Earth System
Dynamics

Discussions

EGU

Interactive comment on "Deforestation in Amazonia impacts riverine carbon dynamics" by F. Langerwisch et al.

Anonymous Referee #1

Received and published: 20 November 2015

Carbon gets transported in water and hence exported from terrestrial ecosystems in particular organic, dissolved organic or inorganic form. The current manuscripts estimates these fluxes and their changes due to climate change and deforestation for the Amazonian basin from preindustrial times until 1950. It further extends the climate change impact until 2100.

This is an extension of another paper in discussion: Langerwisch et al., Climate change increases riverine carbon outgassing while export to the ocean remains uncertain, Earth Syst. Dynam. Discuss., 6, 1445–1497, 2015. It looks very much to me that the current paper is an extension of Langerwisch et al. (2015). I would have appreciated if the authors also cite it like that. For example the natural vegetation climate change runs of the current paper seem to be exactly the model runs from the other

study. I see no harm in this. Being more frank about it, would have open up the avenue to include more results of the other paper in this study. For example, I would have appreciated that the results of Fig 7 of the other paper would be also in Fig 6 of the current paper.

The manuscript left the impression that the effects of climate change (CC) and deforestation (Defor) are not well disentangled. I know that it was tried and it might only be the presentation. Why Defor and CCDefor is the E-metric and CC only is the D-metric? It is very confusing. Defor would have also been cleaner if climate were not changed. Then one could have done, CC, Defor, the combined, and the combination effect.

The metrics are confusing, as mentioned. Why do I need the logarithm? There exist logarithmic axes and colour scales. And the authors have also their problems with it: for example they talk about 5% and then use the strange $10^{-0.02}$. Just use logarithmic scales then the text becomes also more natural.

I think that the regions R1-R3 are not really exploited in the manuscript and can be removed. They are only showing up in Fig 6, and are also of limited interest there.

There are two issues that really disturbed me reading the manuscript: 1. the figures are incomprehensible and 2. there is no insight into the relevance of the research.

While the figures look appealing at first, there are plenty of problems: 1. There are hardly any labels on the figures. What is plotted in Fig 6, for example. All axes need labels. And the colour bars.

2. The text in the figures is much too small. I had to go to 200% on my screen to be able to read Figs 1-5 and to 300% for Fig 6. It was impossible on paper.

3. The colour schemes are beyond me:

a) In Fig 2, the colour scheme is not centred, i.e. the green fraction is smaller than the red fraction.

b) In Figs 3 and 5, the colour bar has sections with colours that span a large section (e.g. yellow) and colours that span a very little section (e.g. orange). This merges all values from about 0.15 to 0.4 (yellow) and from 0.45 to 0.55 (orange). A well-known problem with for example the rainbow colour bar.

4. Fig 6 is unreadable. Text too small, no labels, I cannot separate the lines. I have to enlarge the figure to 300%-400% to be able to distinguish anything. But not more because then the figure gets blurry.

5. I would have loved to see both land use change scenarios in Fig 2 instead of the bar charts for R1-3.

6. Fig 4 should include not only CCDefor but also CC and Defor only. It should also include errors, e.g. on the values given.

7. The green and red borders in Fig 5 are indistinguishable. Think about something else for the distinction.

I am also missing insights about the relevance of the study; some people would probably say that a research question is missing. If there is deforestation than there is less new carbon input and hence carbon export decreases. This is quite logical. So is the flux important? The numbers of POC and TOC in Fig 4 are a factor of 1000 less than the pools. So it looks like a small flux to me. What is wrong with my view?

There is less C input into the ocean. Is this important for the ocean? Do the fish depend on it? Does the carbon cycle care?

What is the influence for the Amazonian rainforest? I guess nutrients are transfered by inundation. How much is it related to POC and DOC and how much to IC. It might be that nutrients are transfered abiotic and are hence rather like IC and not so very influenced by deforestation.

These are all questions that might be asked and interesting for the community given that it is going to be published in Earth System Dynamics.

C847

I am also desperately looking for an explanation what happens after 2050. Why is POC and CO2 suddenly decreasing? The two scenarios were similar up to 2050. Then land use change stops. Why should it then suddenly decrease so strongly? There must be something else happening which should be revealed to the reader.

Minor remarks are: 1. Why extrapolating land use to the past? Why not taking historical land use maps such as of Pongratz et al.? I would have done no land use change at all before 2000 so that the references in the denominators in the metrics are always the same.

2. Longer and shorter to what in Table 1?

3. I would remove R1 to R3 from Table 2.

4. Why are the proportions not adding up to 100% in Table 3?

5. I was wondering if the arrow in Fig 1 that shows the CO2 feedback of LPJml to the climate models is true? It is not written in the text.

As an aside, the present study also cites that "The ability of the coupled model LPJmL–RivCM to reproduce current conditions in riverine carbon concentration and export [...] has been shown and discussed by Langerwisch et al. (2015)." This is summarised in Table 4 of the other paper. The ability seems to be reasonable for the concentrations but rather weak for export. I would see the model system therefore rather as a tool to study sensitivities rather than projections.