Hydrology and Earth System Sciences Discussions

Hydrol. Earth Syst. Sci. Discuss., referee comment RC2
https://doi.org/10.5194/hess-2020-665-RC2, 2021
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Comment on hess-2020-665

Anonymous Referee #2

Referee comment on "Development and evaluation of 0.05° terrestrial water storage estimates using Community Atmosphere Biosphere Land Exchange (CABLE) land surface model and assimilation of GRACE data" by Natthachet Tangdamrongsub et al., Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2020-665-RC2, 2021

General Comments

The authors presented a well-written paper about a high-quality study in which they increased CABLE LSM resolution and assimilated the GRACE data into the model to improve its accuracy. Overall, I am satisfied with the quality of the paper. Some minor revisions can help to increase the quality of the paper. Below you can find my suggestions in this regard.

Specific comments

1) Line 45 and Line 115 LSM model: You used CABLE LSM in your study. What is the advantage of CABLE over other LSMs? Apart from being frequently used in Australia (your study area), what are other reasons/motivations for choosing CABLE as the main LSM in your study?

2) Line 141 and section 3.2.1: Resampling coarse data to high resolution, bears extra uncertainty. How do you deal with this additional uncertainty?

3) Section 3.1: Why did you choose 3D Ensemble Kalman Smoother in your study and did not choose other DA/smoother methods? Please provide few lines about the benefits and potential limitations of this DA method. Also, for completeness, please discuss briefly

why a Smoother can be a better choice than a Filter in your study?

4) Section 4.2: Please provide your reasoning/hypothesis on why GRACE DA impacts deep water storage more than other components of the utilized LSM. You stated that similar finding was reported in other studies. Do you see a similarity between those LSMs and CABLE that resulted in a similar impact of GRACE DA? Is this a location-specific finding (Australia) or can it be generalized to other regions?

Earlier on **line 78**, you state " GRACE DA has shown positive impacts on most TWS components, including groundwater (e.g., Girotto et al., 2017; Nie et al., 2019), soil moisture (Jung et al., 2019), and snow (Kumar et al., 2016)." How do you reconcile this to what you found in your study.

Please discuss.

5) Section Conclusion: What is the role of uncertainty of the CABLE model inputs on the DA results? In another word, if you used other public resources as the CABLE inputs, would you get different results out of DA-based models? You mentioned 250-m resolution SoilGrids data for future use. Based on my personal experience, I found SoilGrids data not very accurate in many locations. Why do you think by using this data you can improve your model? I would suggest that you discuss about it in the paper.

6) Code availability: It would be more useful to the readers if you could share your code for the DA framework.

Technical Corrections

7) Title of the paper: GRACE Data Assimilation implies a DA method that is called GRACE. To avoid confusion for readers who are not familiar with GRACE mission, I would suggest using "Assimilation of GRACE data" instead.

8) Table 2: grid size of Harmonized World Soil Data base is 30 arc-second ~ 0.0083 deg

Please carefully check the rest of the data in this table.

9) Figure 11 & 12: Please specify the label for x axes.