individuals. If any alkyl lipids were present in the m/z 85 chromatograms, for example, we would have expected a disposition of peaks with the same structure as the one shown in supplemental figure 7. The instrument and the preparation procedure used for the ~5 g sediment sample collected from site GC 04 were the same used to analyse the FBOM samples presented in figure 3 and 4.

Fig.S1

Fig.S2

Fig.S3

Fig.S4

Fig.S5

Fig.S6

Fig.S7

Fig.S1 Age model for site 1088C, correlating G. bulloides δ18O from 1088C (A) with nearby dated ODP Site 1090 of Shuttleworth et al. (2021) (B). The result of the correlation is represented in red (B). The three sample depth intervals (0-1, 3-4 and 34-35 cm) are also shown. The age model for ODP Site 1088 is based on oxygen isotope (δ18O) stratigraphy, aligning the planktonic foraminifera species Globigerina bulloides δ18O record of Hoogakker et al. (2022) to that of the nearby ODP Site 1090 of Shuttleworth et al. (2021). For δ18O ~40 specimens of G. bulloides were picked from the >300 µm size

fraction and analysed using a VG Prism (isotope ratio mass spectrometer) at the Department of Earth Sciences (University of Oxford). Calibration was to Vienna Pee Dee Belemnite via NBS19 standards (precision 0.07 ‰). We used six age control points from ODP Site 1090 (4.0, 5.4, 7.0, 10.5, 12.8 and 17.7 ka) to linearly correlate depths in core ODP 1088C (6, 9, 14, 21, 25 and 30 cm). Holocene (interglacial) samples can be found in the top ~ 20 cm, with G. bulloides δ18O of 1.8 ‰ to 2.3 ‰, whereas glacial samples with heavier stable isotopes (>3.0 ‰) are found below 27 cm (Fig.3). The yellow and grey bars represent the Younger Dryas (12.90-11.70 ka) and the Bølling–Allerød interstadial (14.69-12.89 ka), respectively.

Fig.S2 Monospecific sample (G. Inflata) GC-FID analysis of Holocene sample (A), glacial sample (B) and blank (hexane, C). The plateaus after 45 minutes and the peaks after 9 minutes represent siloxanes derived from column degradation.

Fig.S3 GC-MS chromatograms of channel m/z 85. No alkyl lipids peaks were detected.

Fig.S4 GC-MS chromatograms of channel m/z 103. No TMS ethers of fatty alcohols peaks were detected. The two plateaus after 45 minutes and the peaks at 40 minutes represent siloxanes derived from column degradation.

Fig.S5 GC-MS chromatograms of channel m/z 117. No TMS esters of fatty acids peaks were detected.

Fig.S6 GC-MS chromatograms of channel m/z 207. Plateaus (after 45 minutes) and peaks represent the siloxanes derived from column degradation.

Fig.S7 GC-MS analysis, m/z 85 trace TLE of Brazilian Margin (São Paulo Basin) sample GC 04 (25.0°S, 44.3°W; 1024m water depth; 186 cm core depth), representing what an alkanes-containing sample chromatogram looks like for marine surface sediments, incorporating both marine and terrestrially derived components.