Referee comment on "Last interglacial sea-level proxies in the glaciated Northern Hemisphere" by April S. Dalton et al., Earth Syst. Sci. Data Discuss., https://doi.org/10.5194/essd-2021-367-RC1, 2021

Last interglacial (MIS 5e) sea level proxies in the glaciated Northern Hemisphere

In this review the authors thoroughly researched the sea level proxies from a variety of settings within the glaciated Northern Hemisphere (Russia, northern Europe, Greenland and North America). This compilation is a valuable contribution to the World Atlas of Last Interglacial Shorelines database and should prove an extremely useful resource for sea-level scientists and those in other fields in future. After defining the types of sea level proxies, elevations measurements, dating techniques and quality assessment, the authors do an excellent job in describing in detail each site.

General comments

- I understand the authors’ point that given the scale of this database is rather difficult to map all the locations described in Figure 1 and the reader is referred to the original publications for additional site information. However, since the main component of the manuscript is the detailed description of each site, I think it would be very useful to include, close up maps for all these locations. For example, one suggestion would be to consider including the photos from figures 5 and 7 in one single figure which also includes a map indicating the location of this site and the ones nearby. Similar recommendation for Figures 7 and 8.
- I would also recommend the authors to expand on the Conclusions section and future research directions that could merit additional work, and to highlight how this compilation will help those interested in inferring the size of the MIS 6 ice sheets through GIA modeling.
- In my opinion, it is not necessarily to include Tables 2 and 4 but instead the authors can include the information from Table 2 in the text (since it is only one line) and to refer the readers to Rovere et al (2020) for information in Table 4.
In the Relative sea level proxies section I would like to make some suggestions to avoid repeating the same wording too many times:

- Removing lat/long from each subsection title since they are already listed in Table 5.
- Perhaps it would be easier to follow the sites list organizing them by country, for example, 6.1. Rusia, 6.1.1. Novorybnoye 2, Taimyr peninsula, etc., without having to mention the country again in each subsection title.
- I suggest merging sub-sections 6.9.1 and 6.9.2 in 6.9. and also rephrasing to something along the line: “the unit in site 1 and 2 is associated with terraces that reach an elevation...”
- Section 6.10, to avoid repeating “(marine sand, and clays (constrained to MIS 5e; LIG) are located between ...), maybe use instead something like: “marine sand, and clays (constrained to MIS 5e; LIG) are located ...” and then list the 4 sites.
- Section 6.15, I suggest deleting “site” from the first 2 subsections titles. It seems that at each site description there is the same sentence that: “A LIG-age is also suggested by correlation of pollen data from this site with the climate for western Europe (Zagwijn, 1996). To avoid repeating this, the authors could mention this once at the beginning of the section and to mention that this applies to all sites in 6.15.
- Section 6.26, I do not see it necessary to create subsections, but instead I suggest list the 3 boreholes. This way, the word “borehole” is not repeated as often as it is now.
- To avoid confusion, I recommend to clarify the difference between “a date” and “an age” and use it correspondingly throughout the manuscript. I also suggest merging the subsections 4.1.5.- 4.1.7. into Luminescence dating methods.
- For consistency throughout the manuscript, please consider the following:
  - Use properly “sea-level” and “sea level”
  - Choose one of U-Th, U/Th, 230Th, uranium/thorium, 230Th/234U when you refer in the text to the U-series age. Same for radiocarbon dating vs $^{14}$C.
  - Once it has been clarified in the text that the Eemian is LIG in western, central and northern Europe, there is no need to repeat it later in the manuscript.
  - Perhaps you could mention once in the description of the relative sea level proxies that: “The geochronological results are reported for all the sites where data is available.” and no need to mention at each site where there are no ages that “No geochronological data are available for x site.”
  - Refer to the journal citation style and use it consistently.
  - Express a sea level range in the same way, i.e., 2-11 masl instead of 2 masl to 11 masl
  - Use the same time unit “ka”
  - “up-wards” or “upwards”
  - Some ages have uncertainties included in the text and some don’t - is this based on the original publications?
  - Use MIS-5e or LIG consistently
  - Consider rewording some of the paragraphs so that you don’t cite the same reference so many times within the same paragraph (for example, lines 471; 479; 520)

Specific comments by line number:

30 and 31: more up to date references for the temperature and the sea level during LIG
39: define what MIS stands for

55: I think this should read “In the first part…”

62: MIS 7 time interval is not correct here

64: delete “and” before MIS 3

69: define GIA

74: delete one of “the”

96: “whichever”; delete “is” before “it is”. I suggest rephrasing this sentence that start with “The later constraint is it is unlikely the elevation uncertainty…”

118: use ka unit for the age

122: “purpose”

127: I suggest rephrasing the sentence starting with “conversely,…”

172: U/Th method is often applied to determine the age of other LIG deposits, so maybe specify that is not a common method to date mollusks shells in the LIG deposits.

178: missing “.” at the end of the sentence

189: use another word for “precisely” to avoid using the same word twice in one sentence

194: I think there is a word missing in here: “The rating decreases when there is less geological evidence sea level position changes and proximity to sea level.”
check citation style: Moller et al 2019a; 2019b?

consider rephrasing this: “However, two molluscs in the above-lying fluvial sediments (OSL-dated to a MIS 3 age), the molluscs redeposited from erosion of the marine sediment, yield ESR ages of 122 ka and 123 ka.”

no need to use both MIS e and LIG

recommend rephrasing to: “site 373 located at the highest altitude at 133 mapl”

suggest: “however, the authors do no present any numerical age data.”

check the required citation style

GSL ages - do you mean OSL here?

replace “gave” with “turned out”? 

delete comma after “sand”

space missing after “31”

delete MASL after “2”

delete “at the Zaton site” - not needed because the section is dedicated to this site

define “D/L”ratio either here or in the AAR dating section
400; 402: remove ka after 120 and after 133 respectively

407: add “by” after “described”. Find a synonym for “described” to avoid repetition

408: “spans from 12.5...”

410: delete the space before “at”

416: remove “at the Bychye site”

419: “cooler-than-present to warmer-than-present” - temperatures?

424: add space after 21

433: remove “ka” after 133

456: I suggest adding “the” before “correlation” and to replace “place” with “places”

482: replace “again” with “later”

484: delete “at this site”

507: no need to mention again LIG or MIS e

509: delete ESR and OSL in brackets, and use instead “respectively” after the second age

520: add reference for the reported IRSL age.
519: remove “MIS 5e”

526: “span” instead of “spans”

535: “workers”? Perhaps “researchers”?

547: “indicates” instead of “indicate”

565: “described”

575: what is “this” here referring to? This transition? Also, perhaps would be better to rephrase “for all of the LIG” with “Throughout the entire LIG”

592: remove ’ at that site”

594: spectra “show” instead of “shows”

615: delete “m” after 95

627: “especially due to the presence of Picea and Carpinus; Mamakowa, 1989, 1988“ - this information has been already mentioned in the previous paragraph

633: “suggest that these sediments …”

642: remove “at this site”

648: “change” instead of “changes”

649: remove “(together comprising 116.25 to 117.5 MASL)”, it is clear from the context
653: remove “LIG”

654: add “that” after “suggest”

657: a reference is needed at the end of this sentence

660: replace “metre” with “m”

662: remove “LIG”

664: remove “interglacial”

665: remove the second “the Eemian”

666: “Grönlund 1991a, b)” - or “Grönlund, 1991a, 1991b” ? please check

679: remove “(LIG; MIS 5e)”

687: remove “it was”

689: remove “(MIS 5e)”

691: remove “and” before 14C

697: remove “suggesting the end of marine conditions”, is implied by change to freshwater

699: remove “from this site”
701, 706: use ka unit as in the rest of the manuscript

708: add “conditions” after “warmer-than-present”

716: remove the comma after MIS 6 and remove “(≈ Eemian)”

721: what does “on the inland side of the large island” mean?

724: remove “MBSL” after 1

726: perhaps a reference is needed for the amino-acid stratigraphy

750: choose either “m a.s.l.” or “MASL” and use it consistently

765: remove “MIS 5e”

772: “1-km” instead of “one km”

777: “represent”

778: “There were found neither foraminifera...” - , I suggest rephrasing this sentence

782: “The result was large spread in ages from 66 to 263 ka ...” I suggest replacing with something along the line: “The resulted ages vary in a large range between 66 to 263 ka..”

783: which “these two outliers”? Add ka after 119±5

784: the sentence seems to be incomplete, “they obtained a mean age of 118±7 ka”
788: m a.s.l. or MASL?

798: suggest using “1 million years old”

790: complete “we mainly rely on the results reported by Alexanderson et al. (2018)”.

793: replace “three-meter-thick” with “3-m-thick”

803: replace “was” with “were”

804: similar suggestion as for line 790

805: add the word “between” before “10-130 ka BP”

812: replace “giving” with “of”; add “ka” unit after “118 ± 13”

819: consider replacing “given” with “provided”

822: replace “two-meter-thick” with “2-m-thick”

847: delete “that yielded ages”

848: delete “ka” after 155

859: from which maps?

861: add dash between 700 and m
In their study, the authors located between 30 and 38 MASL similar sediments were found at...

For additional context on the LIG marine, we provide below a brief overview of some individual sites to provide additional context on the LIG marine.

Sediment units could several places be traced...“needs rephrasing

“low-angle“?

add “between” before “35 to 40 MASL”

same suggestion as for line 900

“is situated”

“yielded ages of 122 and 121 ka ...”
967: there are 7 sites, not 8

970, 976, 981, 992: remove “at this site”

1013: “within this unit there are class…”

1021: what is meant by “and all radiocarbon ages considered minimum such.”

1034: remove “(Dredge et al., 1992)”. I suggest moving “the U-Th ages are interpreted as minimum age constraints by the original” 2 lines above where the U-Th ages are presented

1042: delete “and” after “reported”; delete “(Miller et al., 1977)” - it has been already mentioned in the same sentence that this are the authors who reported the ages

1044: delete comma after “position”

1046, 1049: remove “at this site”

1068: use ka unit

1109: add “and” before “the date is very close…”

1117: can you explain: “and amino acid ratios 0.1 to 0.15, both supporting a LIG age assignment”?

1125: ’U-Th ages of 133 and 141 ka”

1231: use “is” instead of “in”; remove “position”
1238: replace “is” with “if”

1279: remove the first “an”

1298: suggest rephrasing this sentence: “Radiocarbon ages ….yielded ages”

**Figures and tables**

Figure 1: no need to define again LIG, it has been done so earlier in the text

Figure 2: I suggest organize this figure in such way that you only mention once “nomenclature”; one option would be to color-code the 4 nomenclatures and explain in the figure legend. The measure unit on the Y axis is missing.

Figure 3: I recommend replacing the small black dots with a different symbol to make it easier to differentiate them from the large ones. I think the figure is missing labels a) and b) mentioned in the legend. I suggest listing the location in the order they are presented in the figure from left to right

Figure 4. MASL instead of m.a.s.l.. Add the name the y-axis (Sea level) and place the unit along the axis.

Figure 5. I suggest adding the 10 m thickness of the MIS 5e sediments in the picture.

Figure 7. (from Alexanderson in brackets).

Figure 8: replace “forests” with “foresets”

Table 5. Replace “nation” with “country”.