

We would like to thank the two Anonymous Referees for their comments that improved the quality of the manuscript. The detailed responses to each comment can be found further on in this document.

Anonymous Referee #1

Received and published: 22 November 2019

General Comments: This manuscript provides a lake and mire isolation data set for the estimation of post-glacial land uplift, the data sets focuses on the lake and mire isolation data set and archaeological data set. although the data set can forms the main data set used in the modeling, the manuscript should be not publicated the ESSD, I have three points to reject it. (1) the manuscript only collect the data, it is short of originality of the study. (2) the dataset is at small spatial extent, they will not attract the wide readers of the world. (3) the authors should added the detailed the description of the method in producing the data set

- We thank Referee #1 for the comments. Here are detailed responses for the comments:
  - (1) This is true, but the combination and unification of two different data sets including lot of data from different sources producing a usable data set for the estimation of the land uplift in Scandinavia makes it worthwhile to present the manuscript and the data in our opinion.
  - (2) The land uplift is a phenomenon that is notably present at only few locations in earth and the studies concerning it have been mainly done in Scandinavia so this makes the study focused around the Baltic Sea area.
  - (3) Some details of the method in producing the data set have been added to chapters 1 (page 2, lines 10-20) and 3 (page 6, lines 4-6).

Anonymous Referee #2

Received and published: 19 December 2019

The article 'Lake and mire isolation dataset for the estimation of post-glacial land uplift in Fennoscandia' of Pohjola et al. presents a collection of data, drawn from existing, both archaeological and palaeoenvironmental sources. It has been made available on the PANGAEA database. The data covers the complete Holocene and provides information about the ages of the earliest radiocarbon dates from mires and lakes, supposed to be representing their earliest stages after being isolated from the Gulf of Bothnia. Combined with spatial information (location and elevation), this is useful to build or validate and optimise land uplift models for Fennoscandia. Some potential pitfalls or deficiencies in the use of this data are pointed out. However, certain parts need some more critical discussion while others need clarification in order not to confuse or misguide readers and potential data users. Most of it concerns radiocarbon dating. Furthermore, the dataset uploaded to PANGAEA could benefit from certain additions, especially for the case that inconsistent results need to be evaluated critically. It would also get more interesting for disciplines apart from postglacial uplift modelling. The conclusion seems to devalue the dataset, as it suggests that it should not be published yet by saying that the search for additional (already existing) data is ongoing. All relevant studies that are already published should already be in the PANGAEA data of this manuscript. I suggest revision and a re-evaluation. Detailed comments can be

found below.

We thank Referee #2 for the constructive comments. They have improved the quality of the manuscript greatly. Also, the data set uploaded to PANGAEA will be updated based on the comments. The conclusion has been rewritten to give more basis for the study. Here are detailed responses for the comments.

Detailed comments:

Page 1

I. 20: Add more references if there are any or put an 'e.g.' before the two given citations or mention that these two are the most important (if so).

- e.g. has been put before the citations and the citation style has been corrected

I. 21: Not a complete sentence ('the most important source of information is that describing the shoreline displacement'). Please rephrase to make clear what was intended to be said.

- Corrected as 'the most important sources of information are the ones describing the shoreline displacement'

Page 2

II. 5-7: This needs to be discussed in further detail. Consequently, ages that are from the first organic layers of ponds or mires are rather indicating the age of the ice retreat but cannot safely be used to infer uplift or isolation from marine influence.

- This has been discussed in more detail: 'Generally, the organic matter accumulated to the bottom sediments of the basins indicates ice retreat. The basins collected to the data set are from the time period of the Ancylyus Lake, so it can be assumed that the ice had melted before the accumulation of organic matter. Although the timing might not be exact, it is an indication of the isolation contact. In addition, there are geological interpretations of the retreat of the Ancylyus Lake and the Baltic Ice Lake in mire studies and references'.

I. 27: define the kind of laboratory analysis or rephrase. For example, simply to: 'The isolation is defined by the transition from marine or brackish water algae to fresh-water algae.'

- Corrected as suggested

Page 3

II. 1-2: Bog and mire? Above, it was pond and mire. As a bog is also a mire, but a mire is not always a bog, please correct. See also page 2, I. 31.

- For clarification, the manuscript has been modified to use lakes, ponds and mires throughout the text.

I. 4: Having information on the material that was sampled in both PANGAEA data files would be very good. It would allow the reader to assess the reliability of the radiocarbon age. Depending on the type of macrofossil or sediment dated, the discrepancies can be large.

- A column for the dated material will be added to both data files.

Page 4

Figure 2: Why is the term height used, instead of elevation? The unit of Age is given in cal year instead of years BP, as in the text. Be consistent throughout manuscript and dataset.

- The figure has been corrected with term elevation instead of height and the unit of age has been changed to years BP

II. 7-8: Do you mean older than expected? Something in this sentence is wrong:

'the radiocarbon dated burial remains seem to be younger than expected from the radiocarbon datings.' Expected from which datings? Did you want to say that the burial remains should be younger than the radiocarbon dating suggests?

- Yes, older than expected was meant and it has been corrected.

I. 9: Do you mean 'from a time period stretching over thousands of years' or 'from thousands of years ago'? Consider revising to be more precise.

- Corrected as 'from a time period stretching over thousands of years'

II. 10-12: What about an old wood effect of the dated material? Depending on what type of archaeological material was dated, the marine reservoir effect is unlikely to have altered the sample. What about the possibility that bones of humans were dated, which were eating a lot of fish or molluscs. And: also, freshwater lakes have varying reservoir

effects (e.g. Philippsen 2013). Again, the type of material dated (bulk sediment, plant macrofossils, wood, bones, etc.) would be valuable to add directly to the data files provided on PANGAEA.

- The old wood effect and the freshwater reservoir effect on radiocarbon dated samples have now been discussed: 'Also, the 'Old wood effect' (Olsen et al., 2013) might have had affected the samples. It is concluded in Olsen et al. (2013) that the dating of cremated human bone could have an inaccuracy of approximately 50-100 <sup>14</sup>C years. In addition, the freshwater reservoir effect (Philippsen, 2013) is one aspect that could be considered with the time and elevation discrepancies.' The material issue with the data files was discussed in a previous response.

Page 5

II. 19-22: The term 14C age is normally used for uncalibrated radiocarbon ages (also concerns the 14C-error). In addition, the terminology is different in the .tab data files, where only Age and error are used. Furthermore, the ages given in the .tab file appear to be uncalibrated (for example Hel-146 in archaeological data). It is not only confusing but also dangerous if the data is used wrongly by users who believe to have calibrated ages at hand. This needs to be resolved by clear terminology in manuscript and both data files, and maybe with a comment for readers who are less experienced with radiocarbon dating. It needs to be clear if the age is calibrated or not. Right now, the text suggests that calibrated ages are provided, which is not the case in the data.

- This has been corrected in manuscript, the ages given are indeed uncalibrated. The column headers of the data-files will also be corrected.

II. 21-22: Links/URLs to a database or report in lake/mire data file are not existing.

Why not?

- URLs have been added where it has been possible

II. 25-26.: The Bronk Ramsey citation should be put behind 'Oxcal program' in I. 24.

The IntCal 13 calibration curve should be cited properly with Reimer et al. (2013). The Reimer reference also appears on Figure 3, so it needs to be in the full references anyway.

- The Bronk Ramsey citation has been put to its appropriate place and the IntCal13 reference (Reimer et al. 2013) has been added to the reference list.

II. 25ff.: Does this paragraph relate to the data handling to produce for example Figure 2? It comes a bit out of nowhere as long as the previous lines are saying, that the data is already calibrated. As the radiocarbon data in the data files is not calibrated, consider introducing this paragraph in a different way to put it more into the context of how to handle the data. Right now it says, that "the calibration was done using [ . . . ]", but where was it done then?

- This has been clarified linking this paper to our previous works.

II. 30-31: 'certain areas' and deferring to Fig. 1 is a bit vague. This should have been at least briefly discussed earlier in the text. For example, it is said in the beginning, that the lake/mire isolation data is the most important for modelling, but the data points are concentrated mostly on the eastern coast of the Gulf of Bothnia.

- This has been written in more detail: 'The collected data set in this paper covers the coastal area of Finland and Sweden reasonably well, especially the extent of the Ancylus Lake. There is always room for improvement, because lake and mire data points are missing from e.g. Hälsingland and Västerbotten areas in Sweden. However, the archaeological data points cover sufficiently almost all of the Swedish - Finnish coastal area. Also in the Estonian side, more archaeological and geological data are needed.'

Page 6

Figure 3.: In the example for a calibration, the scale is set to calBC, which is not mentioned before. See comment above concerning the consistent use of units.

- The scale in the figure has been changed to years BP

Comments on the files uploaded to PANGAEA ('Fennoscandia\_lake\_mire\_isolation.tab' and 'Fennoscandia\_archaeological\_data.tab')

- The archaeological data provides URLs to the original radiocarbon data. Unfortunately, this is not the case for the lake/mire isolation data. Why are no URLs or further information provided?

- URLs will be added where it is possible.

- Referring to the problem of using pond/mire data (page 2, ll. 5-7), how can the data user distinguish between lake radiocarbon data and pond/mire radiocarbon data?

- A column will be added to the data file to identify the basin type.

- The whole dataset would greatly benefit from adding the material that was used for radiocarbon dating. By this, the reliability of the ages could be assessed better. Furthermore, disciplines aside from uplift modelling would get attracted to the data collection.

- The material will be added to the data files.

Technical comments:

Page 1

I. 3: its instead of it's

I. 14: see previous comment

- Both were corrected as suggested

II. 16-17: Correct citation style '. . . can be found in Tikkanen and Oksanen (2002), Björck (1995), Punning (1987) and Ojala et al. (2013).

- The citation style has been corrected

I. 22: 'Nowadays, land uplift. . .' or 'Ongoing land uplift...' or 'Today's land uplift..'

- Nowadays land uplift was changed to Ongoing land uplift

I. 24: citation style

- The citation style has been corrected

I. 25: citation style ('Eronen et al. (2001) and Cato (1992) examined the isolation of several lakes. . .')

- The citation style and the sentence have been corrected as suggested

Page 2

I. 5: 'on top of'

- corrected as suggested

I. 19: remove 'timing', put 'age' information

- timing changed to age

I. 28: 'In Finland, the main data. . . .'

- corrected as suggested

II. 30-31: Citation style (brackets). Consider rephrasing: 'Mäkila et al. (2013) present a collection of . . .'

- corrected as suggested and the sentence has been rephrased

Page 3

Figure 1: consider highlighting the Baltic Ice Lake better, as the contrast of the mild blue to the background is partly not high enough. Also think about the graphic being printed in black and white.

- The Baltic Ice Lake has been highlighted better, the figure has also been made more suitable for black and white print.

Page 5

I. 1: I would use British English (organisation), as you are also using 'archaeology' and not 'archeology'.

- organization has been changed to organisation

II. 20-21: Something is wrong with the structure and the brackets here: '. . . the name of the place, the reference (14C) Laboratory Identification, if available),. . .'

- the extra ) has been removed

I. 32: citation style (see above)

- The citation style has been corrected