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Interactive comment on "Capturing interactions between nitrogen and hydrological cycles under historical climate and land use: Susquehanna watershed analysis with the GFDL Land Model LM3-TAN" *by* M. Lee et al.

Anonymous Referee #1

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GENERAL COMMENTS

First of all I must say I enjoyed this paper and I recommend its final publication. Congratulations to authors. Some general comments to the paper:

The model: nice equilibrium between must be (knowledge) and can be (available information). Of course I can improve or modify this or that equation, but it works. So, good job.

Model description in section 2.4 and Tables 1 and 2. It is not clear which parameters

are fixed (from literature and/or measurements) and which are calibrated: in table 1 all listed (new) parameters are fixed? Also in Table 2 the word "variable" I think is not properly used: it seems a mix between state variables, inputs (or forcings) and parameters. Optional: I understand the tables will be much longer, but the journal is online, so it will be more convenient to present in tables all the list of parameters, inputs/forcings and state variables, marking if old or new and in the case of parameters also if fixed or calibrated/adjusted.

Model implementation in section 7. In my experience, authors are presenting very good results. However:

i) The implementation should be better explained here: in the abstract is written the model calibration was done at Marietta and it was done a spatial validation using the rest of stations.

ii) Why it was not done a temporal validation? In my opinion, it can affect the temporal extrapolability/predictability of the model. Or not?

Section 7 is relatively short. I miss results concerning the implementation and exploitation of hydrological state variables. Probably there are interactions with N state variables.

MINOR OR SPECIFIC COMMENTS

P5671 L25. "Global", in which sense: planet scale or simulating all processes or both? I think authors are thinking for the spatial scale, but the multi-process aspect can be also important due to potential interactions between different state variables. See my comment concerning section 7.

P5673. I agree completely with the limitations of semi-distributed models to represent spatial variability (inputs and state variables) and heterogeneity (parameters).

P5675 L1-3. Can you explain better? In particular, how to link "historical reconstruction" with "land use change scenarios"? The same for "unique disturbance histories" in L7.

Here or in section 6.

MINOR CORRECTIONS

P5672 and 5674: “vetetation”

P5677 and others. Add a sentence to introduce the equations.

If authors like structured conclusions, they can be grouped into model characteristics, implementation results and exploitation.

Interactive comment on Biogeosciences Discuss., 11, 5669, 2014.