Geosci. Model Dev. Discuss., 6, C1662–C1671, 2013
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Geoscientific Model Development Discussions
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Interactive comment on "Modeling dissolved organic carbon in temperate forest soils: TRIPLEX-DOC model development and validation" *by* H. Wu et al.

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Responses to Reviewer's Comments

We appreciate your constructive comments and suggestions on the previous version of the manuscript. We have attempted to address every point raised. The following is the outline of the changes we have made.

Referee #1

1. The Reviewer commented "Overall the discussion manuscript should be checked for grammar throughout".

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RE: Following this suggestion, we have carefully checked the grammar in all text for clear expression in revised manuscript(sumpplement file: gmd-2013-61-supplement.pdf).

2. The Reviewer commented "One point that could be expanded upon centers on the comparison of the different DOC models starting on page 3488.".

RE: It is a very good suggestion! Although comparison of different DOC models would enhance the manuscript to show the difference in the prediction of soil DOC, running different DOC models need their original source codes and different input data, which are not available in current manuscript, unfortunately. In next step, we should compare these models for addressing this issue.

3. The Reviewer commented "The authors could also strengthen this manuscript by providing a more thorough presentation of uncertainty across the model. . .Along those lines, the authors are correct to suggest that this model is limited by the assumption of an equilibrium distribution constant for the sorption/desorption kinetics. If possible, could the authors also provide some indication of uncertainty on the figures for calculated DOC fluxes.".

RE: Thank you for your valuable suggestions! We have added discussion "DOC simulation in this study includes the DOC production from throughfall. Although the interception simulation (Rutter, 1971) represents the physically-based process by a running water balance of rainfall input, storage and output in the form of drainage and evaporation, the interception loss depends strongly on the timing and intensity of rainfall, the vegetation structure and the meteorological conditions controlling evaporation during and after rainfall (Rutter et al., 1975; Dingman, 2002; Brutsaert, 2005). As the Rutter model (1971) used in this study was only treated as a simplified process based on a single-layer vertical vegetation structure and a constant storage capacity, further improvements need to involve more detailed interception processes in the future." and "and DOC sorption/desorption results from TRIPLEX-DOC are limited due to its use

GMDD
6, C1662–C1671, 2013

of an equilibrium distribution constant rather than using a time-dependent dynamical process (Qualls, 2000). This last point reflects the fact that TRIPLEX-DOC is in its early stage of model development as it pertains to DOC sorption/desorption and improvements could be made by incorporating more dynamic DOC sorption/desorption processes in more realistic ways." for presentation of the weaknesses or uncertainties in this version model for future users (on page 22 lines 450-458 and on page 23 lines 467-472 in revised manuscript(gmd-2013-61-supplement.pdf)). Because the parameters (m and b) of DOC sorption and desorption simulation were reported by Moore et al. (1992), they did not provide any uncertainties or the ranges of the parameters unfortunately , so it is just impossible for us to provide some indication of uncertainty on DOC fluxes in this version model. In the next version model, we also hope to find suitable way to deal with the uncertainty.

4. The Reviewer commented "In addition, the authors allude to the accompanying manuscript by Wu et al. 2013, integrating a water routing model to TRIPLEX-DOC. . . .More discussion on this point would benefit the reader by providing a broader context for why this effort is so needed right now.".

RE: Good point. Following Reviewer's suggestion, we have added some discussion "it is anticipated the new model could be a useful tool in improving not only estimations of net C flux and greenhouse gas (GHG) emissions from forest soils on a regional scale, but also DOC export from soils. As the DOC from terrestrial ecosystem is critical to C budgets in the aquatic ecosystems, this estimate of DOC export will improve our understanding of the connectivity between terrestrial and aquatic C cycles, reducing the uncertainty in C fluxes of entire lake-watershed systems. TRIPLEX-DOC would take advantage of the TRIPLEX-GHG simulator (Peng et al., 2013) as well as important C loss pathways entering into aquatic ecosystems (TRIPLEX-Aquatic model) as described in an accompanying paper by Wu et al. (2013). Coupling the two efforts would be a strong contribution to understanding the processing and partitioning of organic C across both terrestrial and aquatic C cycles, resulting in a full regional integration

GMDD
6, C1662–C1671, 2013

between terrestrial and aquatic ecosystems." on pages 23-24 lines 475-486 in revised manuscript(gmd-2013-61-supplement.pdf).

5. The Reviewer technical comments: Following the Reviewer's suggestions, we have - changed "missing" to "little attention" on page 2 line 29 in the revised manuscript. - added some recent reference "Humborg et al., 2010; Butman and Raymond, 2011; Dennis et al., 2012; Lapierre et al., 2012" for temperate aquatic ecosystem on page 3 lines 59-60 in the revised manuscript. - corrected "1.9" to "0.17 to 0.36" for DOC and added the references "Aitkenhead and McDowell, 2000; Harrison et al., 2005; Dai et al., 2012" on page 4 lines 74-75 in the revised manuscript. - added the reference "Raymond et al., 2010" on page 4 line 87 in the revised manuscript. - changed "meant to be" to "was" for the grammar on page 6 line 114 in the revised manuscript. - added "The simulations of forest growth, soil carbon, hydrological and thermal conditions were adopted from the Forest-DNDC model, the DOC dynamics simulation is the newly redesigned submodel." for more specific on which component this research is changing or adding (on page 38 lines 776-778 in the revised manuscript). - added "Because mean annual concentrations of DOC in throughfall are between 3 and 35 mg l-1 in temperate forests, and the fluxes of DOC range from 40 to 160 kg DOC ha-1 y-1 (Michalzik et al., 2001), it is an important source that derives as rainfall passes through forest canopies." the magnitude of throughfall DOC on page 8 line 160-163 in the revised manuscript. - changed "Because decomposition rate estimates are difficult to model by a simple approach considering all above-mentioned factors" to "Because the estimates of decomposition rates are difficult to model by a simple approach considering all the above-mentioned factors" on page 9 lines 191-193 in the revised manuscript. - added "A recent analysis of stream discharge and DOM measurements from 30 forested watersheds in the eastern United States revealed the importance of hydrologic events in regulating the transport of DOC to downstream ecosystems (Raymond and Saiers, 2010)." for additional information on flow rates and DOC (on pages 11-12 lines 233-236 in the revised manuscript).

GMDD

6, C1662–C1671, 2013

5. The Reviewer comments on Tables and Figures: For the figure 1, following Reviewer's suggestion, we have changed the gray line to black line for clearly distinguishing the Forest-DNDC model and DOC dynamics submodel that was the newly redesigned in this study.

For the figure 2, we prefer to keep it, because the Forest-DNDC overestimates DOC concentrations in different soil layers and makes it impossible to reliably simulate DOC leaching from soils, which is why we integrated the new DOC dynamics submodel into the model.

For the figure 4, we have changed the measured DOC concentrations to blue color for clear expression.

For the error bars, we have changed the error bars into the bold line (Fig.2,4,5,6) for clear graphics.

Please also note the supplement to this comment:
http://www.geosci-model-dev-discuss.net/6/C1662/2013/gmdd-6-C1662-2013-supplement.pdf

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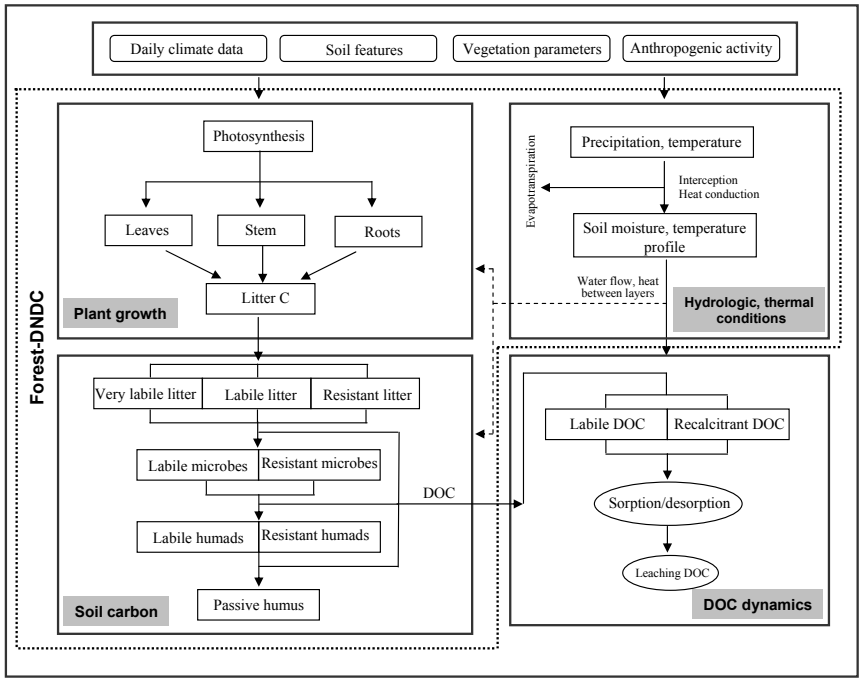
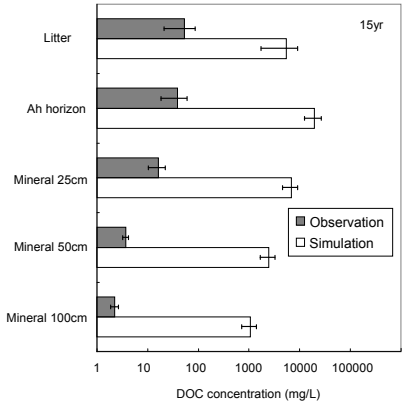
Interactive comment on Geosci. Model Dev. Discuss., 6, 3473, 2013.



Wu et al._Fig.1

Fig. 1. Figure 1

GMDD
6, C1662–C1671, 2013



Wu et al._Fig.2

Fig. 2. Figure 2

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6, C1662–C1671, 2013

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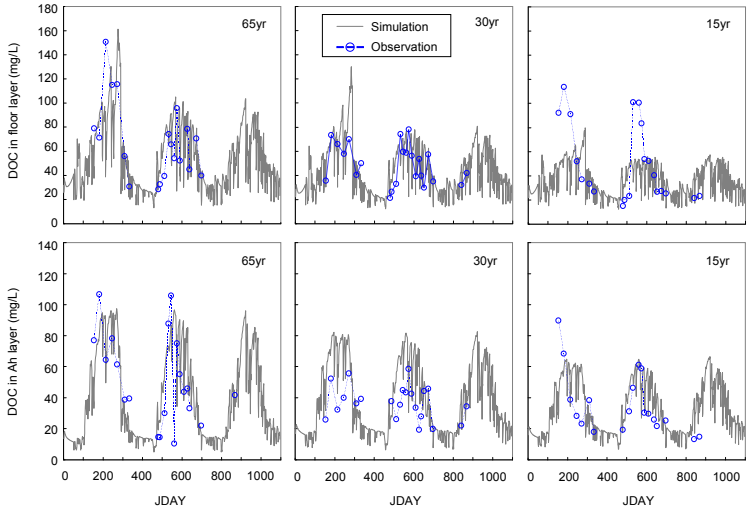
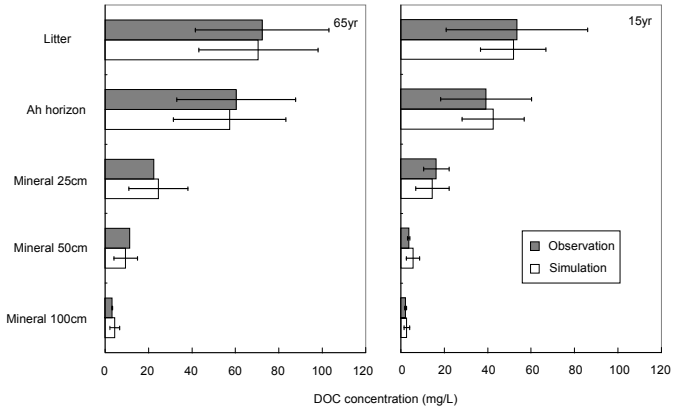


Wu et al._Fig.4

Fig. 3. Figure 4

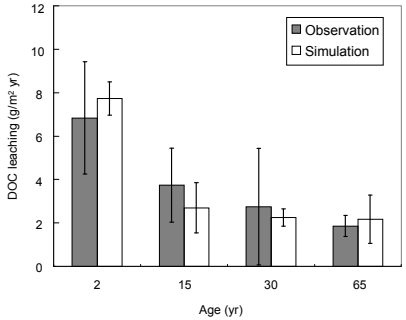
GMDD
6, C1662–C1671, 2013



Wu et al._Fig.5

Fig. 4. Figure 5

GMDD
6, C1662–C1671, 2013



Wu et al._Fig.6

Fig. 5. Figure 6

GMDD
6, C1662–C1671, 2013