Text formats:

Reviewer – bold, non-italic

Answer of the author – non-bold, non-italic

Cited text – non-bold, italic

Anonymous Referee #2

Received and published: 23 September 2016

GENERAL COMMENTS

The authors present an interesting and important study on investigating the benefits of integrating CRNP in data assimilation to improve atmospheric/land surface modeling. While I am not a data assimilation expert, this clearly seems to be a path forward on showing the importance and utilizing long-term monitoring networks for societal benefits. This is a novel study on using a network of CRNP to improve catchment water and energy balance. The authors show the utility of a network on CRNP on improving SWC states and soil parameter estimates in areas with poor or low meteorological coverage and soil information. While the paper is generally well written the authors missed some key references to put this work into proper context. In particular, the recent paper on the Plumber experiment of LSMs (Best 2015) and follow up paper on information content (Nearing 2016) should be discussed in light of this papers major findings. With these additional modifications the paper is appropriate for publication in HESS.

Thank you for your positive evaluation and reviewing this manuscript. The additional references will provide valuable new aspects to the discussion of the results of this manuscript. In the revised manuscript, we will include the suggested references.

Major Comments.

1. The recent paper by Best (2015) on the plumbing of LSMs needs to be discussed in the introduction and discussion. In addition, the follow up paper by Nearing (2016) on discussing the information content of LSMs is critical. Most notably, their findings on the importance parameterization, model physics, and boundary conditions affecting the partitioning of sensible and latent heat, and comparisons between a SWC benchmark are important. The authors need to discuss these results and how their findings agree or disagree with Best (2015) and Nearing (2016). (e.g. Pg. 3 L 12, Pg. 17 L 13, conclusions). Without this it is hard to place this work in its proper context for critical evaluation. 2. The work of Avery (2016) should also be discussed given the importance of soil and vegetation parameters discussed in this manuscript. This and point 1 will help update the referencing to be most up to date. (e.g. Pg. 10 L 25, Pg. 18 L 18).

Thank you. The publications by Best et al. (2015) and Nearing et al. (2016) clearly show a strong relation to the experiment set up, results and discussions of the submitted manuscript. Similar to our study, these papers deal with soil moisture and latent heat flux as key variables in land surface modeling and will be addressed and discussed accordingly.
We will also include the reference of Avery et al. (2016) appropriately in the manuscript.

Minor Comments:

Pg 4. L 6. The cases illustrate a way. . .

Pg 4. L 15-16. Sentence is awkward please revise.

Thank you. This will be corrected and revised.

Referecnes:

Avery, W., C. Finkenbiner, T. E. Franz, T. Wang, A. L. Nguy-Roberston, A. Suyker, T. Arkebauer, and F. Munoz-Arriola. 2016. Incorporation of globally available datasets into the roving cosmic-ray neutron probe method for estimating field-scale soil water content. HESS 20: 3859-3872. doi:10.5194/hess-20-3859-2016.

Best, M. J., G. Abramowitz, H. R. Johnson, A. J. Pitman, G. Balsamo, A. Boone, M. Cuntz, B. Decharme, P. A. Dirmeyer, J. Dong, M. Ek, Z. Guo, V. Haverd, B. J. J. Van den Hurk, G. S. Nearing, B. Pak, C. Peters-Lidard, J. A. Santanello, L. Stevens, and N. Vuichard. 2015. The Plumbing of Land Surface Models: Benchmarking Model Performance. J. Hydrometeorol. 16:3: 1425-1442. doi:10.1175/jhm-d-14-0158.1.

Nearing, G. S., D. M. Mocko, C. D. Peters-Lidard, S. V. Kumar, and Y. L. Xia. 2016. Benchmarking NLDAS-2 Soil Moisture and Evapotranspiration to Separate Uncertainty Contributions. J. Hydrometeorol. 17:3: 745-759. doi:10.1175/jhm-d-15-0063.1.