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Constraining the size of Heinrich Events using an iceberg/sediment model.

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Heinrich Layers, anomalously thick layers of ice borne sediment in the north Atlantic ocean, and the events that caused them have long been associated with abrupt climate changes in glacial times. However, there is still no consensus about either how much ice is needed to transport this sediment or how such a large volume of ice could be produced. Estimates for this ice volume do exist and may be broadly sperated into two categories: estimates derived from icesheet models and estimates derived from isotope records. There is a wide discrepancy between these two sets of esimates with the isotope derived estimates being at least one, and some times two, orders of magnitude larger than those from the icesheet models.

Here we use a different method. We use an iceberg model that includes sediment to simulate the delivery of sediment to the north Atlantic during a Heinrich Event. We show that this model can simulate the spatial pattern of ice raft debris from a Heinrich Event and that we can simulate the sediment layer thickness that would result from the volume of ice released by the different estimates. We show that to best fit the observed Heinrich Layer sediment thickness, $60 \times 10^4 km^3$ of ice needs to be released during the event. This matches better the icesheet derived estimates than the isotope derived estimates and suggests that Heinrich Events realeased relatively small volumes of ice.