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Last Deglaciation Events (16.1-11.4 cal-Ka) Recorded in a Speleothem from DeSoto Caverns, Alabama, U.S.A.

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Whereas the rapid climate swings that occurred during the last deglaciation have been well documented in the Greenland ice cores, their cause/s continue to be a subject of heated debate. Clearly, more geographically dispersed records are required in order to provide better insight into the history of deglaciation, and by extension into the cause/s of the abrupt climate shifts. Particularly scarce are continental deglaciation records from the southeast North America whose atmospheric conditions were controlled by the retreating Laurentide Ice Sheet to the north and the Gulf of Mexico warm waters to the south. In order to remedy the absence of deglaciation records in the Southeast USA in general, and the Gulf Coast in particular, we have initiated a study of a 55-cm long stalagmite (DSSG-2) from the DeSoto Caverns in Childersburg, Alabama (33° 18'N, 86° 17'W). Seven radiocarbon AMS and eighteen U/Th TIMS dates reveal that the continuously layered stalagmite covers the time interval 31 to 11.4 cal-Ka at growth rates varying from 61 $\mu\text{m}/\text{decade}$ at the start of deglaciation and up to 2700 $\mu\text{m}/\text{decade}$ close to its termination. The combination of unusually high growth rates, pristine aragonite mineralogy and tight sampling (n=602) afforded generation of high fidelity $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$ records from about 16.1 to 11.4 cal-Ka whose high resolution is comparable with the contemporaneous Greenland ice core records. The stalagmite $\delta^{18}\text{O}$ record shows excellent agreement in relative amplitude shifts and timing of abrupt and brief cold reversals (Oldest Dryas, Older Dryas, Inter-Allerød Cold Period) that punctuated the overall trend of deglaciation warming (Bølling/Allerød period). The succeeding Younger Dryas is depicted in the stalagmite by rapid positive shifts in $\delta^{18}\text{O}$ and $\delta^{13}\text{C}$ of 1.3‰ and 2.3‰ (V-PDB) relative to the baseline mean value

and its start and termination (12.7-11.8 Ka) are concordant within error with the dates reported from GISP2 ice core (12.82-11.60 Ka). We interpret the negative isotope shifts during the warm B/A interval and the positive shifts during the cold ODs and YD intervals as being primarily an expression of rapid shifts in rainfall amount alternating between excessive floods and severe droughts. The excellent correspondence observed between the DeSoto stalagmite and the GISP2 isotope records further suggests that disturbances in thermohaline circulation caused by repeated fresh water discharge episodes into the North Atlantic from the retreating American and European ice sheets were the principal governing factors controlling the documented isotope shifts in the Southeastern USA and Greenland.

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