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# What controlled the onset of Hudson Strait Heinrich(-like) events in the Mid-Pleistocene (∼640 ka)?

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Hudson Strait (HS) Heinrich events, massive ice-rafting events in the North Atlantic originating from the Laurentide ice sheet (LIS), are among the most dramatic examples of millennial-scale climate variability [Hemming, 2004]. However, it is debated as to whether the occurrence of HS Heinrich events in the (eastern) North Atlantic depends on greater ice discharge, or simply from the longer survival of icebergs in cold waters [Hemming, 2004; Hodell et al., 2008]. Using sediments from North Atlantic IODP Site U1313 spanning the period between 960 and 320 ka to produce a high-resolution record (temporal resolution 400 yr), here we show that sea surface temperatures (SSTs) did not control the first occurrence of HS Heinrich(-like) events. Similar to results from IODP Site U1308 [Hodell et al., 2008], we detect the first HS Heinrich(-like) event in our record around 643 ka (Marine Isotope Stage (MIS) 16), but this first HS Heinrich(-like) event did not coincide with low SSTs. Thus, the HS Heinrich events do indeed indicate enhanced ice discharge from the LIS at this time, not simply the survivability of icebergs due to cold conditions in the North Atlantic. In addition, recently HS Heinrich events have been proposed to intensify deglaciations through feedbacks with the Southern Ocean [Barker et al., 2009; Denton et al., 2010; Sigman et al., 2010]. Indeed, several notably weak interglacials (MIS 19, 15, and 13), as measured by “luke-warm” Antarctic conditions and intermediate atmospheric CO2 levels [Jouzel et al., 2007; Lüthi et al., 2008], lack HS Heinrich(-like) events during the preceding terminations. However, this correlation is thus broken in MIS 16, which does have a HS Heinrich(-like) event but is nevertheless followed by the luke-warm interglacial MIS 15. These results suggest additional mechanisms are needed to reach full interglacial conditions.

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