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# Arctic Freshwater Forcing of the Younger-Dryas Climate Reversal

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The original suggestion of the origin of the Y-D cold reversal as arising due to a shift in the direction of meltwater outflow during Laurentide deglaciation, from the south through the Mississippi River system into the Gulf of Mexico to the east through the St Lawrence River system into the North Atlantic (Broecker, 1989, Nature, 341, 318-321), was found to be unsupported by surface geomorphological evidence (Lowell et al 2005, EOS 86(40), 365-373. The explicit analysis of deglacial meltwater routing in Tarasov and Peltier (2005, Nature,435, 662-665), based upon application of a detailed theoretical model of the isostatic adjustment process, suggested that the switch in routing direction at Y-D onset was actually from the south to the North into the Arctic Ocean through the Mackenzie River outlet. Initially there was no support for this scenario based upon the dating of geomorphological features. Very recently, however, Murton et al (2010, Nature, 464, 740-743) have provided direct evidence for the validity of the Tarasov and Peltier interpretation. Initial model based analyses designed to test the climate impact of the Arctic freshening scenario were published in Peltier et al (2006, GRL 33, L06713) and in Peltier (2007, Geology, 35, 1147-1148). These analyses were based upon the use of the CCSM3 coupled climate model but the freshwater forcing was applied to the modern climate state rather than to a state representative of pre-Y-D onset conditions. In this paper we focus upon a new set of simulations performed using the same model but employ a more realistic control climate based upon use of the continental ice cover and topography provided by the ICE-5G (VM2) model for pre-Y-D conditions. We will present a detailed comparison of the results obtained for climate simulations in which the freshening is applied to the Arctic ocean over the Beaufort Gyre or directly to the North Atlantic.