

***Interactive comment on “Monitoring stable isotopes in caves over altitudinal gradients: fractionation behaviour and inferences for speleothem sensitivity to climate change” by V. E. Johnston et al.***

**V. E. Johnston et al.**

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We sincerely thank guest editor A. Mangini for his astute selection of reviewers and for the opportunity to improve and submit the revised manuscript. Both reviewers made thorough and thought-provoking reviews that will substantially improve the work. The revised manuscript will address the points raised by the reviewers and editor as outlined in our response. We appreciate that all parties saw the value in the limited “snapshot” dataset presented and how these data can be used towards further understanding stable isotope fractionation in cave environments. We hope that this first attempt at

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such an altitudinal study may lead to further, more detailed investigations of a similar kind.

Editor Comments (A. Mangini) This manuscript has a potential to combine better the petrographical observations with the fractionation processes that are described by the models. For example, the models attribute larger fractionation to faster precipitation of calcite. Is this pattern reflected in the fabrics of the stalagmites?

Reply) As was pointed out by the two reviewers, we have little petrographical observations that directly reflect the same samples and caves that were studied in this investigation. Such observations could be made in two ways; by the collection of precipitates on glass or calcite substrates and observation under the Scanning Electron Microscope and/or the collection of actual speleothem samples and the production of thin sections for petrographic observation under a light microscope. However, a thorough investigation would require both methods including observations of the crystallites that compose the calcite and the resulting fabric that is found in the speleothem. This was not carried out as part of this broad, ‘snapshot’ study as it would require the seasonal collection of calcite precipitates on artificial substrates (to monitor changes with saturation index etc.), and the final collection of a large amount of speleothem material from each cave, which for cave conservation reasons, was beyond the scope of this investigation. However, such an investigation could provide important information to the speleothem community given that 1) speleothem fabric has been shown to change based on factors that could be related to the climate, and thus may provide an additional environmental proxy in speleothems, and 2) stable isotope values may vary given the fabrics preserved in the speleothems and therefore it is important to investigate the relationship between petrography and stable isotope fractionation. In the revised manuscript, we may therefore, attempt to answer the editors query, however noting that the petrography section is generally being reduced in size. Moreover, we advocate that this topic of investigation is taken up and studied in full as part of a longer running project that accounts for seasonal and annual variability in the cave processes that affect the calcite

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fabrics. These could then be better modeled or linked to existing models, to understand the connections between the stable isotopes, fabric and fractionation.

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