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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Afforestation by natural regeneration or by tree planting: examples of opposite hydrological impacts evidenced by long-term field monitoring in the humid tropics" *by* G. Lacombe et al.

Anonymous Referee #3

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General comments

The article presents an analysis of the trends in the hydrological features of two catchments under tropical conditions, linked to changes in land use. The authors use hydrological modelling to test the role of vegetation changes in the observed hydrological trends and explore a number of hypotheses to explain the differentiated behavior on the two catchments.

The article is well presented. However I have some concern about the testing method-

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ology used by the authors. I found it difficult to fully understand what the authors did, and some choices seem unclear (see detailed comments below). I think this should be better explained/justified. Possibly some calculations should be redone with more appropriate method.

Detailed comments

1. The title might be shortened into: “Opposite hydrological impacts of afforestation evidenced by long-term ïňĄeld monitoring in the humid tropics”

2. P12617, L12: Write”1-year periods” (and also elsewhere in the text, typically “1-year fallow”)

3. P12648, L27: Homogenize the way “streamflow” is written in the article.

4. P12619: It seems that the authors applied an existing testing methodology (based on hydrological modelling). This should be made clear in the introduction.

5. P12623, L3-4: Is it useful to have this information here?

6. P12624, L7-11: I was a bit surprised by this comment that the initial conditions at the beginning of April vary in such a limited range that they have no impact on the simulations and can be set to average values. It would mean that the dry period would act as resetting the memory of the catchment antecedent conditions and that whatever happens in March, there will be no impact on flow simulation in April. Setting the initial conditions at average values mean that no link between years is allowed. I found this is a strong hypothesis and I do not understand why the authors made such an assumption: it is useless since the model could be run with one year warm-up period.

7. P12624, L11-12: The authors used one-year periods for calibration. This is very short, especially at the monthly time step. Hence the model parameters may be much dependent on the characteristics of the selected year. Is the model robust enough to avoid this dependency? I think the authors should (1) better discuss the stability of performances when going from calibration to validation and (2) analyze the sensitivity

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of their results to the length of the calibration period (if 2- or 3-year periods had been selected, would conclusions remain similar?).

8. P12624, L14-16: This part is unclear for me. If I understood well, for each one-year period, the authors calibrated the model twice: once with NSEQ for the wet season and once with NSElnQ for the dry season. Is it the case? If yes, I have some doubt about this approach. It means that each parameter set was calibrated on six months, i.e. only six data, which reinforces my previous comment. Besides, prior transformations on flows are useful to make errors at various flow levels be in the same range, typically to make errors calculated on low flows be comparable to errors in high flows. If calculations are made on separate flow ranges, then the usefulness of these prior transformations is very limited. If this is not what was done, then this part should be better explained to fully understand what the authors did. Alternatively, a multi-objective approach may be more appropriate.

9. P12624, L14-16: Which calibration algorithm was used?

10. P12624, L18-19: How this constraint was applied in practice during calibration? Was there a weight attributed to bias in the objective function? Are there cases where this constraint could not be achieved?

11. P12624, L19: What "calibration methods" refers to? The two objective functions? This should be clarified.

12. P12624, L29: Maybe write "Flow variations between columns for a given row. . ."

13. P12625, L2-8: I am sorry but I was completely lost in this part. Why this correction coefficient is used? What for? How can it generate an error interval? Please provide more details, explanations or references, else it is very difficult to understand.

14. P12625, L5: Rainfall is noted R here while it is noted P in Figure 3. Be consistent in notations.

15. P12625, L9-10: Please better explain what is shown in Figure 5. At first sight, it

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may look like a hydrograph, but actually it is not: if I understood well, it only shows for each year the simulated flow with the median rainfall using the model calibrated on that year. Hence drawing lines between points may lead to wrong interpretation. The fact that observed flows are also plotted tends to indicate that one could compare the observed and simulated values, but they were not obtained with the same rainfall input (except for the selected rainfall year) so they are not comparable. If I understood wrongly, this should be better explained.

16. P12625, L11-13: Again, I do not understand why the authors used a single year to illustrate model results. If all simulations were plotted, how would it look like and how could this be interpreted?

17. P12626, L10: “increases”

18. P12626, L20-22: How this can be interpreted? Calibration and validation performance should be distinguished to better evaluate model robustness (see comment #7). Note that performance criteria between years are sometimes difficult to compare due to the dependency of NSE values to the observed variability of flows (see e.g. Martinec and Rango, 1989).

19. P12626, L20-22: See comment #15

20. P12628, L7-9: Same as comment #18

21. Section 4: The discussion of results should be checked in light of the previous comments.

22. P12631, L29: Avoid unnecessary precision (e.g. 165 000 instead of 165 004 is probably precise enough)

23. Section 4.4 could be renumbered into Section 5 and extended as a proper conclusion. Some conclusions may change given the comments made above (check also the abstract).

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24. P12635, L2-4: The high model efficiency in calibration may partly be due to the fact that very short periods were used to calibrate the model, therefore making it is easier to get high performance. It should be checked that the loss of efficiency from calibration to validation is not large. The error level of the model should be compared to the trends the authors want to show.

25. P12635, L12-14: This is probably a necessary but not sufficient condition.

26. Figs. 5 and 7: Please make clear in the caption what is shown on the graphs (x axis = calibration year). I still do not understand why the shaded interval would correspond to an error interval.

27. Fig. 6: What is the significance of the regression coefficients given the sometimes very limited number of points used?

Cited reference

Martinec J., Rango A. (1989) Merits of statistical criteria for the performance of hydrological models. Water Resources Bulletin 25:421-432.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 12, 12615, 2015.