about 234 W m^{-2} (today). Hence, they might have been only of minor importance for the YD1 MOT anomaly.

Another hypothesis that could explain the MOT pattern during the Younger Dryas is that a cold, isolated water mass was ventilated during YD1. This water mass would have last been ventilated several millennia earlier, for example during the cold LGM, and only the push of the Younger Dryas onset (collapse of AMOC[30]) would have brought this cold water up to the surface to equilibrate. The end of YD1 would then mark the point in time when this water mass was fully ventilated and hence this scenario would be able to provide an explanation for the stalled warming before the AMOC acceleration. Such a drastic change in ocean ventilation could be explained with a switch from a glacial ocean circulation mode to a modern/interglacial mode as mentioned in the main text. Multiple lines of evidences suggest the existence of such different ocean circulation modes[22–25], and in the case of the shift from interglacial to glacial mode, the 'MIS 5-4 transition' at around 70 kyr BP has been suggested as such[24,25]. The YD1 could be the counterpart of the MIS 5-4 transition, providing a relatively sharp definition of the last glacial period from an ocean circulation perspective.

Data availability. All relevant data from the ice samples (noble gas elemental and isotope ratios) are provided as Supplementary Data; the corresponding reconstructed mean ocean temperatures are provided as Source Data for Figs 2 and 3 and Extended Data Figs 1 and 2.

Code availability. The ocean box model, including the Monte Carlo code (Matlab), is available 'as is' from the corresponding author on request. Details of the ocean box model can also be found in refs 10 and 11.

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