

Interactive comment on “Coupling the high complexity land surface model ACASA to the mesoscale model WRF” by L. Xu et al.

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Authors’ Response to Anonymous Referee #2

We appreciate the comments by the referee #2. We respond to his/her comments point by point.

Major Comment:

(1) I think, the overall advantages gained due to increased model complexity have been lost in presenting the results for all 700 sites together. Authors discuss some of the advantages particularly related to land cover type in the text e.g. Line 5 to 14, page 2843; however these advantages are not clearly visible to me in Figure 2 and other figures. Focusing the results for contrasting land cover

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regions, e.g. central valley regions would be helpful.

We realize that we have to improve the discussion on why WRF-ACASA is a novel and useful model in comparison to WRF-NOAH. The revised manuscript will include the following point: Beyond the complexity of the land surface scheme used in ACASA, ACASA can simulate carbon dioxide fluxes and water fluxes using high complexity turbulent scheme. While this is not presented in this particular paper, which focuses on the more fundamental meteorological aspect of the land surface model, we are currently preparing new manuscripts on the evaluation of carbon dioxide and water fluxes in WRF-ACASA. However, we feel that an evaluation of surface meteorological variables (such as temperature, dew point temperature and relative humidity) is first necessary step.

In addition, we will try to better highlight the advantages of using WRF-ACASA compared to WRF-NOAH and we will focus the results for the contrasting land cover regions in the Central Valley of California.

We will also add a discussion in the conclusion section on the comparison between lower and higher complexity model. The high complexity ACASA model properly accounts for important biological and physical processes between the ecosystem and the atmosphere, and the model performs well when compare to an extensive set of observation. It is true that ACASA did not outperform the NOAH scheme at this point. However, without tuning the ACASA model to any region, the model performs well and quantitatively similar to that highly tuned and lower complexity NOAH model. This should be considered as a good sign of the ACASA scheme.

(2) Several figures e.g. Figures 6 and 7 are not legible, i.e. figure legends, x and y axis titles are not readable, mostly because authors present 16 plots in a single figure. Also, hourly data has been plotted (I think) in Figure 6, and 10 which may not be required because hourly composite (diurnal cycle) have been presented in the subsequent figures. Authors may want to synthesize the data

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and present in the figure only when it is necessary. For example, authors may want to present the figure only for JJA because land-atmosphere interaction is strong during JJA. Also, plotting the difference plot from observation in Figures 6, and 10 may be helpful.

We realize that we need to improve the quality of the figures. The revised manuscript will include figures with better visibility and organization. We will follow the advice of the reviewer regarding figures 6 and 10 in the revision.

Minor Comments

(1) Page 2834, Line 5: 2.5 degree (equivalent to 250 km²) -> 2.5 degree (equivalent to 250 km at the equator)

This will be corrected in the revised manuscript.

(2) Page 2845, Line 10 to 19: This description seems to be based on Figure 7, MD JJA. Please check why there is sharp drop at the beginning of the diurnal pattern. Does this affect the simulation?

The sharp drop at the beginning of the diurnal pattern originates from the observational data and probably caused by instrumental error. This will be made clear in the revised manuscript.

(3) Basins and stations are confused some times. For example, page 2848 Line 28-29, says Figure 10 show results for four stations; whereas Figure 10 caption says results are for four basins. Since, a basin has several stations (Table 2), please check carefully.

This will be corrected in the revised manuscript.

(4) First paragraph in section 4 describes differences between ACASA and NOAH LSM, which is rather long and may not be needed here. Such description can be a part of model description (Section 2.2)

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We agree with the reviewer and this will be changed in the revised manuscript.

(5) Page 2854, Line 6: "... ecosystem responses to the atmospheric impacts..."
-> **"... ecosystem responses to the human and natural disturbances..." or something similar to this.**

We will modify the sentence according to the reviewer's comment.

(6) Page 2870: Figure 9: Legends and axis titles are not legible.

We will improve the quality of all figures.

Interactive comment on Geosci. Model Dev. Discuss., 7, 2829, 2014.

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