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Comment on gchron-2021-40

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Community comment on "Improving age–depth relationships by using the LANDO ("Linked age and depth modeling") model ensemble" by Gregor Pfalz et al., Geochronology Discuss., https://doi.org/10.5194/gchron-2021-40-CC1, 2022

Pfalz et al. present a new tool ("LANDO") that supports users to compare the outputs of five well established age-depth modelling systems for sediment cores. Moreover, LANDO is designed to combine the existing software approaches to create improved age-depth models.

The usefulness of LANDO is well illustrated by two case studies, the first on a record with a continuous, undisturbed succession of dating points, and the second on a record with more scattered dating points. In a third case study age-depth models for 62 sediment cores were created with LANDO, 39 of which are shown in Figures 5 and S1, and the resulting sedimentation rates over time are discussed. This third case study has substantial flaws that basically concern two issues.

(i) Data reference, availability and usage

The origin of the data used in the third case study in most cases is not visible directly from the manuscript but has to be investigated via a "Code and Data availability" spreadsheet, which can be accessed by an attached GitHub link. This spreadsheet in 41 cases provides links to the open and free data repository PANGAEA or original publications, which not always contain the original data and descriptions of age model developments (see below), and in 33 cases the reader is asked to request unpublished data. Once access to the data is accomplished, it is not clear from the manuscript in its present form, which of the existing age data eventually became used in the third case study (see example below).

In our mind the relevant original publications existing have to be cited in the manuscript directly and included in the reference list, the data used in the third case study has to be clarified, and the unpublished data used has to be presented in a table in this paper or at least made freely accessible via an open database.

(ii) Missing geological context

The LANDO-derived sedimentation rates displayed for 39 sediment cores in Figures 5 and S1 suggest continuous sedimentation up to 21 cal ka BP with variable rates. Some of these sedimentation rates are obviously wrong, due to missing consideration of geological evidence. Two examples are given below.

First, the sedimentation rates derived for core Co1309 from Ladoga Lake are based on age data, which according to the "Code and Data availability" spreadsheet originate from Andreev et al. (2019) and Savelieva et al. (2019). However, Andreev et al. (2019) only present OSL ages between 118 and 80 ka BP, substantially exceeding the age range of interest here. Savelieva et al. (2019) present the radiocarbon and OSL ages available from the postglacial part of the record, but mention that the age-depth model used originates from Gromig et al. (2019, in *Boreas*, 48: 330-348), a paper not cited in the manuscript. Gromig et al. (2019) excluded some of the radiocarbon and OSL ages and, on the other hand, added additional age control from varve chronology and correlation with a radiocarbon-dated record close by. Hence, from the references provided it is unclear, which data finally became used for the LANDO calculations presented. Moreover, both Andreev et al. (2019) and Savelieva et al. (2019) mention that the record contains an obvious hiatus, which spans ca. 14-80 ka BP and is described in detail by Gromig et al. (2019). This hiatus is ignored by the LANDO calculations presented, leading to false data at least for the period 21 - 14 ka BP.

Second, the sedimentation rates presented for core PG1205 from Basalt Lake in East Greenland are based on radiocarbon ages originally published by Wagner et al. (2000 in *Palaeo3*, 160: 45-68), although reference is made to the PhD thesis of Wagner (2000). The LANDO calculations suggest continuous and relatively constant sedimentation since at least 21 cal. ka BP. However, both Wagner et al. (2000) and Wagner (2000) state that the lake record consists of a till at its base, which in all likelyhood was deposited during the Milne Land stade 11.30 - 11.15 cal. ka BP, overlaid by ca. 6.4 m of glaciolacustrine sediments deposited with high sedimentation rates during deglaciation and ca. 2.6 m of hemipelagic sediments deposited with much lower rates during the past ca. 10 ka BP. Hence, the calculations conducted by Pfalz et al. obviously neglect the regional glacial history presented and discussed by Wagner et al. (2000) and Wagner (2000) as well as many papers published before and afterwards, giving the wrong impression that this part of East Greenland became deglaciated already prior to 21 cal. ka BP.

These two examples illustrate that neglecting geological evidence for hiatuses or large changes in the rates of deposition can create much larger errors in age-depth models and resulting sedimentation rates than the employment of an age-depth modelling system that may not be ideal for the record investigated. From the two examples it becomes evident to us that the literature existing for all sediment records used in the third case study, not only Co1309 and PG1205, needs to be (re)studied and discussed to assure that the geological evidence provided is considered in the sedimentation rates calculated.

In summary, the paper in our mind can only be published in *Geochronology* if the included presentation of the third case study is substantially revised. It may be an option to exclude this case study here, and present it in more depth and in a more mature state in a separate paper.

With best regards

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