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Western Atlantic ocean changes during Heinrich stadials of the last 45 kyr

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During Heinrich Stadial (HS) 1, δ13C decreased throughout most of the upper Atlantic between $\sim$ 1000 – 2500 m, and in some deeper Atlantic sites. Atlantic Meridional Overturning Circulation (AMOC) during this time is believed to have been weaker. Most explanations of the δ13C decrease suggest that it was a response to the AMOC reduction, but different mechanisms have been proposed. Some studies point to a reduction of the fraction of the glacial equivalent to North Atlantic Deep Water in the upper North Atlantic during the events, which promoted the extension of "southern sourced waters" to shallower depths. Other studies suggest that northern sourced waters flowed still, but with a lower δ13C due to changes in source water composition. The behavior of mid- and deep waters during previous HS is even less well constrained, in part due to the lack of available records.
In this study, we present carefully dated high-resolution records from marine sediment cores off the Northeast Brazilian margin, covering the last 45 ky. Stable isotopes (δ18O and δ13C) were measured on the benthic foraminifer Cibicides wuellerstorfi. Marked minima in δ13C at mid-depths off the Brazilian margin are visible during the last four HS. During all these periods, δ18O and δ13C values converge with those of the deeper core at $\sim$3600 m, indicating that the same water mass bathed depths between $\sim$ 2300 – 3600 m in the western Tropical Atlantic during HS. We explore different scenarios of the origin of this water mass by comparing our records with previously published ones, and with simulations of the isotope-enabled Earth System Model of intermediate complexity iLOVECLIM, but preliminary results do not support a southern origin of the low-δ13C water mass.