Interactive comment on “Diffuse hydrological mass transport through catchments: scenario analysis of physical and biogeochemical uncertainty effects” by K. Persson et al.

Anonymous Referee #2

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The authors present a small, but thoughtful and interesting, study of the effects of subsurface spatial uncertainty on modelling diffuse pollutant mass loading to receiving waters in a Swedish catchment. Using a well-justified scenario approach, the authors investigate uncertainty with respect to (a) the saturated hydraulic conductivity (K) field and (b) correlation between net pollutant decay with travel time and K. I only have a few suggestions to improve the manuscript:

1. The introduction is too lengthy compared to the relatively modest study conducted, please reduce as much as possible. References should be limited to the key ones, especially: P4723, L5f: Biased towards papers of the research group. Reduce to key ones and add external refs, e.g. Howden et al. 2011, “Modelling long-term diffuse nitrate pollution at the catchment-scale: data, parameter and epistemic uncertainty”, Journal of Hydrology comes to mind but there are many more! P4723, L16f: Reduce to key ones. Certainly omit those cited in next paragraph. P4725, L6f. P4726, L17f: Delete refs as they appear later on P4729. P4732, L18f: Use key refs and perhaps add “and references therein”. The total number of 92 (or so) refs is excessive and could easily be reduced by half if not 2/3!

2. While generally well written and exact, the text is often too dense and hard to follow. Please improve readability, for example: P4723, L27f: This would benefit from a bulleted list with another explanatory sentence per point and reduced refs. P4726, L5: Delete “for this quantification, mapping and uncertainty assessment”. P4728, L6: Replace “in the form of” with “as”. Fig1 caption: Delete “in the schematic illustrations of main flow and transport pathways in the different scenarios”.

3. It is worth highlighting that the authors use a very simplistic subsurface transport model that relies amongst other simplifications on single flow directions approximated by surface topography. This is not a problem but should be made clear.

4. I agree with Referee #1 that the correlation equation on P4731, L3 seems wrong. It should be something like lambda = lambda_g * (K_g / K).

5. Some discussions and conclusions are hard to follow and would benefit from more explanation, especially: P4732, L27 – P4733, L6. P4734, L28: Lowest impact, how?

Technical comments

P4722, L13 & P4737, L11: “Of” instead of “between”?

P4723, L24 & P4725, L1: “Dependencies” needs to be defined to help the reader.
P4725, L14: “Few” instead of “limited”?
P4725, L19: “Point” confuses in this context of diffuse pollution.
P4730, L2: Write “deltax =” in front of sum. Leave out “i =” in front of “N as well as “at a” and “at XCP”. Replace “cell” with “of N cells”.
P4730, L6: Can you add the formula for the mean as for the other 2 key calculations.
P4731, L6: Leave out “i =” in front of “N as well as “at a” and “at XCP”.
P4731, L7: “Results and discussion” if you don’t want to separate out a proper discussion section.
P4733, L4: I don’t think the sentence in brackets is right so should be deleted.
P4734, L18: “associate”
P4735, L11: Delete 1st “the”.

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