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The 8k event: abrupt transition of the subpolar gyre towards a modern North Atlantic circulation

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During the relatively stable conditions of our present interglacial, the 8k event is the largest climatic signal with a widespread cooling in the North Atlantic region about 8200 years before present. It coincides with a meltwater outburst from North American proglacial lakes. In the current understanding, this caused a weakening of the Atlantic meridional overturning circulation and a subsequent reduction in heat transport, followed by a recovery of the deep ocean circulation and rising temperatures after a few centuries.
A number of oceanic paleorecords in the western North Atlantic, however, show an abrupt and persistent surface temperature decrease at the same time. This has been suggested to be associated with the onset of deep water formation in Labrador Sea and a subsequent strengthening of the slope current system. Although similarities in timing are compelling, a mechanism that resolves the apparent contradiction of enhanced sinking in response to increased buoyancy from the lake drainage was missing.
Here we show that the transition was due to an abrupt and persistent strengthening of the North Atlantic subpolar gyre. The intense fresh water pulse triggered a transition of the subpolar gyre circulation into a different mode of operation which was stabilised by internal feedbacks and persisted after the cessation of the perturbation. As a direct consequence, deep water formation in its centre was intensified. We show that a stronger subpolar gyre establishes a modern flow regime and stabilises the meridional overturning circulation, probably contributing to the Holocene's climatic stability.