Hydrology and
Earth System
Sciences
Discussions

Interactive comment on "Inverse isolation of dissolved inorganic nitrogen yield for individual land-uses from mosaic land-use patterns within a watershed" *by* Y.-T. Shih et al.

C. Stamm (Editor)

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Dear Dr. Shih

Thank you for submitting the revised version of your manuscript entitled "Inverse Estimation of Dissolved Inorganic Nitrogen Yield for Individual Land-use within a Subtropical Mountainous Watershed".

I went through this version and listed the comments below. They complement the responses to be received by the reviewers.

Based on all comments and the reply you have provided, I will decide how to proceed

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with the manuscript later on.

Sincerely

Christian Stamm

Comments by the Editor:

Abstract:

L. 23 – 24: This sentence does not make a very good start for an abstract. Please follow the normal structure of a paper, where you start with a short description of the topic and its relevance, followed by a statement regarding the scientific deficits in this field and how you will address them in your paper. Provide the context of your study: subtropical climate and predominantly forest as land use with variable degrees of urbanization and agriculture.

L. 28: Does global mean relate to all land use types or only to forests? Please be more specific.

L. 29: (and throughout the manuscript): Why do you consider atmospheric N deposition as inexhaustible? The values you provide are well above natural background, I assume. Hence, they are driven by anthropogenic air pollution and will change according to this pollution level.

L. 33 (and throughout the manuscript): your explanation and description of urban land use and population has improved as compared to the first version of the manuscript but is still not satisfactory. You have to describe clearly what kind of N sources contribute to what you call urban (see also below).

L. 37 – 40: What is the geographical region for which you consider your results as relevant? You have to provide sufficient context.

L. 48: It should be "safe operating space", I assume.

L. 52 – 53: The sentence is awkward. Please reword.

L. 54 – 55: Give a reference.

L. 56: What is compatible with what?

L. 59 – 60: Meaning of the sentence is not clear.

L. 76 – 82: This paragraph is not very clear. You do not introduce the geographical context of your study at all.

L. 85: Replace Danshui River by Study Area.

L. 121: Indicate these sites in Table 2.

L. 143: Provide an equation for the FW approach. Otherwise, it is not sufficiently clear to the reader. For you as authors, everything seems obvious. However, as an outsider to your study the text leaves room for different interpretations.

L. 146 – 149: Why should the problem of high flows only affect the rating curve method?

L. 150 – 159: This should be moved to the result section.

L. 162 – 164: Move to the Introduction or skip it.

L. 165: If you talk about a step further, you need to make clear what the previous step was and what the next step is and how they actually deviate from each other.

L. 168 – 179: This paragraph had to be moved to the discussion.

L. 171: skip "small mountainous watersheds": the assumptions does not hinge on the land use. Skip this part of the sentence.

L. 183: What you call DIN yield for unit runoff corresponds to the DIN concentration (or am I wrong?). Adapt your terminology.

L. 188: Urban and human emissions (here and throughout the manuscript): Clarify what the urban and the population sources comprise. Make clear into which categories

treated and untreated wastewater fall into. Otherwise these terms are very confusing throughout the manuscript (see also below).

L. 190: For Lp you refer to literature values later on. Please mention here that there are constraints to this parameter based on prior knowledge.

L. 192: increased: compared to what?

L. 194 – 206: What for did you use the Monte Carlo approach? Based on what did you determine the parameters of your model? How did you account for Pareto-optimal behavior, which implies that there is no single best parameter set? In the results, you do not refer to these aspects at all. This part on parameter estimation is not sufficiently clear. Hence, this part requires clarification and has to be consistent with what you present afterwards.

L. 237 – 251: Here, you have to explain briefly how you compared the three methods to the reference because this was only introduced in the Method section. Most readers will NOT have read the Method section and struggle to understand this part (do not blame the readers: make articles as easy to read as possible!).

L. 253: These three numbers are fairly similar for the three methods!

L. 263, 268: The unit of your DIN yield has to include a term 1/time.

L. 270 – 271: Sentence not clear.

L. 275: Which are the parameters? Use abbreviations and make the link to the equations you have introduced.

L. 277 (and throughout the manuscript): Please use the same units for all land use classes: sometimes you refer to molar concentrations, sometimes to mass per unit area and time.

L. 284: please provide data on fertilizer applications for comparing the loss rates from the agricultural areas to fertilization levels.

L. 290 – 292: In the method section you refer to multi-objective parameter estimation, but here you just provide single values. How does this fit together? This requires a proper explanation.

L. 302 – 304: Explain the three models more precisely by providing the corresponding equations. Show the corresponding model parameters.

L. 314 – 317: The argument you make is not clear to me.

L. 323: What do you mean by autocorrelation length? How did you actually determined this quantity? Explain.

L. 327 – 329: This sentence is not clear.

L. 342: What are the interquartile ranges? Explain.

L. 346 - 347: I cannot follow your argument. I would argue that the dynamics of N fluctuations determines how frequently you need to sample/measure in order to obtain a load estimate of a predefined accuracy and precision.

L. 352: Which method do you have in mind?

L. 354, 363: On both lines, you talk about the yield factor but you use completely different units. This is difficult to follow.

L. 358: Why should it be inexhaustible?

L. 373: Please stick to one terminology: either you talk about yield factors or about export coefficients. You may introduce both of them in the Introduction and then stick to one of them later on.

L. 377 (and 434): Your statement regarding diffuse pollution from urban areas is confusing: on L. 112, you state that only 48% of all households are connected to sewage treatment plants. These implies that 52% of the households discharge untreated wastewater. According to my understanding, this results in an important contribution of

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untreated sewage to what you call the urban source. This is supported by your statement on L. 310 – 311, where you attribute 94% of human-associated sources to diffuse input. On L. 379 – 380 you state that the DIN from urban areas hardly differ between the wet and dry season and you conclude therefore that DIN export is controlled by point sources (L. 381). This seems fairly consistent and points to a situation where human waste is the main source. How does this fit together with your statement on L. 377 where you associate DIN export with energy consumption and transportation? Explain. Estimate explicitly the N fluxes from human waste and analyse to which degree other sources could play a role. Provide evidence for the role of energy consumption and transportation you claim.

L. 398: Compared to what do you see an advantage?

L. 401: How can you derive a threshold from Fig. 9? This figure depicts a continuous surface. Any threshold seems fairly arbitrary. Be aware of the fact that also your colour coding is arbitrary! If you would change the scale for the colour code you could visually get very different impressions.

L. 410 – 416: This is basically part of a summary not a conclusion.

Fig. 6: Explain what these ranges for the parameters actually mean and how they have been obtained. In the text, you only presented single best estimates for yield factors and here we see quite large ranges. This is confusing. How can it be that your per capita loading from the human population goes down to zero? Does this make sense?

Fig. 9: You use a ratio urban/agriculture but I cannot find a proper characterisation of what you mean by agriculture in this context. Explain.

General comments:

Grammar needs to be corrected in many places throughout the manuscript. Often nouns are used without articles for example.

The language is many times not precise enough and leaves room for too much ambi-

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guity.

Use abbreviations introduced in the text in the part to follow (including figures and tables) to be unambiguous in what you actually refer to in the text (e.g., which parameters are depicted in Fig. 6? They need to correspond to terms introduced in Eq. 1 and 2.).