

Reviewer #2:

We would like to thank you very much for your helpful and constructive review. We write our responses in blue underneath each of your comments.

Best regards,

Daniel Blank (on behalf of all co-authors)

The paper explores the linkage between SM and TWS datasets at global scale and daily timestep (by focusing on correlation and temporal shifts among the considered datasets) in order to provide new insights on sub-surface hydrological processes. The topic is relevant and well suited to HESS and the paper is clear, concise and well written. Here below, please find relevant comments.

Thank you very much for this positive feedback!

Main issues:

(*) what are the main limitations and future perspectives of this application? According to this, the final discussion should be expanded, by focusing on e.g. TWS data limitations (in terms of reliability) and human influence.

We will extend the discussion of limitations of TWS, e.g. with respect to the limited spatial and spatial resolution of the TWS data, the noise floor of the daily time series, and the issue of signal separation (full vertically integrated water column including surface water bodies etc.). For this purpose, we will add more information directly in Section 2.1 (description of GRACE data set) and extend the discussion of the results. Notwithstanding these limitations, the perspectives that are opened by the comparison of soil moisture and TWS data in terms of a better understanding of subsurface water transport dynamics and assessing depth scaling approaches of near-surface soil moisture observations as outlined in the conclusions chapter remain valid.

(*) How is it possible to deal with human influence on TWS and its relationship with SM dynamics? Is this a limitation?

While we are not fully sure on the context of the reviewer's question, we may stress that TWS based on satellite gravimetry as well as observation-based soil moisture capture the human influence on water storage, albeit with the differences that TWS is an integrative observation of water storage changes in all storage compartments, whereas soil moisture represents a subset only. Both observation-based-data sets may thus unravel deficits of modelling approaches that do not or not adequately represent such human influences and may contribute to model improvements. While both data products can do so for the effects of irrigation on near-surface soil moisture, for instance, GRACE-based TWS can provide additional information on the effect of such human impacts on water storage dynamics in the deeper unsaturated zone and in the groundwater, for the latter also on groundwater depletion eventually caused by water withdrawal for irrigation purposes.

(* More details about the differences between L3 and L4 SM products should be provided (i.e. useful for readers not expert in SM)

Thank you very much for this suggestion. We will add more information on the conceptual differences between L3 and L4.

Minor issues

(* all acronyms should be defined at first appearance

Thank you very much for pointing this out! We will update this in the text.

(*).l. 219: remove "the" written twice

We will update the text. Thanks a lot!

(* Figure 2: improve figure resolution

We will update the figure. Thanks a lot!

(* add a dot/symbol on the global map to show where the case study grid cell is located

Yes, that is a very good suggestion. We will add it in the revised version of the manuscript.