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Climate of the Past Discussions

Interactive comment on "Paleoclimate forcing by the solar De Vries/Suess cycle" *by* H.-J. Lüdecke et al.

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General comments of referee#1:

Referee#1: "The spectral and wavelet analysis is performed on differences by linear regression rather than on the original proxy records themselves".

Answer: The spectral and wavelet analysis is actually performed on the original proxy records as cited in the captions of Fig. 3,4, 5 where T(t) resp. P(t) are used. All time series are defined in detail in line 11 - 18 of section "Differences vs. absolute temperatures" with T(t), P(t) as the original data, and DeltaT(t) resp. DeltaP(t) as preprocessed differences. To prevent misunderstandings, we will make additional remarks to the applied data in the pertinent figure captions.

Referee#1: "I'm not entirely convinced of the adequacy of this pre-processing, specifically how representative are the linear trends extracted in the (arbitrary) 100-yr windows. If the goal is to achieve some noise reduction, some non-parametric procedure such as loess smoothing would be probably preferable".

Answer: The goal was not noise reduction. The 100 year differences DeltaT(t) [°C/t] are different physical quantities compared with T(t) [°C]. We used differences to compare past temperature differences with those observed over the 20th century, in order to get an impression whether or not the latter are historically exceptionally high, as is often claimed. The noise reduction is just a by-product of the differencing by linear regression. That the particular choice of 100 years for the differences does not influence the result is shown by comparing with the 50 and 150 year differences.

Referee#1: Fig. 4 is barely discussed and Fig. 5 is not discussed at all. The 200 yr oscillation is not very clear in the wavelet spectra (Fig. 6), this should be addressed and discussed.

Answer: We will discuss Fig. 4 and Fig. 5 more extensively in the revised version. Probably tte referee remark on Fig. 6 is an writing error because Fig. 6 does not depict a wavelet spectrum.

Our answers to Minor comments of referee#1:

Fig. 1: we will try to solve this problem of Fig. 1 in the revised version.

Line 109 (line 15 of the section "Spectral analysis"): Is "discrete" wavelet analysis meant instead of "continuous" because all time series are actually discrete? We will add "discrete" in the revised version.

Line 110 (line 16 of the section "Spectral analysis"): we will correct Fig. 6 to "Fig. 5" in the revised version.

Line 130 (line 12 of the section "Sine wave fit by nonlinear optimization"): We will remove Eq. 5 in the revised version.

Fig. 6: The referee remarks “The differences between the curves could be better appreciated showing the residuals”.

Answer: We thought already earlier about this problem and choose Fig. 6 together with Fig. 8, the latter with deviations that can be identified by number instead of residuals as graphs. It is not a problem to apply an additional figure with residuals. Should we do this in the revised version?

Table 3: The referee remarks “Correlation values are provided without indication of the corresponding uncertainty. This is a serious issue that should be corrected in a revised version”.

Answer: Except for numerical uncertainties that are vanishing with double precision matlab used by us there are no uncertainties caused by the computation steps from the original time series to the final correlation value. These are linear regression, nonlinear optimization (the optimization has no local minima for 100-yr differences, with every random start-vector exactly the same optimum results), and evaluation of the Pearson correlation. Therefore, uncertainties only arise from the original temperature data. Unfortunately, for all time series used in this study no uncertainties of the T(t) resp. P(t) data are given in our the sources http://www.ncdc.noaa.gov/paleo/pubs/buentgen2011/buentgen2011.html, ftp://ftp.ncdc.noaa.gov/pub/data/paleo/contributions_by_author/christiansen2012/christianse ftp://ftp.ncdc.noaa.gov/pub/data/paleo/treering/reconstructions/tasmania/tasmania_recon.txt ftp://ftp.ncdc.noaa.gov/pub/data/paleo/climate_forcing/solar_variability/steinhilber2012.txt The correlations of Stei/Beer, Bü, Chr/Lju, and Cook are similar, thus, we think could be an indication for reasonable small uncertainties of the correlations. We will address the uncertainty problem in the revised version.

Interactive comment on Clim. Past Discuss., 11, 279, 2015.