Tidal Forcing as a Trigger of Arctic Ice Stream Deglaciation

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It has been established recently (Velay-Vitow, Peltier and Stuhne JGR-Oceans 2019) that a high amplitude M2 tide may have triggered and contributed to the forcing of the rapid deglaciations of the Hudson Strait ice stream, commonly referred to as Heinrich events, during the last glacial period. The required conditions for a tidally triggered marine terminating ice stream instability are an ice stream with a retrograde slope of the ice stream bed at the edge of an ice sheet and high amplitude tides coincidental with the grounding line. Two paleo ice streams in the Arctic, the Amundsen Gulf ice stream and the McClure ice stream may have been amenable to rapid deglaciation prior to and during Younger Dryas time, as these locations may have been characterized by the required bathymetric conditions. Additionally, it has been shown in Griffiths and Peltier (GRL 2008) that the Arctic was megatidal at last glacial maximum. We investigate the possibility that some combination of the previously mentioned ice streams were rendered unstable by high amplitude polar tides, and proceeded to rapidly deglaciate, disgorging icebergs and ice rafted debris into the Arctic ocean. We further examine the effect that these proposed ice stream instabilities would have had on the tidal regime in the Arctic, and, by the mechanism of glacial isostatic adjustment, upon the underlying Arctic bathymetry.