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Climate of the Past Discussions

Interactive comment on "Increased aeolian activity during climatic regime shifts as recorded in a raised bog in south-west Sweden during the past 1700 years" *by* R. de Jong et al.

R. de Jong et al.

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Authors comments to CPD paper

The instructions and comments from the three referees (Dan Charman, Heikki Seppä and John Birks) and one interactive comment (Ingmar Unkel) are greatly appreciated. Their comments and suggestions significantly improved our manuscript.

Below we provide point by point a reply to all comments.

D. Charman;

Specific comments;

1) More information from the De Jong et al (2006) paper has been added to the

manuscript: it now includes the age-depth model from both the Undarsmosse and Store Mosse sites for the considered time period, together with stratigraphical information. The level of agricultural disturbance have been added in a figure, showing the total percentage of pollen indicating crop cultivation and grazing.

2) The watertable reconstruction based on Charman et al. (2007) has now been added. We would like to thank Dan Charman for his help with this analysis.

3) In figure 3 the data points have been made visible for the oxygen isotope record from Lake Igelsjon.

H. Seppä

General comments;

The testate amoebae data from the Undarsmosse bog as well as the sand influx data from the Store Mosse site were new, unpublished data. Because the testate amoebae data were derived from the Undarsmosse peat bog, the focus of the discussion is on the sand influx values from this same peat core, which have indeed been published in De Jong et al (2006).

Specific comments

1) The resolution of the samples in the samples from Undarsmose bog is between 10 and 40 yrs per sample. This means, that the testate amoebae reflect an average condition during this time period, thus including both summer and winter conditions. Wet conditions may relate to wet/cool summers and/or wet winters, whereas dry bog conditions relate to dry/warm summers and/or dry annual conditions. The interpretation of testate amoebae records differs between regions, but in this coastal setting it is plausible that the bog conditions are mainly controlled by precipitation, not (summer) evaporation. Therefore, wet conditions may be interpreted as reflecting high precipitation, possibly in all seasons, whereas dry conditions indicate that precipitation was reduced, possibly in all seasons but certainly in summer, when evaporation is highest.

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Seasonal variations are a major problem in interpreting humidity records, but due to the resolution of the samples no more detailed interpretations can be made in this study. We think that the testate amoebae are -in part- a summer proxy because we think it is plausible that at least dry conditions indicate a summer water deficit for evaporation, which is not counteracted by precipitation in the other seasons. The wet part of the signal could, however, be related to summer as well as winter precipitation, as indicated by the reviewers. The interpretation of the testate amoebae data has been adjusted in the manuscript according to this.

2) As mentioned in comment 1 to D. Charman; additional data on the chronology and age models have been added to the manuscript. Error margins have been added to the dates mentioned in the text.

3) Additional information on the Store Mosse bog site (age model, site description, stratigraphy) have been included in the text and figures.

Remarks and technical comments;

4) A reference has been added to the first section of the introduction. Page 386 line 8 has been altered. More subheadings are included in the text to increase clarity.

5) On the source of sand in a snow covered landscape; at the west coast of Sweden it is unlikely that during and after heavy snowfall the entire coastal area -more specifically the coastline, beaches and dune areas- would remain snow covered if a storm would occur. Strong winds would remove a large part of the snow cover in elevated areas such as dunes, whereas low-lying vegetated areas such as peat bogs would keep their snow cover until melting occurs. A short sentence explaining this has been added to the manuscript.

6) A description of LIA and MWP has been added to the text, as well as additional references. The terms DACP and RO have been left out in the revised manuscript since these are indeed culturally restricted terms.

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J. Birks

1) We expected the upper part of the core to be less compacted, and thus thought that a 2 cm interval would be sufficient in comparison to the resolution in the rest of the core. This was wrong, unfortunately, so therefore in the core from Store Mosse bog we used a 1 cm interval throughout the core.

2) ASI is a fast method whereas testate amoebae analysis is relatively time consuming. The pollen data for agricultural indicators from Undarsmosse bog have now been included in a graph, to make clear that increases in landuse can not be the cause for the timing of ASI peak events. The variations in major tree taxa, Sphagnum etc. from both study sites will be used for a separate paper, as the discussion of variations in these does not fall within the scope of this paper.

3) The concentration estimates for the testate amoebae did not provide any extra information to the data shown in the manuscript, so therefore we chose not to use these data. We have now mentioned this in the text.

4) We tested lower degree polynomial functions but none gave a good visual match with the dates as well as the position of sedimentological transitions. A combination of multiple functions with a lower degree polynomial could have been used, but this would have introduced a large number of 'knick points'. Since the sedimentological transitions in the peat were smooth throughout the cores, we did not think that this would have provided a 'better' age model. The error bars were based on a linear interpolation of the 2- standard deviation band. These error margins have now been included in the a new figure, showing the age-depth model, as well as in a Table.

5) Bayesian modelling was not applied in our age model. The stratigraphy was used only to check the position of changes in accumulation rates provided by the age model.

6) We have now added this transfer function.

7) The overall trends in the transfer-function based watertable reconstructions are sim-

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ilar, although the 'stable periods' appear less stable than in the percentage based reconstruction. However, the 'shifts' in humidity are also visible in this watertable reconstruction, and are relatively rapid. Due to the large error margins in this reconstruction, the amplitude of the shifts is difficult to determine.

8) The terminology in this section has been adjusted. For this core the position of for example the LIA was based on the timing of humidity shifts, as indicated by the testate amoebae percentage (and watertable) values. The timing of these shifts, and thus the inferred boundaries of the LIA in this core, was derived from the age model.

9) see comment 5 to H. Seppä

10) A reference and description of the Store Mosse record has been added in the text.

11) see comment 2 to D. Charman.

12) On short time scales grasses are likely to dominate abandoned fields. However, this is only a temporary feature, which would indeed be followed rapidly by an expansion of light demanding shrubs and trees such a Betula. The interpretation of grassland peaks has been clarified in the text.

13) The increase of grassland indicators is now interpreted as an increase in grassland areas. See previous comment.

14) This section has been altered to include the pollen percentage data added in a figure.

15) The phrasing has been altered in this section. As explained in comment 1 to H. Seppä, the sample resolution does not allow for a detailed seasonal interpretation of the data. However, variations in winter precipitation may indeed also have had an effect on the humidity records presented here.

16) We have altered the phrasing in this section, as well as the title of the paper (humidity shifts instead of 'climatic regime shifts'. We agree that this is a more 'true'

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interpretation of our proxy records.

17) Land use indicators are low during and after the majority of ASI peaks (this is shown in a new graph). It is therefore difficult to explain the long duration of the peaks in terms of alterations in land use, although this is certainly what would be expected. In the most recent peaks (after ca. 350 cal. yrs BP) however, the strongly increased openness of the vegetation may certainly have contributed to the long duration of these peaks.

18) AD ages have been added

19) This has been corrected in the revised manuscript.

Interactive comment I. Unkel

We have indeed tried to compare our data to an NAO reconstruction from Luterbacher et at. (Atmospheric Science Letters, 2002, 2, 114-124), but due to the low resolution in our dataset, a comparison to such high resolution reconstructions would be highly speculative.

Interactive comment on Clim. Past Discuss., 3, 383, 2007.