Comment on gmd-2022-4

Anonymous Referee #2

Referee comment on "Spatial heterogeneity effects on land surface modeling of water and energy partitioning" by Lingcheng Li et al., Geosci. Model Dev. Discuss., https://doi.org/10.5194/gmd-2022-4-RC2, 2022

This manuscript examines the relative importance of four heterogeneity sources on the spatially aggregated variability of some modeled components of the water and energy partitioning over CONUS. The study is appropriately motivated and, overall, well written. The presented methods are adequate and innovative, and the results reasonable. I suggest publication after some minor revisions and clarifications.

L136 – L140: Since this study did not use the described model developments, I recommend removing this paragraph. Instead, details on the methods used to characterize the land surface heterogeneity within ELM for this study would be appreciated.

L166 – L167: Please clarify the methods used to resample the original datasets to 0.125°.

L251 – L252: Please clarify the methods used to resample.

Section 2.4: Have you also considered analyzing the first-order Sobol sensitivity index? The first-order index would measure just the direct effect of each heterogeneity source on the variance of the model. Compared to the total sensitivity, the first order index would explain the importance of the interactions between heterogeneity sources (e.g., topography and atmospheric forcing; soils and topography).

L361 – L370: A more comprehensive analysis of the factors explaining the seasonal variation of the importance of heterogeneity sources would be appreciated here. For instance, what drives the increased relevance of topography in zones of the East in Summer and Fall.

Table 5: I recommend moving this table to Supplementary material and including Figure S5 in the main text (primarily, since L361 to L370 mainly focus on analyzing maps).