The Cryosphere Discuss.,
doi:10.5194/tc-2016-143-RC1, 2016

The Cryosphere Discussions

Interactive comment on "Macromolecular composition of terrestrial and marine organic matter in sediments across the East Siberian Arctic Shelf" *by* Robert B. Sparkes et al.

Anonymous Referee #1

Received and published: 24 August 2016

Review of Cryosphere manuscript (MS #: doi:10.5194/tc-2016-143, 2016) Title: Macromolecular composition of terrestrial and marine organic matter in sediments across the East Siberian Arctic Shelf Authors: Sparkes et al.

The manuscript by Sparkes et al. set out to investigate macromolecular composition of terrestrial and marine organic matter in sediments across the East Siberian Arctic Shelf using pyrolysis-GC-MS and radiocarbon measurements. They found that there is a strong offshore trend from terrestrial phenols, aromatics, cyclopentenones to marine pyridines, but not for furfurals which represent carbohydrate component. They also found a good agreement between phenols measured using py-GCMS and independent quantification of lignin phenol. Combined with radiocarbon composition of the bulk OC,

the authors suggested that the aromatics components were derived from old terr-OC while the phenols groups were sourced from modern woody materials. Based on their new data, the authors proposed a compelling index, using the relative proportions of phenols and pyridines, to be used as a novel proxy for terrestrial vs. marine organic components in the East Siberian Arctic Shelf sediment.

In general, this manuscript presents a great quantitative data set based on molecular characterization using pyrolysis-GC-MS and radiocarbon analyses of bulk OC. The index of the proportions of phenols and pyridines seems to be working in identifying the relative contribution of macromolecular organic matter in this complex coastal marine environment in the Arctic Ocean. Results shown in Figure 5 are quite convincing and support the authors' proposed index. I support the publication of this work.

Specific comments: a) Section 2.1: Materials in this section, although important, can be tied up or shortened a bit. b) Throughout the manuscript, Why names of organic compound classes, such as Phenols, Aromatics, Alkylbenzenes and Cyclopentenones, etc., need capitalized for the first character? c) Pg-2, Line-14: Add reference of Ping et al (2011) for pan arctic coastal erosion: Ping, C.-L., G.J. Michaelson, L. Guo, M.T. Jorgenson, M. Kanevskiy, Y. Shur, F. Dou and J. Liang. 2011. Soil carbon and material flux across the eroding coastline of the Beaufort Sea, Alaska. JGR-Biogeosciences, 116, G02004, doi:10.1029/2010JG001588 d) Section 3.1: change " Bulk radiocarbon measurements" to read: " Bulk radiocarbon composition" e) Section 4.5: Regarding title of this section, instead of a sentence, I suggest the use of a regular title.

Overall, I support publication of this manuscript.

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