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Climate variability during MIS3 recorded by two stalagmites from Donnehue's Cave, Midwestern USA

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MIS3 is an important time interval for paleoclimate research. It is characterized by high-frequency climate variability expressed as millennial-scale cycles of abrupt warmings followed by a gradual return to colder temperatures – also known as Dansgaard/Oeschger (DO) cycles. The trigger mechanism(s), as well as the impact of these DO events on temperature and rainfall amounts in continental regions are still poorly understood. Little information about this important time period is available from the Midwestern USA, where terrestrial climate records are needed for a better understanding of the DO's impact and trigger mechanism(s) in areas influenced by large-scale atmospheric circulation patterns.

Donnehue's Cave is located in SW Indiana, an inland region that is seasonally affected by three different airstreams: the Gulf of Mexico airstream in the summer, and the Pacific and Arctic airstreams in the winter. The combined effect of these air streams and of the Westerlies makes this cave region an interesting, albeit challenging, site to study the imprint of large-scale atmospheric circulation patterns in speleothems.

In this study, we compare the δ18O variations from two MIS3 stalagmites from Donnehue's Cave. The two records replicate and complement each other indicating that they reflect the δ18O composition of the rainfall. Further, we interpret this signal as variations in the moisture source and the distribution of the rainfall over the seasons. Lastly, we discuss the implications for changes in atmospheric circulation patterns and compare our records with other available proxy records.