

***Interactive comment on “Brief Communication:
Can recent ice discharges following the Larsen-B
ice-shelf collapse be used to infer the driving
mechanisms of millennial-scale variations of the
Laurentide ice sheet?” by J. Alvarez-Solas et al.***

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Received and published: 19 December 2011

Reviewer's comments J.T. Andrews In many respects this is a commentary as opposed to a review. The basic glaciological question about Heinrich events is whether an ice shelf in the Labrador Sea is a necessary condition for the repeated build-up and collapse of the ice sheet through Hudson Strait. The paper by Alvarez-Solas et al. appears to assume that the existence of an ice shelf is known and proven, hence the basic thrust of the paper is to examine the role of the ice shelf in the subsequent history of the Hudson Strait ice stream. The readers of this article should first note that the suggestion

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by Hulbe et al (2004) was challenged by Alley et al (2005); indeed, despite the “field” research in the Labrador Sea on the stratigraphy and sedimentology of Heinrich-event sediments I am not aware of many papers that makes an argument for an ice shelf. In a general sense the picture of what constitutes an H-event is dominated by the notion of iceberg rafting as the dominant sediment process (Heinrich, 1988). However, what we now term Heinrich events were first described by Chough, Hess and Aksu in a series of papers in the 1970's and 1980's which focused on the role of turbidites originating on the slope outside Hudson Strait and related to the massive North Atlantic Mid-Ocean Channel (NAMOC) (Chough, 1978; Aksu and Mudie, 1985; Chough et al., 1987; Hesse et al., 1990) (see Andrews, 1998 for review), and the importance of detrital-rich carbonate facies (DC facies) as a signature for what we now term H-events. So the real question in my mind is this: what conditions existed in Hudson Strait, and possibly Hudson Bay, that led to massive outburst floods and the creation of major turbidite flows? It is notable that the paper does not reference a single paper that deals with the nature of H-events in the Western North Atlantic, other than the review paper by Hemming (2004) and the recent paper by Marcott et al (2011), which also assumes the existence of an ice shelf in the Labrador Sea. Alley et al (2005) noted some of the objections to the notion of an ice shelf in the Labrador Sea. What is now needed is a concerted effort to establish whether there is evidence for or against this hypothesis. The current paper does indeed point to the fact that the modern analog is in Antarctica—that being said then the answer to the question needs to be sought in a comparison and contrast between the lithofacies and their characteristics from the Labrador Sea versus their Antarctic counterpoints (Anderson et al., 1991). Analogs can also work both ways—is there any evidence around Antarctica, with its numerous ice-shelves, for the presence in the sedimentary record for H-like events? I did a search in the “web of science” using the keywords “Antarctica” and “Heinrich” or “H-” and did not get a single reference. It would thus appear that ice streams, buttressed by ice shelves are not a necessary condition for Heinrich events.

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Interactive comment on *The Cryosphere Discuss.*, 5, 3113, 2011.

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