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Laurentide Ice Sheet lithospheric loading, ice streaming in Hudson Strait, Heinrich events 1 & 11: Potential linkages

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Several hypothesis have been put forth with respect to the trigger mechanisms of Heinrich (H) events linked to major Laurentide Ice Sheet (LIS) streaming pulses in Hudson Strait (cf. Channel et al., Earth Planet. Sci. Lett., 2012, for their occurrence during the late Pleistocene), the most frequently evoked being a binge/purge quasi-oscillatory behavior of the LIS (e.g., MacAyeal, Paleoceanography, 1993; Clarke et al., Geophys. Monograph., 1999). These hypotheses must consider various factors affecting ice instability in such an environment: bedrock/sea-floor topography and lithology in the Hudson Strait and feeding tributary ice stream areas, relative sea-level changes, ice accumulation rates, thickness and thermal conditions at its base, possibly sub-surface water temperatures below the ice -shelf area, etc. Thus one should consider the possibility that Heinrich events from this source might have been triggered by any or a combination ofrelated ice instability mechanisms. Here, we would like to pay specific attention to the role of relative sea-level changes at the very outlet of the ice-stream, i.e. in the narrow and shallow sill of Resolution, Lawson and Killiniq islands, between Baffin Island and the Labrador peninsula. Its present bathymetry (about 200 m in its shallowest parts) contrasts with that of the adjacent deep Hudson Strait basin, reaching a depth of nearly 800m west of the sill, this gives Hudson Strait a fjord-like bottom-topography, leading to episodes with an anchored LIS ice-shelf at the sill, alternating with intervals of accelerated surging. This process has been well documented as early as 1977 for the West Antarctica Ice Sheet by T. Hughes (Rev. Geophys. and Space Phys.). In Hudson Strait, the H1 and H11 streaming events followed with a few kyr offset the maximum extension of the Wisconsinian and Illinoian LIS, respectively. Relative sea-level (RSL) changes for the Last Glacial Maximum (LGM)-H1 better documented time-interval (e.g., Gibb et al., Quaternary Sci. Rev., 2014), have been reconstructed based on the data-calibrated large ensemble model results of Tarasov et al. (Earth Plant. Sci. Lett., 2012). A specific feature of this interval in the Hudson Strait sill area was the isostatic response to glacial loading that culminated at about 18 kyr. The RSL in the area might have risen by 30 to 50 m between $\sim$ 28 and $\sim$ 18 ka, i.e. prior to H1. Given the inferred thick ice at the sill, such a RSL increase is unlikely to have directly triggered ungrounding of ice at the sill. However, it could have facilitated ice destabilization that led to ungrounding. This could have then induced flushing of subglacial water from the rear sill basin with particulate loads of fine detrital carbonates from the local glacial floor that characterize Heinrich layers off shore, in the Labrador Sea (e.g., Stoner et al., Paleoceanography 1996).