

## ***Interactive comment on “Does Belgian Holocene speleothem records solar forcing and cold events?” by Mohammed Allan et al.***

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The high-resolution trace element record and the accurate chronological control of the studied stalagmite definitely invite improved statistical evaluation. I think the study is an interesting contribution and will be a well cited paper after the corrections recommended by the official reviews has been implemented. However, I recognized a few points which were not mentioned by the reviewers and deserve more attention during the revision. I hope this short comment can be useful in the finalization of the revised version.

The minor peaks in the Lomb-Scargle periodograms (LPS) in Fig 5 should be treated cautiously. Actually Lomb-Scargle periodogram analysis estimates the significance

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only of the largest peak (e.g. Press et al., 1996) and cannot provide information on the significance of the minor peaks in one round. The significance of the minor peaks can be tested in an iterative way by omitting the highest peak so the signal of the second one can be tested and so on. I mean the signal related to the frequency found to be significant in the LSP could be removed from the record and the analysis can be repeated on the filtered data.

As correctly stated in the supplementary text the unevenly spaced record had to be re-sampled to an evenly spaced record to be applicable for Wavelet analysis. There is only a very short note in the supplementary text saying that this resampling was performed with linear interpolation. This pre-processing step, however, quite crucial and the applied resampling design might affect the variance spectrum especially in the high frequencies (i.e. redden it). A resampling protocol utilizing a spectral control to avoid spectral bias caused by interpolation and retain the original spectral characteristics of the data has been presented recently (Hatvani et al., 2017) which might be useful to the Authors in the revision work. As a related question, no significance level is marked in the Wavelet power spectra of Fig. 6. In lack of significance level it is difficult to evaluate the results. The seminal paper from Torrence & Compo 1998, cited also in the supplementary, provides an excellent guide on the types and estimation techniques of significance levels of Wavelet power spectra.

Some points also need correction related to the solar cycles. The 130-yr periodic signal is called, erroneously, as ‘Hale cycle’ in the manuscript (e.g. lines 43, 201, and 298 in the original manuscript.) Actually, the 22-yr cycle has been named after George E. Hale as recognition of his great contribution to solar physics. Namely, he found that relating to the reversal of the global magnetic field of the Sun, with the period of 22 years, the polarity of sunspot magnetic fields changes in both solar hemispheres at the start of a 11-year cycle (Hale et al., 1919). Spelling mistakes in the name of the cycles also should be corrected at a few other places in the manuscript e.g: Halstatt (instead of Hallstat) in the abstract. de Vries (instead of de Varies) in section 5.2.

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The last sentence in the caption of Fig3 says: Dark line color presents mean of three measurements. Please clarify the sentence. What do you mean? Were there triplicate measurements and the dark line shows their average, or the dark line is the 3-point moving average?

I truly hope to read a revised final version of this interesting contribution in CP soon.

sincerely yours,

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