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Hydrology and Earth System Sciences
Discussions

# *Interactive comment on* "Evaluating the utility of satellite soil moisture retrievals over irrigated areas and the ability of land data assimilation methods to correct for unmodeled processes" *by* Kumar et al.

**Anonymous Referee #2**

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This paper addresses two topics. Firstly it investigates the potential of several remotely sensed soil moisture products to detect irrigated areas. Secondly it investigates soil moisture data assimilation in irrigated areas when the irrigation process is not accounted for in the model. This study shows limitations in the data assimilation system that prevent from making an optimal use of the observations in these conditions. The results and discussion focus on comparing different bias correction approaches or no bias correction, concluding that none of the approach is fully satisfactory.The paper is well written and results are clearly exposed. I suggest it is published after the com-



ments below are accounted for.

Page 5970, lines 20-22: "Therefore, in this article we focus on irrigation as an analog of a human engineered process that is typically not represented in land surface models." This paper uses irrigation to illustrate a process typically not represented in land surface models (LSMs). This gives the wrong impression that irrigation is not at all represented by LSMs, which is not true. The authors should acknowledge that several land surface models account for irrigation, such as for example ORCHIDEE (de Rosnay et al. GRL 2003), CLM4 (Leng et al. JGR 2011), WRF (Lawston et al. JHM 2015) and many others including Noah as discussed later in the paper. The point is that the bias correction problems addressed in this paper only concern the specific cases/studies/applications where irrigation is not represented in the LSMs. A few lines in the introduction to clarify the context would be useful. In the conclusion, recommendations are discussed to investigate alternative bias correction approaches by grouping model and observations depending on vegetation type for example. This discussion is interesting, however in irrigated areas irrigation is a major process that drastically affects water reservoir and fluxes. The reader wonder if it is the purpose of data assimilation to correct for such a major process when it is not represented. So, one of the main recommendation should also be to account for irrigation in LSMs whatever the application is.

Page 5981, lines 1-6: It is interesting to notice that SMOS and AMSR2 do not capture the irrigation signal whereas ASCAT does. The resolution of the raw data is a possible explanation as discussed in the text. An other explanation could be related to the effect of intercepted water on the signal which, when it is underestimated (or not accounted for) in the retrieval algorithm, leads to opposite effect on retrieved soil moisture from active and passive sensors. So, the fact that ASCAT captures the irrigation signal may be an artefact due to the intercepted water contribution to the signal.

Page 5994, line 9: Draper et al., 2014 should be 2015. Also update the text when the reference is cited.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 12, 5967, 2015.