General comments

In this manuscript, the evaporation process from soil surface under different scenarios was studied numerically. Considering the importance of evaporation from porous media in many hydrological processes, this paper will be of great interest to the readership of HESS and broad community in geophysics and hydrology. The manuscript is engaging and generally well written and the numerical analysis appears to be of good quality; however there is still need to explain the physical aspects of the problem in more detail and especially discuss more about the potential impacts of the coupling between the external boundary conditions and the internal transport properties of porous media on the evaporation rate. Some of the assumptions are too simplified and the authors at least should discuss the possible consequences of these simplified assumptions (see comments below). I recommend acceptance of the manuscript for publication in HESS after addressing the concerns listed in the following of this letter:

Specific comments

Page 7386, line 11: It is helpful to mention some words about what you mean from the "drying front" (is it the interface between unsaturated and dry zone?). Some people define the drying front as the interface between the saturated and unsaturated zone, so it might be confusing for the readers…

Page 7390: In your analysis, where is the contribution of the convective transport of water vapor above the soil surface in supplying the total flux? To me, it seems you just considered the vapor diffusion from the surface through the overlying viscous boundary layer (VBL), while considering Figure 1 in your manuscript, there is air flow above soil surface which for sure induce vapor convection. Therefore, neglecting the convective part is not physically correct. The reason that you don't see the effects of this assumption in your analysis probably is in the end you fit r_b on the obtained results. I am not saying you have to consider the most complicated case, but saying you have to be aware of the simplified description you have provided and have to inform the readers and explain this in the manuscript.

Page 7390: In equation (5), you have assumed a constant value for r_b which is indeed a very simplified assumption. In fact the thickness of boundary layer is zero at the entrance of the soil surface and increases by increasing the distance from the leading edge. When I read the manuscript for the first time, I expected more theoretical development/improvement in addressing the coupling between the external boundary condition with the internal transport of porous media in supplying the evaporative demand. There are too many fitting parameters in equation 5 (the fitting parameters related to ψ and r_b)….where is the effect of evolution of water content at surface and its coupling with external VBL in modification of mass transfer coefficient at the surface?

Page 7394, line 18-19: Change "only" to "mainly" or "mostly". In addition, I would add something like "relatively" or "rather" before "a constant value of", because the evaporation rate during stage 1 is not completely constant, but "relatively" constant due to the evolution of liquid curvature at the evaporation surface affecting the capillary pressure gradients and consequently the upward liquid flux.

Page 7395, line 10-13: There are several studies showing that at the end of stage 1 evaporation, liquid continuity and hydraulic connection between receding drying front and evaporating surface is interrupted resulting in formation of a dry surface layer limiting total evaporative flux from porous media. Recently I wrote a paper (Shokri et al. (2009), Water Resour. Res., 45, W10433, doi:10.1029/2009WR007769) which I believe has direct relation with the current manuscript (it is always awkward to point out a lack of reference to your own wok, but I do believe it is very related to the argument provided in this section of the paper). It was shown experimentally that at the end of stage 1 evaporation, receding of the liquid meniscus from the evaporation surface is resulted in formation of a dry surface layer and marks the onset of stage 2 evaporation. In other words, during stage 2 evaporation, liquid is transported upward via capillary induced liquid flow to the bottom of the dry surface layer, vaporize at that level and then vapor diffuses through the dry layer to enter the atmosphere. This observation/analysis clearly explained the transition from stage 1 to stage 2 of evaporation. In the current manuscript, I think it is better to explain the physically based reason of the abrupt transition rather than arguing based on the drop in the "effective" hydraulic conductivity. I have the same concern about **page 7395, line 27-28**.

Page 7396, line 3-4: Explain the reason of "the drier the sample, the less important is the resistance of the boundary layer"

Figure 4(b): In profile (2), why water content is reduced almost uniformly through the entire sample? I expect existence of an interface between saturated and unsaturated zone after 35 hrs of drying, while in your simulation, you have obtained almost a spatially uniform water loss from the entire column. In the beginning of the process, one can expect intuitively that air molecules invade the porous medium from top surface while bottom of the sample remains saturated, thus there should be an interface between the saturated and partially saturated zone close to the surface.

Figure (8): Changing the atmospheric condition at t=62 (hrs) influenced the outflux computed by the assumption of no vapor transport (blue curve), but why the jump in the atmospheric condition at t=196 (hrs) does not have any influence on outflux (blue curve)?

Technical corrections

General comment: Use thicker lines in all figures. The lines are too thin…

Equation (2): Define θ_r and θ_s.

Equation (4): Show the derivation of equation (4) or at least give a reference. It took a while for me to understand the equation…

Equation (5): I would first introduce the Kelvin equation and then present equation (5). Not all readers are familiar with these equations…

Equation (6): Introduce the parameters and give reference to Levenberg-Marquardt algorithm!

Page 7386, line 14: change "By using the boundary condition changes" to "By changing the boundary conditions".

Page 7394, line 20: "measurand"?!

Page 7409, Table 2: I think you mean p^w and not p_w.