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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Mapping groundwater abstractions from irrigated agriculture: big data, inverse modeling and a satellite-model fusion approac" *by* Oliver Lopez et al.

Anonymous Referee #1

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This study develops an automated approach to estimate agricultural-driven groundwater abstraction by integrating satellite data and land surface modeling. While this research is important and the groundwater estimation results look promising, the methodology is not well elaborated and justified.

1. The land surface model CABLE is the core of the methodology. Only if CABLE could correctly simulate each horological component, the water input could be inferred from ET. This is a big concern as land surface models are known to overestimate the coupling between soil moisture and ET (10.1029/2018WR023469). How the model is calibrated in the study area? What's the sensitivity of ET to water input? What's the

model performance in forward simulation? What's the underlying uncertainty of model inversion? To what degree TSEB ET improve CABLE ET? All these questions are not addressed and therefore the methodology is not convincing, even though the final results look good.

2. ET is the link between the land surface model and satellite remote sensing. However, no ET result is shown in the manuscript at all, and there's no comparison between TSEB ET, CABLE ET and field observation. While TSEB is a reasonable model, it is sensitive to the accuracy of LST but LST retrieval is usually error-prone (that's why ALEXI is developed to mitigate this issue), in particular for the TIRS on aboard Landsat. TSEB is also sensitive to some configurations such as the selection of resistance scheme. The authors use "in-series" scheme while other papers use "in-parallel" scheme. How these intermediate steps were determined and how they perform worth demonstration.

3. The authors shows that the methodology is able to apply to large scale. While this is cool, I wonder if it is possible to evaluate the water budget by e.g., comparing with GRACE or other horological data? I'm still worried that water loss other than ET may not well captured by CABLE and may couse large uncertainty on the relationship between water input and ET.

P3L14: Landsat (7 & 8) is 8 days. P9L28: Why not using Houborg's approach as I note he is in the author list. P9L30: Need to specify the configuration of the training database derived from PROSAIL. P13L14: Why series scheme is chosen as there are studies recommend parallel scheme. P13L19: Is canopy height involved in the calculation? If so, how do you deal with that? P13L26: How do you calculate roughness length without sensible heat? P13L29: Need a citation or justification. While shortwave radiation may follow Beer's Law (and there is impact of leaf angle distribution), longwave radiation is different (you may check CABLE's longwave radiation radiative transfer). P14L8: This assumes a spherical leaf angle distribution. Need elaboration. P14L9: Then is there a sharp change when LAI=1 as you use two different models? P14L16:

Please specify parameter values. P14L20: How is albedo calculated? P14L27: Isn't CABLE a dynamic vegetation model, i.e., LAI is calcualted in a process? How could you use LAI as input which breaks the process? P15L5: Is there a dynamic root consideration? P15L13: How could you figure out these soil parameters? P15L16: I believe there are a large amount of parameters in CABLE which can influence ET response to water input. Do you do any calibration and sensitivity analysis?

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