Comment on essd-2021-367
Anonymous Referee #2

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-RC2, 2021

Overall comments
This paper serves two important purposes – an extensive and detailed review of LIG sea level field sites and a usable database of relative sea level (RSL) and chronology datapoints for each site. This undertaking certainly required a great deal of effort and was very well designed. I think this paper should be accepted for publication after addressing a few minor comments. I will admit that I am a bit of outsider when it comes to knowing individual sites of RSL across formerly glaciated areas (especially in Eurasia), but with that in mind I found the paper to be clear, concise, and easy to follow. Below are my two comments of greatest concern.

First, the presentation of field site chronologic and elevation quality in table format will be helpful for those accessing the database for their own research use, but in the paper, it is difficult for the reader to synthesize all of this information (mostly since the database is so extensive!). What I suggest is making a series of maps that show the elevation/chronology quality scaled by color. I think this could be helpful for the paleo-sea level community as it may allow identification of field areas that need to be re-visited to improve data quality. This could also provide some spatial data that allows us to understand which geographic areas in general need better data coverage (like eastern Siberia).

In addition to making these maps (or as an alternativ, as part of the quality assessment, I think that an additional metric or index could be designed to identify which sites have the best overall data quality. This could be a 2- dimensional plot where the x-axis is the RSL data quality, and the y-axis is the chronology data quality. This would at least identify which sites should be revisited to improve either chronology or rsl measurements (or both!).

Along the same thread of thinking, it may be worth more discussion as to why certain areas have a greater prevalence and preservation of LIG sediments than others. Why aren't there any LIG marine sites from the Cordilleran Ice Sheet? I assume it’s due to some combination of erosion, the prevalence of fjord settings that have drowned many
sites (even if they rebounded after the LGM), but some comment on the spatial distribution of records and identification of data gaps in the discussion would be helpful.

My second comment is that I was surprised that cosmogenic burial dating was not included or discussed in this paper. Burial dating is increasingly common in glacial settings, and it is possible to use cosmogenic nuclide burial isochron dating to constrain an absolute age of sediment burial. If such datasets are not available or common, I think the authors should acknowledge this in the discussion to encourage its application in future studies.

I thank the authors for their hard work pulling together this extensive database. I enjoyed learning about these many field sites and I look forward to seeing the WALIS database continue to grow in the future.

Specific comments:

Intro

Line 64-66: This detail about the different regional names for the LIG seems out of place. I would move it to paragraph 1 where you define the LIG.

Dating techniques

This is a really helpful brief overview of dating methods and their limitations for interpreting ages.

Line 140: I think naming interglacial deposits as “Eemian” is potentially confusing since it has a specific regional meaning. Why not call it a “LIG deposit”?

Line 150-59: I would switch the order of IRSL and OSL so that readers understand what luminescence dating is first, then explain why IRSL has additional complications. I would also include in these sections the temporal limitations of OSL and IRSL. I think you also need to explain what anomalous fading means more fully, i.e., the electrons that accumulate in the crystalline lattice but leak over time, which leads to apparent IRSL ages that are too young. I would also include that fading rates can be measured in the lab and that fading corrections are specific to individual IRSL samples.

Are there any cosmogenic burial ages (26Al/10Be; 36Cl/10Be) for LIG sediments? This method is increasingly common, and I was surprised that this was not included as part of the database. If such papers do not exist, I think it would be important to point this out at the end of the paper in order to encourage the community to apply these methods to these types of sea level archives. I would specifically look for any papers that include cosmogenic burial isochron dating as this approach can provide an absolute age of burial of sediments regardless of nuclide inheritance.
Quality assessment
This is a great feature of this database. The rubric for how quality is assessed makes sense. My concern with the quality assessment is that the results of this evaluation effort are not presented spatially. It would be helpful to know where the best and worst elevation and chronology constraints are located. Would it be possible to include a metric or index value that considers both the RSL and chronology data quality? Or a plot of RSL vs chronology quality with each dataset labeled. This could be used to identify which sites have the best data overall.

Line 196: Why aren’t the total number of age constraints from an individual site considered as part of the quality assessment? Field sites with only a few ages don’t have as robust of chronologies as those with many ages, right?

Relative Sea Level Proxies & Other marine sites.
I did not comment on specific field sites because I am unfamiliar with much of this literature, but I will note that this is really helpful. I was able to learn the most salient information about many different field sites. Each section is concise and clear, and the dataset appears complete.

Discussion
Line 1228-29: Is this the only reason there are so few marine sites from North America? Are there places we could expect to find such records but have not identified them yet? Do borehole records include monitoring well and drinking water well logs? I am not suggesting that you look for all of these for this specific paper, but I was really surprised to see such a dearth of records from North America, particularly in the St. Lawrence River Valley.

Conclusions:
In this section I would also include cosmogenic nuclides as an additional chronologic method that should be pursued for improving age control of these sediments.

Figures
Figure 1: This is a helpful map, which shows how much work the authors have done to compile these records. It also shows the very large spatial gaps that still exist!
However, I think you need to have additional accompanying maps, perhaps by region, that show your RSL elevation and chronology data and quality ratings for all of these sites. It would be helpful at the community level to visually identify which field sites need better constraints for future work.

Figure 3: The age constraints for OSL should have uncertainties reported as well. How were the mean ages reported at the bottom of the figure calculated?

*Tables*

Table 4: I can understand why all of the individual ages for each site are not reported, but could the total n of age constraints for each site be reported? Could a range of ages be reported in this table as well?

*Technical Comments*

Line 25: typo. “...regression due to sea level...”

Line 42: not sure about ESSD, but typically in prep manuscripts cannot be cited

Line 55: grammar: “The first part of this manuscript (Sections 2-5) we defines...”

Line 143-44: grammar, “...although in recent years it has been largely replaced...”

Fig 2: Although it may be obvious to the paleoclimate community I would explain and slightly change the color scheme. The interglacial stages should be red with colder interglacial substages (i.e. MIS 5d, 5b) in a lighter hue of red since they were still warmer than the MIS 3 interstadial. Likewise, MIS 4 and MIS2 should be a darker blue and MIS 3 should be a lighter blue since it was a mild interstadial. Also include substage next to Marine Isotope Stages on upper right label.

Figure 4: Is this figure from another paper? If so, cite the source.

Figure 5: These labels are slightly hard to see. Units in the figure are reported differently (m.a.s.l.) than in the paper (MASL). I would move the white arrow to the outside of the labels and also include some more annotations that help the audience see the strata better.
Figure 6: the scale is washed out. Reduce the brightness and/or highlights of this photo so that it is more visible.

Figure 8. Typo: forests is a typo. Change to foresets. An extremely coarse forest would indeed be a sight to see!