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Interactive comment on "Comparison of MODIS and SWAT Evapotranspiration over a Complex Terrain at Different Spatial Scales" *by* Olanrewaju O. Abiodun et al.

Anonymous Referee #1

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This study compares evapotranspiration (ET) estimates derived from two reknown methods, namely the MOD16 processor and the SWAT model (using the Penman Monteith module for ET). Comparisons are made over the 44 km2 Sixth Creek Catchment of South Australia at different spatial scales, ranging from 1 km2 to 41 km2 resolution.

The paper is well structured and written. My main concern is about the interpretation of the obtained discrepancies between MOD16 and SWAT ET estimates. MOD16 and SWAT are certainly very different approaches, but they have in common several input variables including the land cover and meteorological forcings. It is therefore regrettable that the authors did not use the MOD16 input data set for their SWAT simulations.

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Not because one input data set is more accurate than the other, but rather because it would have been a way to understand and quantitatively assess the origin of the observed differences between MOD16 and SWAT ET estimates. Another drawback is that there is no reference (e.g. in situ meausrements or reference model runs) for evaluating the comparison between MOD16 and SWAT ET estimates. Therefore, it is difficult to assess the significance of either MOD16 or SWAT ET estimates, especially at the 1 km resolution.

Major issues : 1) To me "the drivers of the ET algorithm in both models" (one main objective of the paper, stated at line 420) are not evaluated quantitatively. Abstract, Lines 18-20 : "Land cover differences, mismatches between the two methods and catchment-scale averaging of input data in the SWAT semi-distributed model were identified as the principal sources of weaker correlations at higher spatial resolution". As different data sets were used as input to both MOD16 and SWAT, the above statement is rather an assumption than an "identification". A sensitivity analysis of SWAT model to different forcings (including the MOD16 forcing data) is needed.

2) Figure 7 : I am concerned about the significance of the results at 20 and 41 km2 due to the limited extent of the study area. At those scales (which are about the size of the catchment), the differences in ET estimation are attributed to time only, while at the 1 km2 resolution, the differences in ET estimation are attributed to both space and time. Therefore, those statistics are not, strictly speaking, comparable. It is necessary to separate the spatial differences from the temporal differences at all spatial scales. Otherwise no firm conclusion can be drawn. In addition, since aggregation systematically reduces variability, it would make sense to plot side-by-side the difference in mm (as already shown in Figure 7) and the % of this difference relative to the mean ET, for each spatial resolution ranging from 1 to 10 km2.

Specific points : - Line 110 : define PET, Ecan, Et, Rsoil and Revap in the text to clarify the schematic diagram of Fig. 1 - Line 311-312 : "The land cover is an important parameter in the MOD16 and SWAT MOD16 ET algorithms as it determines the

values allocated to biophysical properties such as leaf conductance, boundary layer resistance and vapour pressure deficit (VPD)" VPD is rather an atmospheric variable than a surface variable controlled by land cover.

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