

Hydrol. Earth Syst. Sci. Discuss., referee comment RC1
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Comment on hess-2021-422

Anonymous Referee #1

Referee comment on "Exploring river–aquifer interactions and hydrological system response using baseflow separation, impulse response modeling, and time series analysis in three temperate lowland catchments" by Min Lu et al., Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2021-422-RC1>, 2021

The study looks in details at the hydrological interactions between lowland rivers and shallow quifers in three different catchments in Belgium. In their analysis, the authors use a combined approach of baseflow separation, impulse response modeling and time series analysis over a 30-year period. Overall, the paper is well-written and the results are insightful and very useful to the hydrology community. I think the paper should be published after addressing the following minor/technical comments:

- Looking at Fig. 11(c), I can see a slight overestimation of the groundwater levels prior to 2000. Can the impulse response parameters be tuned to improve the fit to the data? Also the seasons, as decribed in the text, are not clear on the figure. Consider zooming in.
- Section 4.2.2: I am interested to look at the entire eigenvalue spectrums. I understand that the first mode at the 3 different sites dominate the rest of the modes. Does the spectrum die after the first leading modes? I expect the leading modes to change if there is some sort of an extreme rainfall event. It might be helpful to comment and discuss this further in the text.
- Do you expect the BFI estimates in these groundwater-dominated lowland catchments to change if the precipitation regimes change?
- The figures could be annotated better. For instance, in Fig. 13 does not label the black and the gray curves.