A new archive: Late Quaternary climatic reconstruction using the deepwater coral *Desmophyllum cristagalli*

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A collection of solitary corals from Orphan Knoll in the North Atlantic, 550 km northeast of Newfoundland, contains individuals with ages that range from recent to > 70,000 B.P. One particularly large pseudocolony lived from 12,400 to 11,200 B.P., within the transition from the last glacial to the present interglacial period. The stable-isotope stratigraphy preserved in the skeleton of this coral documents not only this deglaciation, but also the climatic anomalies known to have occurred during this time. Most conspicuously, the onset of the Younger Dryas cooling event, an especially sudden and severe climatic deterioration, was preserved as a > 2 per mil shift in the $\delta^{18}O$ signal, suggesting profound changes in mid-water circulation. This abrupt return to glacial conditions may have been caused by a shutdown of the Gulf Stream heat conveyor: models of ocean circulation predict a rise in the $\delta^{18}O$ of the ocean interior during the onset of the Younger Dryas.

The isotope data, combined with estimates of coral growth rates, also show that the onset of the Younger Dryas may have occurred within 50 years. This rate is comparable to those estimated from ice and sediment cores for the atmosphere and surface waters, implying a close linkage among these three parts of the climate system. The nature of future climate change, sea level rise and global warming can only be understood through an understanding of the nature of this coupling between the atmosphere and the ocean. To date, most paleoclimatic reconstructions have been based on foraminifera from deep-sea cores. Corals are immune to the confounding effects of fluctuating sedimentation rates, bioturbation and transport, and may be superior to forams as archives of benthic oceanographic data.