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Hydrology and Earth System Sciences
Discussions

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

Anonymous Referee #1

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General comments: In this paper the authors are trying to examine the contributions to total recharge from point sources, relatively to diffuse recharge, in 3 sites with Karstic limestone aquifers, which are known as extremely heterogeneous. Their tools to evaluate and compare between point and diffuse recharge are mainly measurements of chloride and δ18O concentrations, geochemical analysis of rain water, groundwater and surface water, and defining their relations. The paper is very difficult to read and comprehend for many reasons.

1.Karst systems are spatially varied. If one looks for systematic understanding of karst (including point and diffuse recharge) he should follow the temporal variations of the system in few representing locations. The author's analysis is based on spatial averaging, which in general not suitable for studying karst systems, as they found at their

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conclusions.

2.For their analysis the authors report about 3 sites, with large amount of location, geological details and measurement sites, which include ground water wells, lakes, caves and surface water basins. Moreover, the provided maps (Figures 1-2-3) does not bring enough information for the average reader to find his way in this huge amount of geographical and geological information, leaving the paper suitable only for local hydrologists familiar with the research region and its problems.

3.There is no clear research approach. In the abstract the authors declared that "We studied three groundwater systems in karstic settings dominated by point source recharge in order to assess the relative contributions to total recharge from point sources using chloride and δ18O relations." However, deeper into the study the entire approach is unclear: do the authors know the degree of recharge through point source, in the different sites, in advance, and verify it with geochemical data? Or is it the opposite – they evaluated the geochemical composition, and with it they managed to evaluated the degree of point source recharge?.

4.The quantification methods and results are unclear. For example: which mathematical procedures and which data were used in the reported tables 1-2? In their conclusions the authors wrote: "This paper presents case studies that concur with the ïňĄndings of Hallberg and Hoyer (1982), Gunn (1983), Tihnasky (1999), White (2003), Bakalowicz (2005), Goldscheider and Drew (2007) and Taylor and Greene (2008) that karst systems have a distinct hydrologic function resulting from a duality of ïňĆow regimes in inïňĄltration and recharge, and in preferential groundwater ïňĆow paths." My impression is that the authors did not bring generally new findings or methodology regarding recharge and spatial distribution of water quality in karst systems, and therefore their publication is more suitable as local report but not recommended for HESS.

Specific comments: These are only several examples of the comments I have. The en-

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tire paper was unclear to me. Page 11425, lines 14 -19: The paragraph does not mean anything. Claiming that karst is complex and cannot be studied using conventional methods is fundamental fact. There is no need to use 5 references to say it.

Page 11428, lines 16-17: I could not understand the difference between “irregular annual volumes” (50,000-200,000 mˆ3) and amounts in “rare occasions” (19,000,000 mˆ3). Section 3.1: What is the meaning of “lack of intermediate data points” if you put it in numbers? Which “gap” is an evidence of sinkholes recharge and which is an evidence of the absence of such recharge? The entire logic and arguments here are not clear. Monitoring bias can be used to criticize any measurement results.

Page 11431, lines 8-11: The conclusion brought here is obvious and well known for karst systems- their non-homogeneity of spatial distribution in many characteristics of geochemical components is well known. The contradiction with the fact that the system is in steady state (statement made by the authors) is irrelevant. Steady state is a characteristic of the system during time, and karstic hydrological systems can be highly varied in space but steady in time. There is no contradiction here.

Page 11432, lines 3-4: In which area the MUSIC model was operated. It is not clear.

Page 11432, lines 15-18: What is the meaning of average annual recharge of 2.5*10ˆ6 mˆ3? What can the reader do with this number? How it helps to distinguish between sink holes recharge and diffuse recharge?

Page 11433 lines 13-19: Most of this section is true, but again, not new. What is the contribution to science of the sentence “...it is generally not possible to get a representative average, or weighted average of chloride samples by measurement. . .”. If the authors are not bringing any new findings or methods to correct this ‘not possible’ situation, this declaration is meaningless.

Page 11435 conclusions: The conclusions are that we cannot estimate anything with the measurements. Once again I have the impression that other than some specific

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measurements in karst system, the paper has no significant “take home message”.

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