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Interactive comment on "Dissolved organic carbon, major and trace element in peat pore water of sporadic, discontinuous and continuous permafrost zone of Western Siberia" *by* Tatiana V. Raudina et al.

Anonymous Referee #2

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The authors present an interesting dataset consisting of 80 porewater samples collected for 5 sites, spanning a latitudinal gradient in Western Siberia. Overall, I think the paper contains very useful results that may allow us to use a space for time approach in examining the potential changes in DOC/ DIC, trace-elemental and rare earth elemental compositions in pore waters following deepening AL.

The overall structure is sensible, yet the text is slightly unclear in places likely simply due to language barriers.

My main concern with the manuscript is how the statistics have been conducted and

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[Discussion paper]

with the potential for improvements to be made in the analysis and then potentially the interpretation. For example, how were each of the variables normalised before the PCA was conducted and can you demonstrate that the PCA results explain a significant proportion of the variance in your dataset? I think you show that the 2 extracted PCA axes explain only 29% of the total variance in the dataset? Would you not be better served trying to improve this, or using a prior step to remove variables that do not show significant differences between sites (e.g. using a Kruskal-Wallis test). Including only the significant data may improve the PCA and allow for wider patterns to be identified. You may be advised to apply a Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy for the overall data set to detect if you have sufficient sampling adequacy to include all of these parameters together. Another approach, maybe to break the dataset down and conduct separate PCA. Also, how did you define the number of eigenfactors you chose for the PCA?

Furthermore, the study often uses multiple Mann-Whitney U tests between pairs of variables, even when a more appropriate approach maybe to use a test that allows more than 2 parameters to be compared (e.g. one-way ANOVA on ranks/ Kruskal-Wallis).

Overall, I feel the study was well conducted and worthy of publication, yet at the moment I feel the statistical approaches need to be re-addressed (or explained more clearly if these approaches are not valid?).

Additional comments: 15 - "is one of the major consequences" currently unclear. 16 - deepening not "rise" 21 - "expected decrease" why would you expect the intensity of DOC and TE mobilisation to decrease? I think you need to provide a rationale for this hypothesis earlier on. 27 - Need to define REEs on first use. What does this stand for (rare earth elements?) and what are you including in this group? actual values ? 33-36 "will not exceed 20%" actual values - do you mean they will not change from current values? 55- misspelt arctic 65-67 - please check these references with what you are referring too. For example, I do not think Mann et al 2015 examines lakes,

or Vonk et al. 2015b soil leachates? Also, if you are discussing soil porewaters, you should likely include: "Optical properties and bioavailability of dissolved organic matter along a flow-path continuum from soil pore waters to the Kolyma River mainstem, East Siberia Frey et al. Biogeosciences"

General - should be consistent with use of either trace element or TE throughout.

82 - elements 86 - "feeding of" is awkward, maybe use "source to" 87 - reference needed for this statement. 152 - its not clear to me where you used the ANOVA in the results - maybe I missed it? 158-162 Here is where I think we need far more info on the approach used in the PCA. 161 - I don't think it really acts upon (as this suggests its constrained in some way) rather it 'explains' a greater variance in. 162 - Need more information here on how you used the PCA to test the influence of lat and ALT on DOC and TE. Were you planning to relating the PC loadings or running constrained PCAs?

168 - Unclear to me how this PCA was run. Did you normalise and standardise each of the measurements? This can have a dramatic effect upon PCA loadings and the potential weighting effects of each measurement. 169 - I don't think it really acts upon (as this suggests its constrained in some way) rather it 'explains' a greater variance in. 173-176 - Does this mean all of the these were significant to «0.05 and have greater R value of 0.6?> In associated supplemental - can you example what the coloured arrows on this plot refer to? and what W stands for? 206 - this is unclear to me. So you did separate tests for each possible site? I think you should run one capable of testing for overall differences first and then examining significant differences. 216 - So why show linear regressions? I would only add these if there is are significant differences between at least the two endmember sites. Adding them to all of the graphs just makes its harder to see the values and error bars. Fig S3 figure text needs an explanation of the circled areas of A. Also, are both not containing the same explanatory variables and neither showing site loadings? 228 - does this mean that R-values varied between these? This way of showing the range is unusual to me. 243 - were these also SUVA 280? As most studies use SUVA at 254nm. 249-256 - I think a range of 2 to 3.5

for SUVA is actually very large. For SUVA 254 for example, we may only expect a natural variation of between 1.5 to 5.5 in pore to coastal waters (in Eastern Siberian freshwaters). A change from 2 to 3.5 demonstrates a significant shift in the composition of the DOM and will have a pronounced effect upon the biogeochemical processing of DOM upon export.

Leachates of permafrost and active layer peats will also demonstrate clearly that SUVA254 at least id much lower in permafrost material across at least most parts of Siberia and Alaska that have been studied. Would the values you have collected not simply be indicative of collecting waters predominately sources from active layer soils and limited permafrost thaw influence?

Could the higher SUVA further North not instead be suggestive of lower rates of C processing within soil environments?

399 - "incoming into" may be instead "prior to export to"