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Interactive comment on "Transformation of organic carbon, trace element, and organo-mineral colloids in the mixing zone of the largest European Arctic river" *by* O. S. Pokrovsky et al.

Anonymous Referee #1

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General comments:

I find this study very interesting, the experiments are well planned and performed, the manuscript is well written and the conclusions are reasonable. I have a few questions on the interpretation of the data, and I therefore recommend it to be accepted after a minor revision.

My two most important questions are:

1. An important finding of the study is that the concentration of LMW (<1 kDa) organic carbon and many trace elements increase with increasing salinity in the estuary. Can you present some evidence (your own results or a reference) that this is not a

method artefact? For example, if the passage of LMW organic complexes through the membrane is influenced by double-layer repulsion from the membrane, this repulsion should decrease with increasing salinity, which could increase the fraction of LMW organic complexes passing the membrane.

2. The % colloidal fraction of organic carbon and many trace elements decreased more rapidly along the salinity gradient in July compared with March. To some extent this finding can be explained by the increase of the LMW-fraction with increasing salinity. However, it can be seen from Fig. 5a and Fig. 7b that the total dissolved concentrations of organic carbon and Fe also decrease more rapidly in July than in March. Is it possible that the river contained a higher concentration of aquatic organic biopolymers in July than in March, enhancing the aggregation of colloids in July? Suggested reading: K. J. Wilkinson et al., (1997). Different roles of pedogenic fulvic acid and aquagenic biopolymers on colloid aggregation and stability in freshwaters. Limnol. Oceanogr. 42(8), 1741-1724.

Specific comments:

Page 1719, line 9: The sentence is a bit confusing. I suggest that it could be changed to: "This decrease of the colloidal fraction, from ca. 80-90 % of the total dissolved concentration in the freshwater, to 10-20 % at 20-15 ‰ salinity. . ..".

Discussion section: Please be better to refer to the figures when discussing the results. It is difficult to follow the discussion if you have to search for the figure where the results are shown.

Page 1722, line 14: I cannot find any data on rubidium in the figures.

Page 1722, line 26: If you look carefully on Fig. 6, in addition to the general increase in concentration with increasing salinity, Cr also shows a mid-salinity maximum similar to Ni and Cu. This result is interesting, because Cr in natural waters can occur both as Cr(VI) which is likely to form oxyanions, and as Cr(III) which could be expected to

associate with humic substances similar to Ni and Cu.

Page 1723, line 11: It was stated in the previous sentence that Si is conservative. This is a bit repetitive.

Page 1724, line 6: “Replacement” is not a suitable term to use, since both Fe-rich colloids and organic complexes are present in the river water, but the colloids are removed from the water at a higher rate by salinity-induced aggregation.

Page 1727, line 2: Please explain why the enrichment of the LMW-fraction with increasing salinity is not a method artefact. Can you be sure that the permeability of the dialysis membrane is not affected by the ionic strength (see my general comments)?

Fig. 17: Organic carbon is shown in November-December and March, but not in July.

Technical comments

Page 1728, line 1: “Induced” is wrongly spelled.

Page 1729, line 4: Please omit “the”.

Fig. 18: I suggest that you use black color for the 50 kDa -0.22 um fraction, to be consistent with figures 16 and 17. The 1-50 kDa fraction could be shown by a different color, e.g., yellow.

Interactive comment on Ocean Sci. Discuss., 10, 1707, 2013.