Interactive comment on "Aerial and surface rivers: downwind impacts on water availability from land use changes in Amazonia" *by* Wei Weng et al.

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Note to the editor and authors: As part of an introductory course to the Master programme Earth & Environment at Wageningen University, students get the assignment to review a scientific paper. Since several years, students have been reviewing papers that are in open online discussion for HESS, and they have been asked to submit their reports to the discussion in order to help the review process. While these reports are written as official (invited) reviews, they were not requested for by the editor, and we leave it up to the editor and authors to use these reports to their advantage. While several students were asked to review the same paper, this was not done with the aim to provide the authors with much extra work. We hope that these reports will positively contribute to the scientific discussion and to the quality of papers published in HESS.

This report/review was supervised by dr. Ryan Teuling.

INTRODUCTION

The paper discusses the impact of land use change on the hydrology of the Amazon. Land use change is happening a lot in the amazon these days and therefore, it is important to know the impact of this change on the regional and global scale. By using a moisture recycling tracking algorithm, Weng et al. tried to get a better understanding of the influence of land use change on rainfall, evapotranspiration and runoff. The results of the paper are that by all the land use changes the rainfall decreases. The extend of this change depends on the location where the land use changes happen. Furthermore, a change of the whole Amazon to a certain type of land use has a large influence on both the precipitation and the runoff.

The paper touches a topic which is very relevant at the moment, other studies have been looking into this as well(Snyder, 2010, Gordon et al., 2005), but the spatial different sensitivity in the hydrological responses to land use change was not well understood. Like said in the paper itself, deforestation is happening in the Amazon to create agricultural land(INPE, 2017). This change to agricultural land use can have a massive impact on the hydrology in the Amazon. Due to the fact that the Amazon is such a large area, this could even have an influence on the world as well. Therefore, it is a very interesting topic which should be looked into even more with other researches.

The paper is well written, but there are some minor improvements which could be made to make this better. These minor improvements will be stated later on in this review. Little research is done at this topic so the research which is conducted by Weng et al. is innovative. It is interesting because the outcomes of this research can be used in other areas which suffer from deforestation as well. For this reason this paper can be an eye opener for other people to investigate this process even more. The hydrological impact which is the result of this paper perfectly fits the aim of the Hydrology and earth system sciences (HESS) scientific journal. The research which is conducted is done

well, but there are some minor issues which could be solved. Therefore, I recommend some minor revisions before publications by HESS. The revisions that should be made in my opinion are listed below

GENERAL COMMENTS

In my opinion there should be made a better substantiation of the use of MOD16ET data. The authors say: "Loarie et al. (2011) validated MOD16ET's estimation with eddy flux tower data and reported its good performance (differences in annual average of evapotranspiration are less than 4 % in savannas, 5 % in tropical forests and 13 % in pasture agricultural lands)". However, other references say something else: "While all three evaporation products adequately represent the expected average geographical patterns and seasonality, there is a tendency in PM-MOD to underestimate the flux in the tropics and subtropics. Overall, results from GLEAM and PT-JPL appear more realistic when compared to surface water balances from 837 globally distributed catchments and to separate evaporation estimates from ERAInterim and the model tree ensemble (MTE)."(Miralles et al., 2016). These references are opposites of each other. The use of the MOD16ET method can have an uncertainty on all the figures and results that are made in this research.

I would suggest to make a better substantiation why the MOD16ET data is used and why for example the GLEAM or the PT-JPL were not used. Furthermore, a paragraph can be added to the discussion with the topic what the uncertainty of the MOD16ET is on the results that are made.

A second revision is to give more substantiation and discussion on the use of the WAM-2layers model. The WAM-2layers simulations of another experiment are used but the use of a WAM-2layers offline model give worse results than an online model like the RCM-tag model. In a paper by Van der Ent et al., 2013 a comparison is made between the WAM-2layer model and the RCM-tag model, a result of this comparison was that simulations of both models give globally the same result. However, at a regional scale,

the error for the recycling ratio of the WAM-2layers model is relatively large if it is compared with this error of the RCM-tag model(respectively 2.8% against 1.9%(Van der Ent et al., 2013)). The research is mostly about the Amazon, which is a regional scale as well. Therefore, the results and figures could be different when a more precise method was used. I suggest the authors to take this into account in the discussion as well. The use of the WAM-2layers model has a larger uncertainty than an online model. Therefore, this uncertainty should be mentioned in the discussion.

A third revision is the title of the manuscript is: "Aerial and surface rivers: downwind impacts on water availability from land use changes in Amazonia". This gives the feeling that the paper is about the water availability in the downwind areas. However, the conclusions that are stated in this manuscript are all about discharge and reduction of precipitation. If I look at the definition of water availability in a random dictionary I get the following: "The portion of a water resource that can be abstracted, as determined by the total water resource and the rights to abstract water from that water resource.". So the title will attract readers who are interested in the amount of water which is available in the amazon to abstract. The first sentence of the conclusion is: "From our analysis of the moisture recycling process, we conclude that Amazonian land use change's impacts on the water regime have spatial heterogeneity in two ways.". So the conclusion is about the water regime, not the availability. I would suggest that the title of the manuscript is going to be changed, especially the term "availability". This is a term which could attract the wrong readers. In my opinion, a term like "water regime" would fit better in this manuscript.

MINOR COMMENTS

P2, line 7: place a space between 80 and the % sign

P2, line 26: There is an abbreviation SDGs in this sentence but it is not said what this abbreviation means.

P4, line 6-10: this is part of a methodology already. This should not be in the introduc-

tion

P5, line 22: eg. Should be e.g.

P7, line 25 and 26: in the first line the reference to a figure is like: "Fig. 4" in the next sentence the reference is like: "figure. 5" Please be consistent. Use "Fig" or "Figure" but not both

P8, line 15: "For that, we apply in the following..." remove "in".

P11, line 19: "The results is...." Remove the "s" in the word "results".

Fig 1: Has no title in the figure itself.

Fig 2: What are the units of the color bar? Give it a label.

Fig 3: What are the units of the color bar? Give it a label.

Fig 4: Add a title at the figure itself

Fig 6: Try to give it the same mask as the other figures, now the whole of south America is showed while the results that are mentioned are only about the amazon.

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