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Precise Timing of Dansgaard-Oeschger events 1-13 in stalagmites from Sofular Cave, Northern Turkey

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Dansgaard-Oeschger events (DO) are apparent in numerous paleoclimate records across the northern hemisphere (e.g., Voelker, QSR 2002). Their absolute timing, however, is still not well defined. This is, in part, due to the chronological uncertainties of ice core (layer counting errors) and sediment records (calibration of radiocarbon dates and marine reservoir ages). Uranium-series dated (^{230}Th) stalagmites showing well defined DO events in their isotopic profiles are crucial to establish a more coherent chronology for DO events (e.g., Wang et al., Science 2001; Genty et al., 2003). To date, the Hulu Cave oxygen isotope (δ^{18}O) record from China (Wang et al., Science 2001) is the only absolutely dated stalagmite record that shows well-defined DO events back to 75 kyr before present (BP). However, in comparison to Greenland ice cores, the Hulu δ^{18}O time series has a rather coarse temporal resolution (50-200 years) and sampling resolution of ^{230}Th dates is in the range of $\sim$1600 years between 20 and 75 kyr BP. Further absolutely dated stalagmite records covering this period are discontinuous and coarsely resolved; others do not show DO events at all. Clearly additional ^{230}Th-dated speleothem records showing well defined DO events are needed to corroborate and, if necessary, refine the current Hulu Cave chronology. Providing concise ages for DO events is also crucial as the Hulu Cave record has become a reference record for many paleoclimate time series, such as the extended Cariaco basin ^{14}C chronology (Hughen et al., QSR 2006). Here we present a 50.3 kyr year-long stalagmite oxygen (δ^{18}O) and carbon (δ^{13}C) isotope record from Sofular Cave located at the Black Sea coast in north-western Turkey. A set of 99 ^{230}Th dates with unprecedented small age uncertainties ($\sim$0.25-2%) and highly resolved ($\sim$20 year resolution for the entire record) δ^{18}O and δ^{13}C profiles, both are showing explicit DO events, allow us to test the accuracy of the Hulu Cave record and to further improve the absolute timing of D-O events 1 to 13.