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Climate of the Past Discussions

Interactive comment on "The magnesium isotope record of cave carbonate archives" *by* S. Riechelmann et al.

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We thank James Baldini for his helpful and constructive review. We greatly appreciate his work, which has helped to improve our paper. In the following detailed answers to his comments are provided.

Comment 1: Section 4: The authors move on to the results a bit too early I think. It would benefit the reader to go through the systematics of Mg-isotopes in stalagmites before presenting the results, so that the reader may put the results into a better context. I therefore suggest that the text from section 5.1 is moved up to between Sections 3 and 4, or possibly even directly after Section 1. This may also require a slight rewording of the text in places.

Our reply: We agree with the reviewer and moved the text from section 5.1 between the sections 3 (Magnesium isotope analysis) and 4 (Speleothem geochemistry: results).

Comment 2: P1846, L15: PCP does not actually lead to a higher Mg-content of the fluid, just a higher Mg/Ca of the fluid.

Our reply: The reviewer is completely right. We corrected this mistake to ". . .leading to a higher Mg/Ca ratio of the fluid."

Comment 3: P1853: The authors are probably correct about the detrital material having an influence on Mg isotope ratios. However, the discussion is limited to areas of stalagmites with clear detrital layers, whereas there is probably detritus in the form of colloidal particles disseminated throughout the samples at variable concentrations. It might be worthwhile to add a few lines discussing colloids, and possible referencing Adam Hartland's work. I have made a suggestion on how to quantify detrital concentrations below.

One possible way to add to the discussion on effects of detrital material on Mg isotopes is to plot Mg isotope ratios versus some proxy for detritus. Maybe 232Th concentrations could be used? These should be readily available for most of the stalagmites discussed, and then it would simply be a matter of either making a time series of 232Th versus delta26Mg for some of the stalagmites, or perhaps just a scatterplot of mean 232Th concentrations for all stalagmites (where this known) versus mean delta26Mg. This might not work, but is maybe worth trying?

Our reply: We thank the reviewer for this constructive comment. We added information regarding colloidal material in section 6.5 (Potential, problems and future work) with reference to Adam Hartland's work. We tried to plot Mg isotope ratios against 232Th concentrations. It is not possible, however, to compare 232Th to delta26Mg, because both were sampled at low resolution and were not taken from the same layers. But we will keep this in mind for future work.

Comment 4: Section 5.5: Maybe I have missed this, but it might be worthwhile pointing out that Spannagel is developed in marble sandwiched between gneiss, and discuss what effect the gneiss might have on the Mg isotope signature.

Our reply: The reviewer is right that it might be worthwhile to discuss the effect of the gneiss on the Mg isotope composition. Unfortunately, only very few data are available in this case. Nevertheless, we added a short paragraph on this topic in section 6.4 (Cold-humid climate: speleothem time series ïĄď26Mg data from Austria).

Comment 5: Figure 3: Currently it's difficult to see the carbon and oxygen records in the figure. Could these be plotted on different axes so that the time-series could be compared better?

Our reply: We changed this as the reviewer suggested.

Comment 6: Figure 5: It might be useful to plot the AH-1 Mg isotope record alongside BU4 in order to facilitate direct comparison. It would be interesting to compare them directly in the figure, because they are compared in the text several times.

Our reply: We agree with the reviewer and added a new figure to facilitate the comparison of the Mg isotope records.

Comment 7: Technical Corrections: P 1836, L1: ". . .of magnesium (delta26Mg) isotope time-series data. . .." L19: ". . .which is consistent with the rather. . ." L21: ". . .suggest changes in outside air temperature was the principal driver rather than rainfall amount." P1838, L15-18: I wouldn't number this list unless there is a number 3. P1840, L24: "powdered" instead of "gounded". Elsewhere as well. L25: ". . .does not exceed the second decimal. . ." P1841, L6: ". . .is found that reverses at around. . ." L12: "The lowest measured values occurred at. . ." L22: ". . .(dated using one U-Pb age of 2.134. . .)" P1842, L13: ". . .between two age points:. . ." P1844, L16: "Rainwater becomes progressively 26Mg-enriched with increasing distance. . ." L29: ". . .weathering increases during. . ." P1846, L27: ". . .is observed (Fig. 8)."

L29: "However, near the calcite-to-aragonite transition the presence of small amounts of aragonite within the calcite is possible." P1852, L15: "led" P1856, L15: ". . .are currently difficult." P1857, L12: ". . .interact. . ." rather than "interfere"

Our reply: We changed these points.

The authors

Interactive comment on Clim. Past Discuss., 8, 1835, 2012.