

Interactive comment on “Disequilibrium of terrestrial ecosystem CO₂ budget caused by disturbance-induced emissions and non-CO₂ carbon export flows: a global model assessment” by Akihiko Ito

Anonymous Referee #2

Received and published: 17 April 2019

Main comments:

This study estimated the influences of eight minor disturbances (MCFs) on global land carbon budget over the historical period 1901–2016 using a process-based terrestrial ecosystem model VISIT. Carbon contributions from minor disturbances like CH₄, BVOC, and carbon loss by water (or river) erosion were often ignored in the past modeling studies, but have been evaluated in this study within one model framework. Results from a group of sensitivity modeling experiment show notable contributions from MCFs to land carbon sink and storage, which is mostly due to land use change, fires, and

C1

wood harvest. The author also find BVOC has a comparable contribution. This study helps improve understanding of land carbon cycle and shows the importance of the MCFs on the land carbon budget. Overall, the manuscript is well written and could be acceptable for publication in ESD after some minor revisions. Please see my minor comments as below.

Minor comments:

(1) Line 17 in the abstract: It is unclear the net biome production was estimated for which period?

(2) Page 11, Lines:29–30: does it mean that NEP dominate the trend of NBP? As from other estimates that trend in land-use change emission is relatively small. How are the fires from, e.g. FEEDs?

(3) Page 12, Line 7: How the mean residence time (MRT) was calculated? What are the assumptions were used to calculated the MRT for each C pool? Also, why MRT was decreased in the Fig. 4?

(4) Page 16, section 4.5: It is good to see the uncertainty assessment. Because this study is based only one model (i.e., VISIT), and the single-model simulation may cannot avoid propagating the uncertainty of other processes to the minor C flows. For example, the uncertainty in C partitioning among vegetation, litter and soil pools may affect the simulations of FBB and FCH₄ in this study. A further discussion on this point is necessary.

(5) Page 14, Line 31: delete “(” or add a “)” after “...Chapin et al. (2006)”.

(6) Fig.3 d and e: Impacts of MCFs on NEP is offset by emissions from MCFs?

(7) Fig. 6f: For the CH₄ emission (FCH₄), have you compared the FCH₄ in this study with some other estimates? Why does the East Asia show much higher values in comparison with any other regions? In line 23, you have also mentioned that FCH₄ in Asia was mostly from paddy field, could you show more details?

C2

