

### Reply to anonymous referee #3

In the following we reply to the main point of criticism. Minor aspects (e.g., related to language and grammar) will be directly considered in a revised version. Referee comments are in italic and grey, the author response in black

*The manuscript presents a 4000-long palaeoclimate record from Late Holocene, from Hermes Cave (Peloponnese, Greece). The area and the period is obviously very interesting for archaeological, geoarchaeological and societal sciences too. During the last years/last decade, there have been very interesting, robust and solid studies of this period and in the general area of East Med, Aegean and Greece in particular. The level of current knowledge is quite high and any new addition should step on this and make a step forward. The major problem of the study by Kluge et al. is that their proxies, together with their assessment of the data, are not supporting their conclusions. It seems that the authors tried to use their available data and forces some conclusions which cannot be supported. The manuscript is well written and the methods used are indeed enough to proceed to a palaeoclimate study, but the results are not helping. It is probable that the specific speleothem archive is actually not suitable for such a study.*

- So far, there exists no continuous speleothem record for the last 5000 years for the Peloponnese. Furthermore, the existence of several records from the same region would allow to assess signal reproducibility and climatic relevance and, given the temporal resolution is comparable, also to investigate potential spatial pattern. In this respect, the Hermes Cave stalagmite can complement the fragmented stalagmite data from the Peloponnese. In a revised version we'll strengthen the regional comparison and embed the new results in a more comprehensive discussion

*Major remarks: - Age uncertainty. The stalagmite growth period is very short, so the age model must be very precise and accurate. Unfortunately, the GH17-05 calcite was not 'clean' enough to give proper U/Th datings for this purpose. It is impossible to proceed to such detailed and specific interpretation, discussion and reconstruction with such uncertainties in Late Holocene.*

- See response to ref. 2
- The stalagmite growth period covers almost half of the Holocene which is related to the major phase of societal development in Greece
- The age model will be improved by additional radiometric dates and comparison with well-dated speleothem sequences from Greece
- The uncertainties are variable, but comparable to other speleothem records with low uranium content. Especially around the 4.2 ka event the chronology is reasonably precise and accurate and allows to provide unique, new information

*- Identification of phases. The authors proceed to identifying phases of wet and dry pulses, based on vague observations on the  $d18O$  curve. These observations must be justified, by any means of analysis, considering value trends, statistical evaluation (is a pulse an outlier from the rest of the curve?), normalization or any other way of analysis. In some proxies, a periodicity is given (eg. line 28, page 9) without any analytical calculation (naked eye?).*

- A sub-section about statistical methods will be added in the revised version

*- Discussion. Correlation with other records is not properly justified. The observations by the authors are not really visible in the plots, even by comparing some of the records and excluding others. One needs to keep in mind the age uncertainties as well, in order to try to find correlating pulses between records. Eg. detecting dry conditions in time windows of 0.1 ka (eg. line 8, page 15) is not consistent with the age model.*

- We'll restructure the discussion regarding the comparison with the other records and also visually support our observations in the corresponding figures

- *Figures. Figures need reorganization and improvement. Fig. 1 A, does not give a clear location of the cave. Fig. 1 B, is not really needed in such details. Fig. 2 B, photo is not helping actually. Fig. 4, the stalagmite needs more info plotted, such as the axis of sampled positions. Fig. 8 and 9, the references of the presented records are missing, they should be added here and in the reference list.*

- **Suggested improvements will be implemented in the revised version**

*Generally, the article cannot be accepted in its present form. It needs an overall major revision and additional analytical effort (eg. age model) in order to be considered for publication in CoP.*