Atlantic connections to Southern Ocean warming and overturning during the last deglaciation

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The Antarctic Intermediate Water (AAIW) conduit for dissolved carbon, nutrients, and heat exchange is key to the interhemispheric-transmission of climate anomalies. Yet, studies have argued both for and against strong northward advection of AAIW during the last deglaciation. Here we present seawater temperature (Li/Mg), [Ba] of seawater (Ba/Ca), pH ($\delta^{11}B$), and radiocarbon (^{14}C) records from precisely-dated cold-water corals from the Drake Passage and Equatorial Atlantic. Together, these records produce a coherent picture of centennial-scale Southern Ocean mixing and circulation change within the Atlantic Basin.

We find tropical Atlantic sub-surface temperatures were inextricably linked to Antarctic and Southern Ocean warming during the last deglaciation suggesting strong northward advection of intermediate waters from the south. We further constrain the timing of Southern Ocean ventilation and associated release of carbon and nutrients. Our results point to the Southern Ocean source region for intermediate waters as a key location dictating interhemispheric climate change.