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Biogeosciences Discussions

Interactive comment on "Trace elements transport in western Siberia rivers across a permafrost gradient" *by* O. S. Pokrovsky et al.

Anonymous Referee #3

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Comments to the ms 'Trace elements transport in western Siberia rivers across a permafrost gradient' by Pokrovsky et al.

Element transport of rivers in the arctic region is highly relevant and the dataset and interpretation of the data is as such very useful for studying element fluxes to the arctic ocean and processes therein and for other type of studies about permafrost, carbon cycling and trace elements chemistry. The ms describes data in a gradient through Siberia covering a vast number of Siberian rivers (approx. 60) draining to the arctic ocean and has, at least in the objectives, an aim to use PCA to scale up the results to be more general. To get full use of a PCA landscape data is needed to get the bigger picture more complete (with this mean I the proportion forest, wetland, lakes etc etc). Especially the proportion of wetlands and concepts like hydraulic load (see

Behrendt 2000, Behrendt H, Opitz D. Retention of nutrients in river systems: dependence on specific runoff and hydraulic load. Hydrobiologica. 2000, 410:111–22) can give information about TE transport. But on the whole think that the ms is successful in describing the TE transport and important processes in the boreal, subarctic region. I also like the model the ms hypothesise on how the movement elements are in a soil profile where permafrost exists. It is intriguing that smaller watersheds in the northern part is hard to sample during winter as they seems to be completely frozen, something to keep in mind when wanting to sample winter bas flow in these regions.

The organisation of the paper is logical and the references are adequate covering the field well.

The English in the ms is variable, from good to poor, especially in the introduction it is poor. This makes it hard to understand sometimes what the authors mean and I think some of the sentences should be rephrased. An example is the sentence, see line 132-134, 'However, it remains unknown, to which degree retaining of downward migrating DOC (and thus, organic complexes of TE) on mineral horizons in the south may be overweighed by enhanced TE mobilization from mineral horizons and water-rock interaction at the depth.', what this means I don't know, I may guess, but it is better if the authors clarify what they mean. The ms is full of similar phrases, especially in the introduction, but also here and there in the ms, maybe the it is wise to have the manuscript checked for language. With that said I do think that the scope of the ms is clear and the outcome of the ms precise and scientifically sound.

The objectives of the ms is very good and highly relevant, but I cannot follow what is meant by the phrase, see line 123-126, 'those originated from water-rock interaction at depth.'. I would have liked to see landscape types as a base for explaining TE behaviour, if there is such data available I think they should be included.

Specific comments

Line 72 Clarify what you mean by that the size of catchment determines the amount

of groundwater feeding. I cannot see that this is mentioned in the Beaulieu text, is this motivated by the critical zone concept or has it to do with the fact that permafrost is in the region, please clarify.

Line 151 What is meant by the 400±30, I guess that is the variation of some sort (standard deviation, range, confidence interval). Please specify. See also line 152.

Line 189 Do you have any idea why the contamination from Zn was so high? Can this have an effect on other elements as well?

Line 200 Did you recalibrate when the certified standard was too far away or did you drift correct using another standard?

Line 201 What is meant by intrinsic uncertainty?

Line 216 Kraskal-wallis test is new to me, I guess that the authors mean Kruskal-Wallis test. Please check the spelling throughout the ms, different variants exists (like kryckal-wallis in line 339) in the text.

Line 248 Should be R>0.55, p<0.05

Line 253 Figure 2 is rather hard to read, is it possible to to do a loadings plot instead with lines ending with the component names?

Line 279, 280, 292, 294, 384 Please provide statistical test for significant/significantly or rephrase (for example much lower, higher). I think the word significant only should be used when referring to statistical tests.

Line 350 Trend were statistically significant for Sr, Mo and U, why do you think it is so, two redox elements and one that is not?

Line 402 Pleas provide what ±30% means, confidence interval, standard deviation, range.

Line 430 How common is it to find clay minerals in soils in the northern river catch-

ments?

Line 462 Watershed area and discharge does not have an effect on the TE transport, as postulated in the introduction. DIC and DOC seems to be the most important factors controlling TE. This was also evident from analysis of major cations. I think it is surprise that discharge does not have any effect since this control the amount of DIC and DOC (depending where the water comes from in the soil). I think that this needs a comment.

Line 556, 559 Give an explanation for the ±5 and ±30

Line 567 Intrinsic uncertainty, explain what you mean.

Line 568-575 In view of this information it would be interesting to also have information on bedrock and soil. These data can then also be used, by for example performing a PCA to give statistical information on the control of element fluxes. Is this information available? If not please give information, with for example a reference, about the extension of carbonate and silicate rocks in the dvina area.

Figures and tables There is many figures in this ms. I think all of them is necessary.

References Should be sorted by author and then chronologically Pokrovsky et al, 2002, missing in reference list

Huh et al 1998 is 1998b in the list

Frey and Smith (2007) is not in the list, only 2005 not 2007

Pokrovksy and Schott (2002) is missing in the list

Huh et al (1998) in the text but in the list Huh et al (1998b)

Dahlqvist et al (2007) but in the list 2005

Frey and McClellan (2009) is in the list but not inte text

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