EGUsphere, referee comment RC1
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Comment on egusphere-2022-452

Anonymous Referee #1

Referee comment on "Technical note: Improving the Initial Conditions of Hydrological Model with Reanalysis Soil Moisture Data" by Lingxue Liu et al., EGUsphere, https://doi.org/10.5194/egusphere-2022-452-RC1, 2022

The topic covered by the Paper is very interesting. The adoption of authoritative (freely available) datasets as support for hydrological analysis or weather-induced impact analysis deserves great attention. In this regard, ERA5 Land represents a valuable example providing data with a very high temporal and spatial resolution (1 hour and 9 km, respectively over the entire Globe).

However, the actual goal of the Article is not clearly identified. The main goal for which hydrological analysis are carried out, has to be identified because it play a key role on the significance (or not) of initial conditions and of the soil moisture data. Furthermore, the two test cases seem to be too large. It entails the adoption of coarse DEM for representing the orography and then the performances could be greatly affected.

Furthermore, I suggest introducing, first, the performance of the "best-configuration" hydrological chain. It permits to give confidence on the entire assessment.

Discussion and investigation about the reasons entailing the discrepancy between ERA5LAnd and BTOP should be improved: how different are the two soil hydraulic parameter datasets and how the values are computed in the two approaches? The key point is the link among the soil zones of the two approaches: I can understand that the choice is not trivial. Probably an analysis about the water fluxes in ERA5 LAnd could permit clearly linking to the soil profiles in the hydrological model. Furthermore, is it not possible to set the depth of soil profiles in BTOP? However, when you use statistical relationships to "correct" the values, all the physical reasons for which they diverge could play a minor role.

Furthermore, some minor suggestions:

The Abstract should be improved. The main topic and the principal Results of the work should be made clearer . A one-sentence about ERA5-Land should complement its introduction. Furthermore, I suggest improving the lexicon (e.g. “luxurious” is not an usual term in scientific literature)

General remark: please check the Figures quality. I suppose it should be greatly reduced during the PDF building

L30: to “explore” the uncertainties; it could be better than “minimize”

L31-35: the significance of initial conditions is strictly related to the “memory” of the analysis and then to its duration (as for weather analysis). This aspect should be clarified.

L43: However, soil moisture represents the key variable as it summarizes the contributions of the different components of the soil water budget (precipitation/infiltration, potential/actual evapotranspiration)

L75: please add information (if available) about the period over which the temperature values have been assessed

§2.1 you should try homogenizing the contents in the description of the two Test Cases (e.g. temperature information is missing for the second one)

§2.3.1: for long-term analysis, surely, evapotranspiration dynamics should be considered; please provide details and insights :about the choice of using external datasets

L146: ERA5Land is conceptually very far from the other products you have introduced (e.g. satellite data); it should be very important to introduce a paragraph to explain what is a reanalysis is, what is ERA5-Land (e.g. the limitations linked to its horizontal resolution). Furthermore, it should be important to report and compare the soil parameters (e.g. porosity) between the BTOP analysis and ERA5 land. It could significantly influence the results.

L171: please check for typos

L185: the rationale for the three EXP should be clarified. You are considering a physically-

based sub-division with a geometrical one. More details about the coupling are needed.

Figure 7: it seems to have a low information content; the scatter plots are quite disperse and then it is hard to identify clear patterns to discuss; furthermore, too many series are retrievable on each plot

Figure 13: the investigated variable is not introduced in the graph; please provide additional information

Under such premises, in my opinion, the Article is not suitable for publication at this stage but I highly recommend its resubmission after major revisions are implemented