Mapping Asian monsoon changes with speleothem $\delta^{18}O$ records

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Speleothem $\delta^{18}O$ records have extensively been used to study Asian monsoon changes. However, less attention has been paid to the spatial distribution of speleothem $\delta^{18}O$ values. Despite some caveats, we advocate an approach to reconstruct spatial and temporal transects ("maps") of speleothem $\delta^{18}O$, thus time series of precipitation $\delta^{18}O$ distribution over the region.

We obtained three speleothem $\delta^{18}O$ records from caves along a SW-NE transect from coastal Myanmar to southwestern China. All the three records cover the whole or a major portion of the past 40,000 years, particularly the last glacial maximum and present day. The comparisons between the records show a broadly decreasing trend in speleothem $\delta^{18}O$ values along the transect, consistent with an overall continental rainout effect of water isotopes when surface moisture is transported further inland. A much larger $\delta^{18}O$ gradient however exists during the last glacial maximum than in the late Holocene. A stronger water isotope fractionation during the glacial period is likely caused by a larger temperature gradient and suppressed plant transpiration along the transport pathway. Caution therefore is needed when interpreting the speleothem $\delta^{18}O$ records from a monsoon downwind region.