We thank the referee for his comments and hope to have answered them as best possible. Since the changes to the manuscript are extensive, the new version is uploaded as a separate file.

This study investigated the benefit of integrating SMOS brightness temperature and the Community Land Model over Australia. Three different scenarios were performed to update different layers of soil moisture by the LETKF method. The results were evaluated using ground soil moisture measurements. Personally, I think this paper was well written. The organization was reasonable and the experimental design was clear. However, there were still some major issues need to be addressed before it can be considered for publication. A more systematic literature review on remote sensing data - land surface model assimilation need to be conducted. There are two groups of remotely sensed soil moisture (or brightness temperature) assimilation studies, one for soil moisture estimation typically through land surface models, and the other for runof and streamflow prediction normally through catchment hydrologic models. The current introduction mixed these two together, with a lack of detailed review on remote sensing constrained land surface modelling. The contribution of this study should be better articulated based on the review of the current progress on this topic. The authors discussed extensively on bias issue in the Introduction and Results sections, which I agree is an important issue; however, I did not see what is new in this study in addressing this issue. The CDF matching is a traditional approach with the advantage of removing relative bias. However, the problem is that it does not estimate and disaggregate the relative bias into model one and observational one. I did not see how this study addressed this issue. The design of the different DA experiments were not well justified. Technically, there is no problem to update all soil moisture layers through cross covariance, which should maximize the benefit of assimilating remotely sensed surface soil moisture by addressing the gross error accumulated in the deep soil moisture. So what was the point of just update the first 9 cm? It may be argued that updating only surface soil moisture could test the ability of the CLM to update the deep soil moisture by the model dynamics itself; however, I do not think a Kalman filter is the best choice to answer this question. The error in deep soil moisture is an accumulation of the error from the surface soil moisture and a smoother to assimilate the RS data to update both current and past surface soil moisture will have a better capacity on testing the capability of the model to update deep soil moisture through model dynamics. Besides, more in-depth analysis and discussions need to be added. For instance, what is the implication of the results from this study on the issues such bias? Whether the results is reasonable (and being improved after data assimilation) for the whole Australia? Also, I would suggest the authors to be careful in using the words “assimilate” and “update”. It should be very clear through the paper that RS surface soil moisture was “assimilated” while different layers in the model were “updated”. P2L31: Based on the review above, I cannot get to the conclusion that TB assimilation is under researched compared with soil moisture retrieval assimilation. P7L10-15: Why 32 ensembles? Why no spatial correlation was considered while most of the errors are known to be spatially correlated? How these error parameters are estimated/determined? 50% of rainfall is a lot, I reckon. P10L1-5: A bit of details on the soil moisture measurements quality control.

Literature review: We have added some assimilation case studies, some specifically focusing on the study area. Also, while referencing these we now mention the model that has been used. We agree that catchment models vs land surface models can be quite different but don’t see a big problem in referencing these together, since the assimilation steps are usually quite similar.

CDF-matching: We agree that the introduction was too long (as also pointed out by referee 2). We have therefore shortened and streamlined it towards the objectives of the study. Quite some detail on observation rescaling has been removed, or when appropriate moved to other parts, since it might have caused the false impression of the issue being resolved within this study or that this study heavily focuses on it.

Experiment design: We hope to have clarified the design of the experiments within the introduction as well as the assimilation and results section. Concerning the udating into different layers, we argue that errors in the upper layers are actually best fed into the deeper layers through model physics. The experiment DA 2 however shows, that directly updating the root-zone leads to further improvements. Due to the high temporal variability of upper soil layers we believe the Kalman filter is the method of choice for close to surface soil moisture. We agree that for lower layers a smoother might be an interesting option, such as is used for the assimilation of GRACE data.

Analysis and Discussion: We have added more in-depth discussions on the in-situ validation, patterns in the increments as well as the quantile analysis. A land cover map as well as maps to show the in-situ validation within the Murrumbidgee catchment have been added. We have clarified that the consistent improvement of correlation with in-situ measurements makes us believe that the results are valid for all Australia, although the problem of sparse in-situ measurement sites remains.

Assimilate vs Update: We have substituted the wording "assimilate" with "updating" where appropriate.

We have changed the sentence stating that TB assimilation is under researched to that it is relatively new in practical terms.

Number of Ensembles: We have added that around 30 Ensembles is common for land data assimilation studies.

Spatial noise: The assimilation was performed in 1D, thus not requiring spatially correlated perturbations. This has been added in the text. The relevant references have been added from which the perturbation factors were taken, including the rainfall perturbations.

Quality control: We have removed the sentence, the quality control was carried out globally and actually no sites in Australia were affected.