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for

Oxygen isotope precipitation anomaly in the North Atlantic region during the 8.2 ka event

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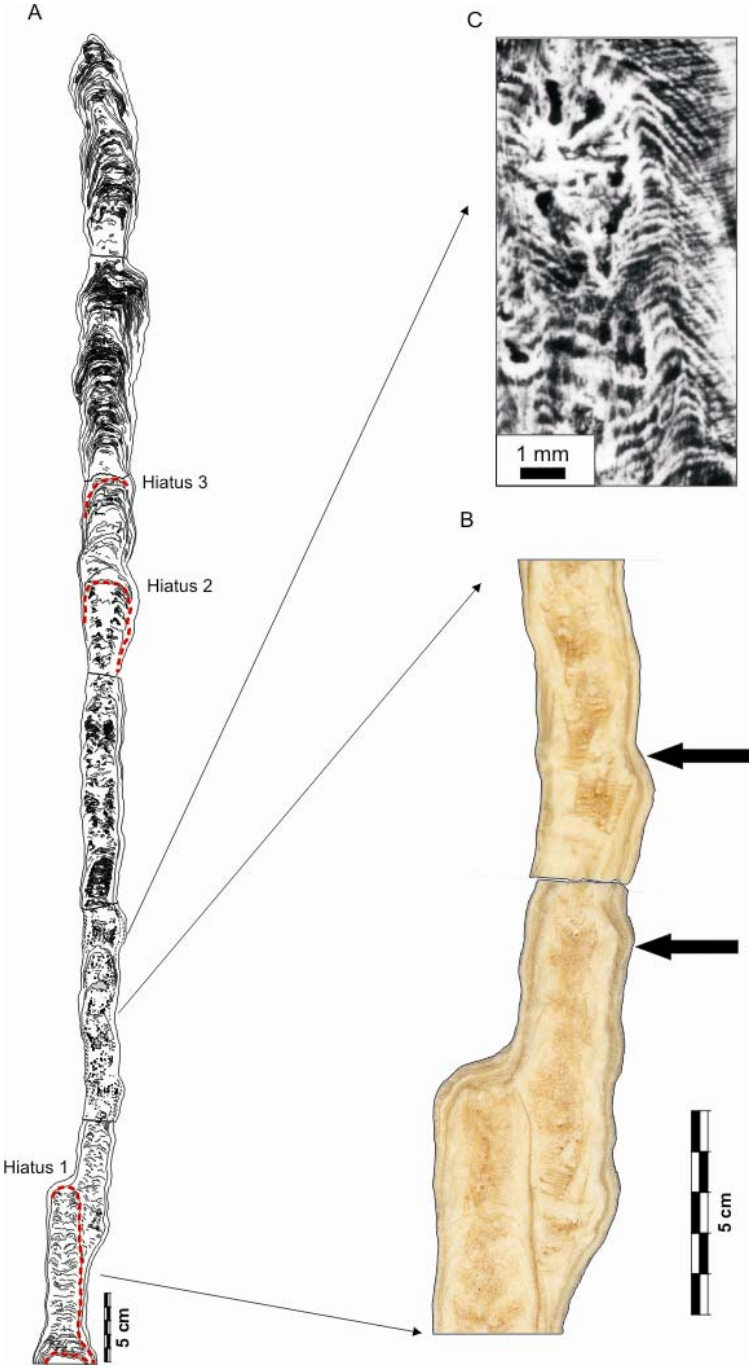

Figure DR1. A: Schematic section of LV5 stalagmite. The sample was growing over a small pre-Holocene calcite deposit from the cave. Major hiatuses have been indicated by bold red lines. The sample was found broken in the cave floor and six pieces were recovered. B: Detailed picture of the section covering the 8.2 ka event. Arrows show the onset of the first $\delta^{18}O$ spike and the sharp demise of the second spike. The hiatus reported prior to ~8550 yr BP implies not only a truncation of continuous laminae, but a main change in the growth axis of the stalagmite. Small mismatches between stalagmite pieces are due to slightly different cutting angles. However, observation under the microscope allowed the identification of continuity of laminae from one piece to the other of the sample. C: Detail of some annual laminae.

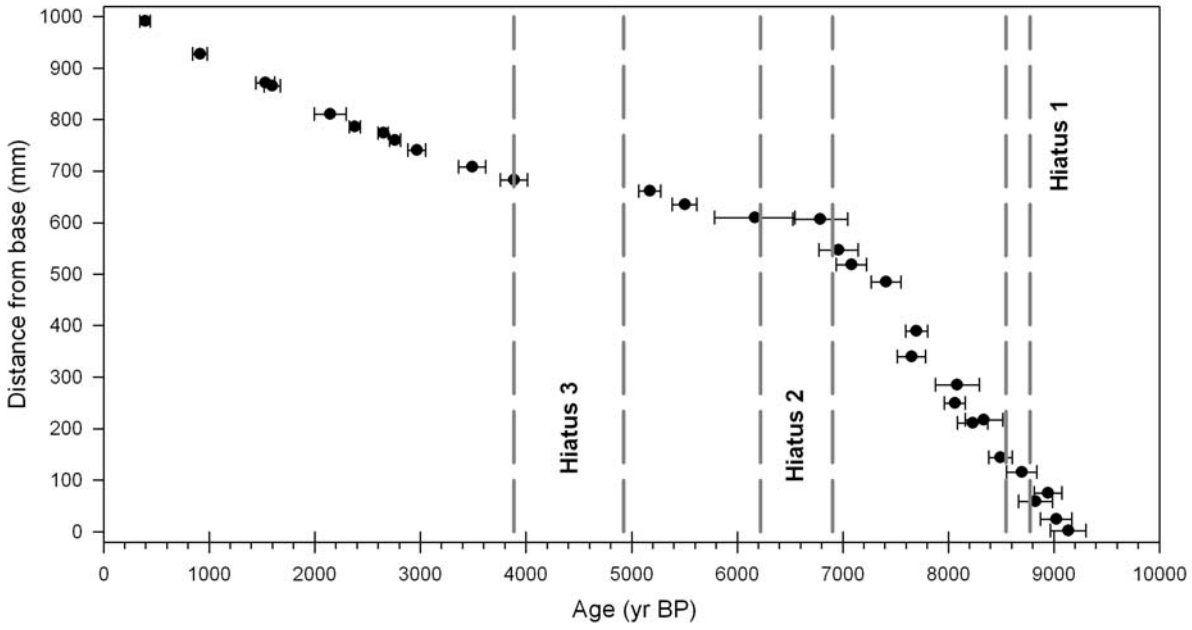

Figure DR2. U-Th dates for LV5 stalagmite in relation to their distance from the base. Vertical grey dashed lines indicate the base and top of three major hiatuses recognized by petrographic discontinuities and a chronological gap. The portion of the sample below the second hiatus presents annual laminae that help to establish the age model based on lamina counting shown in figure 2. Some of the dates close to those discontinuities appear partially inside the hiatus, but note that in all cases the dates fall in the growth portions within the error bars (2σ).

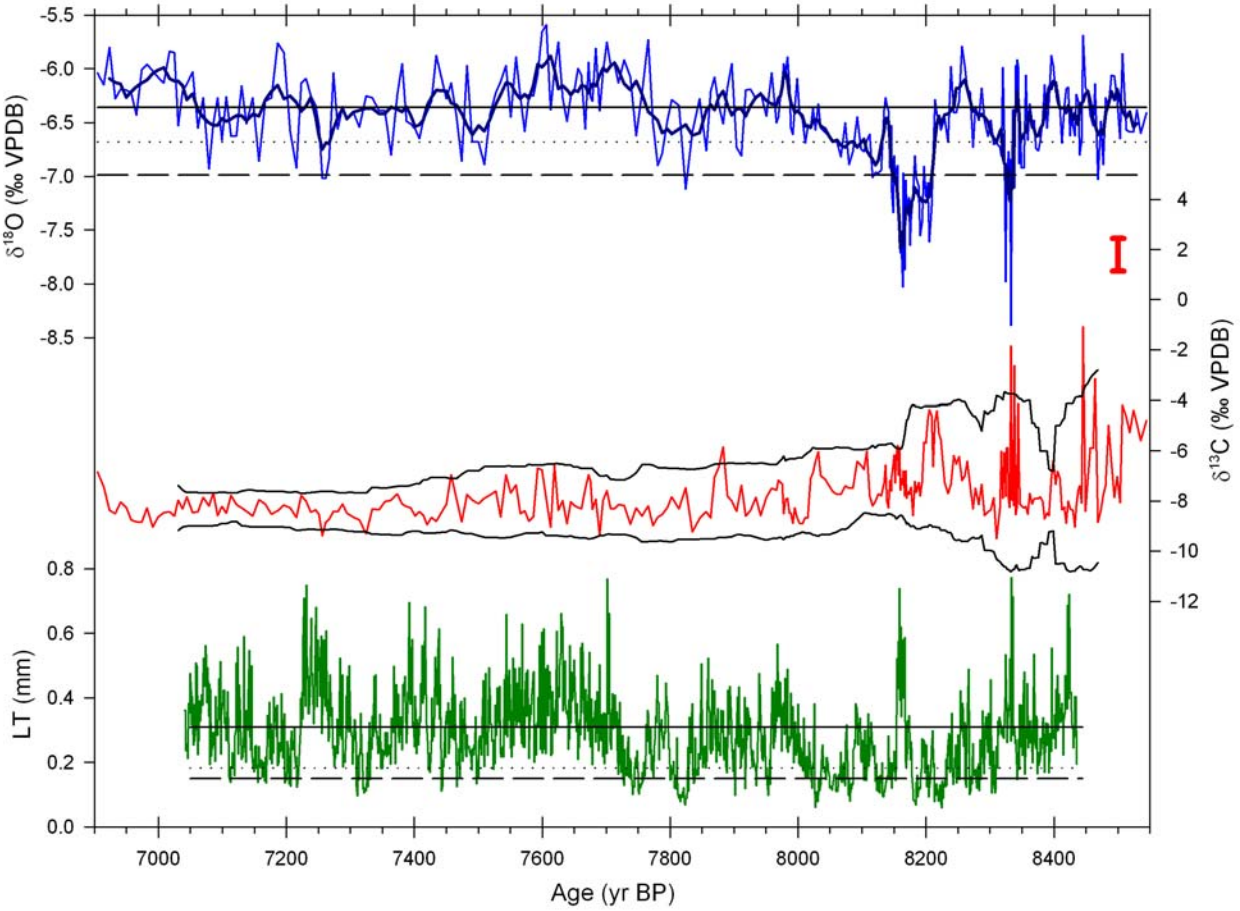

Figure DR3. Significance of the anomalies in $\delta^{18}O$, $\delta^{13}C$ and lamina thickness (LT) at the 8.2 ka event. In the case of $\delta^{18}O$ a 5-point moving average is shown in order to minimize the large inter-annual variability. For $\delta^{18}O$ and LT plots black horizontal lines represent the average (solid), 1σ (dotted) and 2 σ (dashed) deviations towards the direction of the anomaly. Data within the anomalies have been removed from calculations to avoid biases. Thus, for the $\delta^{18}O$ record, a broad anomaly was considered from ~8,340 to 8,140 yr BP, and for LT the major anomaly was considered between 8,312 and 7,718 yr BP. LT data are log-normal and standard deviations shown are calculated under this criterion. For the $\delta^{13}C$ record the black lines represent the 31-point moving 2 σ deviations to account the different mode of oscillation before and after ~8,000 yr BP. The $\delta^{13}C$ signal presents heavier values when $\delta^{18}O$ becomes lighter during both events, indicating environmental changes during the events, but $\delta^{13}C$ changes are not more significant than others during the Early Holocene. Interpretation of the $\delta^{13}C$ is ambiguous. The large positive anomalies could be related to the duration of snow canopy over the cave, implying a shorter growing season. This would explain such a heavy $\delta^{13}C$ (vertical red bar scale show range of bedrock $\delta^{13}C$). However, effects of in-cave processes which could have caused variations in degassing should not be ruled out. For $\delta^{18}O$ and lamina thickness interpretation see main text. Both events recorded in the $\delta^{18}O$ signal are well defined with several data points passing the 2σ threshold; six in the first event and 23 in the second event. During both events significant increases in carbon isotopes occur and a clear diminution in growth rate is obvious

immediately after the first event. Note that although some of the lowest $\delta^{18}O$ values coincide with increases in lamina thickness, most of the anomalously depleted isotope values during both events occur with regular or even slow growth rates. This is the case for the 66% of the duration of the first event and 74% of the second event.

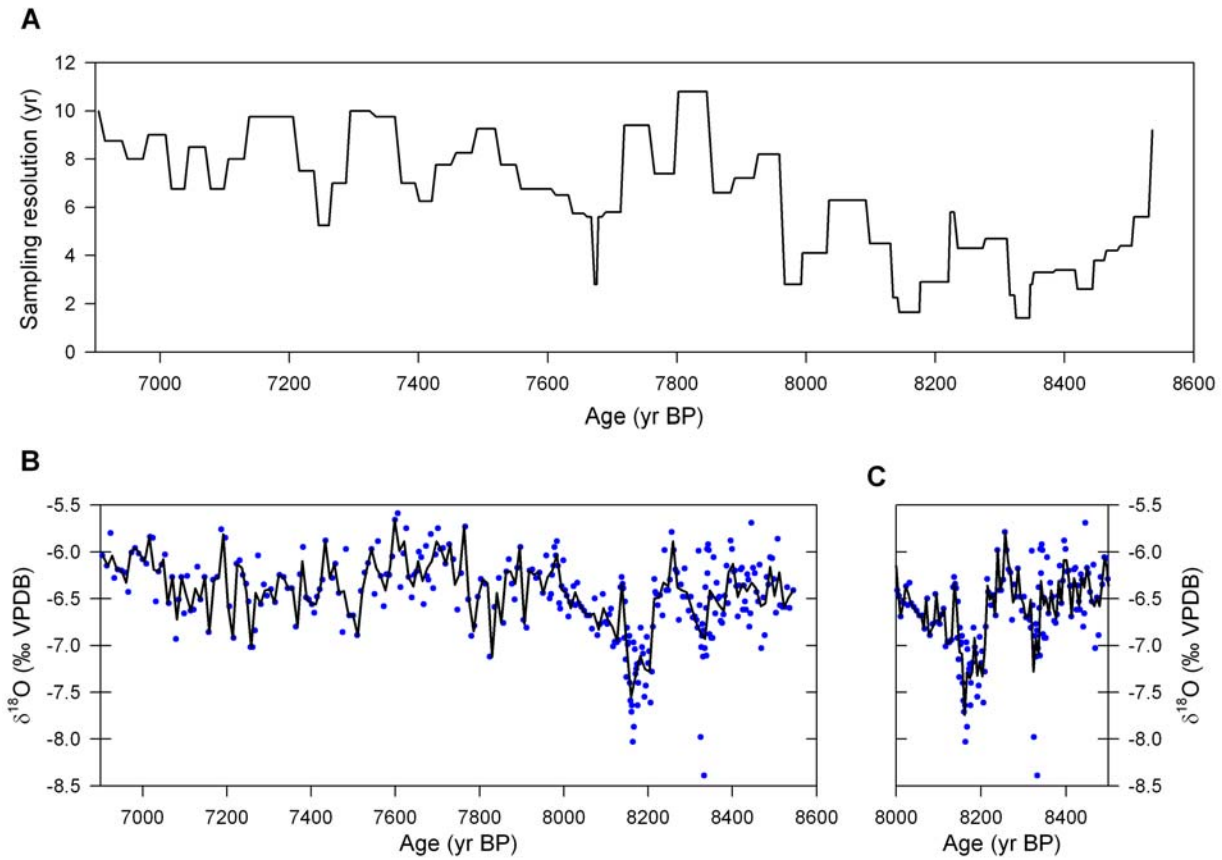

Figure DR4. Isotope sampling resolution and signal filtering for the 8.2ka event. A: Sampling resolution expressed in years per sample. Variations are caused by different spatial sampling as well as changes in growth rate. B: Raw data for the event (blue dots) and series after an 11 yr filter was applied (black line). C: Raw data for the event (blue dots) and series after application of a 6 yr filter (black line). No seasonal $\delta^{18}O$ pattern has been identified within the annual laminations or in drip waters through the year (Turrero et al., 2007), and each analysis covers several years, so aliasing is not thought to be an important factor affecting $\delta^{18}O$ variability. The 6-yr filtered $\delta^{18}O$ series clearly shows two main anomalies. However, when the 11-yr filter is applied, the former spike becomes less prominent because of its short duration. Therefore, sub-decadal sampling resolution is required in order to resolve events as short as the first $\delta^{18}O$ anomaly.

REFERENCE CITED

Turrero, M.J., Garralón, A., Gómez, P., Sánchez, L., Martín-Chivelet, J., and Ortega, A.I., 2007, Geochemical evolution of drip-water and present-growing calcite at kaite Cave (N Spain), *in* Bullen, T. D., and Wang, Y., eds., Water-rock interaction: London, Taylor and Francis Group, p. 1187-1190.