PP048-06 - Using triple oxygen isotopes to constrain speleothem paleorecord interpretation in western USA cave systems

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Abstract

Speleothem oxygen isotope ($\delta^{18}O$) records provide key insight into the rate and timing of terrestrial paleoclimate changes during the late Quaternary. However, it can be difficult to deconvolve the $\delta^{18}O$ signal into its individual components, which include numerous processes related to temperature, rainfall, evaporation, infiltration, and the cave environment. Here, we develop a geochemical framework for using triple oxygen isotope analyses ($\Delta'^{17}O$) to constrain interpretation of $\delta^{18}O$ speleothem records. This framework identifies dominant hydrologic processes by their characteristic (although not necessarily unique) trends in $\delta^{18}O$ vs. $\Delta'^{17}O$ space. We apply this framework in case studies of western USA speleothems. First, we investigate the Cave of the Bells, Arizona, record. Data define a horizontal $\delta^{18}O$ vs. $\Delta'^{17}O$ trend consistent with Rayleigh distillation, which agrees with published interpretations invoking changing temperature and precipitation (amount, intensity, source, or seasonality) as drivers of the changes in the $d^{18}O$ record. Notably, results likely exclude within-cave kinetic effects as a driver. Second, we compare two Nevada speleothems, from Leviathan and Lehman Caves, which formed under (near-)equilibrium and kinetic

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