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Discussions

Interactive comment on "Permafrost coverage, watershed area and season control of dissolved carbon and major elements in western Siberian rivers" *by* O. S. Pokrovsky et al.

Anonymous Referee #2

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"Permafrost coverage, watershed area and season control of dissolved carbon and major elements in western Siberian Rivers" presents a rich dataset of river biogeochemistry in the Western Siberian Lowlands , building upon previous work by Frey and Smith 2005 and Frey et al., 2007. Specifically, by conducting sampling across seasons, a better understanding of carbon dynamics and hydrology can be produced. However, the paper could be improved in a number of ways.

Specific comments: First, and most importantly, fluxes of DOC, DIC and elements are discussed throughout. However, the units reported are for yields (mass per area per time, e.g. tons C km-2 yr-1) rather than fluxes (mass per time, e.g tons C yr-1). Much of the discussion and figures 9 -12 depend upon these calculations. Please either

revise the text to discuss yields, or calculate fluxes. As it stands, evaluating many of the conclusions are difficult without knowing precisely which the authors intended.

I am also concerned about using mean monthly discharge as the basis for calculating fluxes or yields, particularly since it appears that discharge data for northern regions is from 1973-1992. Basing flux or yield estimates largely on discharge data that is decades old while constituent concentration data is only from the past few years, and using that to make conclusions about future possible climate scenarios is difficult. There have been significant increases in discharge in many Siberian rivers over that time frame. I would be more reassured if there were data available or cited showing how discharge from recent years compares to older data, even if just for a subset of sites. Even without discharge, and subsequently flux or yield data, this is an important dataset of concentrations that should be published.

Also, the paper, while presenting a great deal of data, is rather long and not all the data presented necessarily strengthens the paper. For instance, the PCA presented in supplemental materials and discussed in section 3.1 does not explain a great deal of the variation (PC1 only 6-7%, for instance) and is not explicitly referenced again in Discussion sections. Given the relatively small explanatory power of the PCA, I do not think including it is necessary or improves the paper.

There are a large number of graphics, some of which present the same data in different forms, which could be consolidated. For instance, Figures 6a and 7 a-c are presenting the same data (pH, DOC, DIC, 13dDIC) from figures 2 – 5, only showing all seasons for each chemical parameter together, with color coding for permafrost extent. If tick marks, lines or shading were added to figures 2-5 to differentiate permafrost zones, the latter figures might not be necessary. Even if the figures are kept as is, the color scheme is difficult to see – please change it so that the discontinuous and continuous permafrost symbols are less similar.

Throughout the text, the authors cite significant differences between rivers, based on

permafrost, season, latitude or watershed size. For instance, the first paragraph of section 4.3 discusses the significant "contrast in DOC concentrations among permafrost-free, discontinuous and continuous permafrost zones". Given the number of such tests, it would be useful to include a table summarizing the statistics, and highlighting which relationships are significant.

In grouping seasons, were October samples included in summer or winter? Or only included in analyses that grouped all seasons together?

Section 2.2: Were DOC samples stores frozen, cool or acidified? No details on how UV absorbance samples were stored or measured.

P 10631, L 14-25: I found the PCA explanation unclear. If this analysis in included, a biplot of how the variables are explained by PC1 and PC2 would be helpful. See Connelly, T.L et al. (2015) in Marine Ecological Progress Series as a good example.

P10632 L 18-27: The optical characteristics are described briefly, then not referenced again. Figure 8 could be moved to supplemental materials or removed completely. The results from other supplemental figures are discussed in more detail than the UV absorbance.

P10643 L20-21: Are the Taz and Nadym rivers in discontinuous or continuous permafrost? Unclear why they are contrasted with the Pur and Ob rivers.

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