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Reconstructing the Gibraltar speleothem record of Dansgaard-Oeschger events in the early last glacial period against the ice core record, N-GRIP2.

Humarrah Sheikh, Dave Mattey, and Nathalie Grassineau
Department of Earth Sciences, Royal Holloway University of London, UK

Gibraltar is a valuable location for analysing climatic transitions as it is located in the transition zone between the Atlantic jet stream and tropical anticyclone belt. This project aims to build a comprehensive stable isotope record of the Ragged Staff cave system by analysing the d13C and d18O isotopes from the stalagmite sample Gib10e and combining it with other speleothem data from the cave system. The speleothem stable isotope record shows a strong correlation with the N-GRIP2 d18O and polar dust record, over the last ∼100 kyrs. The 22 U/Th dating points show that this specific sample coincides with Dansgaard-Oeschger (D/O) events 19, 20 and 21, and Marine Isotope stage (MIS) 4 and 5a– filling a hiatus in the pre-existing record between ∼70-80 kyrs. These D/O events mark millennial-scale periods of rapid climate change that have been characterised from ice core records and can be clearly observed in this stalagmite.
The dating of Gib10e shows that the stalagmite grew in two stages; from 106-66 ka and 46-38 ka. The isotope analysis has a strong overlap with the previously analysed flowstone (Gib10d) between 68 – 71ka. The high-resolution isotope data from both samples show a strong correlation between the calcite d18O vs. N-GRIP d18O, and the calcite d13C vs. N-GRIP polar dust (Ca ppb) – with the speleothem record preceding the ice core record by a few thousand years. This could suggest a teleconnection between the Western Mediterranean and Northern Greenland. The lag may be due to the time taken to change the waterbody between the two locations as well as lag in the polar jet stream. Further analysis of the data is needed to assess exactly what climatic implications can be made.