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The potential of magnesium isotopes for process studies in dolostone cave systems

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Palaeoclimate data provide the background against which models, forecasting future climate changes, are calibrated. Well-dated, high-resolution speleothem deposits are essential in this context, but caves and thus speleothems are affected by a complex spectrum of processes, which take place in the atmosphere, the soil zone, the karst zone or the cave itself. Monitoring programmes performed in caves worldwide shed light on these processes. Recent studies have shown that the non-traditional Magnesium (Mg) isotope system is instrumental in understanding processes taking place in the soil and karst zone. This is because Mg isotope ratios provide information on rock-water interaction, water residence time and weathering processes. However, research focused mainly on caves formed in low Mg limestone caves up to now. On the other hand, only very limited studies involving dolostone (high Mg limestone and dolomite) caves were conducted. Here, we present Mg isotope data of leached soil samples, host rock (both limestone and dolostone) and drip water from German and Moroccan caves. The German caves, Zoolithen and Kleine Teufels Cave, are located in South Germany in the Fraconian Alb. The Moroccan caves, Grotte Bab Mafraque, Grotte Prison de Chien, and Grotte de Piste, are located in North Morocco in the Middle Atlas. First data show variable Mg isotope ratios of drip water, which range between -1.53 and -2.27‰ DSM3 in the German caves. The drip water Mg isotopic composition is similar to that of the dolostone host rock (-1.66 to -1.86‰ DSM3). Interestingly, drip water Mg isotope ratios of sites from both German caves show similar variations suggesting that the same processes influence the Mg isotope signatures. Although not fully understood, the presented data are promising, and give insight on rock-water interaction, water residence time and weathering processes in the soil and karst zone.