Hydrol. Earth Syst. Sci. Discuss.,
https://doi.org/10.5194/hess-2019-438-AC1, 2020

Hydrology and Earth System Sciences
Discussions

Interactive comment on "Ionic aluminium concentrations exceed thresholds for aquatic health in Nova Scotian rivers" *by* Shannon Sterling et al.

Shannon Sterling et al.

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Received and published: 15 February 2020

We thank Anonymous Referee #1 for the thoughtful review of our manuscript. Below we respond (in bullets) to Anonymous Referee #1's comments (in quotes).

"Overall this is a well written manuscript that contributes new information on an important topic in relation to aquatic ecosystem risks from labile Al.

Line 134 - re: Bond Elut Jr column - I am unfamiliar with these specific columns and it would be could to specify what the active cation binding phase is. Further discussion on the limitations of this binding phase for determining Ali would be useful,

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Discussion paper

Would weakly complexed Al-organic species be retained on the column? This may need further discussion as if so it may mean less toxicity than what is assumed. This paper may have some useful information on this: Robert W. Gensemer & Richard C. Playle (1999) The Bioavailability and Toxicity of Aluminum in Aquatic Environments, Critical Reviews in Environmental Science and Technology, 29:4, 315-450, DOI: 10.1080/10643389991259245"

- We have added a discussion on the limitations of this binding phase for determining Ali, drawing upon Gensemer and Playle 1999. Weakly complexed Al-organic species, if positively charged, would be retained on the column (Aligent, personal communication). The assumption here is that if the cations are retained on the exchange column, they may also will be retained on the negatively charged fish gills, and therefore are potentially toxic.

"Were any QA/QC checks performed on column performance (e.g. passing labile Al solution through and/or spikes)."

- In addition to the standard lab QA/QC checks (described in Appendix D), we checked for column performance with spiked blank samples using ICP Al standard; the columns retained all of the aluminum. We have added the results of this QA/QC check to the description of the QA/QC checks.

"Lines 163-167 - Also these speciation results appear quite similar to Simpson et al. (2014) from acid sulfate soil environments. Chemosphere 103, 172–180."

- Thank you for bringing our attention to this paper. We have added this comparison to the results and use it to expand our discussion that, in addition to chronically acidified forests, acid sulphate soil environments also have elevated aluminum in drainage waters.

"Lines 189-194 - I suspect some of the lack of correlation is also due to a relatively low pH range within the data set. Hence any small uncertainties in analytical parameters

such as pH become more influential. Maybe a little more caution could be applied to last sentence in this paragraph as this is not the case for some other streams globally. Before streamwaters I would suggest adding "acidified Nova Scotia..."”

- Good point about the lack of correlation between pH and Ali being likely due to a low pH range in observations. We have added this point to the discussion and have added more caution to the last sentence in the paragraph, defining more clearly the study area as chronically acidified. We have also highlighted other mechanisms that may cloud the strength of the inverse relationship between pH and Al: Al buffering in base cation-poor soils such as in Nova Scotia, increased DOC solubility at higher pH, increasing Al solubility in soils.

“Some more discussion would be good also on the potential role of colloids affecting the results (and how they may bias measured Alo fraction?). I would suggest ultrafiltration could be used in future research to try to understand this further.”

- Simpson et al., 2014 is a useful example of how ultrafiltration can provide insights into colloidal forms of trace metals. To the discussion we have added a recommendation to use ultrafiltration and a description of how colloids might affect the results.

“Table 1 - check subscripts on Al species”

- Done and fixed.

“Figure 1 - suggest note in caption that shaded region corresponding to individual sites is the catchment area?”

- Done.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2019-438, 2019.