

Interactive comment on “Dendrochronologically dated pine stumps document phase wise bog expansion at a northwest German site between c. 6700 BC and c. 3400 BC” by Inke Elisabeth Maïke Achterberg et al.

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Response to Referee #2

Thank you very much for your time and your many valuable suggestions! I will change the manuscript according to your suggestions where possible. Please find below the response to the individual points you raised.

1. For most trees, the roots are not individually dated. I will make it more clear in the text. Root morphology has been documented for many ex situ finds at the site, giving

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a good over-all impression. The reconstruction of bog expansion, which is the focus of this paper, is based in in situ finds, however. For the in situ finds, digging under the root plate has been performed for 18 tree stumps on the site, not all of which are dated unfortunately. Root morphology, described in more detail at a comparable site by Eckstein et al. 2011, served as one indicator for the main cause of tree death being water table rise. Other possible causes of cumulative tree death are discussed (and dismissed) in Eckstein et al. 2009.

2. I will get a native speaker language proofreading.

3. I will rephrase the text to make it more clear. I do believe the data to be ok, and for it to represent a climatic signal. It is a case study however, using trees grown on the site itself. It therefore represents a local signal. I therefore think it unsurprising, that the deducted hydrological variations are not throughout the exact same as those described for records located a couple of hundred kilometres away. This does not make the data less valid. Studies including several sites (e.g. Eckstein et al. 2011, Achterberg et al. 2015), or using, for example, pollen influx from a wide catchment area, give a more regional picture. I believe this study to gain value from its relatively high temporal resolution (which is possible via dendro-dates). This is further amplified by its local restriction. I highly appreciate your interest in a more detailed investigation of the individual die-off events and their environmental indication by including extensive root-related data. It should be considered for future research projects, to acquire corresponding data. I will change the text regarding your suggestion to explain better, during what conditions the bog-tree record works well, and where its limitations are.

Abstract. a) As suggested, I will include more results in the abstract. b) I will evaluate, in how far the root data can be described more in the text and abstract (compare above, 1.).

Page 1, line 11: you suggest changing 'site chronology containing gaps' to 'site chronologies'. This would regard the whole manuscript, as I speak of 'site chronol-

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ogy' and 'chronology segments'. I will evaluate, if the suggested change can be made without making the result more confusing in other sections.

Page 1, line 14: change will be made accordingly.

Introduction.

Page 2, line 2: I will add 'sylvestris'.

Page 2, line 3: change will be made accordingly.

Page 2, line 9: Yes, I agree. I have used the mentioned paper (Edvardsson et al. 2016) in my work after the submission of the manuscript, and will now include it in the manuscript. I will also see where I can bring in the second mentioned paper (Krapiec et al. 2016), thank you for the suggestions!

Page 2, line 13: thank you for the correction. It will be changed.

Material and Methods.

Page 2, line 20-23: I will change the sentence in close approximation to your suggestion. It actually is sand, but I can apply a more general term.

Page 2, line 29: change will be made accordingly.

Page 2, line 30: change will be made accordingly.

Page 3, line 4: change will be made accordingly.

Page 3, line 6: change will be made accordingly.

Page 3, line 6: 's.s.' is short for 'sensu stricto' meaning 'in the stricter sense'. I also made use of 's.l.' for 'sensu lato' meaning 'in the wider sense'. I will rephrase (not using those terms).

Results.

Page 3, line 25: Somewhere over a hundred. A first sampling of about 70 trees had

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not delivered absolute dating. As the trees are sampled, measured and cross-dated in bundles, I could not name the exact number of trees that were necessary to acquire the first absolute dated chronology segment at the site. I can make mention of the first, unsuccessful set, though.

Page 5, line 20: change will be made accordingly.

Page 5, line 25: change will be made accordingly.

Discussion.

Page 6, line 10: change will be made accordingly.

Page 6, line 15: do you mean "the data display phases of..." would be better than "the data displays phases of..."? I will work on improved phrasing.

Page 6, line 18-19: thank you for pointing it out, I will rephrase.

Page 6, line 24: change will be made accordingly.

Page 6, line 25: change will be made accordingly.

Page 7, line 1-2: change will be made.

Page 7, line 10-14: change will be made accordingly.

Page 7, line 13: I will rephrase.

Page 8, line 2: change will be made accordingly.

Page 8, line 7-9: you are correct, the growth of trees on the mineral ground surrounding the bog is possible, and also evident (according, for example, to my own pollen data). I will include this aspect in the text.

Page 9, line 5-7: this may be true. To clarify for in situ stumps, whether they are standing on top an older tree stump however, would require a lot of digging. At the moment I don't think I can apply the theory in a good way to the present data set, but I

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will give it some more thought and testing.

Page 9, line 10: yes, the brown moss peat was found directly on the sand. With the exception of two cores taken at places with relatively high elevation mineral base. I had erased the discussion about this from earlier drafts, because it was too speculative. I cannot clarify on base of our data, whether there might have been a hiatus, or if there was no, or only a brief lake stage at the site.

Page 9, line 28: change will be made accordingly.

Page 10: the text will be changed accordingly.

Page 10, line 25: that would mean, that it is uncertain, whether the die-off phase relates to the 8.2k event. I will rephrase.

Page 10, line 32: change will be made accordingly.

Page 11, line 18: change will be made accordingly.

Page 11, line 25: will be corrected.

Page 12, line 1-4: Dreslerova (2012) includes results of numerous studies which use various proxies. Dendrochronological studies are also taken into account there. I will evaluate the possibility you suggest in detail and rephrase accordingly.

Figures.

Figure 1: I agree that such a figure would be good. The required date is not available though. a) The tree stump layer is typically exposed at the terminal level of peat mining. At other places there are still peat layers of sometimes several meters thickness above the fen-bog-transition level (where extended tree layers occur typically), and modern tree growth on top of that. It would require large scale survey with high-tech support to clarify the actual extent of the tree layers below, if it is possible at all. b) I am not aware of a reconstruction of the maximum extent of lake Steinhuder Meer having been published. I will search for such information again, and if it can be found, I will gladly

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include it.

Figure 11: the die-off phases are already highlighted by blue vertical bars. I had excluded the germination phases to make the figure easier to read. I will reconsider.

I also thank you for showing real interest in the research we did!

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