

Interactive comment on “Stalagmite water content as a proxy for drip water supply in tropical and subtropical areas” by N. Vogel et al.

Anonymous Referee #2

Received and published: 23 August 2012

General comments: The paper explores stalagmite water content as a new paleoclimate proxy for rainfall in tropical and subtropical areas. It is well within the scope of Climate of the Past and addresses a topic with high paleoclimatic significance. The paper is in general well-written and organized.

The presented novel proxy may help to discern different influences on the stalagmite calcite $\delta^{18}\text{O}$ value (e.g., temperature, rainfall amount and rainfall isotope signature, isotopic fractionation during calcite precipitation). In the tropical and subtropical setting, rainfall-related isotope signals are typically large relative to non-equilibrium isotope effects, however, as the calcite $\delta^{18}\text{O}$ value is additionally influenced by temperature variations, the stalagmite water content as a rainfall amount proxy will help to clarify the origin of the observed signals. The presented proxy may be of substantial help

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beyond the application in tropical and subtropical regions. For example, subtle climate signals in stalagmites from mid-latitudes are overprinted by comparatively large non-equilibrium effects. A proxy that gives information about rainfall variability clearly helps in stalagmite data interpretation and is an interesting parameter by itself.

The used technique is clearly described, all necessary data for discussion are given, the interpretation is based on the authors genuine data combined with independent research that is properly cited. In light of the proposed potential of stalagmite water content as a new paleoclimate proxy (and after minor revisions, given below) the manuscript should be published in *Climate of the Past*.

Minor suggestions:

General: Using ‘precipitation’ with reference to rainfall can lead to confusion with calcite precipitation. ‘rainfall’ is a less ambiguous alternative.

Introduction:

- References to other work that already raised the question of a possible paleoclimatic significance of the water content in speleothem fluid inclusions should be added at a suitable place.
- few sentences explaining the connection between rainfall amount and oxygen isotopes in tropics and subtropics (and how they are visible in stalagmites) would be helpful for readers not totally familiar with this topic and may be a good reminder for the following discussion.

Experimental

- page 2899, line 7-8: give numbers or reference to section 2.5.
- page 2900, line 26: “...were numerous and heterogeneous in size, shape and distribution...” , in general, or only in some thin sections?

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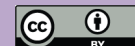
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- Values of P3-A and P3-B are identical within uncertainty.
- How does the amount of black pixels (in Figures 4 and 5) relate to the volume fraction of fluid inclusion given in section 3.2?
- Whereas black pixel amount (Figures) and fluid inclusion volume fraction (section 3.2.) are rather similar for D1-A and D1-B, these values are quite different between figures and text for D1-C, P3-A and P3-B. What is the reason for that?

With respect to microscopy an analysis of the crystal fabrics might also be of interest. The authors suggest that drier periods lead to imperfect and irregular crystal growth (page 2895, line 12) favouring the incorporation of fluid inclusions. Changing water supply may lead to changes in the crystals itself, instead of columnar crystals other fabrics may occur (see e.g. Frisia et al., 2000; J. Sed. Res., 70, 1183-1196). Information about the fabrics in the different stalagmite parts before and after the stated break points in water content and oxygen isotope records would enhance and support this statement, which is crucial for the understanding why the water content in stalagmites changes. An understanding of the governing processes will lay the foundation for further research in this field.

Discussion: Page 2907, line 1: ...formed during times of increased drip water supply... higher drip water supply in general might not lead to undisturbed calcite growth (e.g. if drip water supply only increases during few months), however, a continuous drip water supply is certainly conducive for it. Please specify.

Table 1: What do the columns refer to? Concentration, activity ratios? Give a brief description in the table caption. Give also references to the papers that include the dating of the other stalagmites.

Fig.3: Add in the caption that the samples at 320 °C were externally pre-crushed. That helps the reader to understand directly why the water yield is lower for these samples.

Fig.4 and 5: How does the black pixel percentage relate to the fluid inclusion volume fraction (see comment above)?

Typos: Page 2907, line 9: University of Bern

Page 2907, line 11: unbureaucratic

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