

Interactive comment on “Hydrological functions of sinkholes and characteristics of point recharge in groundwater basins” by N. Somaratne et al.

Anonymous Referee #3

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General comment

In this study, water isotopes and major ions are used to characterise the hydrological characteristics of point recharge at three karst aquifers in Australia. In addition, chloride measurements in the groundwater and the chloride mass balance method (CMB) are tested for their adequateness at the three locations. The authors conclude that the system shows strong effects of karstification and that the CMB method is difficult to apply under such conditions.

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But it is difficult to understand how the authors came to these conclusions. The paper is written in a unstructured way and a lot of information is missing or appears too late at wrong locations in the manuscript. In more detail:

1. The introduction provides no state of the art about karst system characterization, karst recharge and the CMB method.
2. The methodology section focusses on a detailed but unsystematic description of the study sites. Only few lines explain some of the methods.
3. In the results and discussion section the reader confronted with a mixture of methodology, results from methods that were not explained before, and conclusions that are not based on the previous findings.
4. Only a short section “recharge” finally focusses on the recharge processes and point recharge. This section is too short and repeats again study area, methods, and the mixture of results discussion and conclusions with the same problems as mentioned above.

In my opinion the analysis in the form it is presented does not support the conclusions, i.e. there is no conclusive picture about the functions of sinkholes and the characteristics of point recharge. In this form the manuscript is not adequate for publication in HESS. To reach the required level analysis, figures, tables, and finally the manuscript structure need strong improvements, which unfortunately fall beyond major revision. Please find below some comments that might help to conduct the necessary improvements.

Specific comments

1. P11424L12: “diluted”, in this context I rather expect “enriched”. Please correct or clarify.
2. P11424L25: The duality of karst hydrological processes does not stop with recharge; it also appears in the phreatic zone and at the karst springs.

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3. P11424L19-P11425L26: The introduction misses a link to the current state of the art in the relevant fields (karst system characterization and recharge assessment). Consequently the research questions and the scope of this study are not clear.
4. P11426L9-13: This is actually the only part of the methods that describes the methodology (with only 5 lines obviously too short). The rest of the section is rather a study site description. There is no description about the methods that will be used and the data that will support the analysis.
5. P11426L14-P11428L22: The description of the study sites is too detailed and not systematic. I recommend providing a table that shows the important characteristics of the three basins, the available data, and their sources, and shorten the text strongly.
6. Figs. 1-3: The three figures of the study sites show different types of information, which makes their comparison very difficult. In addition, a lot of information is shown, that is not relevant for the study. Please simplify and unify.
7. P11429L3-10: This general information does not belong here since it has only little relation to the results (as does the link to Fig 4a at this location).
8. P11429L16-P11430L6: These two paragraphs appear rather like conclusions. In addition, the methods that brought their findings are not explained in the methods section.
9. P11430L8-20: The use of major ions and piper diagrams was nowhere mentioned in the methods section. Therefore, the results presented here are hardly understandable.
10. Fig 5: Without any elaborations about the choice of the different wells for this analysis, the figure is difficult to understand.
11. Fig 6: Just for mentioning two values of EC, it is not worth to show an entire figure. Please remove and provide information in the text.
12. P11431L1-11: See comment 9; method not explained, results hardly understand-

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able.

13. P11431L11: This would be the place for a discussion.

14. P11431L14- P11432L14: Repetition/site description. This does certainly not belong here. In addition, no word about the determination of recharge was found in the methods sections.

15. P11432L15-18: It is not clear, what was done by the authors of this study and what was done in previous studies.

16. P11432L21- P11433L8: This belongs to the methodology section.

17. P11433L9-L27: These points, as well as the figure 9, appear like hypotheses about the characteristics of the systems. But the very little results presented here and before, and the difficulties in understanding them because of the majorly missing methodological explanations, do not support much conclusions about their validity or falseness.

18. P11434L1-11: This belongs to the methods section.

19. P11434L12-24: Again, too little mentioning of results.

20. P11435L2-6: This is well known and has not to be mentioned in the conclusions of a research paper.

21. P11435L10-20: Like many parts of the manuscript the conclusions do not clearly relate to the rest of the text. In my opinion the analysis, in the way it is presented here, does not support them.

Technical comments

1. P11424L2-3: Please rephrase

2. P11425L1-24: There is no relation between these sentences, which makes them difficult to read.

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3. P11426L10: change “Vs” to “vs”.

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