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Stable isotope fractionation in speleothems as a proxy for subsurface environmental changes, Milchbach cave (Switzerland)

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Recent modelling work concluded that stable isotope fractionation along speleothem growth layers is largely controlled by cave temperature and drip interval (e.g., Mühlinghaus et al. 2007, Romanov et al. 2008). The magnitude of isotope fractionation could, therefore, be used as a proxy of the subsurface depositional environment. Here, we present evidence of changing isotopic fractionation in speleothems from a periglacial karst system, which experienced drastic changes in cave ventilation and hydrology during the Holocene.
Three coeval stalagmites were sampled from Milchbach cave (Switzerland) and U/Th-dated to between 2 and 8.6 ka. 2D mapping of stable isotopes reveals major changes in 13C and 18O along individual growth layers. These changes correlate noticeably with changes in the calcite fabric and speleothem growth rate suggesting that changes in drip rate were the predominant control, possibly related to fluctuations of the mass balance of the Upper Grindelwald Glacier.

References:
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