

## ***Interactive comment on “A new 30,000 year chronology for rapidly deposited sediments on the Lomonosov Ridge using bulk radiocarbon dating and probabilistic stratigraphic alignment” by Francesco Muschitiello et al.***

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Received and published: 15 February 2020

First, we would like to thank Reviewer 2 for the time he/she/they took to review our study and for their constructive criticism. His/her/their comments have helped us to craft a revised and more rigorous version of our manuscript. Please find below a detailed point-by-point response to the “Reviewer’s comments”.

“One thing I find poorly explained is the “Assigned prior uncertainty range” which is shown in Table 1. This term does not appear in the text (only in the table caption). Its

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calculation involves subtraction of 20,000 years from the radiocarbon dates ranges, but this number is not explained. Was it arbitrarily chosen? Why do the authors use 20 kyr and not any other number? It may be my inability to fully understand the statistical methods (which is probably my fault and not that of the authors), but this issue definitely needs some better explanation...”

Thank you for pointing this out. We acknowledge that this issue should have been more clearly explained in the former version of the manuscript. We now included a more detailed discussion as to why we subtract 20 kyr from the calibrated bulk ages. This value was chosen arbitrarily to assign a highly non-informative prior on the uncertainty of the bulk dates employed for the proposed Bayesian age modeling procedure outlined in Section 2.4. We provided a clearer rationale for this choice not only in the table caption but also in the main text alongside the methodological section (see new lines 83-86, 115-116, 145, 163-165, 455-450).

“The discussion of the results is sound and the correlation of the results from core 31-PC to core PS2767-4 seems mostly straightforward. A point that should be discussed is the last glacial maximum hiatus in arctic sediments which has been proposed by a number of authors in recent years. How does the applied statistical method cope with a possible hiatus? Was the area of 31-PS affected by the thickened sea ice cover that was proposed as the reason for this hiatus?”

This is a fair comment. We have now expanded the discussion section (also following comments from Reviewer 1) to include a commentary that tackles the LGM hiatus within the context suggested by Reviewer 2. In particular, we here argue that the LGM/MIS-2 sedimentation rates inferred from our new marine chronology (i.e. ~24 cm/kyr) are in stark contrast to those observed in sediment cores from the Western Arctic Ocean, the Mendeleev Ridge, and in few instances on the Lomonosov Ridge (Jakobsson et al., 2014; Poirier et al., 2013; Polyak et al., 2009). The rapid sedimentation rates found at our coring site, i.e. on the southern Lomonosov Ridge off Siberia, indicate a profoundly different depositional environment with strong sediment supply,

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and they are notably more in line to MIS-2 sedimentation rates reported along the Eurasian continental margin and northern Greenland margins (Jakobsson et al., 2014; Nørgaard-Pedersen et al., 2003). Please see section 3.3 of the revised manuscript (new lines 244-252).

“Considering that the focus of Geochronology papers is expected to lie on age constraints and the establishment of age models, the implications of the new age model for deposits and for paleoenvironmental reconstructions from the easternmost Lomonosov Ridge are otherwise sufficiently discussed. The figures are illustrative and overall fine. Please correct "synhronized" in the insert box in Fig. 3a”

This has now been corrected (see new Figure 3).

#### References

Jakobsson, M., Andreassen, K., Bjarnadóttir, L. R., Dove, D., Dowdeswell, J. A., England, J. H., Funder, S., Hogan, K., Ingólfsson, Ó., Jennings, A., Krog Larsen, N., Kirchner, N., Landvik, J. Y., Mayer, L., Mikkelsen, N., Möller, P., Niessen, F., Nilsson, J., O'Regan, M., Polyak, L., Nørgaard-Pedersen, N. and Stein, R.: Arctic Ocean glacial history, *Quat. Sci. Rev.*, doi:10.1016/j.quascirev.2013.07.033, 2014.

Nørgaard-Pedersen, N., Spielhagen, R. F., Erlenkeuser, H., Grootes, P. M., Heine-meier, J. and Knies, J.: Arctic Ocean during the Last Glacial Maximum: Atlantic and polar domains of surface water mass distribution and ice cover, *Paleoceanography*, doi:10.1029/2002pa000781, 2003.

Poirier, R. K., Cronin, T. M., Briggs, W. M. and Lockwood, R.: Corrigendum to Central Arctic paleoceanography for the last 50kyr based on ostracode faunal assemblages [*Mar. Micropaleon.* 88-89C (May 2012) 65-76], *Mar. Micropaleontol.*, doi:10.1016/j.marmicro.2012.08.001, 2013.

Polyak, L., Bischof, J., Ortiz, J. D., Darby, D. A., Channell, J. E. T., Xuan, C., Kaufman, D. S., Løvlie, R., Schneider, D. A., Eberl, D. D., Adler, R. E. and Council, E. A.: Late

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Quaternary stratigraphy and sedimentation patterns in the western Arctic Ocean, *Glob. Planet. Change*, doi:10.1016/j.gloplacha.2009.03.014, 2009.

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Interactive comment on Geochronology Discuss., <https://doi.org/10.5194/gchron-2019-16>, 2019.

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