EGUsphere, referee comment RC1
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Comment on egusphere-2022-529

Anonymous Referee #1

Referee comment on "Evidence-based requirements for perceptualising intercatchment groundwater flow in hydrological models" by Louisa D. Oldham et al., EGUsphere, https://doi.org/10.5194/egusphere-2022-529-RC1, 2022

Review of Oldham et al: Evidence-based requirements for perceptualising intercatchment groundwater flow in hydrological models.

General remarks

The study uses an extensive dataset from the Thames catchment to find proof for (variations in) intercatchment groundwater flow (IGF). IGF is hard to quantify, but it is an important process to consider in hydrological modelling. The paper is very well written and well structured. A significant amount of data collection and processing work was done to enable a useful analysis of IGF at this scale.

On several places in the paper it is stated that both spatial and temporal variations of IGF were studied (e.g. L 19, 112, 605). The spatial variations of IGF are indeed well analyzed. I did not see much about temporal variations of IGF. There is Figure 7 with seasonal patterns in groundwater levels and water balance metrics, which are shortly described in chapter 5.2 and in L476-490. However, the link between this seasonality and the temporal variability in IGF was not described. In addition, there is probably more than just seasonality: what about year to year variations in IGF losses and gains? Do these year to year variations match between losing and gaining stretches (or is there a delay)? These temporal aspects could be either better covered or left out of this paper.

Regarding the spatial analysis: would it be possible to connect losing and gaining stretches, compare the IGF fluxes and maybe combine catchments into larger scale conservative catchments? This may be possible for e.g. the Coln, Kennet, Colne and Mole

catchments.

Detailed comments

L27: We found temporal as well as spatial variability of…? See above regarding temporal variability in IGF.

L110-112: Consider to rephrase into an objective statement.

L190-198: Groundwater abstractions are not mentioned here. Later, this is covered and discussed. Still, I am curious whether the volumes of groundwater abstraction are significant enough to have impact on your analysis. Maybe some regional numbers are available?

L271: in->is?

L302: is the->is in the?

L338: it could save a lot of space to only show the naturalized results in fig 4,5,6. The difference is indeed not that large.

L356-357: with the low amount of catchments (4 in LG, 11 in JL) these interquartile ranges are highly uncertain. You could also choose to plot the averages with error bars to show the (variable) uncertainty of the statistics.

Figure 5: the catchment boundaries are unclear in these maps. Would more legend colors be possible?