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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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Reviewer #1 General comments: This paper is focusing on the evaluation of LGD and its related nutrient budgets and hydrologic partitioning in proglacial lake of QTP. The work is great and the paper is overall well organized. Anyway, I have the following comments for the authors to consider.

Reply to General comments: ïČŸ We appreciate the overall positive comments for this study.

Specific comments 1. Authors should address more about why it's important to study proglacial lake, especially the ones in QTP, in the introduction part. ïČŸ Well taken. We have added more description of the proglacial lakes, and lake dynamics in QTP under the influence of climate change and global warming. Some latest lake studies in the QTP were also reviewed (lines 72-93).

2. The primary productivity is calculated based on the dissolved inorganic nutrient budgets. Authors should be careful to do so. Did the authors consider the transformation between dissolved inorganic and particulate inorganic forms? Redfield ratio usually works in oceanic aquatic system. In lakes, the ratio is fairly variable. ïČŸ Good question, indeed, we noticed that the DIN and DIP relation cannot be used to quantify the primary production in the fresh lacustrine systems due to the high variability of Redfield ratios and the possibility of transformation between DIN/DIP. Based on the measurement results, DIN: DIP ratios in the lake water and groundwater are all much large than 16:1, indicating the phosphate limited conditions. ïČŸ As indicated by previous studies of glacial melting water bodies in the QTP, Arctic and Antarctic, the dominant form of dissolve phosphate is DIP, while the DOP contributes less than 10 % of the dissolved phosphate (Hawkings et al. 2016, Hodson 2007, Hodson et al. 2005, Liu et al. 2011, Mitamura et al. 2003). In the freshwater system, particular? phosphate is highly bounded. Therefore, it is reasonable to assume that primary production in the lake water is limited by DIP, and to assign glacial melting water as phosphate limited condition in this study. ïČŸ The primary producers in the lake system consume the nutrient production under variant N: P ratios as indicated by previous studies (Downing and McCauley 1992). To avoid the ambiguous statements and conclusions, we discussed this term as the biological uptake/transformation of nutrients, and removed the ambiguous statements on primary production throughout the MS (lines 707-751).

3. Radon in air is important term to do balance calculation. Was the Rn in air measured? I did not see the information or data about this term in the manuscript or the SI. ïČŸ Yes, we placed RAD7 for air radon-222 measurement at the lake shore for about

4 hours, and the mean activity of the lake area is 1.51 ± 0.97 Bq m-3. We added the ambient air radon-222 activities in Table 1 and some descriptions in the methodology part (lines 249-252).

4. Line 53-60, these two sentences are both started with the locations. Please revise them. ïČŸ Well taken, these sentences were revised as suggested (lines 67-68).

5. Line 208, how often were the Ra-226 samples collected? Or just one sample, and you assume Ra-226 is constant? 6. Line 279, how long is ïAËŻDËĞ t? 7. Line 327, figure 5 is not attached. ïČŸ Due to the bad weather condition and large sampling volume, we could only obtain one 226Ra sample. However, radium in the lacustrine system is significantly lower compared to 222Rn, therefore, the decay input of 222Rn from 226Ra is minimal and negligible. Thus, the spatial heterogeneity of radon-222 will mount minimal effects on the final 222Rn mass balance models. ïČŸ The time step is set to be 5 min, in consistent with the 222Rn record interval. More statements? were added in the revised MS (lines 333-334). ïČŸ Figure 5 was attached in the revised MS.

Technical corrections 1. Line 144, 0.7 or 7? ïČŸ Well taken, this is 0.7 m s-1, and change was made in the revision MS (line 187).

2. Line 195, the unit should be L min-1. ïČŸ Well taken, unit was change to L min-1 (line 238).

3. Line 230, change “recently” to “recent”. ïČŸ Well taken, change was made (line 283).

4. Line 280, should be Equation (2). ïČŸ Well taken, change was made (line 335).

5. Line 383, two 18O? ïČŸ Typo and change was made (line 439).

References Downing, J.A. and McCauley, E. (1992) The nitrogen: phosphorus relationship in lakes. Limnology and Oceanography 37(5), 936-945. Hawkings, J., Wadham, J., Tranter, M., Telling, J., Bagshaw, E., Beaton, A., Simmons, S.L., Chandler, D., Tedstone, A. and Nienow, P. (2016) The Greenland Ice Sheet as a

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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-AC1-supplement.pdf

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