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The pathways and impact of fresh water discharge through Hudson Strait 8200 years ago

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The strongest climate cooling event in the last 10,000 years occurred about 8200 years ago (8.2 ka). Numerous papers hypothesize that this abrupt cooling was caused by the drainage of glacial Lake Agassiz that covered much of northern Canada. The basic premise, mainly based on coarse-resolution global numerical modeling studies, is that the large volume of freshwater from Lake Agassiz spread over the northern North Atlantic forming a fresh, buoyant surface layer that inhibited the normal formation and sinking of dense water that drives the large-scale meridional overturning circulation (MOC) in the ocean, resulting in reduced poleward heat transport causing the observed abrupt cooling and associated climate changes in the time range 8400 to 8000 yrs BP. Here we show that the freshwater released from Lake Agassiz just prior to the '8.2 ka event' probably did not spread offshore into the northern North Atlantic, but instead formed a narrow buoyant current that flowed southward along the coast. This result and paleo-oceanographic data indicate that most of the low salinity water probably did not reach the open ocean until mixing in the slope water system between Newfoundland and Cape Hatteras. This work highlights the need to resolve the basic physical processes involved in abrupt releases of freshwater including the shelf and shelfbreak, bottom-boundary layer dynamics and cross-shelf flow and shows that previous numerical hosing experiments may prove unrealistic in their responses to freshwater perturbations.