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Interactive comment on "Incorporating remote sensing ET into Community Land Model version 4.5" *by* Dagang Wang et al.

Anonymous Referee #2

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Manuscript Number: hess-2016-696 Title: Incorporating remote sensing ET into Community Land Model version 4.5 Authors: Dagang Wang, Guiling Wang, Dana T. Parr, Weilin Liao, Youlong Xia, Congsheng

Summary

This paper follows the ET bias correction scheme proposed in Parr et al. 2015 and carries out a regional scale (CONUS) study in order to evaluate the effectiveness/performance of this approach over a large domain in terms of estimating ET, runoff, and soil moisture. The main idea I see is to reduce the ET overestimation in CLM 4.5 by rescaling it down and push the reduced ET back into the model to raise the runoff and soil moisture content – this goal is obviously achieved. The data, experiments and analysis in this study are all carefully chosen and the descriptions are

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very clear too. The overall quality of the research is good though most of the major conclusions are more or less well expected even without these experiments.

I think the paper can be published in HESS with minor revisions.

Major Comments

Unlike true "state" variables like moisture content or temperature, whose current value directly influences the future state of the underlying dynamic system, ET is not a state variable but a flux variable. Therefore, any effort to incorporate ET information effectively into the land surface model needs a way to propagate the change to ET flux across other parts of the dynamic system (e.g., soil moisture, canopy storage, runoff fluxes, etc.). The approach taken in this paper (following Parr et al. 2015) is to re-run the model (CLMET) and force the ET flux to be a value rescaled relative to the initial run (CLM), where the rescaling factor is pre-calibrated for every location and month. This approach is simple and effective, I think.

On the other hand, this approach is also awkward as it looks like an enhanced "post-processing" for bias correction instead of tackling the ET overestimation from its root cause, e.g., an underestimated surface resistance. The awkwardness comes in also because the "forced" ET in the CLIMET run will considerably disrupt the model physics itself, e.g. breaking the water balance and sustaining wetter soil without letting the plants transpire more. If we adjust the resistance (or some other related process like to make the water easier/faster to drain from the soil), then most of such physical inconsistency would be gone.

The authors have a major assumption that the ET biases won't change from year to year (with seasonal variability, though) so that such static errors can be corrected with static correction factors. So, the entire long ET validation section (4.2.1) is really validating the performance of the new estimation system but this stationarity assumption.

It'll be interesting if the results can be compared to a pure "post-processing" approach,

i.e., to rescale ET then rebalance the water budget between precipitation, ET, soil moisture, and runoff.

Details:

Line 65: model -> models

Line 88: intense -> intensive

Line 91: past -> historical

Line 101: Parr et al. -> Parr et al. (2015); into -> for

Line 111: spell out PFT

Line 122: “CONUS” was first mentioned in line 115

Line 155: unbalance -> imbalance

Line 322-334: where does the runoff data come from? GSCD or GRDC? What is GRDS in line 328? And Line 379?

Line 413: replace -> to replace

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