

Dear Dr. Zoltan,

Thank you for your interest and comments. Here are reported our answers (in blue color).

The minor peaks in the Lomb-Scargle periodograms (LPS) in Fig 5 should be treated cautiously. Actually Lomb-Scargle periodogram analysis estimates the significance C1 CPD Interactive comment Printer-friendly version Discussion paper 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

We agree with you that the minor peaks in the Lomb-Scargle periodograms should be treated cautiously.

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.

It was already noticed by one reviewer and it is now corrected in the text. In the revised version, we explain the resampling protocol utilized in our ms. Prior to perform the spectral analysis each dataset was resampled as follows : for each age t (in BP) in the evenly spaced sequence 1789, 1799, 1809,...., the corresponding concentration of trace element is obtained through a linear interpolation between two consecutive data points whose ages (in BP) surround t. Since 92% of the time gaps in the original time series are lower than 25 years and the remaining 8% all occur at once at the end of the signal (after 9500 BP), the effects of such a resampling on the results presented are negligible, especially for periods such as the de Vries cycle or larger. See more information in supplementary materials Fig. 6-8.

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.

In figure 6, continuous wavelet transform spectra for sunspot number, Ba, Sr, Mg. Spectral power (variance) is shown by colors ranging from deep blue (weak) to deep red (strong). Ba, Sr, and Mg concentrations and sunspot number are presented along y-axis. The white contour lines represent 95% confidence level. The caption text has been modified.

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).

The 130 yr frequency interval corresponds to the subharmonics of the Hale cycle. See the following references: Attolini, M. R., Cecchini, S., Galli, M. & Nanni, T.: On the persistence of the 22 y solar cycle. *Sol. Phys.* 125, 389–398, 1990; Tuner, T.E., Swindles, G.T., Charman, D.J., Langdon, P.G., Morris, P.J., Booth, R.K., Parry, L.E., Nicolas, J.E.: Solar cycles or random processes? Evaluating solar variability in Holocene climate records. *Sci. Rep.* 6, 23961; doi: 10.1038/srep23961 (2016).

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. Ok, it is now corrected.

The last sentence in the caption of Fig.3 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?

Indeed the Dark line color in Fig. 3 corresponds to the 3-point moving average.