Supplementary Information for

# Arctic drainage of Laurentide Ice Sheet meltwater throughout the past 14,700 years

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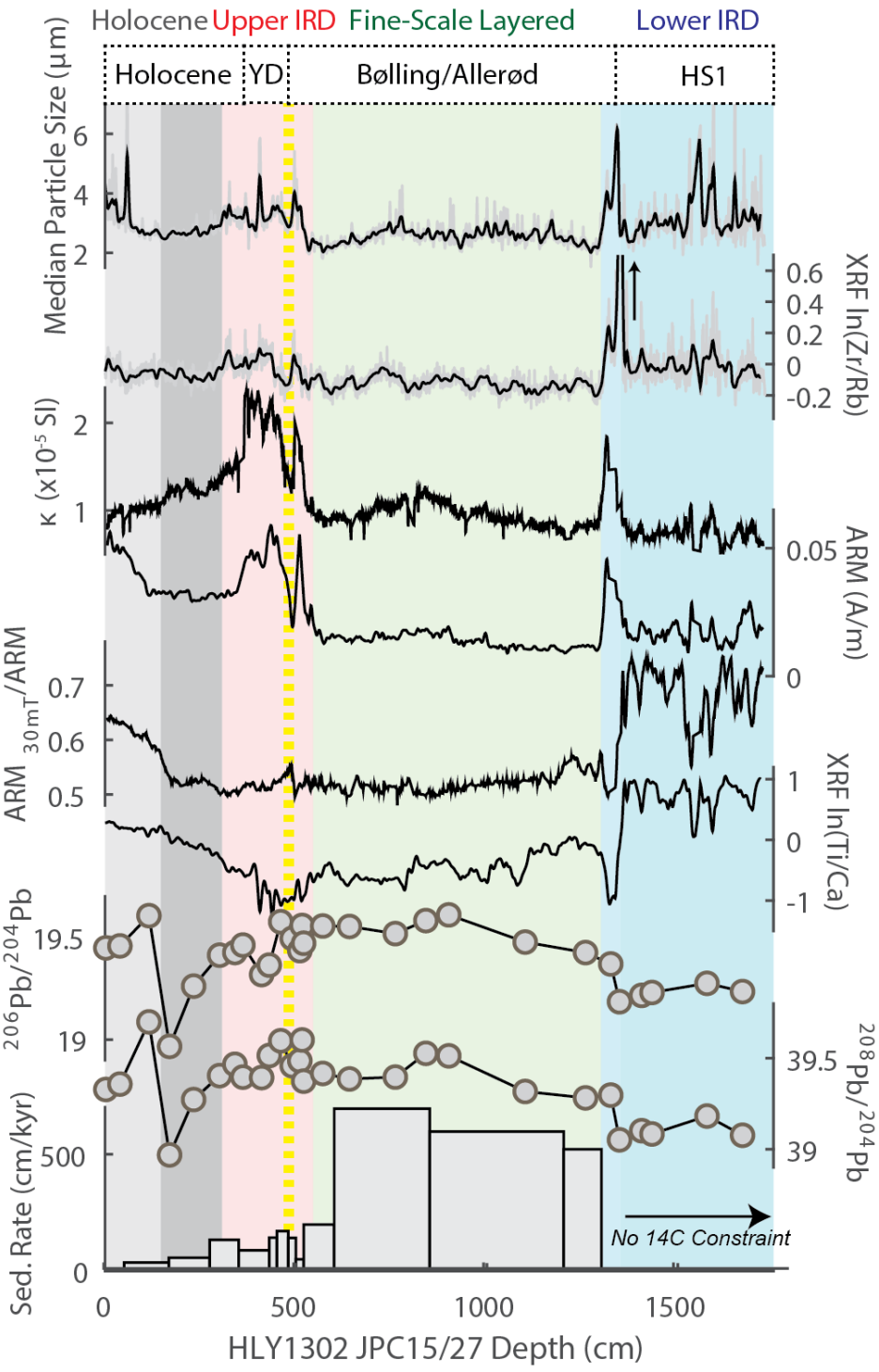
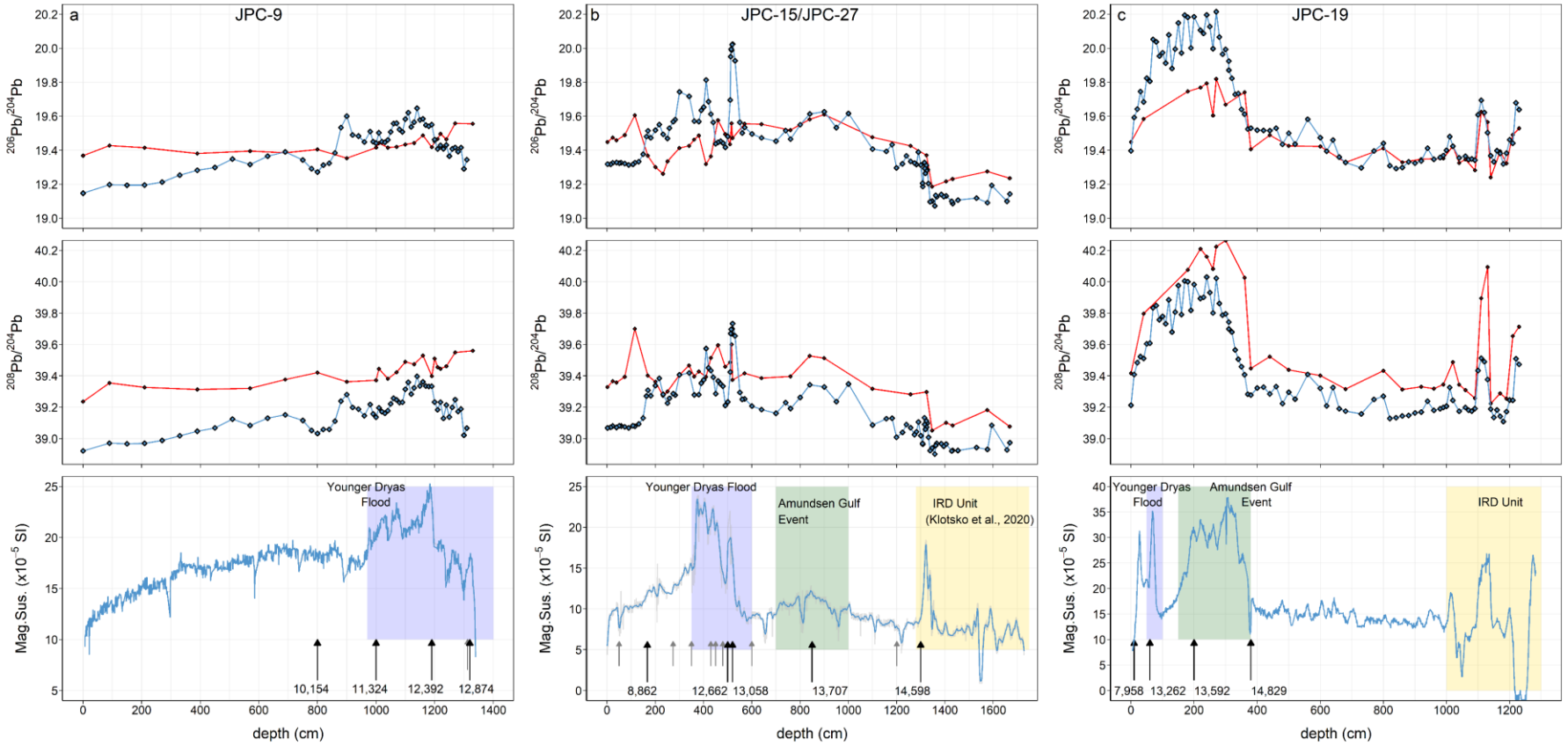
**This PDF file includes:**

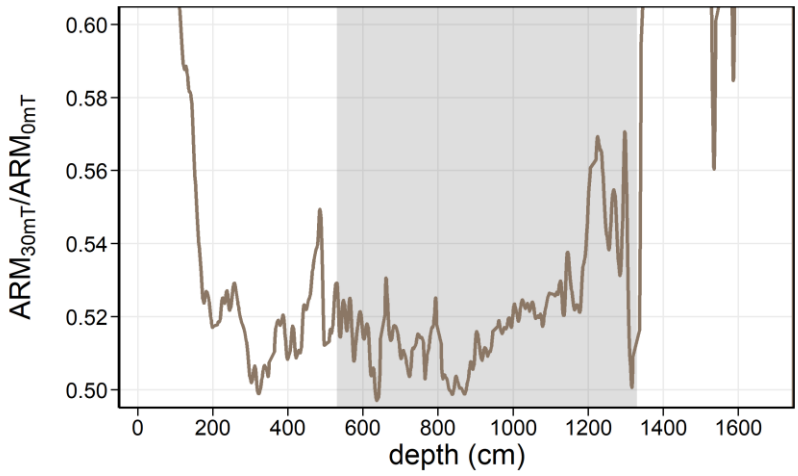
Figures S1 to S5
SI References



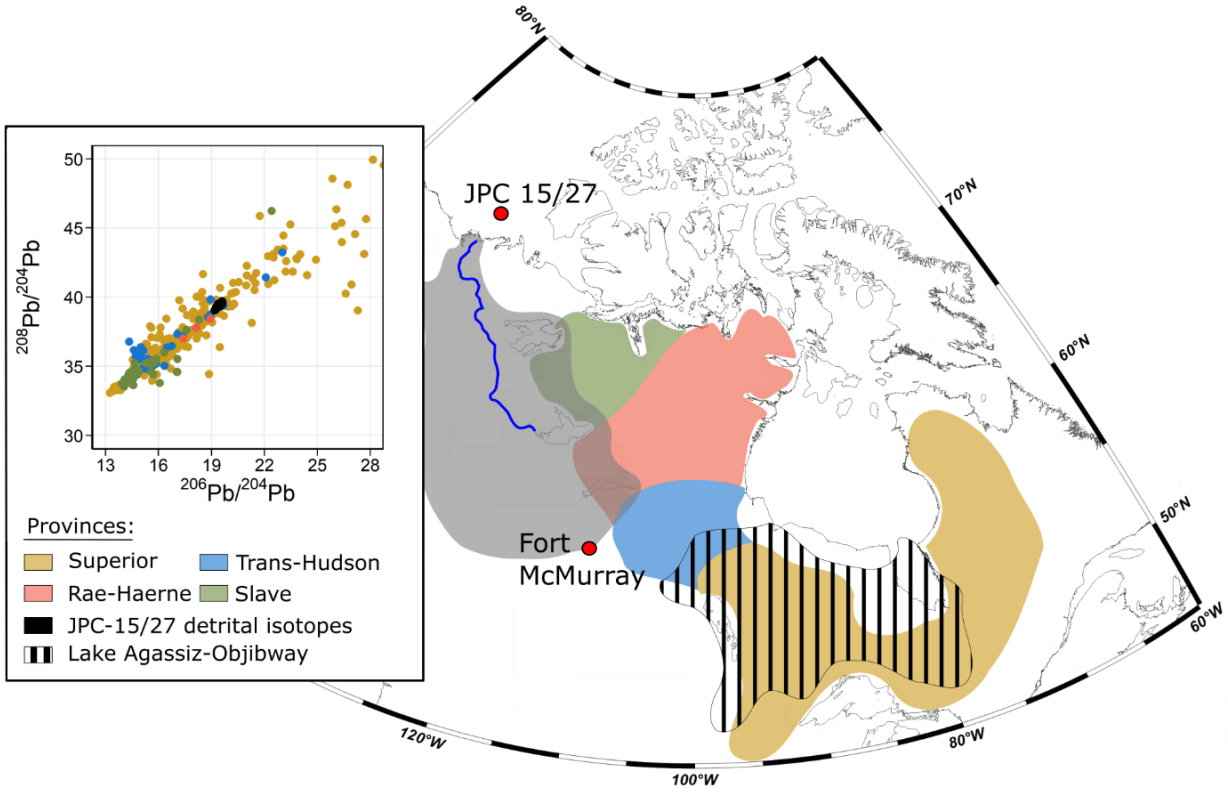

**Supplementary Figure S1:** Downcore comparison of magnetic proxies as well as the detrital Pb isotope composition presented in this paper with the lithofacies, particle size, and XRF data of Keigwin et al. (2018) and Klotsko et al. (2019). Magnetic parameters are influenced by both particle size variations and sediment source changes.



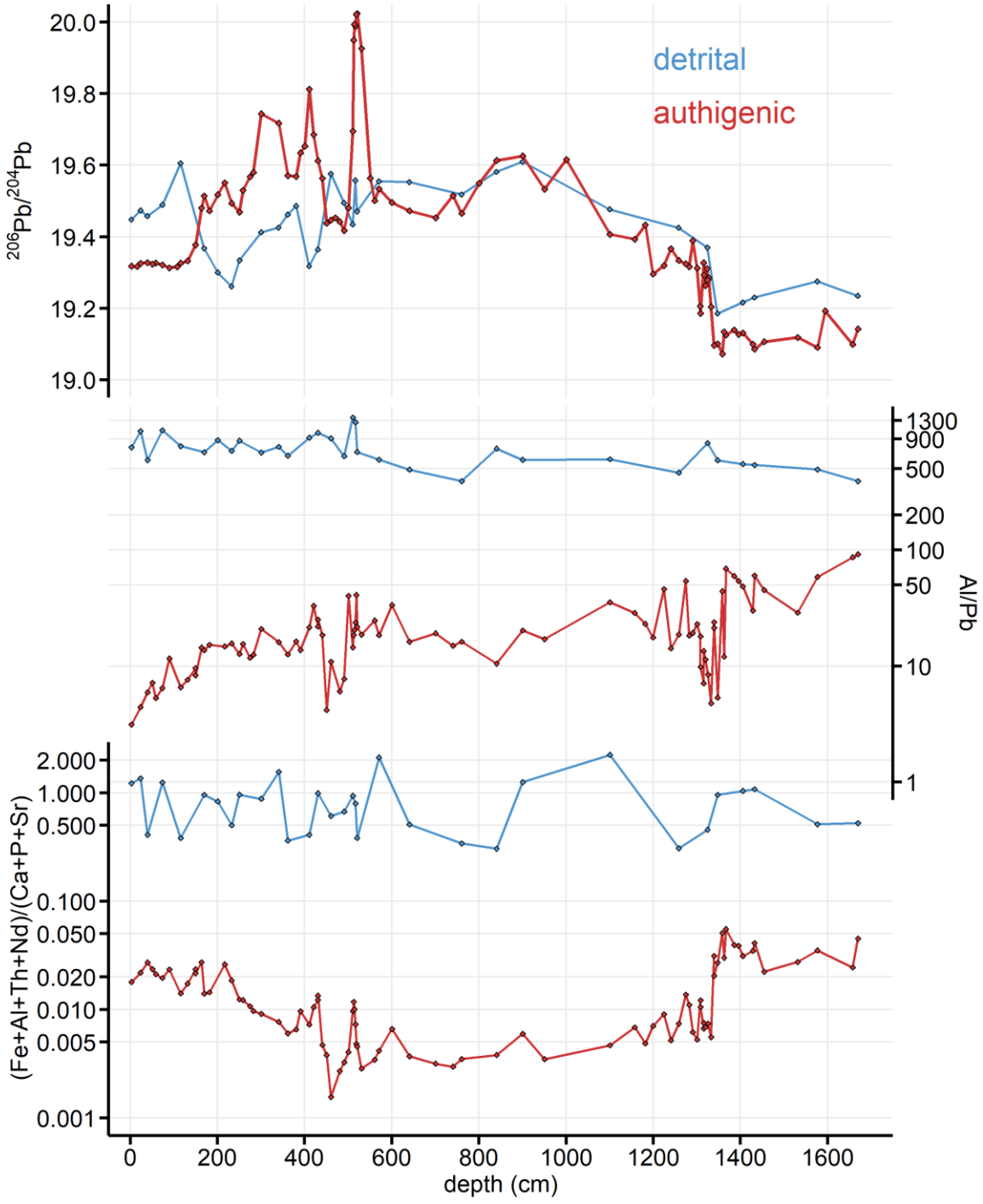

**Supplementary Figure S2:** Authigenic (blue) and detrital (red) Pb Isotope records (upper row: $^{206}Pb/^{204}Pb$; middle row: $^{208}Pb/^{204}Pb$) compared to magnetic susceptibility for cores JPC-9 (a), JPC-15/27 (b) and JPC-19 (c) of the Beaufort Sea margin and Amundsen Gulf (Keigwin et al., 2018). Light blue area indicated the timing of the late Bølling-Allerød freshwater event which continues into the Younger Dryas and earliest Holocene. The green area highlights the timing of the strong Amundsen Gulf excursions (JPC-19) which is potentially also preserved in JPC-15/27. The timing of IRD deposition before the onset of the Bølling-Allerød is marked by the yellow area. Arrows (gray and black) indicate sedimentary depths wit radiocarbon datums. Ages for JPC-9, JPC-19 and JPC-15/27 are listed in Keigwin et al. (2018) and this study and are marked by the black arrows.




**Supplementary Figure S3:** The ARM30mT/ARM0mT ratio of core JPC-15/27. The gray bar indicates the timing of the Bølling-Allerød.




**Supplementary Figure S4:** Overview map of the exposed granitic cratons of the North American Continent which were potentially involved in the formation of the authigenic and detrital Pb isotope signals analyzed in the study area. The Pb isotopic signatures ($^{206}Pb/^{204}Pb$ and $^{208}Pb/^{204}Pb$) of the different provinces are plotted in the left chart (brown: Superior Province; blue: Trans-Hudson Province; red: Rae-Haerne Province; green: Slave Province) (Isotope Data derived from the GeoRoc database) together with the detrital isotopic signatures of site JPC-15/27 (black). The blue line marks the position of the Mackenzie River and the gray shaded area marks the modern catchment of this river. The striped area encompasses the area which was covered by glacial Lakes Agassiz and Objiway in the course of the Deglacial.




**Supplementary Figure S5:** Authigenic (red) and detrital (blue) signatures of (upper panel) $^{206}Pb/^{204}Pb$ (middle panel) Al/Pb ratio and (lower panel) immobile vs mobile element ratio of sediment core JPC-15/27 against core depth in cm. Please not the logarithmic y-scales for the middle and lower panel. The low Al/Pb values in the authigenic phase compared to the high values of the detrital phase are indicative for no contribution of the detrital signal to the extracted authigenic signal. For detailed information see Gutjahr et al. (2007).

**SI References**


1. Keigwin, L. D. et al. Deglacial floods in the Beaufort Sea preceded Younger Dryas cooling. Nat. Geosci. (2018) doi:10.1038/s41561-018-0169-6.

2. Klotsko, S., Driscoll, N. & Keigwin, L. Multiple meltwater discharge and ice rafting events recorded in the deglacial sediments along the Beaufort Margin, Arctic Ocean. Quat. Sci. Rev. 203, 185–208 (2019).

3. Scott, D. B., Schell, T., St-Onge, G., Rochon, A. & Blasco, S. Foraminiferal assemblage changes over the last 15,000 years on the Mackenzie-Beaufort Sea Slope and Amundsen Gulf, Canada: Implications for past sea ice conditions. Paleoceanography 24, 1–20 (2009).

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