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Discussions

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Interactive comment on "First Pan-Arctic Assessment of Dissolved Organic Carbon in Permafrost-Region Lakes" *by* Lydia Stolpmann et al.

Anonymous Referee #1

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General Comments: The authors have presented a synthesis of a very large data set of DOC concentrations from permafrost affected lakes spanning the entire Arctic and a straight forward, but yet effective regional scale analysis of the landscape controls on the DOC concentrations in these lake.

The authors have identified the data gap and clearly spelled out the objectives of the study They have done a commendable job at gathering this very impressive and novel data set, they have provided a detailed summary of the temporal and spatial nature of the data, and have applied valid statistical tools to investigate and identify the role that a range of landscape variables play in controlling the DOC concentrations in Arc-

tic/permafrost lakes. The authors have also done a very good job at addressing the uncertainties and challenges with the data in the discussion.

On it's own the act of gathering and describing this data set constitutes a valuable contribution, and the analyses conducted and conclusions drawn add significantly the value of that contribution. The research presented is well within the scope of the journal and should be of interest to a wide audience. As such I believe the work is definitely worthy of publication. I do feel that the data have been under-utilized in a few respects, and/or there are some analyses that could be added to address some of the issues of uncertainty and the variability in the data and strengthen the paper.

I detail the suggestions in the specific comments below. I view these as minor to moderate revisions, as they require some additional analyses or description of the data, but I do not believe they will change the outcomes or conclusions that are reached.

Specific Comments:

Title – I suggest a couple minor changes. First I would remove "-Region" from the title - simply state Permafrost Lakes.

Second I would advise the authors to consider editing the title slightly to specify the nature of the "Assessment" conducted.

Perhaps: "First Pan-Arctic Assessment of landscape characteristics as controls on Dissolved organic carbon in Permafrost Lakes"

Or "First Pan-Arctic Assessment of environmental parameters as drivers for Dissolved organic carbon concentrations in Permafrost Lakes" Or along these lines.

Study Area: The authors spend several paragraphs on pages 3-5 describing the percentages of the lakes that are from the different Arctic regions and the different ecozones etc. Although the authors do provide the lake/sample numbers as n values in Table 2 and Figure 3, because there is a strong spatial bias (with more than half the lakes in Alaska) I suggest that a histogram be included, to better illustrate the geo-

graphical distribution of the lakes. This could be included as an insert for example in Figure 1 (using this regional description).

The other aspect of the data that is not clearly illustrated is the timeframe of collection. It would help the reader understand the data, if there was some illustration of the number of samples/lakes that were taken from the various years (e.g. how many samples are from 1979-1985 in Nunavut?). I do not think it would require much effort to generate a temporal histogram (with the number of samples from the various years and quarters).

The authors need to address the potential impact of including samples from nearly 40yr span of time could have on the analyses, especially given that climate and permafrost has been changing dramatically (and at different rates) across these ecoregions during this time. For example this long time frame of the sample period could play a role in the relationship between DOC and latitude. Is it possible the relationships might be more robust if the authors limited themselves to data from the last decade or two? The temporal histogram suggested above would provide a means to speak to this issue.

Results: Temporal Variability of the data set.

I like that the authors indicate the nature of the seasonality of the sampling. Althought section 4.1 breaksdown how many lakes were sampled multiple times, and how the DOC concentrations varied in terms of the overal range and trends in concentrations of DOC (i.e. across all lakes) through different seasons, I feel what is lacking is an assessment of the degree to which DOC concentrations vary in individual lakes over the year or seasons. i.e. is the range of variability within a year/season in a given lake greater than the variability between lakes for this subset? I suspect this seasonal variability is minimal, however if seasonality is important then the authors would need to consider limiting the data set to lakes sample from a consistent time of the year?

Although the temporal subset is small relative to the whole data set, there are 81 lakes and 266 samples, which is by most any measure still a substantial data set. There is

likely sufficient data within this to provide some assessment of the relative impact of both the seasonality on the data.

I didn't see a data availability statement. Even if this is not a requirement of the journal, it is critical and needs to be included – perhaps in the results or cited as a data archive?. Readers are going to want to know how or where they might be able to access this valuable data set.

Technical corrections:

P1 L29 Edit: Our synthesis shows a significant relationship of lake DOC concentration and ecoregion of the lake. *cut "of" insert "between" , insert "lake" ahead of "ecoregion" and cut "of the lake"

P1L32 Compared to previous studies we found a weak significant relationship of soil organic carbon content. . .. *cut "of" insert "between"

P7 Line 21 - add "data" to the end of the section title

P13 L16 change "with a surface are " to ". . .surface area"

P.21 L20 – check reference volume number "Limnol. Oceanogr., 9999"?