



Towards an improved Understanding of the Magnesium-Isotope Record of Speleothem Archives

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The geochemical record of speleothems, combined with U-Th age dating, provides a high-resolution archive of past climate change, albeit one that is not without problems. Many of the main environmental proxies involved record not one factor alone (e.g., amount of rain fall, cave temperature, seasonality etc.) but a combination of several parameters.

Despite novel research initiatives including cave monitoring or fluid inclusion studies, the interpretation of speleothem data is not without ambiguity. One possible way to (at least) reduce the number of unknown factors is the application of multi-proxy data sets and particularly the application of non-conventional isotope systems (here $\delta^{26}\text{Mg}$). Previous work (Buhl et al., 2007) has shown that Mg isotope time series in calcitic speleothems from calcite hostrock caves shift systematically throughout time.

Speleothem $\delta^{26}\text{Mg}$ data from a semi-arid setting (Morocco), a temperate-humid setting (Germany) and a tropical-humid locality (Peru) all demonstrate the sensitivity of this proxy to even subtle climate changes reflected in changes of carbonate *versus* siliciclastic weathering and rain-water residence time in the soil profile and aquifers overlying the caves. The Peruvian record is combined with fluid inclusion data from the same speleothem allowing for a better prediction of controlling factors. In order to understand Magnesium-isotope data from speleothems in a quantitative manner, time-series data are calibrated against $\delta^{26}\text{Mg}$ records from cave monitoring experiments including calcite precipitated under known environmental conditions.

Buhl, D., Immenhauser, A., Smeulders, G., Kabiri, L. and Richter, D.K. 2007. Time series $\delta^{26}\text{Mg}$ analysis in speleothem calcite: Kinetic versus equilibrium fractionation, comparison with other proxies and implications for palaeoclimate research. *Chemical Geology*, 244: 715-729.