Geophysical Research Abstracts, Vol. 7, 02486, 2005
SRef-ID: 1607-7962/gra/EGU05-A-02486

Geochemical proxies of freshwater routing as the cause of the Younger Dryas cold event

A. Carlson (1), P. Clark (1), B. Haley (2, 3), G. Klinkhammer (2), K. Meissner (4)

(1) Department of Geosciences, Oregon State University, Corvallis, OR 97331, USA

(2) College of Oceanic and Atmospheric Sciences, Oregon State University, Corvallis, OR 97331, USA

(3) Now at Department of Earth Sciences, University of Bristol, Bristol BS8 1TH, UK

(4) School of Earth and Ocean Sciences, University of Victoria, Victoria, BC, V8W 3P6, Canada

Contact information: carlsand@geo.oregonstate.edu / Fax: 541-737-1200 / Phone: 541-737-1248

Proxies of deepwater formation show that a large reduction in the Atlantic meridional overturning circulation occurred at the start of the Younger Dryas event, indicating that the attendant loss of ocean heat transport caused Younger Dryas cooling in the North Atlantic region. The trigger of this ocean response remains unclear, however, with the leading mechanism, involving the routing of continental runoff to the St. Lawrence River, having been questioned on the basis of marine and terrestrial evidence. Moreover, the rate of Atlantic meridional overturning varied during the Younger Dryas, which is not readily explained by the conventional routing argument. Here we capitalize on the well-known relation between river geochemistry and underlying bedrock lithology to use changes in U/Ca, Mg/Ca, and $^{87}Sr/^{86}Sr$ measured in

planktonic foraminifera tests as tracers of routing of continental runoff derived from distinct geological terranes. These data, supported by previously published records of planktonic δ^{13}C and $\delta^{18}O_{sw}$, confirm that routing of runoff from western Canada to the St. Lawrence River occurred at the start of the Younger Dryas. Modeled changes in these tracers indicate increases in freshwater flux of 0.10 ± 0.04 Sv to 0.12 ± 0.04 Sv, which are sufficient to induce a decrease in the meridional overturning circulation. Additionally, we identify a large fluctuation in freshwater flux through the St. Lawrence River at 12.1 kyr B.P., thus explaining the variability in the overturning circulation and climate during the Younger Dryas.