

Interactive comment on “Summer-temperature evolution on the Kamchatka Peninsula, Russian Far East, during the past 20,000 years” by Vera D. Meyer et al.

Anonymous Referee #1

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“Summer-temperature evolution on the Kamchatka Peninsula, Russian Far East, during the past 20,000 years” by V. Meyer et al. discusses a 20-kyr-long terrestrial temperature reconstruction for a region with relatively sparse continuous paleoclimate reconstructions. The methods used are at the forefront of climate reconstructions. The authors compile existing temperature reconstructions for the last glacial maximum from the region and compare these reconstructions with a climate model simulation. There are several aspects of the study, particularly related to the data-model comparison, that would need clarification and revision prior to publication in *Climate of the Past*. Clarifying these points will make this study a strong and robust contribution to Beringian paleoclimate reconstruction.

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Specific comments:

Line 95: list the number of samples analyzed and the approximate or average depth and time sampling resolution

Line 133-134: How exactly what the standard deviation measured? Is this for this lab or labs in general? Was a standard measured regularly among sample injections, or were the repeat measurements of the samples? What is the pooled standard deviation of samples that were run multiple times (if any?...and if none, then that is important to report)? Please clarify in the text.

Line 136: it is critical to report the calibration error, which is much larger than the analytical error. While relative changes in a single record are likely real, the absolute temperature change is difficult to pinpoint because of this large calibration error. Please clarify in the text.

Line 148: does the word “glacial” belong here? it doesn’t make sense. Please clarify in the text.

Line 148-149: what parameters were used in this simulation? While the reader can check the references given here, it would be good to briefly summarize the parameters that were used to force the model and the parameters that were changed between the glacial and preindustrial runs (ice volume? sea level? orbital forcing? greenhouse gases? land cover? etc. ...) Please clarify in the text. Ice volume, sea level, and land cover are of particular importance for this region, where a large amount of land was exposed during the LGM.

Line 157: what does “integrated” mean? is this the model spin up? was this done twice, once for each the LGM and PreIndustrial runs? Please clarify in the text.

Line 181: Because this record is not in the North Atlantic, it would be best to avoid using terms that are related to North Atlantic climate change (ie. Bolling Allerod) in this results-oriented portion of the paper. When the authors later discuss links with the

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North Atlantic, these North-Atlantic-based terms can and should be introduced.

Line 204: It seems to me that the change from exposed land during the LGM to ocean during the PreIndustrial run over the land bridge would be a source of large changes in modeled SAT. This aspect is important to address, not only how this is handled in the model (is this exposed land in the LGM simulation?), but also how this could affect SAT in the model, and whether that is similar to the real-world effects. I would question whether these anomalies are even meaningful, and would need more explanation of what the changes mean, because of the changes from land to ocean surface.

Line 227: using slashes to indicate opposite effects is confusing. I suggest removing them and adding a phrase at the end of the sentence, like “with the opposite effect occurring with low terrigenous input”. See [Robock, 2010] for a humorous take on how confusing it can be to use slashes to express opposites.

Line 231: do the authors mean “in marine areas where brGDGTs are thought...”? please clarify.

Lines 242 and 244: what are the uncertainties or standard deviations on these temperature observations? please clarify.

Line 251: cite PMIP?

Line 267: clarify whether this attribution was by previous studies, or by this study.

Line 280 and others: Clarify in the text what proxy was used to produce this Sea of Okhotsk SST reconstruction.

Line 285: 1°C is well within calibration error of these proxies, and is important to mention in the text.

Line 325-328: It seems as if the final two sentences in this paragraph say opposite things. Can this be clarified?

Line 330: How robust or meaningful is this warmer-than-present temperature, given

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that there were large changes in surface conditions (land to ocean) from the LGM to present? I would expect summer temperatures to be quite warm over land, as dark soils can retain quite a bit of heat, whereas sea water remains much cooler. It is important to address the changing surface conditions in the text.

Line 344: It might clarify to add the following wording: “potentially explain the mismatch between model and proxy. . .”

Line 351: does the term “in the surrounding seas” refer to the Pacific or the Atlantic? It is unclear, as both are mentioned in this section. Please clarify.

Line 360: in addition to the age model error, the authors must also discuss error in marine reservoir corrections, and it would be helpful show age uncertainties in Fig. 2 time series.

Line 367: clarify what proxy is used to reconstruct SST in the NW Pacific.

Line 368-369: this sentence is unclear, please rewrite and clarify.

Line 370: What does AS stand for? Perhaps just spell out the full term.

Line 366-373: why would ocean waters place a “restriction” on atmospheric teleconnections? Can this be clarified?

Line 405: I don’t understand how the HTM is delayed on Kamchatka relative to other parts of Siberia, as both have the same beginning time (9ka). Can this point either be deleted or made more clear?

Lines 407-410: these speculative connections with the North Atlantic seem like a stretch and could be explained by other, regional climate forcing mechanisms. Perhaps it would be best to remove these sentences?

Lines 428-429: It is unclear what this sentence means. Please clarify.

Fig. 2: Plot age and proxy uncertainty envelopes for all data from core 12KL. Proxy

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uncertainty includes analytical uncertainty (relatively small) and calibration uncertainty (quite large, relative to the signal). This is important to report.

Fig. 4: show the model LGM land boundaries and the PI land boundaries. Are these annual or summer anomalies? Clarify in the figure caption.

Technical corrections: Line 12: Branched Glycerol. . . does not need to be capitalized

Line 35: clarify what “next to” means: rather than? or in addition to?

Line 53 (and elsewhere in the text): I think the authors mean 150°W here, and this same typo is made elsewhere (e.g., line 385).

Line 74: clarify what “over the northern shelves of central Beringia” means. Is this a geographic location? Could this be highlighted on a map or described in more clear terms?

Line 175: it might help to add the word “respectively” to the end of the sentence that lists the percentages.

Line 184: change “with approx.” to “at approx.”

Line 194: Add “North” before “American continent”

Line 203: remove the w in “now”

Line 209: it might be more clear to say that the SAT anomaly becomes stronger or becomes more pronounced from east to west (because the anomaly is actually decreasing from east to west).

Line 226: this is an incomplete sentence.

Line 248: add comma between climate and according

Line 250: change ‘computer’ to ‘general circulation’

Line 253: change “ice caps” to “ice sheets”

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Line 255: is CO₂atm defined prior to this? If not, then define here.

Line 261: add “summer” between present and conditions.

Line 412: define what “it” refers to.

Line 420: change “were as high as at present” to “were similar to present temperatures” or something to that effect.

Line 421: remove “a” before “stronger-than-present”

Robock, A. (2010), Parentheses Are (Are Not) for References and Clarification (Saving Space), Eos, Transactions American Geophysical Union, 91(45), 419, doi:10.1029/2010EO450004.

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