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Large subsurface freshwater pulse on the northern Labrador Shelf during the early Holocene gives new insights in the Lake Agassiz drainage event

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The sudden release of freshwater from proglacial Lake Agassiz-Ojibway, which formed during the final melting of the Laurentide Ice Sheet, has been implied to be the trigger for a major disturbance in North Atlantic Deep Water formation and a reduction in the Atlantic Meridional Overturning Circulation (AMOC) that caused the 8.2 ka cooling event. However, direct evidence for the freshwater signature along the proposed drainage route from Hudson Strait through the Labrador Current is still missing, leaving the exact mechanisms and timing of the Agassiz drainage event unclear. This study presents a well-resolved early Holocene record from the northern Labrador Shelf proximal to Hudson Strait that reveals two successive freshwater events, inferred from a combination of Mg/Ca temperatures and stable oxygen isotopes of benthic foraminifera. The sedimentological changes associated with the Agassiz drainage layer per se are reflected by peaks in both lightness (red *a) and Ca/Ti (XRF). However, this layer correlates with only a minor freshwater signal. In turn, the most prominent freshwater signal stemming from the temperature corrected benthic oxygen isotope record in our core – the largest ever recorded in the Labrador Sea – immediately follows this layer, suggesting that it was not caused by the lake outburst itself. We posit that the initial outburst flood indeed accelerated the decay of the remaining ice sheet, causing a centuries-long ice saddle collapse in Hudson Bay. This continued collapse would have produced the subsequent larger freshwater signal and was the key trigger for the AMOC reduction associated with the 8.2 ka cold event.