



## Were there Heinrich events during Marine Isotope Stage 6?

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Heinrich events were rapid global climate perturbations that coincided with the collapse of the Laurentide ice sheet. These events are seen in the North Atlantic sediment record by large quantities of ice rafted debris (IRD), suggesting that a Heinrich event is associated by the release of very large quantities of icebergs which subsequently melted. The existence of Heinrich (H-) layers during Marine Isotope Stage 2 (MIS 2, ~18ka) is well established; however, the geological evidence for H-layers during the earlier MIS 6 (~140ka) is ambiguous. This could be because of an observational deficit in the geological record, or because the ocean circulation did not allow for icebergs to drift into the North Atlantic during MIS 6, or the ice sheets collapsed in a different way during the last glaciation compared to previous glaciations (or a combination of the three processes). Using FRUGAL – a coupled ocean-atmosphere-iceberg model – we investigated how icebergs from a collapsing Laurentide ice sheet would drift during both MIS2 and MIS 6. Using appropriate forcing for each period, the results show that the oceanic conditions were quite different during the two time periods, but also that the drift patterns of the produced icebergs would be very similar. Thus the H-layers created would be similar in composition and location. This important result shows that there is no oceanic reason why H-layers should not have formed during MIS 6, and the lack of evidence for H-layers from MIS 6 must therefore be due to an observational deficit and/or a different type of ice sheet collapse.