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Precise chronology of Heinrich-1 meltwater pulses in the Nordic Seas

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Various ocean mechanisms have been proposed to explain the abrupt warming of DO event 1 forming the onset of the Bølling/Allerød (BA) period near 14.7 cal. ka BP, for example invoking multiple equilibria of Atlantic meridional overturning circulation (AMOC) and southern hemisphere climate forcing. A transient state-of-the-art model simulation of the deglacial ocean and climate evolution by Liu et al. recently reproduced the abrupt BA warming, provided a sudden termination of meltwater fluxes (MWF) to the North Atlantic occurred a few centuries prior to the BA. Thus an accurate history of MWF before the BA is crucial. Up to now, however, a precise timing of Heinrich-1 MWF prior to the BA warming has not been established for deep-sea sediment records from the northern North Atlantic because great changes in planktic 14C reservoir ages of a few hundred to 2500 years form a major obst¬acle for precise age control. The 14C plateau-tuning technique now paves the way for closely constraining the age of Heinrich-1 MWF signals which are recorded by abrupt negative planktic δ18O excursions reaching 1.5–2.0 per mil. In the East Greenland Current we find intensive MWF from 17.25 to ~15.0 ka ago. Likewise in the Norwegian Sea we date vast meltwater fluxes associated with the deglacial break-up of the Barents ice sheet at ~73°N. This plume terminated no more than a few hundred years prior to the onset of the BA. In summary our records support the simulations of Liu et al. by showing that MWF to the North Atlantic did suddenly stop shortly after 15 ka BP, which could drive a quick restoration and overshoot of the AMOC and in turn, the abrupt warming at the onset of the BA.

Liu, Z. et al., 2009, Science 325, 310-314.