

## ***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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Received and published: 8 August 2017

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.

C1

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

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

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

10

11 **Reviewer #1, anonymous**

12 **GENERAL COMMENTS**

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

17 **RESPONSE**

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

19

20 **Reviewer #2, Thomas Cronin**

21 **GENERAL COMMENTS**

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

24 **RESPONSE**

25 Thank you for the positive and supportive comment.

26 **SPECIFIC POINTS**

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

29 An explanation about lignin and cutin products has been added to the text (L25). There is also a method  
30 description given in Sect 2.5 and a more detailed explanation of lignin and cutin compounds in lines  
31 283–286.

**Fig. 1.** Author response

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

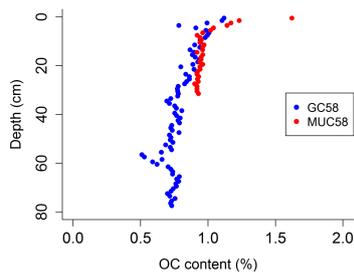
3  
4 Kirsi Keskkitalo<sup>1</sup>, Tommaso Tesi<sup>1,3,4</sup>, Lisa Bröder<sup>1,5</sup>, August Anderson<sup>1,6</sup>, Christof Pearce<sup>2,3</sup>,  
5 Martin Skjold<sup>1</sup>, Igor P. Semiletov<sup>6,7,8</sup>, Oleg V. Dudarev<sup>7,8</sup> and Orjan Gustafsson<sup>1,3,7</sup>  
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8 Sweden  
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19 **Abstract.** Thawing of permafrost carbon (PF-C) due to climate warming can remobilise considerable amounts  
20 of terrestrial carbon from its long term storage to the marine environment. PF-C can be then buried in sediments  
21 or remineralised to CO<sub>2</sub> with implications for the carbon-climate feedback. Studying historical sediment records  
22 during past natural climate changes can help to understand the response of permafrost to current climate  
23 warming. In this study, two sediment cores collected from the East Siberian Sea were used to study terrestrial  
24 organic carbon sources, composition and degradation during the past ~9,500 cal yrs BP. The C<sub>18</sub>-derived lignin  
25 and certain products of lignin degradation (i.e. compounds solely biosynthesised in terrestrial plants) combined with δ<sup>13</sup>C suggest that  
26 there was a higher input of terrestrial organic carbon to the East Siberian Sea between ~9,500 and 8,200 cal yrs  
27 BP than in all later periods. This high input was likely caused by marine transgression and permafrost  
28 destabilisation in the early Holocene climatic optimum. Based on source apportionment modelling using dual-  
29 carbon isotope (Δ<sup>13</sup>C, δ<sup>13</sup>C) data, coastal erosion releasing old Pleistocene permafrost carbon was identified as a  
30 significant source of organic matter translocated to the East Siberian Sea during the Holocene.

Fig. 2. Revised manuscript

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1 Supplementary information  
2  
3 Tables and figures



4  
5 Figure S1. Comparison between the organic carbon (OC) content (%) of the sediment cores GC58 and  
6 MUC58. Based on the comparison, we deduced that the top 3cm of GC58 were lost during sampling.

Fig. 3. Revised Supplementary Information

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