

## ***Interactive comment on “Hydrological impacts of global land cover change and human water use”*** **by Joyce H. C. Bosmans**

**Anonymous Referee #3**

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Review of Bosmans et al “Hydrological impacts of global land cover change and human water use”

This manuscript discusses a series of global hydrologic simulations to infer the impacts of land cover change on changes in ET and subsequent water balance changes. They project the impacts this will have on discharge over major water basins. I find the manuscript clearly presented and topically appropriate for HESS. I think the conclusion that land cover change needs to be considered when studying anthropogenic impacts is important but not particularly novel as this has been shown in other regional and global studies. Nevertheless, I still think the authors make a contribution to the literature and recommend moderate revisions the manuscript at which point I think it will be suitable for publication in HESS. My major comments are below.

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1. Energy balance. The authors discuss changes to ET using a model that does not contain a fully land-energy balance as many land surface models do. I think this may influence the findings of the work, particularly where the results show canceling out or reinforcement from land cover changes and the Budyko relationships. It would seem that exploration of the sensitivity (beyond what is in the SI) of this assumption on results would be important. I would like to see discussion of the impacts of the simplified approach used here contrasted with a more complete energy balance both in approach and with discussion on the impacts to the conclusions.

2. Since the authors force the model with a reference  $E_p$  (p3, lines 25+) “We force the model with CRU-TS3.21 temperature, precipitation and reference potential evapotranspiration from 1979- 2010...” and the PCRLOB does not calculate a land energy balance on it's own, the only component that is changing within the simulation is the available water stress curve and shallow soil storage. This also would have a direct effect on the simulation results. The authors discuss the copy factor sensitivity in the SI but a discussion of the sensitivity of soil moisture storage and plant and bare soil water stress on the overall water budget and simulation results is important.

3. As I understand it, the authors compare rain-fed (p6. ~line 25) with irrigated agriculture (same page ~line 30) but do not present results for groundwater depletions. Either I'm misunderstanding the work and groundwater is not pumped in these cases or I feel there is an opportunity to present differences in abstraction with land cover change.

4. It would be interesting to compare to the simulation results to both point and remote sensing products (eg. p 19 discussion) and other studies spatially. The authors discuss total magnitudes of change but how do the spatial patterns change between model and remotely sensed inferences?

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