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Climate of the Past Discussions
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Interactive comment on "Sources and characteristics of terrestrial carbon in Holocene-scale sediments of the East Siberian Sea" *by* Kirsi Keskitalo et al.

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Please find attached a detailed author response and the revised manuscript and supplementary information as track-changes documents.

Interactive comment on Clim. Past Discuss., https://doi.org/10.5194/cp-2017-20, 2017.

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Discussion paper

Author responses to reviews and edits to Climate of the Past manuscript titled "Sources and characteristics of terrestrial carbon in Holocene-scale sediments of the East Siberian Sea"

by K.Keskitalo, T.Tesi, L. Bröder, A. Andersson, C. Pearce, M. Sköld, I.P. Semiletov, O.V. Dudarev and Ö. Gustafsson

We are grateful to all the three reviewers for their comments on the manuscript. These constructive and overall positive comments have improve the manuscript during revisions. All the referee comments with our responses are detailed below. The referee comments are given in italics and our response in regular font. All references to line numbers refer to the revised track-changes document.

Reviewer #1, anonymous

GENERAL COMMENTS

"This paper uses novel proxy analyses to identify the provenance of the organic carbon in marine sediments during the Holocene. The results show that total organic carbon flux was high during the early Holocene and that it was primarily from terrestrial Pleistocene permafrost and mostly from shoreline erosion during the sea level transgression."

RESPONSE

Thank you for your comment. This is exactly what we are trying to show.

Reviewer #2, Thomas Cronin

GENERAL COMMENTS

"This is an excellent, well-written paper. Minor queries are made as inserted comments in the attached PDF. Minor revision is needed, but an organic geochemist should also read the paper."

RESPONSE

Thank you for the positive and supportive comment.

SPECIFIC POINTS

1) *"This sentence "The CuO-derived lignin and cutin product" sounds like all readers will know what you are talking about, can you expand and clarify a little." (L24-26)*

An explanation about lignin and cutin products has been added to the text (L25). There is also a method description given in Sect 2.5 and a more detailed explanation of lignin and cutin compounds in lines 283–286.

Fig. 1. Author response

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Discussion paper

Sources and characteristics of terrestrial carbon in Holocene-scale sediments of the East Siberian Sea

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Abstract. Thawing of permafrost carbon (PF-C) due to climate warming can remobilise considerable amounts of terrestrial carbon from its long term storage to the marine environment. PF-C can be then buried in sediments or remineralised to CO_2 with implications for the carbon-climate feedback. Studying historical sediment records during past natural climate changes can help to understand the response of permafrost to current climate warming. In this study, two sediment cores collected from the East Siberian Sea were used to study terrestrial organic carbon sources, composition and degradation during the past ~9,500 cal yrs BP. The CuO-derived lignin and cutin products (i.e. compounds solely biosynthesised in terrestrial plants) combined with $\delta^{13}C$ suggest that there was a higher input of terrestrial organic carbon to the East Siberian Sea between ~9,500 and 8,200 cal yrs BP than in all later periods. This high input was likely caused by marine transgression and permafrost destabilisation in the early Holocene climatic optimum. Based on source apportionment modelling using dual-carbon isotope ($\Delta^{14}C$, $\delta^{13}C$) data, coastal erosion releasing old Pleistocene permafrost carbon was identified as a significant source of organic matter translocated to the East Siberian Sea during the Holocene.

Fig. 2. Revised manuscript

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Supplementary information

Tables and figures

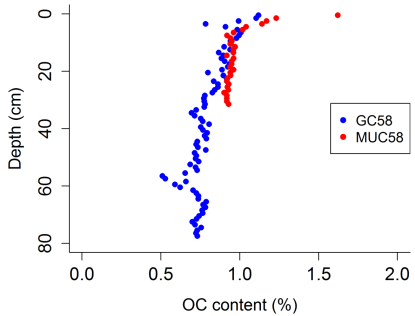

Figure S1. Comparison between the organic carbon (OC) content (%) of the sediment cores GC58 and MUC58. Based on the comparison, we deduced that the top 3cm of GC58 were lost during sampling.

1

Fig. 3. Revised Supplementary Information

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