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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Assessment of Irrigation Physics in a Land Surface Modeling Framework using Non-Traditional and Human-Practice Datasets" *by* Patricia M. Lawston et al.

Anonymous Referee #2

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Summary: The authors provide a useful and clearly-written evaluation of irrigation simulated by an advanced Land Surface Model. These types of evaluation are in short supply, and the use of CRNP in model evaluation is, to my knowledge, novel and potentially quite useful. I believe that the Discussion Paper is of sufficient interest and quality for publication in HESS. That said, the numerical experiments presented in the study are rather limited. Sensitivity to GVF dataset and irrigation intensity factor are evaluated, but none of the many other factors that the authors list are explored. This may lead to the wrong impression that the tested factors are the most important when simulating irrigation, when I see no evidence presented by the authors that this is in fact the case. Ideally, the authors should present a more inclusive set of sensitivity tests

to inform future modeling studies about the relative importance of different factors. If this is not possible, or if the authors view it as unnecessary, then a more convincing justification for the choice of experiments is required.

General Comments:

1. Meteorological Forcing: In the abstract and at several other passages in the text the authors emphasize the importance of high quality meteorological forcing data for accurate simulation of irrigation. Their results suggest that NLDAS is high quality, as shown most convincingly by the temporal match of simulated irrigation to spikes in observed soil moisture. I believe that NLDAS is high quality and that these results show impressive performance at local scale. But I'm not sure that the authors can actually make any conclusions about the importance of forcing data to irrigation simulations, given that they do not compare NLDAS simulations to simulations with any lower quality forcing dataset. Yes, it its intuitive that simulations with NLDAS will be better, but the numerical experiments don't demonstrate this, and they don't show us *how* important it is. This is particularly the case when one considers spatial or temporal scale. The authors nicely demonstrate that simulations are more realistic at larger and longer scales than they are at local and shorter scales. How important is meteorological forcing if we are concerned with large and long time scales? Additional simulations with an alternative, poorer quality meteorological forcing dataset would be the obvious way to test this, but the authors might find other ways to make the point.

2. Thresholds: The authors appropriately emphasize the importance of selecting proper thresholds for soil moisture and GVF at several points in the text. But the manuscript does not offer any evaluation of either. In both cases a single threshold is applied and attributed to previous studies. It would be quite interesting to know how the impact of using different GVF datasets compares to differences caused by small changes in GVF threshold. And how does a modest change in threshold impact total water use, as compared to the tested sensitivity to prescribed irrigation intensity? I understand that no study can be comprehensive on all parameters, but I don't fully

understand why the authors chose to look only at GVF dataset in GRIPC irrigation intensity when other subjective modeling decisions might have as large or larger impacts on the simulations. If possible I would encourage the authors to expand their sensitivity test in order to justify the selection of these two factors as the focus of study.

Minor Comments:

Page 3, line 20: This list of options misses flood irrigation simulation (unless it's supposed to be covered by #1). Several studies have employed flood irrigation, including Yilmaz et al. (2014), Leng, and Evans & Zaitchik (2008).

Section 2.3: It would be useful to include a sentence or two on why CRNP measurements are sensitive to soil moisture. Many readers (myself included) are not deeply familiar with this technique.

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