

Interactive comment on “Carbon budget of tropical forests in Southeast Asia and the effects of deforestation: an approach using a process-based model and field measurements” by M. Adachi et al.

Anonymous Referee #1

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Review result for Adachi et al. (Carbon budget of tropical forests..)

In this paper, authors conducted a set of numerical experiments with a terrestrial biogeochemical model, VISIT, for a deciduous forest, a rain forest, and an oil palm plantation. They thus compared some physical variables, e.g., photosynthesis uptake, C stock, etc., with other sources. They also conducted a simulation on the sudden land use change from forest to palm plant. Due to high sensitivity of the model parameter on turnover rate of residual debris, importance of adequate forest management is suggested to reduce C emission.

C1358

Regarding the current poor understanding of global carbon cycle and the consequence of CO₂ increase in the atmosphere in the future, it is indeed very important to validate the model at various sites with different land use types. Even though the results of the validations were not so nice, it is still meaningful to reveal the good and bad things of the model. In this regard, I recommend not rejecting the paper instantly.

However, the way of writing was not scientifically fair. According to the series of the validation exercises, I learned that VISIT's performance is relatively good for stabilized states (e.g., Table 4) but relatively not good for temporal variations (e.g., Figure 5 and 6). However, the authors always kept their self-appraisal with showing little objective evidences. Moreover, regarding that the performance is rather poor in the temporal variability, how would the result of sudden land use change experiment (Figure 4) be realistic and plausible?

Mainly due to the reason above, I would like to request the authors to revise the manuscript significantly. Please describe pros and cons of the model and evaluate the performance in a fair manner. Then, please describe the reasons of the model's performance (both good and bad), and explain potential remedies if exists.

Hereafter, specific issues and suggestions are listed. I would be very happy if the authors positively resolve and incorporate these comments to improve their manuscript.

Abstract: I couldn't understand the last two sentences "The C stock ~ and observations." How would "the rate of remaining residual debris" or "46% of the rainforest's C" be related with "adequate forest management"?

Abstract: Is there any specific reason why you came up with a rather general conclusion of "C budget must be evaluated over a long term"? Please make the paragraph more logical and scientific.

P3055L15: Please specifically describe the improvement of VISIT compared to Sim-Cycle.

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P3045L23: "40% and 27% of total biomass C was returned to the atmosphere within the 1st and 10th year, respectively": This reads no return from the 2nd year until the 9th year. Didn't you mean 40% was returned during the first year and 27% was returned during the period from the second year and the tenth year?

P3056L28: I couldn't understand the sentence of "C flux from soil in 1 yr and total C flux in 10 yr in Table 5 were in addition to ...". Please rephrase the part.

P3057L26: Quantitatively evaluate the NCEP/NCAR forcing data (Figure 2) with in-situ measured data (Figure 1).

P3058L1: "The diurnal patterns of GPP from 2003 to 2005 were compared with GPP data gathered by two satellites" – Where is the result and evaluation?

P3058L6: What is "the quality assurance"? Describe.

P3058L17: "Based on the field data"; a reference is needed.

P3058L25: VISIT's GPP at DEF is always smaller than at RF, where it is opposite in the observation. This seems a significant fault of the model. How would this be interpreted in the other results?

P3059L4: "The VISIT model was able to capture appropriately the impacts of disturbances" How could it be? Need more explicit description. What is the controlling physical process(es) to capture the impacts?

P3059L11: "Estimation of total C flux was lower than in the undisturbed forest..."- When all three parameters are 100%, the total C flux (9.5) is less than no-disturbance (18.1).

P3060L24: "The differences between Terra and Aqua data for OPP were not consistent" What is the reason of the inconsistency?

P3060L25: Please be more specific to explain why "these data were not suitable for validation of the model simulation"

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P3061L3: It seems that the model simulation results were consistent only in long term averages. Figure 5 clearly displays inconsistency in the temporal variability.

P3061L9: How did the model estimates differ from the actual plant properties?

Figure2: Why did you show the data for only 1997-2007, not the whole period?

Figure2: Why are the differences between MAX and MIN temperatures decreasing? What is the consequence of this trend on the carbon cycle simulations?

Figure2: You need to compare the NCEP atmospheric forcing with in-situ data in Figure 1. You may want to add NCEP's monthly climatology to Figure1.

Figure3: Carbon stocks are increasing at both places! Does it imply that the spin-up period is not enough?

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