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Interactive comment on "Estimating groundwater recharge from groundwater levels using non-linear transfer function noise models and comparison to lysimeter data" *by* Raoul Collenteur et al.

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Dear Rodrigo Manzione,

We would like to thank the second Reviewer for his review of our manuscript and the constructive comments to further improve our work. In this short response we outline how we wish to address the Reviewers' concerns in an updated version of this manuscript. With regard to the comments about the value of this work we acknowledge the importance of these comments here, and kindly refer to our response to the first Reviewer for how we plan to address this issue.

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Discussion paper

Specific comments:

The Reviewers' comments are in bold and our response in normal font.

Introduction: highlight the problem and the advantages of TSM. Just an example: Line 35: "In recent decades, the use of a specific type of TFN models using predefined response functions (von Asmuth et al., 2002) has gained popularity for the analysis of groundwater levels (Bakker and Schaars, 2019)". Bakker and Schaars (2019) mention it, but if you present more studies, worldwide, with references from Australia, Brazil, Europe (there is a lot of studies in international journals with those cases studies), the readers could be convinced easily that it is one of the paths to follow. I recommend do add more references. And paint the whole picture about it (at least the last 10 years).

We focused our literature review on the translation of precipitation and evaporation into groundwater levels fluctuations for this type of TFN models, instead of providing a complete literature review on the impulse response method (e.g., von Asmuth et al., 2002). We think this is appropriate for the presented work, but we agree with the Reviewer that adding a few case studies from around the world may convince more readers of applicability of these methods. We therefore plan to add citations to several case studies in a revised version of this manuscript.

Study site and field data: a map of the study is welcome. Lysimeters as well, unless they are commercial as sounds like.

A map of the study area and its location in Austria will be added.

Software: is that available at GitHub? Are you publishing the code? It would be great, consider it.

The software for the time series modeling (Pastas) is publicly available on GitHub (https://github.com/pastas/pastas), this includes all models and tests used in this study.

The scripts to analyze the data are available upon request, but since these require the non-publicly available time series data we did not make them public. The scripts are however available upon request from the first Author. We will add a statement in the "code and data availability" section about this.

Section 4: I did not like the small graph under the others at Figure 6, too polluted. We will consider adding a separate plot of the impulse and step responses for all three models in a revised version of this manuscript.

Section 5: the text of the items are too small to be individual items, consider changing the numbers (5.1, 5.2. . .) by bullets.

We plan to rewrite parts of Section 5 (we refer to our response to Reviewer 1) and will reconsider the subsection titles and numbering.

Conclusion: too long, still with references, still sound loke discussion to me. Be mo direct to the point, staying just with the finds of your study and move back to the previous item the remaining text.

We will consider moving parts of the Conclusions to the previous Section 5 and try to be more concise in the conclusions. We want to clarify that the references cited here are already cited earlier on in the manuscript and are only meant to show how the conclusions from this study are in line with findings in earlier studies.

Appendix: I don't think the whole appendix is needed. The formulas and the test is described in the literature, just plots and tables are fine.

We thank the Reviewer for this comment. We agree with the Reviewer that these tests are already well described in the literature and will remove this Appendix and add references to the original literature instead.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2020-392, 2020.