Hydrol. Earth Syst. Sci. Discuss.,
https://doi.org/10.5194/hess-2018-26-AC2, 2018

Hydrology and Earth System Sciences
Discussions

Interactive comment on "Evaluation of Lacustrine Groundwater Discharge, Hydrologic Partitioning, and Nutrient Budgets in a Proglacial Lake in Qinghai-Tibet Plateau: Using ^{222}Rn and Stable Isotopes" *by* Xin Luo et al.

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Received and published: 7 May 2018

Reviewer #2 General comments: This is an interesting and generally well-written paper that makes a good contribution to understanding the groundwater surface water interactions and estimating the lacustrine groundwater discharge in mountainous proglacial lakes in the QTP. The abstract is correctly informative with some remarks (see below). The introduction and the site description take into account previous papers in exhaustive way. The methodological approach for data analysis is modern without particular novelties. High-resolution 222Rn activities, water level, both in water temperature and,

wind speed together with stable isotopic data are quite impressive. Many studies have done to explain the high single digits in the whole paper. ïČŸ We appreciated the overall positive comments.

4. Discussion Do the adjoining lacustrine aquifers receive ('recharge') to sustain the inferred rate of groundwater discharge? And is the inferred width of the zone of lacustrine groundwater discharge compatible with the physics of the groundwater flow system and hydrological cycle? ïČŸ The regional precipitation recorded by the Jiuzhi station is to be around 90 mm d-1 during Aug, 2015. When deploying an empirical infiltration coefficient of 0.2 for the lake basin, the aquifer recharge rates are yielded up to 18 mm d-1, which is sufficient to maintain the water balance within the lacustrine aquifers. Moreover, as indicated by previous studies in an interior lake of the QTP, Nam Co, a lake located at the area with relatively high evaporation and lower precipitation, its LGD is estimated to be 5-8 mm d-1 and is comparable to the results of this study. This also indirectly implicate that the LGD in this study is tenable and can be balanced by the recharge of the lacustrine aquifers, as Ximen Co basin is influenced by rather larger precipitation and lower evaporation compared to Nam Co. ïČŸ The inferred width of the zones of lacustrine groundwater discharge is also regarded as the seepage face. Previous studies have indicated that the groundwater seepage areas are mostly located along the transect within 10-20 m across the lakeshore (Luo et al. 2016, Luo et al. 2017, Rosenberry et al. 2015, Schafran and Driscoll 1993). While the deep groundwater system is rather constrained by the Precambrian bedrocks (Einarsdottir et al. 2017), and the LGD occurrence is considered to be constrained within the seepage faces along the lakeshores, and within the bathymetry of epilimnion.

Did you consider the lag time between recharge and chemical changes in the lacustrine aquifers? ïČŸ The lag time between the recharge and the chemical changes in the lacustrine aquifers is not considered in this study for the following reasons: (1) For 222Rn, the equilibrium state is assigned as 222Rn will reach equilibrium states within short distance (sever centimeters) and elapsed time after the infiltration (Ku et al. 1992,

Porcelli 2008). (2) Stable isotopes generally behave rather conservatively after entering the aquifer and there is negligible fractionation during the transport in the aquifer between the recharge and discharge. (3) The groundwater sampling locations were located at the immediate zones of the lake shore, and therefore, the dynamics the flow length and recharge lag time is minimal and negligible for the reactive solutes of DIN and DIP, similar as suggested in many previous studies (Dimova and Burnett 2011, Dimova et al. 2013, Kluge et al. 2012, Luo et al. 2016).

Please consider the relationship between Fig 5 and Fig 6 to give a relevant illustration on chemical components and isotopic data. ïČŸ We are sorry that we forgot to attach Figure 5 in the previous version. This figure was used to give a relevant illustration on chemical components and isotopic data.

Fig. 6 The conceptual model of 222Rn transient model looks well. But the associated illustration in the text is not convincing on the flow pathways for the 222Rn sources. Clearly some components of the conceptual understanding are not supported by the data. The manuscript would also benefit greatly from a more thorough literature review, which in-turn will help establish the objectives of the work. My main concern with the paper is with the 222Rn analysis that I don't think is well enough explained to be convincing. Doing a more thorough job on this will add material. ïČŸ If we understood properly, this comment has two points: reliability of some components and literature review. The reviewer did not specify which components that were no supported by the data. We guess they could be lake evaporation and riverine inflow. To take account this comment, we have reviewed more relevant literatures and added more discussion on lake evaporation and riverine inflow (lines 586 to 664).

Conclusions This section just summarizes the main findings of the project. In the introduction you make some general statements about the need to understand processes in these impacted lacustrine aquifers in general. In this section explain in more detail how your project helps us to understand processes in these environments more broadly; the paper will have more impact if researchers from elsewhere in the world

can see relevance to their studies and a paper in a major international journal such as HESS needs to have broad appeal ïČŸ To stress the research significance of this study, we have added more discussions to explain how the results of this study facilitate the understanding the environments more broadly (lines 767-773). We hope the updated MS can meet the board research interest of HESS.

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Please also note the supplement to this comment:
https://www.hydrol-earth-syst-sci-discuss.net/hess-2018-26/hess-2018-26-AC2-supplement.pdf

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