

## ***Interactive comment on “A comprehensive evaluation of input data-induced uncertainty in nonpoint source pollution modeling” by L. Chen et al.***

### **Anonymous Referee #1**

Received and published: 8 January 2016

The methodology in this paper is not very well described so I'm not entirely sure which analyses were carried out and what the motivations for these were exactly. But it seems clear that the study doesn't go substantively beyond the authors' previous papers (Shen et al. 2012a, 2013). It is thus not suitable for publication in my opinion. I detail the major shortcomings in the following.

The introduction and discussion lack references to fundamental papers on uncertainty in water quality modelling and input uncertainty propagation more generally. The authors focus largely on the SWAT literature, but should go beyond this to demonstrate sufficient grounding in the state-of-the-art of model uncertainty estimation.

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The authors fail to distinguish between measurement uncertainty and calibration uncertainty and make confusing statements: “due to the availability of validation data” (P11423, L2), “simplification in natural randomness” (P11423, L4).

The authors fail to distinguish between input uncertainty propagation and parameter uncertainty amplified through calibration with uncertain input data. The authors focus on the former which is well studied whereas the latter, despite some studies in the last decade, is rather new and much more interesting. Failing to discuss this weakens section 4.2 considerably.

Separate paragraphs should introduce land use and fertilizer data uncertainty as done for rainfall and topography.

P11422, L2 and elsewhere: Do you mean “propagation” instead of “transitivity”?

P11422, L9-12: The meaning of the coefficient of variation is not clear in this context.

P11422, L21: I wouldn't consider hydrological models “essential” for the stated purposes.

P11422, L22: The named models cannot explain anything about water quality deterioration as they don't have ecological impact components.

P11423, L11: What is meant by “scenes”?

P11423, L12-14: This statements would need a reference.

P11423, L27-29: I think higher-resolution data should lead to better model performance; the question is whether this can be detected quantitatively!

P11424, L12-13: There is a sizable literature now on uncertainty in NPS modelling!

P11424, L13-15: How does this statement about management relate here?

The materials and methods fail to convey the details and the motivations for the uncertainty assumptions. Are these practically relevant? What about issues of rainfall data

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quality (section 2.3.1) before interpolation is even considered (biases, gaps, etc)? What about the issue of different maps and the issue of representativeness of spot land use information (section 2.2.3)? Is the fertilizer data uncertainty distribution (section 2.3.4) applied to the spatial average or is it applied spatially differentiated? The former would be pointless in the light of the arguments put forward in this section. Is the normality assumption realistic? Where does information on sigma come from? These choices will have influenced the results, i.e. that fertilizer data uncertainty was negligible here. It remains unclear how the per-input uncertainty assessment was done and whether the interaction of uncertainty sources was analysed at all (section 2.4).

P11425, L22: What is meant by “efficiently and effectively”?

P11426, L9: What is meant by “due to the lack of”?

P11426, L16: I would say rainfall uncertainty stems predominantly (!) from representativeness issues.

P11426, L20: Define E\_NS.

P11426, L22: And then interpolated?

P11426, L25-P11426, L2: Why was not the ‘best’ performing interpolation technique from Shen et al. (2012a) used?

P11428, L4: “Aggregate” and “average” should be swapped in this context.

P11429, L6: What is meant by “re-validate”?

P11429, L12: That’s an unwarranted generalisation of a coarse grouping of different uncertainties.

P11429, L15-18: Reasoning unclear.

P11429, L15: What’s meant by “interaction of input errors”?

P11429, L19: What’s meant by “grouped in all possible ways”?

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P11430, L1, P11431, L8: What’s meant by “multi-input ensemble method”?

P11430, L6: Table 3 says 0.66 and 0.89.

P11430, L8: Table 3 says 0.13 instead of 0.46.

P11430, L17: Which single rain gauge simulations? Unclear what exactly was done here.

P11430, L25: This plateau would be interesting to show.

The results don’t clarify what the benchmark is against which uncertainty scenarios are being compared.

P11431, L19-21: Argument not convincing.

P11432, L6-10: Unclear.

P11432, L8: What is meant by “due to the availability of validation data”?

P11433, L13: What’s meant by “certainty-appropriate”?

P11434, L7-11: Argument not convincing.

P11435, L15: Is it realistic to suggest this uncertainty reduction?

P11435, L17: “As a complex function of” was never demonstrated in the paper.

P11435, L18-20: But how to define it a priori?

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 12, 11421, 2015.

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