

Interactive comment on “Water and nutrient balances in a large tile-drained agricultural catchment: a distributed modeling study” by H. Li et al.

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First of all, we greatly appreciate the valuable and constructive comments from Reviewer #1. Our responses are following.

1. How are the U1 and U2 zone defined? Response: To adequately capture the vertical movement of water and nutrient within soil column, the unsaturated zone is further divided into two layers, the upper unsaturated zone (u1-zone) and the lower unsaturated zone (u2-zone). The depth of u1-zone is usually fixed (for example, 0.3
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m), and that of u2-zone is allowed to vary with the water table.

2. You should provide some information which inputs (e.g. soil information, DEM, etc.) Response: We added the description of the DEM, along with the description with the other inputs, in Section 3.

3. Equations require some more explanations, especially the variables H_p , U_p , M_p and S_p are not explicitly explained and units are missing. In some cases it would be good to know the final product of the equation. For example, it is not clear what is the result of residue decay and how it differs from mineralization. What is the output of residue decay, P_o ? Response: We added the description for units. The final products of the equations are also briefly explained.

4. From the description of mineralization only a threshold temperature is considered but no temperature function. How are soil temperatures obtained and at which resolution? Also it would be interesting to know, how the dependence of the retention index with the soil type works? Response: Hourly soil temperature data were obtained from the Water and Atmosphere Resources Monitoring Program conducted by ISWS. As for the dependence of the retention index with the soil type, in this work a universal value is applied to all soil types for simplicity. Sorry for the incomplete description.

5. Regarding N fixation by crops, it should be explained why fixation is addressed to the ammonium pool instead of putting it to the crop compartment. Response: Explanation has been added.

6. Can nitrogen losses in the saturated zone be excluded? Response: Good point. In our model denitrification loss is assumed to occur throughout the whole soil column, although the generated N_2 gas exits from the top layer. Figure 2 is modified for clarification.

7. For a better interpretation of the results some details about soils and relief should be given for the watershed. Response: We added some description about soils and

topography in Section 3.

8. Heading of 4.1 “model application and validation” is misleading. Because all data were used for calibration there is no real validation in this study. Response: The heading is modified.

9. On page 19 the authors mentioned the impact of point source pollution which has an impact on P performance of the model. Why is there no effect on nitrogen? Response: The amount of nitrogen such as nitrate from effluent discharge is rather small comparing to other sources such as the lateral loading from agricultural field, so its impacts on the nitrate concentration in the channel is insignificant.

10. Technical corrections: Please give a reference for the Nash-Sutcliffe index. Response: Done.

11. The description of the temporal pattern of N storage changes are hard to follow with figure 10. Please add some larger tics at least at January 1st and July 1st for a better orientation. Response: In Figure 10 we are presenting the pattern for a 10-year period, in consistence with the other figures. If add tics for January 1st and July 1st, there will be too many tics. However, we did adjust the limits of the vertical axes so that the readers will see the tics more clearly (from the top of the figure).

12. On page 25, line 15: the sentence contain two time “is”. Delete one. Response: deleted.

13. Citation of Torizzo and Pitlick (2004) in the reference list is missing in the text Response: it has been removed.

Note: The revised manuscript is provided along with this reply (see below).

Please also note the supplement to this comment:

<http://www.hydrol-earth-syst-sci-discuss.net/7/C2134/2010/hessd-7-C2134-2010-supplement.pdf>

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