Clim. Past Discuss.,
https://doi.org/10.5194/cp-2018-104-RC3, 2018

Climate of the Past Discussions

Interactive comment on "Re-examining the 4.2 ka BP event in foraminifer isotope records from the Indus River delta in the Arabian Sea" *by* Alena Giesche et al.

Anonymous Referee #3

Received and published: 23 October 2018

The authors present fascinating new data from core 63KA from the Arabian Sea to reconstruct changes in Indian Summer Monsoon rainfall over the adjacent continent and Indian Winter Monsoon strength. Compared with the original work by Staubwasser et al. (2003) this study presents new d18O records from subsurface and thermocline-dwelling foraminifera species. The difference between subsurface and surface foram-d18O reflects the intensity of surface freshening, whereas the difference between subsurface and thermocline foram-d18O is a measure of wind-driven vertical mixing. The authors focus on the time period 5.3 to 2.9 ka BP encompassing the major shift in both summer and winter monsoons at ~4.2 ka. This mid-Holocene climate change as seen in the 63KA records is compared with the numerous land and marine data that have

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been published since Staubwasser et al.'s study. The interpretation of the new data is sound. Taken individually, each sub-section of the Results and Discussion is well written and clear.

The problem of the manuscript is that the study aims have not been sufficiently worked out. The authors provide an overview on the state of knowledge, but they should more clearly work out the problems and "missing pieces". Indicate possible solutions, and then describe your own approach (which exactly follows those "possible solutions"). This information must be more clearly and prominently provided in the Introduction and not postponed until the Discussion; otherwise, the reader has no guideline for following the manuscript. As it stands, the Abstract and Introduction present the manuscript as a replicate of Staubwasser et al. (2003) with some additional data. But actually these additional data (N. dutertrei and G. sacculifer records) and their interpretation make up the core and primary scientific asset of this study.

Specific comments

1. Abstract, lines 64-65: See above. Even though the G. sacculifer and N. dutertrei records provide the key data for this study, they are presented as by-products, and only in the following sentence (line 66) the reader is informed why they have been generated in the first place.

2. Introduction, lines 124-128: Be more specific on the importance of the IWM. Reconstructing the IWM is one main part of this study, and hence its significance should be sufficiently highlighted.

3. Lines 146-153: Some explanation on the new G. ruber record is required. I guess that the N. dutertrei and G. sacculifer samples are from different sampling positions than the G. ruber samples from Staubwasser et al., and a new G. ruber record is necessary for calculating Dd18O (ruber-sacculifer). This is fine, but should be mentioned.

4. Methods, line 317ff, and Fig. 2d: These CTD data are a snapshot from a single

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day. I would prefer profiles from the World Ocean Atlas, as these are probably more representative. Provide temperature and salinity profiles for two seasons, one covering the main fluxes of G. ruber and G. sacculifer (July-September), the other the peak occurrence of N. dutertrei (December). This will also give the reader an idea on how much seasonality is present at different water depths.

5. Line 329: Provide the total number of samples and the average temporal resolution of the raw data.

6. Results, line 362 and throughout: What is the number of degrees of freedom when calculating the p-values, do the authors use the number of actually measured data or the number of annually interpolated data?

7. Discussion, line 454ff: "is confirmed" should be toned down. The authors are correct as far as the main conclusions of the study are concerned, but otherwise the two records are not congruent. Do different test sizes potentially reflect different seasons?

Minor points

8. Line 238: Down to 100 m.

9. Line 253: recording the d18O and temperature of the seawater

10. Line 256-258: Please, rephrase.

11. Fig. 2a: Use stronger color contrasts.

12. Line 504: Add small delta (same format as in subsequent sentence).

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