

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.

Anonymous Referee #2

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The manuscript by Muschitiello et al. documents an important step forward in the challenging process of developing a reliable chronostratigraphic framework for Quaternary Arctic Ocean sediments. The lack of directly datable materials in many layers, the low sedimentation rates in most parts of the perennially ice-covered deep-sea area, the effect of sediment mixing by bioturbation, and the problem of largely unknown reservoir effects for pre-Holocene times render a huge set of difficulties that need to be overcome when reliable reconstructions of past Arctic Ocean environments are to be presented. Muschitiello et al. present a novel approach using advanced statistical

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methods on data from a sediment core with apparently high resolution and a correlation to a Greenland ice core which is still the age benchmark for the succession of Late Quaternary climate change in northern high latitudes.

Overall, the manuscript is well structured and well written in very good English. The abstract is informative and fine. The introduction gives a good overview of the published literature on the problems of Late Quaternary chronologies for Arctic marine sediment cores. It also outlines the strategy applied by Muschitiello et al. to add to a solution. The methods for investigations on the cores are standard ones and properly documented.

I must say that my knowledge of advanced statistical methods is not sufficient to evaluate chapter 2.4.2. I have to take it for granted that these methods and calculations were applied correctly. The basic assumptions, however, seem okay. 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 calculation involves a 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...

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? 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 "synchronized" in the insert

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box in Fig. 4a.

Overall, I think that the manuscript by Muschitiello et al. will be of great interest for the community of Arctic Ocean paleoenvironmental researchers. In my eyes, only minor work is needed to make this manuscript publishable.

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