

Review of **Testing water fluxes and storage from two hydrology configurations within the ORCHIDEE land surface model across US semi-arid sites** by *MacBean et al.*

The new version of the manuscript by MacBean et al., who compares two different soil schematizations for the ORCHIDEE land surface model, shows many improvements compared to the initial submission. I am happy that my comments were proven useful, and noticed the authors addressed most of them adequately. I also appreciated the open attitude of the authors and the scientific discussion.

I think the manuscript is making a better comparison now between the two model set-ups. The changes in Figure 2 and the additional performance measures help a lot here. I still think the authors could focus the manuscript a bit more, as often a discussion of the results is already included in the Results section, whereas an actual Discussion section is present in the paper. This is however a minor comment, and hope the authors just go over the manuscript once more to sharpen these details a bit. I also still have quite some minor issues, and think the authors should address these as well before the paper is published.

Regarding some specific questions of the authors, a discussion on soil texture and depth would definitely be appreciated by me, but I am also already quite happy with the additional discussion on the need for groundwater. I would also appreciate a short and condensed version of the text in the author's response on soil texture and depth, maybe just a few lines, but I leave this up to the authors. The statements on runoff in the conclusions are also much more moderate now and relate more to previous discussions in the manuscript.

I hope the authors find these comments useful again, and look forward to a final version of the manuscript.

**Minor comments**

P4-5.L112-159. This paragraphs contain quite some details, and would probably fit better in the Methods section.

P9.L269. In the introduction bare soil evaporation was introduced as E, here it is E<sub>g</sub>, later in the manuscript it is E again, and in some figures BS evap, so please check consistency throughout the manuscript.

P11.L341. Please define GPP.VPD 0.5

P13.L393. Reduced bare soil fraction → maybe also good to mention how much you reduce this.

P13.L419-421. This sentence seems a bit odd to me.

P13.L425. The low-elevation shrub and grass sites → here you mean the remaining four correct? It is maybe helpful to repeat the site names here.

P14.L439. Lower drainage flux → I think you should refer to lower total runoff in general, as the surface runoff is higher.

P14.L445.onl → only

P14.L448. How is it possible to have such a variation in the upper soil moisture during dry periods?

P14.L450. 3 → three

P14.L450. In much better fit → in a much better fit

P16.L500-501. Where do I exactly see this? The second panel of US-SRM and SRG?

P16.L516. I do not see a light green zone, do you mean light blue? It is also not very visible in the figure.

P17.L543-545. As the forests...temporal variability. → I do not follow this reasoning completely. When the hydraulic conductivity is higher due to roots and preferential flows, you would expect a higher temporal variability, not lower.

P18.L561. 11LAY observed ET → do you mean modelled?

P19.L591. spring mean LAI → is this observed LAI?

P20.L632-633. This decrease...at all sites (Fig. 7) → Figure 7 only shows that this happens for all sites averaged together, but not for each site individually. So I do not think you can say this based on Figure 7.

P20.L636-637. The mean estimated...11LAY version (Figs.7) → Figure 7 is not about all sites, correct?

P20-21.L650-651. Why would there be a high sensitivity for transpiration when the bare soil resistance is changed and there is hardly a bare soil fraction? The bare soil evaporation is also rather similar in Figure 8, but I would expect that that would change instead of the transpiration.

P21.L651. TeNE PFT T → please write this out, it is not very clear like this.

P27.L856. Discrepancies semi-arid → discrepancies of semi-arid?

P27.L858. Timing transpiring → timing of transpiring?

Fig3. Please add a space between mmm-1, and write out month, because even though explained in the caption, it is not a correct unit like this and a bit confusing. See also the HESS-recommendations on units: [https://www.hydrology-and-earth-system-sciences.net/for\\_authors/manuscript\\_preparation.html](https://www.hydrology-and-earth-system-sciences.net/for_authors/manuscript_preparation.html)

Fig5. The lightblue parts are not very visible, maybe use a different color for the marking. Please add this also in the caption.

Fig7. The authors commented they wanted to keep the figure as it is, but averaging results like this just does not make any sense. In this way, results can actually look pretty good “on average”, but two big overestimations can completely compensate for two big underestimations, and results that are actually rubbish can be accepted as good. Obviously, this is not the case here, and fortunately I can check this in the supplement, but I think one should be careful by showing results in this way as it can be perceived as misleading. I think it is better to show an example instead, or create envelopes with the full range of results.

Fig.S5. The caption is not correct.