

Hydrol. Earth Syst. Sci. Discuss., referee comment RC1
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Comment on hess-2021-394

Anonymous Referee #1

Referee comment on "The importance of vegetation in understanding terrestrial water storage variations" by Tina Trautmann et al., Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2021-394-RC1>, 2021

Comments on "The importance of vegetation to understand terrestrial water storage variations"

This study uses a conceptual hydrological model to consider the influence of vegetation on transpiration (via vegetation fraction), the maximum available soil water for plant (via rooting depth), and the partitioning of infiltration and runoff (via the infiltration/runoff parameter being the function of vegetation fraction [it is however not clear how p_{berg} partition infiltration and runoff though]). The daily climatology of EVI, and several rooting depth (and maximum soil water storage capacity and maximum plant available water capacity) datasets are used here. And then, the model is calibrated using TWS anomalies from GRACE, ESA CCI Soil Moisture, FLUXCOM-RS ET and also runoff data from GRUN. The results show that with or without vegetation dynamics, seasonal storage variations from B and VEG are not that much difference. Nevertheless, including vegetation changes dramatically the contributions of soil moisture, deep soil water and slow water storages to TWS variations. It also shows in the B simulation, soil moisture dominates TWS variations, while in the VEG simulation, the role of deeper and delayed water storage becomes prominent. Although the paper reads interesting, this reviewer finds some additions are needed to clarify/reinforce the discussions.

Major comments:

1. The current manuscript only used two numerical experiments. One with and another without vegetation. And highlight that the VEG is different than the current approach of using plant functional types or land cover classes. Nevertheless, the comparison between the VEG and the 'traditional approach' is not presented. This reviewer suggest the authors to add simulation results of the traditional approach. As such, the add-value of using

dynamic vegetation can be demonstrated more clearly.

2. It is to note that some studies (see below and some literatures mentioned in the attachment) have dealt with the impact of dynamic vegetation on land surface processes, land-atmosphere interactions, etc. please help to discuss your novelty vs. what has been done.

Weiss, M., van den Hurk, B., Haarsma, R. et al. Impact of vegetation variability on potential predictability and skill of EC-Earth simulations. *Clim Dyn* 39, 2733–2746 (2012). <https://doi.org/10.1007/s00382-012-1572-0>

BO Christoffersen, N Restrepo-Coupe, MA Arain ..., Mechanisms of water supply and vegetation demand govern the seasonality and magnitude of evapotranspiration in Amazonia and Cerrado, *Agricultural and Forest meteorology*, 2014
<https://doi.org/10.1016/j.agrformet.2014.02.008>

Weiss, M., Miller, P. A., van den Hurk, B. J. J. M., van Noije, T., ÅrtefĂnescu, S., Haarsma, R., van Ulf, L. H., Hazeleger, W., Le Sager, P., Smith, B., & Schurgers, G. (2014). Contribution of Dynamic Vegetation Phenology to Decadal Climate Predictability, *Journal of Climate*, 27(22), 8563-8577.

Also, this reviewer felt that the background/literature review part could be enhanced by citing some similar studies on using spatial information for model calibration, for example, those below:

Ruiz-Pérez, G., Koch, J., Manfreda, S., Caylor, K., and Francés, F.: Calibration of a parsimonious distributed ecohydrological daily model in a data-scarce basin by exclusively using the spatio-temporal variation of NDVI, *Hydrol. Earth Syst. Sci.*, 21, 6235–6251, <https://doi.org/10.5194/hess-21-6235-2017>, 2017.

Su, Z., Zeng, Y., Romano, N., Manfreda, S., Francés, F., Ben Dor, E., ... Mannaerts, C. (2020). An integrative information aqueduct to close the gaps between satellite observation of water cycle and local sustainable management of water resources. *Water*, 12(5), 1-36. [1495]. <https://doi.org/10.3390/w12051495>

3. One major concern of this reviewer is that the use of various products for model

calibration are not necessarily consistent. At least, the consistency issue should be checked and discussed before their use here. Sometimes, certain bias-correction might be needed to make various products consistent, before using them with the multi-criteria calibration approach. This reviewer also noticed that the author discussed a bit this in the discussion. Nevertheless, it is not fully clear how the inconsistency between different products will impact the output of the multi-criteria calibration.

Minor comments

Please see attached.

Please also note the supplement to this comment:

<https://hess.copernicus.org/preprints/hess-2021-394/hess-2021-394-RC1-supplement.pdf>