

## **Geochemical proxies of freshwater routing during the last deglaciation**

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The relationship between North American freshwater routing and abrupt climate change is uncertain because interpreting a clear salinity signal from paleo-proxies is complicated by competing controls on a single proxy. To circumvent this problem, we use new geochemical freshwater routing proxies (planktonic foraminiferal U/Ca, temperature and salinity corrected Mg/Ca, and Sr-isotopes) from the last deglaciation that link the source of freshwater to specific North American geochemical terranes. Our data from the St. Lawrence Estuary record the initial opening of the St. Lawrence River at ~13.4 kyr BP followed by the routing of western Canadian Plains water from the Mississippi River to the St. Lawrence at the start of the Younger Dryas (YD) cold interval ~12.9 kyr BP. Another record from Hudson Strait identifies the final collapse of the Laurentide Ice Sheet and routing of western Canadian Plains water to Hudson Strait ~8.2 kyr BP, coeval with 8.2-ka cold event. These data are supported by previously published records of planktonic  $\delta^{13}\text{C}$  and temperature and ice volume corrected  $\delta^{18}\text{O}$  that indicate an increase in freshwater influence and decrease in salinity during these routing events. Based on back predictive estuary-river geochemistry modeling, base discharge increased ~0.1 Sv to the St. Lawrence during the YD and ~0.07 Sv to Hudson Strait during the 8.2-ka cold event. In addition, we identify a previously unrecognized intra-YD routing event at ~12.0 kyr BP when western Canadian Plains water was temporarily diverted from the St. Lawrence to the Arctic Ocean due to either isostatic adjustment or a readvance of the Laurentide Ice Sheet. This event lasted ~200 to 300 years and is in excellent agreement with Northern Hemisphere paleo-records that indicate a temporary increase in Atlantic meridional overturning, warming of the northern, subtropical and tropical North Atlantic, and an increase in East Asian Monsoon intensity. The short duration but hemispheric impact of this routing event demonstrates the sensitivity of Atlantic meridional overturning and the climate system to North American freshwater routing.