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Hydrology and Earth System Sciences Discussions

Interactive comment on "Some practical notes on the land surface modeling in the Tibetan Plateau" *by* K. Yang et al.

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1, As for the description for the special soil stratification in section 4.1, it is useful to understand why the soil moisture in the topsoil is higher than in the deep soil. However, this character could not be used to get the conclusion of that the water content within the topsoil is commonly under-predicted by all LSMs due to the soil stratification. First, the author used the default parameters in LSMs, which would not represent the real soil properties in the field. Then, the under-estimation might be caused by the use of default parameters. Second, the parameterization of the soil structure developed by Yang (2005) might be an improvement, while it is different to the parameterization in the 3 LSMs. There is a need to compare the calculated results by the 3 LSMs to those by Yang's parameterization, using the same time series data; otherwise, it is hard

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to conclude which parameterization is better. Response: We do not want to give an impression that the model in Yang et al. (2005) is better than the three LSMs. Instead, what we really want to address is that the soil vertical stratification is important and soil moisture can be simulated well after considering the soil vertical stratification. Though soils with high organic matters can be found in forest or heavily vegetated areas, as indicated by one reviewer, the TP topsoil directly controls surface processes. However, in highly vegetated areas, the topsoil plays a minor role as only small part of radiation can reach the under-canopy surface. The major conclusion for this vertical stratified soil is not that we have already had a good model. Instead, we show this soil is important and we need to consider it and quantify its parameters by laboratory soil experiments. In this sense, a direct comparison between the three ISMs and the model in Yang et al.(2005) might not be so important.

2, In the section 4.2, it is better to indicate that what does the downward stand for.(Is it downward the positive or negative?). I thought, in the equations the author showed, the fluxes sign is downard positive. Although readers can understand that, there is still a need to mark this out. Response: Thank you! We have defined it. In fact, Section 4.2 is rewritten for a better description.

3, Still in the section 4.2, as for the equation (3), I thought the author missed the density of water in the denominator. Without the water density, the unit of the E_demand could not be in the form of (Length/Time). And, subsequently, it is impossible to get equation (4) as the form showed in the manuscript. Response: Actually, we have the water density in new Eq. (9).

4, As for the explanation on the simulation without the excess resistance yields higher sensible heat fluxes though its surface temperature is under-estimated, the description in the line25-27 on the page 1303 might not be completely correct. How could the under-estimated surface temperature cause the net radiation to be over-estimated? The more reasonable explanation might be showed as followed: the under-estimated surface temperature would make the soil heat flux under-estimated; then, the larger proportion of net radiation is dissipated into sensible heat flux, considering the latent heat flux could be neglected for a very dry surface. At this sense, the alternative increase of surface temperature and the sensible heat flux between two different LSMs could be expected, as showed in Fig.10 in the manuscript. Response: Thank you for the important insight to the energy budget. Indeed, the reduce of soil heat flux contributes to the increase of sensible heat flux. We added one panel (panel c) in Figure 12 to show the soil heat flux. We have added text to read "We have added text to read "Meanwhile, the lower surface temperature would directly result in lower ground soil heat fluxes, which are also consistent with the higher sensible heat fluxes." (P14, L17-19).

5, For the excess resistance for heat transfer, there is a small question. Why the simulated Tg-Ta with excess resistance fit the measurement with a larger amplitude compared to the simulation without excess resistance (Fig.10)? Due to the temperature gradients in the soil is linked to the soil heat flux (so the surface temperature is also linked to the soil heat flux), the increased soil heat flux would cause greater simulated soil temperature oscillations. Does the excess resistance developed by the author just increase the soil heat flux? And, if the author did that, the greater oscillations of the simulated surface temperature would fit the daytime Tg-Ta very well like Fig.10 shows. However, the approach of increasing the soil heat flux would make the parameterization of excess resistance no difference from the scheme without the excess resistance, considering, might be, just the increase of the soil heat flux and the amplitude of surface temperature, while no changes in the mechanical aspects. Response: The direct influence of the scheme is to increase the excess resistance for heat transfer, and then increase the surface temperature, which, in turn, enhances soil heat flux. Therefore, the scheme plays a role to increase the soil heat flux indirectly.

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