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Hydrology and Earth System Sciences Discussions

Interactive comment on "Relations between topography, wetlands, vegetation cover and stream water chemistry in boreal headwater catchments in Sweden" *by* J.-O. Andersson and L. Nyberg

Anonymous Referee #2

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General comments

The paper is well-written and in general transparently structured (with minor augmentations, see below). The presented study is focussed on the relationship and/or dependency between stream water chemistry and some topographic and vegetational watershed characteristics in a northern boreal environment. In principle, this subject is scientifically interesting and certainly adresses a relevant subject well within the scope of HESS. Still, a number of prevailing questions remain unanswered or at least unclear and should be thoroughly adressed by the authors prior to publication. My recommen-

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Discussion Paper

dation at this point is thus 'major revision'. Most importantly, I have the feeling that the strong focus on regression analysis does not provide a sufficient amount of 'new knowledge' to the community. A more physically based discussion to clarify the causal interactions and a critical conclusion would have been very useful. It is stressed by the authors themselves, that the obtained results are strongly dependent on scale considerations - keeping in mind the (probably) strong non-linear behaviour of the retrieved regression functions with scale changes, I have great doubt that the results '...can be useful in the prediction of headwater chemistry...'. The most important points of criticism are listed in the following:

- lots of this work has obviously been adressed in an earlier publication of the authors. It is unclear to me, to which extent the presented results were selected from this previous publication (Anderson and Nyberg). What criteria were used to draw these 18 out of 76 watersheds? Why only a subset?

- the abstract promises quite a bit of water chemistry analysis with relation to watershed characteristics retrieved from official datasets. However, as the paper proceeds, a strong focus is given to DOC, the other components Si, Al and Fe are only marginally mentioned.

- the problematic issue of scale is mentioned several times. The authors are granting lots of space to this issue (e.g. see pages 1193ff) but its implications are not thoroughly discussed in the paper. This is certainly crucial (and well-known) when the TWI comes into play. What effect can we expect, when other algorithms are applied besides D8? What stability can we assume for the retrieved regression functions, when grid size is changed (to the better or to the worse). Why didn't you test your hypotheses against changing grid sizes? What would you expect?

- in the abstract, it is said that the occurence of wetlands is strongly influenced by topography (which is quite obvious in nature). In the discussion (page 1204 - lines 4f), the authors are mentioning in a paraphrase, that 'Comparing the TWI grid with the

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wetland layer [...] was not a success.' It is argued that geology has a major effect as well, which has not been considered anywhere in the manuscript before.

- it is unclear to me, what criteria were applied to distinguish medium flow#1 and #2?

- the overwheighted role of vegetation classes in this paper is not fully transparent. There are many accurate tables and figures related to vegetation, yet their impact on (head)water chemistry are not really mentioned in the discussion. Why? Even if the relation is not so clearly visible, you should discuss the reasons in more depth or reduce/skip parts of the paper with lengthy descriptions of related regression functions.

- in general, I would expect a much deeper discussion, and please include a sound and concise conclusion that is based on your results in this study (and don't refer to previous or other studies).

Questionnaire:

1. Does the paper address relevant scientific questions within the scope of HESS? Yes.

2. Does the paper present novel concepts, ideas, tools, or data? Not really. The presented methods are generally known and in wide use. The data base is remarkable, yet much of this work has obviously been published already. Using regression analysis is useful for this case study, but does not really support new concepts in this field of research.

3. Are substantial conclusions reached? No. Conclusions are somewhat merged in a short discussion chapter. Conclusions, which are based on the presented analysis should me included in much more detail.

4. Are the scientific methods and assumptions valid and clearly outlined? Yes.

5. Are the results sufficient to support the interpretations and conclusions? There are some substantial findings, which should be interpreted in more detail (see 3).

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6. Is the description of experiments and calculations sufficiently complete and precise to allow their reproduction by fellow scientists (traceability of results)? Yes, in principle. Please explain, why 18 out of 76 catchments were selected, based on which criteria?

7. Do the authors give proper credit to related work and clearly indicate their own new/original contribution? Yes (in principle), but one must read their earlier 2008 publication in Hydrological Processes first to see and understand what is new and original here. (I didn't read it yet...)

8. Does the title clearly reflect the contents of the paper? Yes, even though I find it a little bit too promising, regarding the final output.

9. Does the abstract provide a concise and complete summary? See above. I have the feeling that the abstract was written prior to the manuscript as some points are practically left out or are only marginally referred to in the following.

10. Is the overall presentation well structured and clear? Yes.

11. Is the language fluent and precise? I am not a native speaker, but language seems to be fluent and precise enough.

12. Are mathematical formulae, symbols, abbreviations, and units correctly defined and used? Yes.

13. Should any parts of the paper (text, formulae, figures, tables) be clarified, reduced, combined, or eliminated? Yes. See above.

14. Are the number and quality of references appropriate? Yes.

15. Is the amount and quality of supplementary material appropriate? - not applicable -

Technical comments

The earlier referees have done such a fine job on this, that I don't need to repeat it here

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again. I fully agree to their statements and suggestions.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 5, 1191, 2008.