EGUsphere, referee comment RC1
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Comment on egusphere-2022-516

Anonymous Referee #1

Referee comment on "Contrasts in dissolved, particulate, and sedimentary organic carbon from the Kolyma River to the East Siberian Shelf" by Dirk Jong et al., EGUsphere, https://doi.org/10.5194/egusphere-2022-516-RC1, 2022

Jong et al. offer a look at the organic carbon (OC) pools across the rapidly changing land-ocean interface associated with the Kolyma River. They use stable and radio isotopes of OC as well as lignin, phenol and lipid biomarkers to demonstrate how the composition of the dissolved (DOC), suspended particulate (POC) and sedimentary (SOC) OC pools varied from Kolyma River tributaries, along the river itself and out to the East Siberian Sea. They find considerable variability in the age and sources of OC between these pools and across their transect.

Overall, I enjoyed reading the manuscript. It is clearly written and importantly, integrates terrestrial (freshwater) and marine measurements along a coastal margin experiencing rapid environmental change, something that is still not often done. I do believe that the manuscript will be of interest to the readers of Biogeosciences, particularly those interested in carbon dynamics at the coastal margin and/or in Arctic regions. The most substantive changes that I have suggested relate to the inclusion of more information in the Methods section to enable replicability of the methods, particularly as it relates to sample processing and analysis. Note also one editorial suggestion related to the description of isotope ratios that will involve a detailed look throughout the manuscript.

General considerations for the authors:

- Until the reader consults Vonk et al. (2012), Wild et al. (2019) and Bröder et al. (2020), how this study differs from those published previously by some of the author team is not entirely clear. It would be helpful for the reader if this was made more explicit in the manuscript itself. There is obviously great value in using previously published data to answer new questions, but what distinguishes this study could be more clear.
- There is a temporal offset between the collection of the riverine (2018) and marine (2008 & 2014) data. Do the authors think that this temporal offset could be important?

Did anything important happen within the watershed during that time that might be reflected in the organic carbon pool? In 2021, for example (evidently outside of the sampling time period but likely not an isolated incident), widespread wildfires occurred within the Kolyma River watershed. Wildfires are just one example of events that are known to impact both permafrost thaw dynamics but also organic carbon pools.

Additional details in the method:

- Section 2.1: Could more information on the receiving ocean environment be provided? Is the Kolyma River at station K6, for example, tidally influenced? How do waters circulate within the East Siberian Sea? How was from the edge of the continental shelf from the sampling site furthest from land.
- Were replicates collected/run for any of the analyses?
- L178-179: How many subsamples were collected for each sample?
- L189: How were the filters subsampled for the radiocarbon analyses?
- L211: How was it determined to select one, two or three GF/F filters for the analysis?
- I'd be curious to know why two different acidification techniques (direct acidification and fumigation) were used to remove inorganic carbon from the SOC/POC samples for the stable isotope and radioisotope analyses, respectively? Do the authors have confidence that the two were equally effective in removing inorganic carbon?
- Were the samples for stable isotope analysis rinsed or neutralized following HCl addition?
- L238-240 and L247-251: How many samples contributed to the mean +/- SD used for the permafrost OC and primary production end-member values?
- L245-247: Why did the authors choose to include vegetation and soil OC as one end-member instead of two as in the source publication?
- Please specify whether means and standard deviations are indicated throughout the manuscript or if not, what metrics of average and variance are used.
- It is not clear until Table 2 that SOC was not collected at all sites.
- L260 – 263: How was convergence of the Bayesian model assessed?

Figures and figure captions:

- Figure 1 caption: Include the names of the tributaries and their abbreviations as a key in the caption.
- Figure 1c: It may be helpful for the reader to change the colours of marine sampling stations to distinguish between the two sampling campaigns. If possible, it would be great to see a bathymetry layer added to the figure, which would help in describing the receiving marine environment (as above).
- Figure 2 caption: Indicate whether the "average" refers to a mean or median.
- Figure 4 caption: What values are presented in the figure? Are these Bayesian median credible intervals? Means?
- Figure 5 caption: It does not appear as though any POC samples have been included in the figure, though POC (triangles) is included in the caption.
- Possible additional supplementary figure: It might be helpful to include a hydrograph of the Kolyma River as a supplementary figure and outline the time period over which the

presented samples were collected. This would help to give hydrological context to the samples presented.

Results and Discussion:

- L277: Indicate the range of DOC concentrations observed in ESS surface waters from the literature for the reader to be able to make the comparison.

Editorial changes:

- L134: Change "or" to "of"
- L182: Remove "in" between "acidified" and "as described".
- L246: Change "weighed" to "weighted".
- Throughout the manuscript (example usages on L324, 334, 335, 336, 342, etc.): This is a matter of semantics, but $\delta^{13}C$ and $\Delta^{14}C$ are ratios and the ratio itself cannot inherently be more enriched or depleted. For $\delta^{13}C$, for example, the sample is more enriched or depleted in the heavier isotope ^{13}C or in the lighter isotope ^{12} Alternatively, the ratios can be described as higher or lower, but not enriched or depleted without specifying to which of the two isotopes these modifiers refers. See the guide to Common Mistakes in Stable Isotope Terminology and Phraseology: http://dx.doi.org/10.6084/m9.figshare.1150337