Review of the manuscript hess-2019-305: “Weak sensitivity of the terrestrial water budget to global soil texture maps in the ORCHIDEE land surface model” by Tafasca et al.

General

This paper explores the impact of soil texture on the simulated water budget by the ORCHIDEE LSM at the global scale at 0.5 degree resolution. The authors conclude that the use of three different soil texture maps result in very similar terrestrial water budgets, and that the choice of the input soil texture map is not crucial for large scale modelling. While the study topic is very relevant and deserves publication, the manuscript needs to be revised. First, I think the authors should make in the Introduction their research question(s) clearer, in my opinion lines 52-53 are not sufficient, and it is also not quite clear why this research is different from earlier studies. The authors mention the use a physically based soil hydrological modelling component (including Richards equation) in these lines (line 53), but do not follow up in the Discussion and conclusions section. Furthermore, I believe the manuscript could benefit from a more detailed analysis and description on the differences between hydrological variables from different soil texture inputs (and PTFs), also focused on a regional/local scale. Finally, I am wondering why the authors did choose to scale up the high resolution soil texture dataset to the model resolution as a function of the dominant USDA soil texture class. Why not, when applicable, calculate the soil hydraulic parameters at high resolution, and then scale up (with appropriate scaling operators (for example in the line with Samaniego et al., 2010))?

Specific comments

A detailed description of the ORCHIDEE LSM would be helpful.

Line 13: explain “medium texture”, I think not every reader knows what medium means

Line 13-14: “The three tested complex soil texture maps being rather similar by construction…”. Do the authors mean that the soil texture maps are similar because of the way how they were constructed (taking the dominant USDA soil texture class)? As mentioned in the General comments, why not calculate soil hydraulic parameters at the high resolution scale? Indeed the soil texture maps are quite similar. Why then not focus more on sensitivity of PTFs (now two are used in this study)?

Line 35: 1-km SoilGrids database. A 250 m version is also available. Were the different soil layers also included in the analysis? And if yes, how? Also for example to calculate the exponential decline of Ks?

Lines 144-145: “Rather surprisingly, we find here…”, Could you explain this in more detail? If drainage and transpiration decrease you would expect higher soil moisture values, right? The transpiration decrease is perhaps controlled by dominant vegetation type?

Lines 148-149: Could you elaborate more (also include references)? These factors should also affect evapotranspiration…

Line 158: Please describe Figure 4 in more detail.

Figure 5: EXP5 seems to show a large difference in soil moisture with EXP4. In my opinion an interesting result, but not mentioned in the text and explained.

Line 187-188 and Figure 7: Ok, indeed transpiration and soil evaporation show weak sensitivity, but other variables like drainage, surface runoff and soil moisture show a stronger sensitivity. For example, when you focus on Scandinavia, drainage decreases, surface runoff increases, and soil moisture increases. I believe the manuscript should also focus on these variables, in specific regions. Why is transpiration not affected here by the soil texture maps, and the water balance components as drainage, surface runoff and soil moisture do change?

Lines 208-209: what about other variables (water balance components) than evapotranspiration?

Lines 214-215: why not calculate hydraulic parameters at high resolution to remove some of that bias?

Lines 218-219: yes, the authors could have used these upscaling method of Samaniego.

Lines 226-235: again the focus on evapotranspiration. What about other water balance components?

Line 236-244: To include and end with this paragraph the authors should focus more on PTFs (methods and results) and describe these in more detail (methods).