

Interactive comment on “Impacts of future deforestation and climate change on the hydrology of the Amazon basin: a multi-model analysis with a new set of land-cover change scenarios” by Matthieu Guimberteau et al.

Matthieu Guimberteau et al.

matthieu.guimberteau@lsce.ipsl.fr

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Editor comments:

Having read the paper and the responses of the reviewers, my consideration is that the paper has potential, but needs considerable clarifications and improvements. In particular, it is difficult to draw a line between what is the new contribution of the paper and the rest (available data, models, model results, etc.). The introduction, currently very short, should be expanded to serve this objective. The methodologies should be complemented and clarified.

C1

Reviewer 2 mentions that the paper does not present new data or new models, and that the contribution of the paper lies primarily in the use and integration of existing tools. Based on this, I do not understand why the paper has 19 authors. Did each of these 19 persons have a fundamental role in this research? Which one? Otherwise I would consider reducing the number of authors to a more realistic number.

Author answer:

We acknowledge your decision regarding our manuscript. We carefully addressed each of the point raised by the reviewers and we submitted an updated manuscript including many corrections and additions. Regarding your specific comments, we are willing to address them and we offer the following explanations and propositions.

C1 "considerable clarifications and improvements"

We have addressed all clarifications and improvements requested by the reviewers, namely:

- the evaluation of the models performance in present time by comparing simulated ET and discharge with dataset (new Table S2 in supplementary material)
- the discussion of the LSMs calibration which has been conducted in our answers to the reviewers 1 and 3
- a better description of the climate change scenarios (section 2.2)
- a re-written section describing the deforestation scenarios (section 2.3) and additional informations in the introduction
- a new analysis to give the different contributions of the LSM/GCM/LCC to total uncertainty in ET and runoff projections with an ANOVA (section 4.3 + new Figure 14)

C2

We feel that the reviews have been addressed in depth and we cannot offer more clarification at this stage, unless more specific questions are raised.

C2 "draw a line between what is the new contribution of the paper"

Our manuscript is an original contribution with new LSM simulations that were not published elsewhere. The land use scenarios used as a forcing have been published by Aguiar et al. (2016) and Tejada et al. (2015) and the GCM forcing fields by Zhang et al. (2015) and Moghim et al. (2016). This is clearly detailed in the paper (sections 2.3 and 2.2 of the new version of the manuscript, respectively). In fact, reviewer 2 requested a more detailed description of the land use scenarios which has been added. To our knowledge, there is no multi-LSM study with different land use and climate scenarios for the Amazon basin rivers with a detailed attribution of uncertainties to land use change vs climate change, considering each component of the water budget of each sub basin (ET, runoff). We offer to explain this novelty of the paper more clearly in the revised introduction.

C3 "The introduction, currently very short, should be expanded to serve this objective".

We revised and expanded the introduction as explained above.

C4 "The methodologies should be complemented and clarified".

We already addressed this in the revised manuscript with a complement about the land use scenarios in section 2.3, the evaluation of models in Table S2 and their descriptions are better described in the Supplementary material.

C3

C5 "Reviewer 2 mentions that the paper does not present new data or new models, and that the contribution of the paper lies primarily in the use and integration of existing tools. Based on this, I do not understand why the paper has 19 authors."

Reviewer 2 is right that the paper is based on published land use scenarios and GCM forcing but there was a significant work to adapt these scenarios and forcings to the objectives of the AMAZALERT project and to the LSMs. The novelty is in performing the simulations with a new protocol and separating the effects of land use vs climate change in different sub-basins. Integration studies are very much needed for climate assessments in regions like the Amazon where both land use change and climate change are susceptible to modify hydrological variables, and our study is the first to date to offer a formal attribution of uncertainties to land use vs climate change vs LSM structure. As a result, because 3 LSMs with LCC and CC scenarios are involved through the AMAZALERT project, we have the following co-authors, who all contributed to write the manuscript:

ORCHIDEE model

- Matthieu Guimberteau (in charge of the whole hydrological study and performed the model simulations)
 - Philippe Ciais (coordinator for the IPSL work (ORCHIDEE modeling) in the AMAZALERT project)
 - Agnès Ducharne (main contributor of the hydrology modeling)
 - Juan Pablo Boisier (responsible of the LCC modeling)
 - Hans Verbeeck (responsible of the AMAZALERT modeling group and contributor of the vegetation modeling in ORCHIDEE)
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LPJmL-DGVM model

C4

- Hester Biemans (contributor of the hydrology modeling)
 - Fanny Langerwisch (contributor of the hydrology modeling and performed the model simulations)
 - Anja Rammig and Kirsten Thonicke (both contributors of the hydrology-vegetation modeling)
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INLAND-DGVM model

- Daniel Andres Rodriguez and Rita C.S. von Randow (both contributors of the hydrology modeling)
 - Celso von Randow (contributor of the hydrology modeling and performed the model simulations)
-

LCC scenarios

- Ana Paula Dutra Aguiar (built the Brazilian LCC scenarios)
 - Graciela Tejada (built the Bolivian LCC scenarios)
-

LSMs quality control

- Hannes De Deurwaerder (post-processing and quality control of the three LSMs)
-

Climate change scenarios

- Ke Zhang (built the climate change scenarios for the Amazon applying downscaling methodology)

C5

- David Galbraith (contributor of the protocol adopted for this study)
-

Articulation of the present study with the rest of the AMAZELRT project

- Bart Kruijt (coordinator of the AMAZALERT project)
 - German Poveda (in charge of studying the effect of climate on the hydrology)
-

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C6