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Hydrology and Earth System Sciences Discussions

Interactive comment on "Seasonal evaluation of the land surface scheme HTESSEL against remote sensing derived energy fluxes of the Transdanubian region in Hungary" *by* E. L. Wipfler et al.

Anonymous Referee #2

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This paper is an attempt at one of the greatest challenge in the community which is to compare on an equal footing surface fluxes derived from remote sensing information with those simulated by models. To establish clearly the benefits of each of these estimations will be an important step toward merging these complementary informations in assimilation systems. But even though the authors have a worthwhile goal they failed to convince me that they have yet relevant results to show. I would thus accept this paper only after major revisions. My major concern with this paper is that the authors

work with the assumption that the satellite derived fluxes are reality and should be used as a reference. They are probably lead to believe this by highly underestimated error bars on the SEBAL method. The claimed accuracy (3-5%) is typically the one which is claimed by the satellite instruments which measure the top of the atmosphere radiation budget. As the surface radiation fluxes and subsequent evaporation estimations are only derivations from top of the atmosphere observations they can by no means be as accurate ... unless we know the atmosphere perfectly ! So in order to make this work worthwhile the accuracy estimates of the SEBAL have to be re-evaluated and then determined where HTESSEL brings extra information and where not. There are some concrete points where this can be done in the analysis and the text. I will try to point to them in the detailed comments below.

* The description of HTESSEL seems to be incomplete. The equation 4 is inconsistent with the different types of evaporation presented afterwards.

* Throughout the seasonal average is used as an evaluation scale. I guess the summer season is meant but it could also be any of the 3 other seasons or all together. I have not seen where this is clearly defined and should I have missed it then it needs to be reminded at a few strategic locations and detailed in the captions of the figures.

* The comparison of SEBAL and the fluxes observed at the 2 towers needs to be detailed and underpinned with some figures. To my knowledge the accuracy of flux towers are not better than single digit per-cents. So if SEBAL is better than that we should see it clearly for E, H and E/Rn in a comparison with Fluxnet data.

* Using the 2 towers some evaluation of the spatial correlation of the fields could be made. This should be one of the trumps of satellite derived products which need to be compared with model outputs.

* Using honest error estimations of P and E a shaded zone should be drawn around the line E=P in figure 6. Are then the areas which are assumed to be irrigated or influenced by groundwater uptakes significant outliers ? This would be much more

convincing. Drawing that zone by hand I guess it will be a close call.

* Figure 8 is very misleading as it is averaged over a very large area. Nevertheless why is the difference between SEBAL and HTESSSEL only attributed to incoming solar radiation. Are the 2 models using the same assumptions for albedo and surface temperature ? This is probably not the case and could explain the differences in Rn without any problems.

* Why is there no detailed presentation of all the fluxes (observed, SEBAL and HTESSEL) at the 2 towers ? I would guess that the discrepancies of the 2 estimations dwarf the issue of scales when comparing point observations with area averages. This is worth showing and discussing.

* As alluded to earlier the big advantage of remote sensing derived products is their spatial coherence. Why is there no discussion of the weekly correlations of the flux maps between HTESSEL and SEBAL. This could for instance show that the lacking irrigation and groundwater recharge progressively leads to a degradation of the spatial correlation during summer.

* The choice of sensitivity experiments performed with HTESSEL is surprising. The matrix (table 3) does not contain a simulation in which only the number of levels in the soil changes. There is sufficient literature to demonstrate that this is not without consequence on the annual cycle of evaporation and it needs to be documented for HTESSEL here.

* There are a number of land surface models which include lateral redistribution of water at the surface. Except through the routing schemes, none was yet able to validate the enhancement of local evaporation produced. So the validation through remote sensed products is worthwhile and I regret that the methodology used here is not convincing.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 6, 6293, 2009.