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Tracing the source of IRD in the Heinrich Layers of the North Atlantic

B. DAVID A. NAAFS[1,2*], JENS HEFTER[1], SHUNXIN ZHANG[3], AND RUEDIGER STEIN[1]

[1]Alfred Wegener Institute for Polar and Marine Research, D-27568 Bremerhaven, Germany
[2]Leibniz Center for Earth Surface and Climate Studies, Potsdam University, D-14476 Potsdam, Germany
[3]Nunavut Geosciences Office, NU X0A 0H0 Iqaluit, Canada
*correspondence: david.naafs@awi.de

Heinrich Events (HEs) are among the most dramatic examples of millennial-scale climate variability. During HEs large amounts of ice-rafted debris (IRD) derived from glacial erosion of continental bedrock accumulated in the sediment of the North Atlantic, forming Heinrich Layers (HLs) [1]. One of the key issues in understanding the still poorly understood mechanisms behind HEs is the development of specific provenance indicators that provide information about the source areas of the IRD [2]. Here we present an organic geochemical study on the type, distribution and relative abundance of biomarker compounds of extractable organic matter from the different HLs of the last glacial at multiple locations in the North Atlantic.

The results demonstrate that an unique assemblage of organic "petrogenic" compounds such as (benzo)hopanes, mono- and triaromatic steroids, and palaerenieratene and isorenieratene-derivatives characterize the HLs in the North Atlantic. The presence of aromatic counterparts and dominance of mature isomers in the hopanoids and steroids indicates that the biomarker distribution within HLs is incompatible with recent sediments [3]. Rather, these compounds derive from the transportation of ancient organic matter by icebergs because of glacial erosion of bedrock in the Hudson Bay Area. Comparison of the biomarker assemblage of HLs with available geologic and organic-geochemical data allowed narrowing down the assumed source of IRD to a sequence of Upper Ordovician oil shales and limestones outcropping in and close to the Hudson Strait, which have a strikingly similar biomarker signature to that of HLs. Monitoring the presence of these petrogenic compounds in marine sediments thus allows to distinguish organic matter in HLs from adjacent samples and can be used as specific organic-geochemical tracers for the input of continental material from the Hudson Bay Area in northern Canada.

[1] Heinrich (1988), *Quaternary Research* 29, 142. [2] Hemming (2004), *Review of Geophysics* 42, RG1005. [3] Rashid & Grosjean (2006), *Paleoceanography* 21, PA3014