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Hydrology and Earth System Sciences Discussions

Interactive comment on "Ensemble modelling of nitrogen fluxes: data fusion for a Swedish meso-scale catchment" *by* J.-F. Exbrayat et al.

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I would thank the two referees for their valuable contributions. Overall, both coincided that the data presented in this paper is an "interesting" contribution that clearly fit the HESS aims and scope. However an evident revision is necessary before to resubmit the manuscript to HESS. Therefore I strongly suggests to analyse in depth all suggestions and critiques provided by reviewers. It is crucial that authors make an effort to remove all reviewers doubts.

What my concern, I agree totally with the referee #1 with respect to the need to focus on concentrations rather than to the nitrogen loads. The lack of information about the modelled dissolved nitrogen fractions concentrations strongly contrast with the exhaus-

tive description of the observed dissolved nitrogen fractions in the study site description section (see page. 5306 and lines 15-17, and figure 2**). It is essential to fill this gap. Under this perspective, figure 5 suggests that most of the models tend to subestimate the measured nitrogen loads (i.e. most of dots are below the 1:1 line. The expection is the NO3 and total-N fluxes at Savja, see below). If I couple this observation with your sentence that reveals "high concentrations and high flows during winter" (see pag. 5306 and lines 15-17), a reader might suspect that models tend to fail in the activation of the nitrogen mobilization from hillslope to the streams during winter storm evens (or the spring snow melt episodes). Then, leaching processes might a feeble node in simulations modules. I believe that a detailed exploration of simulated dissolved nitrogen fractions concentrations might strongly help to obtain a more depth understanding of models strength and weakness. As mentioned before, and outlined by the authors as well, (see pag 5320, lines 1-3) the most noticeable exception is that for total-N and NO3 at Savja. In this case the best MME have a good prediction along the entire range of observed total- N (and nitrate) fluxes. Nevertheless a question arise at this point: is it the ensemble modelling approach really necessary? At the end of the discussions authors are rather ambiguous: "the improvements were not very high compared to those of the best SMEs" (pag 5320, line 5). Effectively, from figures 5 and table 4 it appears that SWAT model is typically better than other models, and its output quality is similar to that obtained with the Multi-Model Ensembles (MME). I believe that a critical discussion of this apparent incongruence might strongly enhance the entire discussion section.

Additional comments: I have serious problem when I attempt to compare data in table 4 with those used to create figures 4. (See my attached file). Is it a misinterpretation?

Pag. 5302, lne 27: perhaps a reference might help to test your assertion.

Pag 5318, line 16: "As illustrated on Fig. 3 the SWAT"....do you refer to figure 4?

** What does "Remaining N" means?...Does the authors refer to the dissolved organic nitrogen fraction (DON)?

All my best,

Andrea Butturini HESS associate editor

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 7, 5299, 2010.

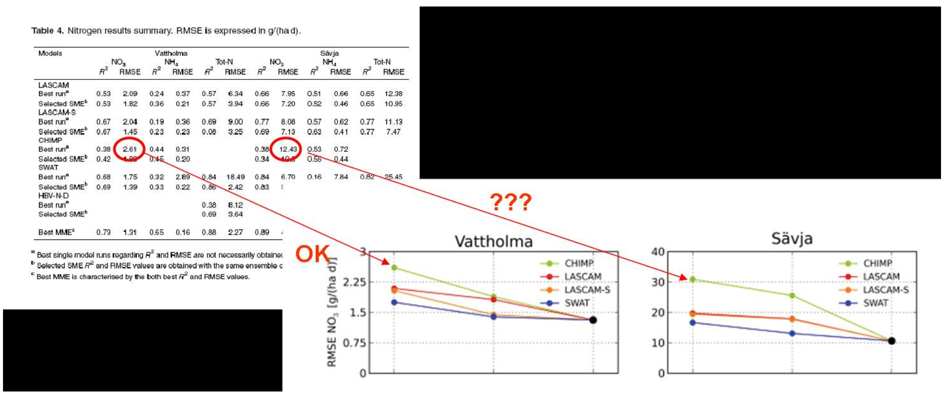

Table 4. Nitrogen results summary. RMSE is expressed in g/(ha d).

Models	Vattholma NO_3 R^2	RMSE	NH_4 R^2	RMSE	Tot-N R^2	RMSE	Sävja NO_3 R^2	RMSE	NH_4 R^2	RMSE	Tot-N R^2	RMSE
LASCAM												
Best run[a]	0.53	2.09	0.24	0.37	0.57	6.34	0.66	7.95	0.51	0.66	0.65	12.38
Selected SME[b]	0.53	1.82	0.36	0.21	0.57	3.94	0.66	7.20	0.52	0.46	0.65	10.95
LASCAM-S												
Best run[a]	0.67	2.04	0.19	0.36	0.69	9.00	0.77	8.08	0.57	0.62	0.77	11.13
Selected SME[b]	0.67	1.45	0.23	0.23	0.08	3.25	0.69	7.13	0.63	0.41	0.77	7.47
CHIMP												
Best run[a]	0.38	2.61	0.44	0.31			0.38	12.43	0.53	0.72		
Selected SME[b]	0.42	[illegible]	0.45	0.20			0.34	[illegible]	0.55	0.44		
SWAT												
Best run[a]	0.68	1.75	0.32	2.89	0.84	18.49	0.84	6.70	0.16	7.84	0.82	25.45
Selected SME[b]	0.69	1.39	0.33	0.22	0.86	2.42	0.83	[illegible]				
HBV-N-D												
Best run[a]					0.38	8.12						
Selected SME[b]					0.69	3.64						
Best MME[c]	0.73	1.31	0.65	0.16	0.88	2.27	0.89	[illegible]				

[a] Best single model runs regarding R^2 and RMSE are not necessarily obtainec
[b] Selected SME R^2 and RMSE values are obtained with the same ensemble c
[c] Best MME is characterised by the both best R^2 and RMSE values.

Fig. 1. comparison table 4 vs figure 4