**Biogeosciences
Discussions**

Interactive comment on "Trace metal concentrations in acidic, headwater streams in Sweden explained by chemical, climatic, and land use variations" *by* B. J. Huser et al.

B. J. Huser et al.

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Thank you for the valuable comments. Our responses are listed below.

Reviewer Comment: - The division into northern/southern areas based on vegetation feels a little bit vague. For sure there are vegetational changes but shouldnt the change be more of a gradient than a cut-off?

Author comment: It is true that there is a gradient instead of a sharp division, but the divide also separates regions based on climate (stated in the text) where snow and limited runoff dominate during the winter in the north while limited or no snow accumulation occurs in the south. In our previous article dealing with long term trends for

all sites (not only acidic, headwaters), we focused on the Limes Norrlandicus divide. When investigating at a smaller scale, we did detect additional variability but not substantially more than when we used the Limes divide.

Reviewer Comment: - p1797-1798 The samples have all been filtered (0.45 _m?) This should be mentioned. For sure there are differences in the results between this fraction and several of the studies dealing with more dissolved fractions (ultrafiltered). The authors mention and discuss ultrafiltered results of other authors, but the connection between those results and the authors results could be more clearly mentioned or discussed (point is: don't avoid these problems, every hydrochemist have their issue with colloids).

Author comment: The samples are not filtered and are total concentrations for each metal. We will clarify this in the text. We do compare our results with some studies looking at filtered or ultrafiltered metals and we justify this with the acidic conditions for each stream. Metal concentrations will generally be in the dissolved form but colloidal forms can be substantial at low pH for metals like Pb. We will better clarify the comparisons between our results and the referenced studies so that the reader is fully aware of the differences between our study and others.

Reviewer Comment: - p1799 Setting below detection values to half values is common, but very far from the best option. For instance Dennis Helsel has written many papers on this issue. For instance one can search for the truer values with regression (or PCA, since you are well into multivariate statistics). And lets say that you would have one value below detection, then it is much fairer to set it to the detection limit concentration rather than half, which seems unlikely.

Author comment: This was something we discussed at length before beginning work on the dataset. Because the amount of less than detect values (LTD) was small (between 0 and 2%), the dataset was relatively large, and all samples were analyzed at the same laboratory with same methods and detection limits, negative consequences of

substitution compared to other methods should be small (Helsel, 2006). We did check for differences between using half detection limit or using the actual detection limit and the results did not change most likely due to the small number of LTDs.

Reviewer Comment: - p1800-1803. Multivariate statistics. Handling of this part seems to be ok (although one easily longs for some more figures with raw data when everything is "hidden". It wouldn't harm if the reader, in the future, would have the possibility to follow data handlings of multivariate and similar step-by-step from screen recordings, for reproducibility purposes).

Author comment: The issue of reproducibility was also mention by Reviewer #1 so we will add a graphical figure with detail on the process so the methodology can be more easily followed.

Reviewer Comment: - p1802 The authors discuss some potential problems in sampling that may or may not have caused problems for Pb, for example. Problems in this kind of data is more than expected, but the cause of this quality change could have been sorted out. The analyses are not that old and there should be good potential in finding out what was the cause.

Author comment: We went back to the laboratory responsible for sampling and analysis to discuss the Ringsmobäcken site. It appears there was a change in personnel at the time when the differences in model means and variance occur. This information will be added to the manuscript.

Reviewer Comment: - 1808 Seasonal variability: Inflow of ground-water is an interesting and plausible hypothesis(yet it is a suggestion that is picked up every time there are stream water patterns that cannot be explained). Another factor that could be searched for some elements is plant litter decay. In late autumn after the growth season there is a initial decay of fresh plant litter. The break up of plant cells releases potassium, for instance, that is not directly taken up by plants and that is also relatively mobile compared to Ca and Mg, this potassium could perhaps be detected in stream waters,

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depending on hydrological conditions.

Author comment: It is known that lead and aluminum compete for binding sites on organic matter (Tipping et al. 2002). If lead mainly originates from geological sources under low base flow then higher lead concentrations may occur due to the export of groundwater transported DOC with higher ph that is low in aluminium.

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