Clim. Past Discuss.,
doi:10.5194/cp-2016-107-RC2, 2016

Climate of the Past Discussions

Interactive comment on "Decadal resolution record of Oman margin upwelling indicates persistent solar forcing of the Indian summer monsoon after the early Holocene summer insolation maximum" *by* Philipp M. Munz et al.

Anonymous Referee #2

Received and published: 19 December 2016

Review of manuscript "Decadal-resolution record of Oman margin upwelling indicates persistent solar forcing. . ." by Munz et al.. This manuscript presents data from a sediment core from the northern Arabian Sea. The high-resolution data spanning the early to mid Holocene comprise abundance records of planktic foraminifera and SST estimates based on those, Mg/Ca based SST estimates, some element concentration records and frequency analyses of a number of downcore profiles. Overall this is an interesting paper touching on an important part of ongoing research. The manuscript is easy to read and the quality of the figures is high. With regard to the main thrust of this work, relating changes in the monsoon system to variations in solar insolation

at the decadal to century scale would indeed be relevant in the context of understanding the processes having driven past climate change. It would also aid in improving predictions of future climate change. There are a number of concerns that prevent recommending publication in the current form. The first issue relates to the age control of core SL 163. The authors correctly report that there are age reversals in the section of the core presented in this study. It is to some degree justified to apply a spline to the AMS14C dates and assume constant sedimentation occurred. It seems, though, that the location is not free of the potential for disruption of normal sedimentation. The authors themselves mention that a section of the top of the core is missing (section 4.1) alluding to slope instability as a possible cause. If so, is it possible that the sections with age reversals represent other periods of sediment instability (turbidites)? This should be discussed in more detail.

The authors state that the overall time resolution across the entire section presented in this manuscript is around 20 years. Whilst undoubtedly true for the section younger than 7.5 KaBP, it is not true for the section covering the time period between 8.5 and 7.5 KaBP. The sample resolution in this section seems much closer to 50 years. This should be clarified. Statements related to highlighting differences in the spectral analyses results for different time periods should be double checked as well (see for example page 11 lines 16-18). To me, the fact that higher frequencies have not been recorded between 8.5 and 7.5 KaBP is likely a result of the insufficient time resolution in this section.

There is a little bit of confusion related to a statement made on figure 8 (page 10 lines 4-6). Based on the text a rather strict relation between solar insolation and SST change has been found, i.e. solar insolation leading SST change by roughly 200 years. I may read figure 8 incorrectly, but does this figure not partly show the opposite relation. Between 7.7 and 6.7 KaBP for example my read of the figure implies that amplitude variation in SST (certainly for the assemblage based data) leads the respective change in solar insolation. Other sections of the record also do not show the alleged relation.

This part of the manuscript should be revised. This should also have ramifications with regard to the relation of solar forcing and the response in the climate system. The authors spend quite a bit of text on the technical details related to SST analysis. It would be useful to know what the error bar is with regard to both SST estimates (I might have overlooked a statement on this). My best guess is that it is in the ballpark of $\pm$1-2 degC. Using such an uncertainty, quite a bit of the SST variability would not represent statistically significant change. With regard to the Mg/Ca based SST estimates the main thrust of this paper might change to work assessing specific short term events with significant changes in temperature (e.g. around 8.2 KaBP). Please note that the statement on page 9 line 8 is misleading. There is a maximum change in temperatures of roughly 6 degC, the majority of the change is, however, much smaller. Overall this is an interesting paper, that merits publication after a moderate revision. Minor issues:

Title is too long: (suggestion) Solar forced decadal-scale upwelling in the Arabian Sea during the early Holocene. Abstract: The first four lines are misleading. The abstract should introduce solar driven climate change and not the socio-political implications thereof.

Introduction: There are some detailed statements related to monsoon circulation. in the Arabian Sea (page 2 lines 2-8) that would be better placed at the start of chapter 2. In the introduction more generic wording could be used.

Importance of AAIW in the Arabian Sea (page 3 lines 11-18). Whilst Boening and Bard indeed suggest that there is a strong influence of AAIW in the Arabian Sea, most of the available work seems to suggest that AAIW in the modern ocean does not reach the Arabian Sea (at least not with near pristine properties).

Figure 1: labeling partly too small.

Figure 6: Labeling on the right side should have the same orientation.

Interactive comment on Clim. Past Discuss., doi:10.5194/cp-2016-107, 2016.