Climate of the Past Discussions

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Comment on cp-2021-66

Savannah Worne (Referee)

Referee comment on "Biomarker proxy records of Arctic climate change during the Mid-Pleistocene transition from Lake El'gygytgyn (Far East Russia)" by Kurt R. Lindberg et al., Clim. Past Discuss., https://doi.org/10.5194/cp-2021-66-RC1, 2021

General Comments

The MPT is a perplexing component of Quaternary climate change which provides a unique opportunity to understand the interconnectivity and feedbacks between different components of the climate system on orbital and sub-orbital timescales. Lindberg et al. present an interesting dataset from a unique archive to assess Arctic response to MPT climate dynamics and provide thorough discussion on the role of the North Pacific, Bering Sea, and inter-hemispheric teleconnections which could result in the observed changes in vegetation and temperature in north-eastern Russia. They properly outline the limitations of their datasets and calibrations, interpreting their data to a suitable resolution and using statistically robust techniques. The study concludes that the warm interglacial conditions widely observed during MIS 31, as well as subsequent MPT cooling, are not apparent at Lake El'gygytgyn. They discuss potential causes for this, as well as the detected sub-orbital cyclicity in the temperature record, including the interplay between temperature and moisture availability resulting from teleconnection with Arctic and sub-Arctic, as well as tropical and Atlantic Ocean feedbacks. Overall, I recommend that this manuscript be accepted subject to minor revisions. I have outlined some areas which I feel could benefit from additional discussion, as well as some technical corrections. I hope that the authors find these recommendations helpful.

Specific Comments

- Could a short discussion be made on the difference between the results from the original and re-analysed samples from de Wet et al. (2016)?
- Figure 5 presents an MBT/CBT calibration from Sun et al. (2011) in light brown squares, however there appears to be no mention of this calibration is made in the text. There is clearly an offset in values in the MBT/CBT record compared to the African lakes and BAYMBT calibrations at ~1.1 myr. Could the author include some information on this calibration and the likely reason for this discrepancy, as they have for the

Greenland lakes calibration? This is particularly relevant for the later discussion on MIS 31 as the MBT/CBT calibration has notably higher temperatures which would support superinterglacial warmth, compared to the BAYMBT and African Lakes which do not show a similar peak in temperature or subsequent cooling trend.

- The authors include a very interesting discussion on suborbital cyclicity at ~11 kyr. Some mention is given to the potential control of the monsoon. I wonder if the authors has considered the amplification of the Walker Circulation as a mechanism of suborbital cyclicity? Intensification of the Walker Circulation is suggested to have occurred in the build up to the MPT from ~1.17 Ma, propagating to the high latitudes through changes in the El Nino Southern Oscillation and East Asian Winter Monsoon (McClymont & Rosell-Melé, 2005; Stroynowski et al., 2017). Evidence from the adjacent Bering Sea supports this, where sea ice is suggested to have responded to the resultant changes in wind strength, temperature and moisture delivery (Stroynowski et al., 2017; Worne et al., 2021). This would also fit with the authors discussion of changing wind strength and wetter conditions.
- Line 437: Evidence from the Site U1343 does not show reduced diatom productivity, where the opal MAR record (Kim et al., 2014) is high through this interglacial, indicating high productivity. Furthermore, Detlef et al. (2018) states that "beginning at MIS 25, [Site U1343] is characterised by an ice-free eastern Bering Sea". Recent diatom data may be in better support of your discussion here, where fossil assemblages suggests that MIS 25 represents an interval of peak marginal sea ice conditions across the MPT interval, suggested to be a result of increased wind strength and longer sea ice melt seasons (Worne et al., 2021).

Technical Corrections

- Line 12: comma after "Arctic"
- Line 35: comma after "(Brigham-Grette et al., 2013)"
- Line 36: rephrase, perhaps to "tundra vegetation, where the tree line lies…"
- Line 67 and 75: capitalise Arctic
- Line 114 and 116: extra space before methanol needs removing.
- Section 3.1: be consistent with capitalisation of Eq or eq.
- Figure 3: Caption for E and F appears to have errors with references in the wrong place and text missing, perhaps because of referencing software. Needs to be re-written.
- Line 334: NE has been fully written as northeast earlier in the text, needs to be consistent.
- Line 450: "short-lived" needs hyphenating.

References cited here, not included in original manuscript:

Kim, S., Takahashi, K., Khim, B. K., Kanematsu, Y., Asahi, H., & Ravelo, A. C. (2014). Biogenic opal production changes during the Mid-Pleistocene Transition in the Bering Sea (IODP Expedition 323 Site U1343). *Quaternary Research*, 81(1), 151–157.

https://doi.org/10.1016/j.yqres.2013.10.001

McClymont, E. L., & Rosell-Melé, A. (2005). Links between the onset of modern Walker circulation and the mid-Pleistocene climate transition. *Geology*, 33(5), 389–392. https://doi.org/10.1130/G21292.1

Stroynowski, Z., Abrantes, F., & Bruno, E. (2017). The response of the Bering Sea Gateway during the Mid-Pleistocene Transition. *Palaeogeography, Palaeoclimatology, Palaeoecology*, 485(March), 974–985. https://doi.org/10.1016/j.palaeo.2017.08.023

Worne, S., Stroynowski, Z., Kender, S., & Swann, G. E. A. (2021). Sea-ice response to climate change in the Bering Sea during the Mid-Pleistocene Transition. *Quaternary Science Reviews*, 259, 106918. https://doi.org/10.1016/j.quascirev.2021.106918