Review of Lutz et al. Climate of the Past, https://doi.org/10.5194/cp-2024-74

Thank you to the editorial staff and the authors for the extra time for reviewing this paper. My appreciation also goes to the authors and their collaborators for pursuing an archive like this exposed in collapsing coastal bluffs. These sites are very special in the arctic regions and especially important as we are cut off from Russian collaborations for the foreseeable future.
Thank you very much for those very kind words.

I am very excited about this paper overall, but have some concerns about presentation, figures, and context. I hope my comments increase the value of the manuscript. The extension of treeline to the arctic coast in northeastern Arctic Russia during the MIS 5e was first discussed by Lozhkin, A. and Anderson, P.: The last interglaciation in northeast Siberia, Quaternary Res., 43, 147–158, 1995. and then in Lozhkin and Anderson, CP 2013. These papers are about sites to the east of this paper by Lutz but the coherence or contrast is important to the community understanding of the nature of 5e in these remote arctic settings of Arctic Russia. I think Lutz et al should mention this work in the conclusions. Lets hope collaboration with Russian scientists continue but right now we need to celebrate and cite important collaborations that contribute to paleoclimate science in the Arctic.
We will incorporate the aforementioned work by Lozhkin and Anderson into our discussion. We also very much hope that times will improve and that we will be able to cooperate again more effectively with our Russian colleagues.

My comments on the paper are documented by page and by line number.

Abstract page 2 Line 15, Clayish Silt is not used. Should be clayey- silt or clay-rich silt.
Thank you. We changed accordingly.

Page 3 - line 4 -- superimposed "on" local factors.
done

Page 4 -- move Fig 1 closer to where its first used here line 10
We have moved Figure 1 to the introduction, after the first reference to it.

Page 6 -- figure 1 and Figure 1b and 1C have numbered locations that are totally different from the sections (e.g., L14-12) in figure 2. Also Figure 2 b should be flipped so that the east end of the coastline is in the east as shown in Figure 1C. Why not put the section IDs on Figure 1 and not the numbers?
For space reasons, the section IDs were not entered on the maps in Figure 1a, b. Instead, we have now written the section numbers from Figure 1 in front of the section IDs in Figure 2. This should make the individual sections recognizable in both figures.

Page 7 line 2 - eastern parts, Bol'shoy Lyakhovsky Island is shaped by hills reaching elevation of about 100-300 m. Could you include a LIDAR or shaded relief map? Its not shown in Fig. 1. Yedoma or yedoma uplands?
Unfortunately, despite an intensive search, we have not been able to find a more suitable map basis for a better elevation visualization at sufficient resolution. Therefore, we will leave Figure 1 as it was before. The noted hills are except for thin cover deposits built of bedrock and do not refer to Yedoma or Yedoma uplands.

Page 8 line 28 -- something missing in this sentence. Do you want to say " K-feldspars with grain sizes of 40–63 µm were extracted for IRSL dating from core samples L14-12-OSL1, L14-12-OSL3), but coarser grains, 63–90 µm, were extracted from cores at L14-12-OSL1.
Thank you; we have changed this sentence to: Sample preparation targeted K-feldspar extracts at grain sizes of 40–63 µm for IRSL dating from both samples, L14-12-OSL1 and L14-12-OSL3. Additionally, the coarser grain-size fraction 63–90 µm yielded sufficient material for sample L14-12-OSL1. Coarser material (>100 µm) did not provide enough material for further analysis.

Page 8 lines 33-36. Confusing to follow. Extracted medium-sized feldspar grains were used to prepare sets of 24 aliquots with 2 mm diameter?? is 40-63 um medium and what is 2 mm referring to?
Indeed, this was confusing as it covered two aspects, the grain-size fraction and the aliquot diameter comprising a monolayer of grains. We have clarified the respective section in the text.

Page 9 - line 1 -- what is cut-heat temperatures?
This details the SAR protocol. "cut-heat" is the pre-heat in test dose cycles - knowing preheat and cut-heat defines fundamental parameters in the SAR sequence for eliminating instable signal components and needs to be specified. The SAR protocol is the basic concept used to design measurement protocol.

We added information for clarification.

Page 10 - This might need more explanation and it's my lack of knowledge perhaps. Dot occurrences in this GBIF database. I had to go look that up.
We have explained the abbreviation GBIF in more detail:
"The Global Biodiversity Information Facility - GBIF (2023), which …"

And we explained the "dot occurrence"
"The temperature range of a certain species was determined by the correlation of the species occurrences within Yakutia published in GBIF (2023), with the mean July temperature as MTWA at the grid point closest to the respective occurrence with a resolution of 0.5° longitude/latitude (Leemans and Cramer, 1991)."

Page 12 - nitrogen-cooled coldfingers? Part of the instrumentation?
Yes, part of the instrumentation. Whilst this is a widely used term in the clumped community, it might make sense to change it for a wider audience:
"Analyte gas was dehydrated and cleaned following established methodologies (e.g., Bernasconi et al., 2018; Eiler and Schauble, 2004; Petersen et al., 2015). Briefly, CO_2 was dehydrated at –80 °C in two liquid nitrogen-cooled water traps (coldfingers) and scrubbed of contaminants by passing through a static cryotrap filled with PorapakTM Q absorbent (Waters Corporation) trap cooled to –30 °C. Traps were baked at 150 °C after each measurement to avoid cross-contamination."

Page 13-14 - The climate modeling was confusing, but I think you were using existing ensemble models from the CMIP6 project, (needs a year) and extracting their data for your field area. So, you are not running the models again but extracting from published models? Is this correct? This section might need a figure. The issue you point out about trying to run the model without knowing what the land configuration was during 5e is a good one so you might

want to bring Figure S3 up into the main paper, not the supplement. Land Point needs to be capitalized in the figure caption as you have it through the paper.
Thank you for your comment. We changed the manuscript in several places to clarify the paleo modeling part. The heading of section 3.6 was changed to Paleoclimate Modelling Data to emphasize that we use existing data. We added the citation for the CMIP6 description paper to the manuscript. Also, we added text describing that the model data is provided by 13 different modeling groups from all over the world to emphasize that we have used existing model simulations that contributed to a model intercomparison study following a specific protocol. We also changed the figure caption in the supplement.

Regarding the land-sea distribution in the models contributing to PMIP, the protocol stated that paleogeography and ice sheets were to be the same as in the present-day simulations." (Otto-Blienser et al., 2017). In local studies, particularly in coastal areas, this leads to a potential mismatch between the distance to the coast a paleo proxy site experienced in the lig127k and has in the actual model setups, which is what we discuss in section 4.14. While we agree that an overview of the model setups would be interesting in the methods section, due to the length of the manuscript, we prefer to keep that figure in the supplement

Otto-Bliesner, B. L., Braconnot, P., Harrison, S. P., Lunt, D. J., Abe-Ouchi, A., Albani, S., Bartlein, P. J., Capron, E., Carlson, A. E., Dutton, A., Fischer, H., Goelzer, H., Govin, A., Haywood, A., Joos, F., LeGrande, A. N., Lipscomb, W. H., Lohmann, G., Mahowald, N., Nehrbass-Ahles, C., Pausata, F. S. R., Peterschmitt, J.-Y., Phipps, S. J., Renssen, H., and Zhang, Q.: The PMIP4 contribution to CMIP6 – Part 2: Two interglacials, scientific objective and experimental design for Holocene and Last Interglacial simulations, Geosci. Model Dev., 10, 3979–4003, https://doi.org/10.5194/gmd-10-3979-2017, 2017.

Page 14- line 25 -- clay-rich silt, not clayish silt
done.

Page 16 -- line 14. -- TIC values are not shown in Figure 5a. Typographic error somewhere? should this be TOC?
Thank you. The reference to Figure 5a will be deleted. It was more about calculating the carbonate estimate, which was made stoichiometrically on the basis of the TIC values.

Results section -- It was long to read but you do go step by step through the proxies and point out how some match and some don't. But that probably to be expected because of calibration errors for each. Very through.
Thank you very much.

Page 24 -- line 3 -- add reference to Figure 2 for Profile R35.
Done

Page 28 -- Figure 9 and S3 are interesting, and it shows the failure of not having a fine enough grid size. Not your fault but of models and trying to work that this local scale.
Thank you for your comment. We agree that there is often a distinct mismatch between scales from in situ observations and model grid cells, especially in simulations as coarse as those available for PMIP lig127k. The proxy data presented here represent different spatial scales themselves, but none represent areas as big as the grid cells in PMIP. Still, in situ proxy information about past climates are often the only data sets available for model validation, so the mismatch in scale needs to be taken into consideration when discussing the results. We discuss the uncertainties in the model simulations caused by employing different land sea masks and by not representing paleogeography in section 4.14.

Page 30 line 22-23 -- that first sentence is a mess. I am not sure how to even reword it. perhaps it needs to be 2 sentences?
Thanks for this feedback, we simplified the wording in order to introduce the following details on geochronological results.

Page 31 lines 25-34. Yes, water or ice would impede the dose rate. So, agree that all you can do is assume an uncertainty. And it is good to point out the overburden issue, but I thought it was not an issue below 1-2 meters of the exposed surface. I am not surprised that the age differences between 35 vs. 29 m is tiny.
Yes exactly. We include the uncertainty for the water content because of the unknown effect of water versus ice and related density versus volume effects.
And yes, the effect of cosmic dose rate declines significantly below 2 m, we include the estimates for transparency.

Table 7 page 33 and 34 -- hard to read. I suggest leaving all of the n/a boxes empty so that boxes with data stand out.
done

Page 36 -- around lines 15 and/or 27. Here is where you should cite the work in Chukotka by Lozkhin and Anderson at Lake El'gygytgyn and in an older synthesis the migration of treeline in 5e (QR paper). Your work and theirs paints a very clear image of the near loss of tundra long the coast during that time.
We added in the discussion chapter "5.5 Last Interglacial ecosystems", after the sentence:
"A major discrepancy to prior studies but also a highlight of our record is the detection of Larix, Picea, and Populus in the interglacial strata, suggesting that the treeline reached indeed as far north as Bol'shoy Lyakhovsky Island (73.3 °N)."
The two sentences:
"This is in line with MIS 5e pollen spectra at Lake Elgygytgyn (Lozhkin and Anderson, 2013) that indicate the extensive presence of forest in northern areas of the Russian Far East and the likely establishment of deciduous forest in the Chukchi Uplands. Similar MIS 5e pollen spectra are also known from the Yana Lowland, the Lower Indigirka Basin, and the Kolyma Lowland. (Lozkin and Anderson 1995)."

In addition, we add to the "Conclusions" the sentence:
"The LIG treeline shift is a transregional record that affected both Northeastern Siberia and the Chukchi Peninsula, as well as the Far East."

Page 39 -- lines 10-15 -- very good points here for future work.
Thank you very much.

Page 39 -- Strong summary.
Thank you very much.