

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

Anonymous Referee #2

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Somaratne et al. have studied the hydrological functions of sinkholes and point recharge at three karst systems in Australia. The study presents some interesting ideas and data, but the paper is somehow confuse and not ready for publication. I recommend rejection, but would encourage the authors to continue their study and prepare a more complete and thought-out paper later on.

It is interesting to think about fresh-water plumes related to point recharge at sinkholes. It is also interesting to study the propagation of these plumes in the aquifer and to investigate how this influences representative sampling and the use of natural tracers for recharge quantification.

Several major shortcomings of the paper prevent me from recommending it for publi-

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cation:

The structure is confusing. The Methods chapter does not focus on methods but presents detailed descriptions of three study areas, including some results found during this study, such as the density of sinkholes. The Results chapter does not focus on results, but starts with some general statements concerning the importance of recharge quantification in managing aquifers. After the results chapter, there should be a discussion or conclusion chapter, but instead, chapter 4 deals with Recharge.

The research approach, as well as the results and conclusions are not fully convincing. The paper presents some interesting measurements, such as EC profiles in wells or EC in a water cave. This is interesting, but it is not clear if and how these EC anomalies are actually related to point recharge. Such anomalies can also be found in other hydrogeological settings and can be related, for example, to seawater intrusion, up-coning of brackish water caused by aquifer over-pumping, limits between local and regional flow systems (Toth), or to mixing of water from different aquifers. So although the data are potentially interesting, the presentation and interpretation is not sufficiently conclusive.

Additional comments:

The conceptual block diagram is useful to understand one of the three study sites. However, the other two study sites are difficult to understand based. Hydrogeological cross-sections would help.

Karst systems are also characterized by a high degree of temporal variability. The paper mostly deals with spatial heterogeneity but largely misses the important aspect of variability.

There are very different types of sinkholes or similar features. Not all are related to significant point recharge. Furthermore, there are different definitions and understandings of sinkholes. Point recharge mostly occurs where surface streams sink underground at

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swallow holes or ponors (some people would call this a sinkhole). However, most “sinkholes” in the US are rather collapse features, and most dolines in the classic Dinaric karst are geomorphologic depressions but not necessarily places of point recharge. A paper dealing with “sinkholes” should be more precise in using this term. It’s not about terminology, but it’s about understanding the systems and processes.

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