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The nature of millennial-scale climate variability during the last two glacial cycles

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During the last glacial period, iceberg discharges into the North Atlantic led to a disruption of the Atlantic Meridional Overturning Circulation (AMOC), a cooling of the Northern Hemisphere, and a warming of Antarctica. This asymmetric response has been explained in terms of a bipolar seesaw mechanism, whereby changes in the strength of the AMOC result in changes in interhemispheric heat transport. However, it remains unclear to what extent the response of the AMOC and the operation of the bipolar seesaw may depend on background climate conditions, or the magnitude/delivery of freshwater flux to the North Atlantic. Here we present foraminiferal isotope and pollen records from the Portuguese margin from the last and penultimate glacial periods. A comparison of our records with temperature reconstructions from Antarctica indicates that the bipolar seesaw was a characteristic feature of both glacial periods. However, our comparison also underlines the dependence of the bipolar seesaw on background climate as well as the magnitude of iceberg discharge. Our results suggest that an intensified hydrological cycle may lead to a weaker overturning circulation with a smaller disruption threshold and extended North Atlantic stadial durations.