*We thank all reviewers for their suggestions. The original comments are in black normal fonts. The answers are in blue italic fonts. Modified text is underlined. Figure, page and line numbers generally refer to the old manuscript. An indication of anticipated new figure, page and line numbers are provided in brackets.*

Referee #3

In order to investigate the impact of the different assimilation schemes (Tb & SM re- trieval assimilation) on the skill of surface and root-zone SM estimates, the authors as- similated five years of SMOS Tb data or SM data into the GEOS-5 land surface model and RTM model, using a spatially distributed EnKF. They found that different assimilation systems show surprisingly different spatio-temporal increment patterns, leading to very different adjustments to the modeled soil moisture trajectories. Nevertheless, the various schemes yield SM estimates with similar average skill metrics, introducing sig- nificant improvements over the model-only simulations. The manuscript was very well structured. However, considering the complexity of the information delivered, some minor adjustments were needed, for the sake of reader's ease in understanding.

*We thank the reviewer for the encouraging review and for all suggestions.*

Specific comments: 1. The concept of total soil profile water (Δwtot) was used to investigate the innovations, increments and relevant statistics (e.g. in Figure 1, 2, 5, 6). On the other hand, this Δwtot is a diagnostic variable (e.g. an aggregated variable representing changes in catdef, srfexc, rzexc) and is not a member of the state vector for Tb & SM assimilation. It is not clear if the analysis has been done for catdef, srfexc and rzexc, what is the necessity left (or add value) for doing analysis for Δwtot?

It is suggested to use catdef for Figure 1,2,5 & 6, instead of Delta_wtot. Or, if the authors would like to stick with their choice, a verification/clarification is needed.

*We agree to edit the text for clarification (p.7, L6 [p.7, L27]).*

2. Paragraph 2 on Page 12 (e.g. between line 4 and line 12). (a) It is said " ... The catdef increments pertain to the entire profile depth ... and have a relatively small impact on the upper 5cm SM ..., would scale to about 0.1 mm for a 5cm soil layer". First of all, catdef is a state variable of CLSM and would exert only second order effects on surface SM (Koster et al. 2000). It is not clear how the authors scaled the catdef increments to surface SM; (b) "The increments in rzexc are relatively smallest, because this variable is not perturbed by design". The rzexc is another state variable of CLSM and was also member of the state vector used by the assimilation system. So, with such context, what does it mean ".. not perturbed by design" here?

*We will further clarify the details (p.12, L10 [p.12, L30]).*

3. line 16, page 2, gage-based -> gauged-based;

*We will edit this to read gauge throughout the text.*

4. line 17, page 2. Not clear what does it mean here by "inconsistent"? Did you mean here that the ST observed by a different satellite other than the one for SM?

*ST is estimated by a modeling system, not even by a satellite. We will rephrase this for clarification (p.2, L17 [p.2, L18]).*

5. line 3, page 4, range between 30 and 50 deg?

*Sure, we will edit this (p.4, L3, [p.4, L6]).*

6. line 30, page 4. Reichle et al. (2015) is not detailed enough for an overview of the CLSM model variables. Please update them with following references: Koster, R. D., M. J. Suarez, A. Ducharne, M. Stieglitz, and P. Kumar, A catchment-based approach to modeling land surface processes in a GCM, Part 1, Model Structure, J. Geophys. Res., 105, 24809-24822, 2000. Ducharne, A., R. D. Koster, M. J. Suarez, M. Stieglitz, and P. Kumar, A catchment- based approach to modeling land surface processes in a GCM, Part 2, Parameter estimation and model demonstration, J. Geophys. Res., 105, 24823-24838, 2000.

*We will add the suggested references (p.4, L30 [p.5, L2]).*

7.Section 2.3, there are lots of information in this subsection. However, it is difficult to follow without further checking other references. More specifically, for the concept of "footprint scale" and 36-km grid, how they were relevant and how exactly they varied with latitude and longitude are not clear. Perhaps a schematic will help? Furthermore, could the authors help to use a flowchart here to show that RTM converted CLSM simulations into Tb and then this calculated Tb was used to compute O-F residuals inthe assimilation system, while considering the geometric relations between "footprint scale" and "36km grid"? Such flowchart will help tremendously the readers to have an overview of the whole processing chain, which is the most fundamental for understanding the topic of this manuscript.

*We will add a schematic overview of the assimilation algorithm with special attention to the resolutions for clarification (p.6, L22 [p.7, L16]).*

8. line 26, page 5, how were the weights assigned, with different depths?

*This will be edited (p.5, L27 [p.6, L2]).*

9. line 1-2, page 6, any reference for this statement?

*We will add a reference (p.6, L2 [p.6, L14])*

10. section 3.1, again, this is also fundamental for readers to understand the manuscript. Could the authors help to add a flowchart here to show the difference between the Tb and SM assimilation algorithm?

*See above, comment 7. We will add a flowchart.*