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# Enhanced sea-ice export from the Arctic to the GIN seas during the Younger Dryas: A "Canadian" source from radiogenic isotope signatures

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The Younger Dryas (YD) cooling event and the related slowing of the Atlantic Meridional Overturning Circulation (AMOC) have been linked to a large array of processes. The most widely supported causal mechanism involves an influx of freshwater into the North Atlantic Ocean linked to a partial drainage of glacial Lake Agassiz. Recently, a northward drainage route, through the Mackenzie River outlet into the Arctic Ocean, has been suggested from land-based studies [Murton et al., *Nature* 464, 740-743]. Sedimentological and geochemical analysis of cores raised from Lomonosov Ridge and the Fram Strait area, yield relatively robust evidence for enhanced ice-rafting deposition -IRD- (with a 5-fold increase -) during the critical interval. At Lomonosov, the corresponding sedimentary layer (from ca. 13 to 12 ka) is marked by a pulse of detrital carbonates in the silt to sand fractions, with approximately equal amounts of calcite and dolomite, pointing towards an Arctic Canadian sediment source area [Not & Hillaire-Marcel, *Nature Communication*, Jan. 31, 2012]. The layer also depicts a 5 fold increase 230Th-excess, which we link to an enhanced flux of scavenging particles. At both sites, the geochemical signatures of the YD-layer, based on elemental (Zr/Al) and isotopic (Sr, Nd and Pb) data on bulk sediments and residues ensuing from the removal of exchangeable fractions (Zr/Al, Nd, Pb, Sr), are used to identify detrital sediment source areas. Whereas three major source areas variably contributed to IRD during the MIS 3-Present interval (i.e., the Russian, Canadian and Greenland margins), the YD interval singles out by strongelemental and isotopic excursions, notably a peak in radiogenic Sr, indicating prominent supplies from the Canadian end-member. This suggests enhanced sea-ice production and drifting along the BeaufordGyre, then the Trans-Polar Drift. A major drainage event along the Mackenzie outlet area, as proposed in the above reference,would be a suitable trigger for enhanced sea-ice production, leading to the nearly 5-fold export of Arcticsea-ice suggested by our data. As already proposed by Tarasov and Peltier [*Nature* 435, 662-665], sucha routing of freshwater would have been very efficient in reducing the AMOC in the Greenland, Icelandand Norwegian seas, and/or in the North Atlantic area south of the Denmark, Iceland-Faroe-Scotland,sills.