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Climate of the Past Discussions

Interactive comment on "Palaeoclimate significance of speleothems in crystalline rocks: a test case from the Lateglacial and Early Holocene (Vinschgau, northern Italy)" *by* Gabriella Koltai et al.

Anonymous Referee #1

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Authors studied 9 flowstone samples grew in non-karst host rock fractures from 3 locations in the Alps. Both aragonite and calcite were found to be present in these samples. Using U-Th geochronology, growth history was constructed and stable oxygen and carbon isotope time series were produced. Based on the covariance of oxygen and carbon isotope variations, authors believed that the oxygen isotopes are likely to be in isotopic equilibrium for all but 2 samples, and reflect local precipitation signals, while carbon isotopes are likely affected significantly by kinetic fractionation. Authors noted the similarity of segment of the record with coeval ice core oxygen isotope time series at the

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beginning of Holocene and suggest that these flowstones do contain climate signals, even though a more robust and continuous record are challenging.

Overall, the study of speleothems outside a cave environment is a very attractive proposition as it greatly expands the areas for which a study can be carried out. The manuscript contains excellent work and should warrant publication. There are some edits or clarifications, however, I hope authors will consider.

First, the complete data for oxygen and carbon isotope analysis is not available in either manuscript, or supplementary documents. The data table only listed min and max isotope values for each of the nine samples. This greatly restricted exploration of the data by readers who intend to do so.

Second, the presentation of oxygen isotope record is fragmented and difficult to read. Because aragonite and calcite fractionation factors are known, it may worth converting aragonite stable isotopes values to equivalent calcite values and construct a composite record. This may produce a more readable time series, which can be more easily compared with ice core record. On these time series, it is also apparently that some samples represent much larger time windows than others (e.g., fig 5, first SQ time series, between 10-10.5 ka). For these samples, line graph masked the uncertainty in the magnitude and frequency of the variations. Authors may consider not connecting the individual data points in these locations.

Third, I have reservations on the reliability of using covariance of oxygen and carbon isotopes as an indicator of the presence of kinetic effects. As pointed out in Feng et al. (2012) and Myers et al. (2014), oxygen and carbon isotopes of calcite are affected by difference factors: PCP/PAP is the major control on calcite isotope values, where it has virtually no impact on oxygen isotopes, which is controlled by evaporation, growth rate. A strong covariance between oxygen and carbon isotopes does not necessarily indicate a significant impact of oxygen isotope kinetic fractionation.

Fourth, lack of image of the samples studied. Most speleothem samples from cave

have regular growth patterns and readers are familiar with them. A flowstone grew in the fracture of non-karst settings is more difficult to visually grasp. A photo of the sample (if it's taken as a whole) or a diagram (if a core was taken) could help readers understand the work being done.

Fifth, Large part of section 5.3 seems belong to the introduction section rather than discussion section. The introduction section, as written, is a bit light. Moving some part of the text from 5.3 to introduction may provide more background for readers before presenting the details of the study.

Lastly, author should address the problems surrounding the flowstone. Most studies avoid flowstone due to concerns of kinetic effects, what steps have authors taken to avoid this pitfall?

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