



EGUsphere, referee comment RC2
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Comment on egusphere-2022-529

Anonymous Referee #2

Referee comment on "Evidence-based requirements for perceptualising intercatchment groundwater flow in hydrological models" by Louisa D. Oldham et al., EGU sphere, <https://doi.org/10.5194/egusphere-2022-529-RC2>, 2022

Review of the paper: Evidence-based requirements for perceptualising intercatchment groundwater flow in hydrological models.

Non-conservative reaches and catchments are popular in groundwater-dominated regions and karst areas. Perceptualizing of hydrological processes in these regions is of great importance as it enables us to recognise where intercatchment groundwater flow (IGF) may be occurring and highlights the need for local investigation. In this study, a framework is proposed to evaluate the spatial and temporal IGF and applied to the River Thames with wealth of data and densely gauged river network. It is an interesting topic in hydrology, and the manuscript is well organized. However, there are still several problems and deficiencies in the paper and further revision is needed

General remarks

The water balance is the basic metric to recognize the IGF and the term AET plays a key factor in determine the metric. However, the estimation of the AET contains great uncertainty and AET has great spatial variability in large mountainous basin. The uncertainty in estimate of AET and then water balance metric should be analyzed.

Line 393-410. The analysis of water balance at inter-annual scale should be careful, as the temporal variation of water balance metrics is more complex than that for the multi-year average condition. For example, the soil water storage is a nonnegligible term for water balance. Further, the change of groundwater level is mainly controlled by local hydrogeological conditions. That's for sure, there are significant differences in the temporal variation of hydrological factors among hydrogeological units. But I don't catch that how these reflect or indicate the differences in IGF.

The perceptual model of the Thames is of great importance in the paper (Figure 8). But it seems confusing as too many lines and explanatory text. I suggest authors reorganize the figure 8.

A description of climate, especially the spatial and temporal variability of P and AET, is needed for the basin in the section of study area. A brief introduce of the runoff depth and its temporal variation for the basin is also needed. It will be helpful to understand the degree of losing and gaining of reaches.

Others:

Line 220. "A positive residual" is , which should be pointed out clearly.

Line 265. More explanatory text is needed for figure 2.

Line 380. In figure 5, the water balance metric is greater than 1000 mm/yr in several catchments. The value seems too large for the region. The authors may check it carefully.

Line 413. In figure 7, what are the means of shadows in the sub-figures (a)-(g) and different colors of curves in (h)-(o).

Lines 600-6015. In this section, the authors should focus on what you have found in the paper rather than suggestions.