

Interactive comment on “Effect of year-to-year variability of leaf area index on variable infiltration capacity model performance and simulation of streamflow during drought” by Z. K. Tesemma et al.

Anonymous Referee #1

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In this study, the effects of the inter-annual variability of monthly leaf area index (LAI) on hydrological simulation were evaluated using the VIC model. The simulated streamflow, as fed with the observed monthly LAI or LAI climatology, was compared. The land surface hydrological models usually use the seasonal cycle of vegetation index while only a few applications use time-varying vegetation. The difference between the time-varying vegetation and the climatology may result in error in hydrological simulation. This study focuses on the important issue. Although the research topic is very interesting, I have some major concerns.

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Major comments:

1. There is a flaw in the method. Comparing with the model fed with LAI climatology, the model fed with the observed LAI does not show significant improvement in term of streamflow simulation. The streamflow estimated by the model fed with the observed LAI was then taken as ground truth (synthetic streamflow) and any difference departed from it was taken as error. This is not right because the estimates from the model fed with the observed LAI are not observations. It is not surprised that no significant improvement is found for long term simulation. The year-to-year variability of LAI affects mainly the simulation at the seasons with extreme low or high LAI. It may be useful to assess the effects at some special season or year, rather than compare the overall performance in a long period.
2. The difference in NS efficiency (4-25%) can not be interpreted as the systematic improvements due to the use of observed LAI.
3. The title says the simulation of streamflow during drought but there is basically nothing essential about drought in the text. The interpretation of Figure 5 mentions a little about drought but it seems the figure can not directly support the arguments about the prolonged drought. It is hard for me to identify the underestimation or overestimation, arguably corresponding to wet and dry periods, in Figure 5. More solid evidence should be shown to support the link between drought and LAI and the related model performance change.
4. All the selected 13 sub-catchments lie in the south part of the basin with annual precipitation of 659-1407 mm. However, the paper concluded the largest effects are found for pasture. It is understandable that pasture is generally in semi-arid area where LAI largely affected by precipitation. Previous studies also suggest year-to-year variability of LAI has large effects over arid area. Why this study selects the humid areas only (with annual precipitation more than 600 mm)? In the arid area, the linkage between drought and LAI would be stronger. It may be useful to take a look at the semi-arid

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area.

Some specific comments:

1. Page 10523, line 13. Normal University of Beijing should be Beijing Normal University.
2. Please revise the statistic NSE may be NSE (%) in the equations.
3. Page 10527, how to change the mean annual LAI? To change the monthly LAI at the same proportion?
4. Page 10529, section 4.2, line 13-16. I can not find “sect. 4.2.1”, “sect. 4.2.2”, and “sect. 4.2.3” in the manuscript.
5. Page 10531, line 3 The arguments in section 4.5 are not directly supported by Figure 5. Please revise the figure and interpretations.
6. Page 10533, line 15. I can not find “Fig. 7c”.
7. Page 10533, line 24 “. . .mean monthly LAI . . .” or “. . .mean annual LAI . . .”?

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