Response to Reviewers

Reviewer #1:

General comments

This is a very thorough piece of research and it's well written throughout. It's rare to find a combination of macrofossil, charcoal, testate amoebae, pollen, dendrochronology and remote sensing data. It's also unusual for all of these techniques to fit together well in order to make an accurate as possible environmental reconstruction. All in all this is very good work with very little to fault. The manuscript will be very useful for researchers in the fields of ecosystem restoration and long-term wooldland ecology. The minor corrections and typos are indicated on the attached pdf file.

We thank the reviewer for the positive opinion of our manuscript. We have corrected all the linguistic corrections and errors in the text as suggested in the attached PDF file.

Response to comments in the pdf file:
Line 524: What type of correlation coefficient?

We used the treeclim package and the dcc function in the R statistical environment to determine the climate-growth relationship between the residual chronology and monthly data (temperature and precipitation). This DCC function builds upon and extends the functionality of programme DENDROCLIM2002 (Biondi and Waikul, 2004), and calculate among of others bootstrapped similarly moving response functions as described in the mentioned paper. Currently, the sentence reads: The colour code represents the response function coefficients. The information about the statistical analyses performed using the dendrological data set is explained in detail in section 2.10.

Reviewer #2:

General comments

This manuscript presents interesting multidisciplinary and multiproxy study of change in forest dynamics and peatland development for last 300 years.
In general, this manuscript is well organized and written in clear language. Introduction is informative, but as this manuscript has a lot of data it would benefit from more clearly stated objects. I would suggest thinking of what is the main aims that this paper is targeting and pointing them out more plainly. In relation to this, I would also suggest that authors rethink the title of this manuscript. This is as much (or even more of) a comparison of historical knowledge and satellite imagery than dendrochronology. In my view dendrochronology provides information of the climate conditions in region as a one possible driver, but there is not actual comparison with paleodata. This does note in anyway decrease the importance and the quality of this study, but is maybe a little bit misleading. Based on the title I was maybe expecting more closer comparison of dendrochronological records and paleodata. Maybe more descriptive title would be referring to multiproxy or multidisciplinary study of peatland development in Scots pine monoculture.
Methods used to investigate the past changes in Scots pine monoculture are relevant and well established in their respected fields. This diverse multidisciplinary and multiproxy dataset is valuable and not often presented, which definitely increases the value of the manuscript. The

results are interesting and discussed in the light of previous knowledge of the topic and in the light of the importance of the study region and general ecological knowledge. However, as this is very long manuscript, I would strongly suggest that the authors reconsider if the text could be reduced in some parts in the results and interpretation or in discussion as sometimes there is a bit of overlap. I have made some suggestions to reduce the length of the manuscript on the attached pdf-file.
In general, I liked this study and after some modifications it will be very interesting read to experts in different fields. I have made a list of some comments and suggestions that can be found from the attached pdf.

We thank the reviewer for the positive opinion of our manuscript. We agree that some parts of the manuscript needed shortening and slight modifications. We have incorporated reviewers' corrections and suggestions into the text according to the comments highlighted in the attached pdf file.

Response to comments in the pdf file:

Title

Lines 1-3: Please, reconsider the title.

We modified the title according to the reviewers' suggestions. Now it reads: "Assessing the impact of forest management and climate on a peatland under Scots pine monoculture using a multidisciplinary approach".

1. Introduction

Line 53-54: This is very general statement and you could start diretly of Peatlands.

As suggested, we have removed this sentence.

Line 112-124: Please, reconsider if the aims could be more clearly stated. You are presenting a lot in this manuscript, please state which are the main aims.
I think this could be integrated to the aims and some of this deleted. I think this could be modified a bit and placed to a conclusions.

We have merged these paragraphs and rewritten the text to make the goals of our study clearer. We hope they are now presented more straightforwardly.

2.1. Study site

Line 159: This is quite long distance from the paleodata study site and this gives the regional climate signal, but hard to integrate paleo and dendrodata in any other sense.

This site has been chosen for dendrochronological sampling because of the presence of the oldest pine trees in the entire Tuchola Pinewoods (over 200 years old). Local foresters recommended this place as the most suitable location. Pine trees closer to the site were located in the actively managed plots where harvesting of trees is planned regularly and individual trees were approximately 50-70 years old, thus too young for our analyses. Sampling the oldest trees

allowed us to compare paleoecological and historical data with dendroclimatic data over a large time interval. We understand that in this situation the signal is regional. However, we emphasize that the largest extreme events in the history of this forest complex had a very large range that affected entire forest districts, leaving behind a very strong regional signal. Dendroclimatic analysis proved statistically significant.

2.9. Visualization of the palaeoecological results

Line 257: I dont think you would need separate chapter for this. Information in this chapter could be included to the text in corresponding chapters.

This section has been removed, and information on software used for visualisation has been placed next to the description of specific methods.

2. Results and interpretation

Line 345: Please, consider if you would be able to decrease the amount of the text in this chapter.

We thank the reviewer for this comment. After re-reading this chapter, we found that we could not to shorten it more. We tried to write as concisely as possible. The length of this section is an effect of the use of many different methods (each of which needs certain explanations), which is the strength of this study, not its weakness.

3.2. Palaeoecological analyses

Line 366-367: Please, check the order of the figures, you should refer to the figures in right order. I suggest moving the figure 5 as figure 3 since you discussing it already here. And then changing the numbering of the figures accordingly.

We have changed the order of the information in this paragraph so that the information about Figure 3 appears first. This is with the idea that the information on lithology/plant composition forming the peat should appear before the results obtained by other proxies.

Lines 449-450: This I would leave for the discussion.

We agree, this information was removed from the title of the section.

3.3. Dendrochronological and pointer years analysis

Line 511: Please, indicate here in the figure caption that from where do you get this informaition about the insect outbreaks as it does not come from your own records.

In the caption of the figure, we have added information about the bibliographical sources from which the information about extreme phenomena was acquired. These are the same sources that we mention throughout the text.

3. Discussion

Line 593: The discussion is very long and I strongly recommend that you consider shortening the text.

We agree with the reviewer that the discussion was too long and could be shortened. We want to thank for highlighting the parts that could be shortened without losing the context important for the readers that need to become more familiar with the history of the Tuchola Pinewoods. We moved a large part of the text with historical information to Supplement No. 1, so as to reduce the length of the discussion.

4.1 Exceptionally high peat accumulation rate

Line 594: This is quite common knowledge, no need in here.

We have removed the sentence as suggested.

Line 597: Please, indicate here in the figure caption that from where do you get this informaition about the insect outbreaks as it does not come from your own records.

This is a repeat of a previous comment and does not apply to this section of the text. We are not sure what the reviewer meant here.

Lines 598-617: This is quite long account of other peatlands. Here I woudl suggest less detailed and more of summarizing the differences and rather short discussion why these differences or similarities occur.

We agree that this description was too detailed and shortened this part of the discussion.

Line 617-622: Also, here maybe add some justification why this information is important related to your results.
We added a sentence about the fact that a comparison of the accumulation rate with other regions of Poland and Europe allows us to confirm that the calculated accumulation rate is relatively high, not only in comparison with peatlands located in pine monocultures in northern Poland, but also located in other ecosystems.

4.2.1. The complex history of the Tuchola Pinewoods and its influence on the forest

In this chapter the discussion based on the results of this study starts from line 682 and you have here over onw page of historical account of the Tuchola pinewoods. It is very interesting, but I was thinkgin that why am I reading this? I would suggest deleting some of this text before line 682 and integrating the most relevant parts into the remaining text that is based on the results from this study.

As mentioned above, we moved a large part of the text with historical information to Supplement No. 1, to reduce the length of the discussion. We left only a brief description of historical events that will be enough for the readers to understand the context of the study.

Line 691: Here you could tell when and ass some information form the sart of the chapter, for example.
Line 699: and here use the previous text to explain a bit the reasons for the deforestation.

This information is written at the beginning of this section of the discussion. We have also added a supplement providing an overview of the most important information about the development of planned forest management related to changes in forest composition and partial deforestation.

4.3.1. The impact of droughts and fires on the forest and peatland

Line 789: Missing from the reference list, please add.

We added citations.

Line 799: Missing from the reference list, please add.

We added citations.

4.3.2. Insect outbreaks and their impact on pine monoculture

Line 820: This feels first a bit like and our of place as in your own data there is now records of insect outbreaks. If you keep this in here, please add to the methods some explanation where the insect outbreak data comes. Maybe where you present the historical maps, you could include historical records.
Also, I would suggest that you rearrange the text a bit and move teh text in lines 850 - 855 to start this chapter. It would make more clear connection to your own results.
Lines 850-858: Please, move this paragraph to start this chapter.

We moved the paragraph to the beginning of the chapter, as suggested. In the "Historical and cartographic information" chapter, we added information on when the insect outbreak data originated.

4.4. Current condition of the peatland vs. remote sensing and dendroclimatic data

Line 897: Please, adda reference here

We removed this sentence from the manuscript.

4. Conclusion

Line 942: add here also historical records/information since you compare the paleodata more to that than in dendrodata that provides information of the climatic conditions.

We added historical and remote sensing data to the text.