**Supplementary Information for:** Laurentide Ice Sheet extent over the last 130 thousand years traced by the Pb isotope signature of weathering inputs to the Labrador Sea

**Contents of this file**

This supporting information document contains 17 figures (S1 to S17) referred to in the main text.

Map

Description automatically generated

**Figure S1.** Map of the North American Superior Province and its various sub-provinces and terranes, Green shaded regions highlight terranes with oceanic-arc affinities that likely have high 206Pb/204Pb values (also see main text Table 1 and Section 2.2). H.B.T: Hudson Bay Terrane; M.T: Marmion Terrane; N.C.T: North Caribou Terrane; W.W.T: western Wabigoon Terrane; W.A.T; Wawa-Abitibi Terrane; W.R.T: Winnipeg River Terrane; OSD: Oxford-Stull Domain; ILD: Island Lake Domain; UD: Uchi Domain; ERB: English River Belt; QB: Quetico Belt; PB: Pontiac Belt; O: Opatica; AG: Abitibi-Grenville; WS: western Superior; E: Eastmain; OP: Opinaca; A: Ashuanipi; LG: La Grande; B: Bienville; G: Goudalie; LM: Lac Minto; T: Tikkerutuk; U: Utsalik; Q: Qalluviartuuq; DH; Douglas Harbour. Modified from Percival et al. (2012).

Chart, scatter chart

Description automatically generated

**Figure S2**: Cross plot of Site U1302/3 authigenic Fe-Mn oxyhydroxide-derived Pb isotopes data spanning MIS 5d-a: **(A)** 206Pb/204Pb vs. 207Pb/204Pb, **(B)** 206Pb/204Pb vs. 208Pb/204Pb. They show that all authigenic Pb isotope ratios became more radiogenic over MIS 5d-a, but also that 208Pb/204Pb ratios changed more than 206Pb/204Pb ratios, which in turn changed more than 207Pb/204Pb ratios over this time.

Chart, scatter chart

Description automatically generated

**Figure S3**: Cross plot of paired authigenic and detrital Fe-Mn oxyhydroxide-derived Pb isotopes from marine sediment at Site U1302/3 with regression analysis: **(A)** 206Pb/204Pb isotope ratios, (**B)** 207Pb/204Pb isotope ratios, **(C)** 208Pb/204Pb isotope ratios

Chart, line chart

Description automatically generated

**Figure S4:** Whole-rock Pb isotope composition of the North American Abitibi subprovince . Top panel = 206Pb/204Pb vs. 207Pb/204Pb,bottom panel = 206Pb/204Pb vs. 208Pb/204Pb. Mean = circle and median = star. Envelopes highlights range of Pb compositions that typically characterise this subprovince.

Chart, scatter chart

Description automatically generated

**Figure S5:** Whole-rock Pb isotope composition of the North American Churchill Province. Top panel = 206Pb/204Pb vs. 207Pb/204Pb,bottom panel = 206Pb/204Pb vs. 208Pb/204Pb. Mean = circle and median = star. Envelopes highlights range of Pb compositions that typically characterise this province.

A picture containing text

Description automatically generated

**Figure S6:** Whole-rock Pb isotope composition of the North American Nain Province. Top panel = 206Pb/204Pb vs. 207Pb/204Pb,bottom panel = 206Pb/204Pb vs. 208Pb/204Pb. Mean = circle and median = star. Envelopes highlights range of Pb compositions that typically characterise this province.

Graphical user interface, application

Description automatically generated with medium confidence

**Figure S7:** Whole-rock Pb isotope composition of the North American Grenville Province. Top panel = 206Pb/204Pb vs. 207Pb/204Pb,bottom panel = 206Pb/204Pb vs. 208Pb/204Pb. Mean = circle and median = star. Envelopes highlights range of Pb compositions that typically characterise this province.

A picture containing text, worm

Description automatically generated

**Figure S8:** Whole-rock Pb isotope composition of the Greenland Ketilidian Mobile Belt. Top panel = 206Pb/204Pb vs. 207Pb/204Pb,bottom panel = 206Pb/204Pb vs. 208Pb/204Pb. Mean = circle and median = star. Envelopes highlights range of Pb compositions that typically characterise this terrane.

Shape

Description automatically generated with low confidence

**Figure S9:** Whole-rock Pb isotope composition of the Greenland Archean Basement. Top panel = 206Pb/204Pb vs. 207Pb/204Pb,bottom panel = 206Pb/204Pb vs. 208Pb/204Pb. Mean = circle and median = star. Envelopes highlights range of Pb compositions that typically characterise this terrane.

A picture containing dark, night sky

Description automatically generated

**Figure S10:** Whole-rock Pb isotope composition of the Greenland Nagssugtoqidian Mobile Belt. Top panel = 206Pb/204Pb vs. 207Pb/204Pb,bottom panel = 206Pb/204Pb vs. 208Pb/204Pb. Mean = circle and median = star. Envelopes highlights range of Pb compositions that typically characterise this terrane.

A picture containing night sky

Description automatically generated

**Figure S11:** Whole-rock Pb isotope composition of the Greenland East Caledonides. Top panel = 206Pb/204Pb vs. 207Pb/204Pb,bottom panel = 206Pb/204Pb vs. 208Pb/204Pb. Mean = circle and median = star. Envelopes highlights range of Pb compositions that typically characterise this region of Greenland.

Graphical user interface

Description automatically generated with medium confidence

**Figure S12:** Whole-rock Pb isotope composition of Greenland Paleogene Volcanics. Top panel = 206Pb/204Pb vs. 207Pb/204Pb,bottom panel = 206Pb/204Pb vs. 208Pb/204Pb. Mean = circle and median = star. Envelopes highlights range of Pb compositions that typically characterise this region of Greenland.

Chart, scatter chart

Description automatically generated

**Figure S13:** Pb isotope composition of North American aeolian dust. Top panel = 206Pb/204Pb vs. 207Pb/204Pb,bottom panel = 206Pb/204Pb vs. 208Pb/204Pb. Mean = circle and median = star. Envelopes highlights range of Pb compositions that typically characterise this dust.

Diagram, engineering drawing

Description automatically generated

**Figure S14:** Histograms of raw whole-rock 206Pb/204Pb data used to define regional source end-members shown in Figure 2. Mean = red arrow, median = black arrow.

**Diagram, timeline

Description automatically generatedFigure S15:** Histograms of raw whole-rock 207Pb/204Pb data used to define regional source end-members shown in Figure 2. Mean = red arrow, median = black arrow.

A picture containing text, light, screenshot

Description automatically generated

**Figure S16:** Histograms of raw whole-rock 208Pb/204Pb data used to define regional source end-members shown in Figure 2. Mean = red arrow, median = black arrow.