

***Interactive comment on* “The contribution of groundwater discharge to the overall water budget of Boreal lakes in Alberta/Canada estimated from a radon mass balance” by A. Schmidt et al.**

Anonymous Referee #3

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The Schmidt et al. paper is a nice example of calculating the direct groundwater input into surface water body, using a Rn balance. The paper shows that groundwater discharge to glacial lakes may sometimes be significant, but also that it is very variable from one lake to another and even within the same lake. The RAD7 continuous mode, usually used for monitoring submarine groundwater discharge, was applied here successfully to a limnological study. My main comments are as follows.

1. The authors calculated a discharge of 0.01 cm/d for Lake A. This is actually zero, especially considering all the uncertainties involved. Thus, the discussion of its signifi-

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cance relative to the total discharge is unnecessary and not relevant.

2. Surface Flow. The authors conclude that even in Lake B, 86% of the water input to the lake is by surface flow. On the other hand, in their mass balances they have a (hidden) assumption that this surface flow carries no Rn. This had to be studied or at least discussed, especially since the authors mention (P. 4997) that the drainage pattern is poorly developed. A surface flow with no developed creeks could lead to larger rock/water ratios, thus to higher Rn activities. Actually, considering the relatively low Rn activities in the lake, surface flow could account for a major part of Lake B inventory and probably all Rn in Lake A. The nature of this flow should also be discussed. Please note

3. Lake B. It is assumed (P. 5002) that the 5% of the lake floor is sandy, while 95% is silty. It is not clear what is the basis for this assumption. What observations is it based on?

4. The percentage of groundwater/total input. The authors claim (P. 5004) that in 2007, groundwater discharge could be up to 64% of the input. However, they base it on their 2008 Rn measurements and on the total low input of 2007. 2007 balances should be based on this year's measurements.

5. The difference between Lake A and Lake B. The authors suggest that the difference in discharge (in favor of B) is related to the higher catchment/lake surface ratio in Lake A, which leads to higher fraction of surface flow. This is true, but it should not affect the absolute value of groundwater discharge, which is actually zero in Lake A. The other explanation of difference in hydraulic properties of the lake floor sounds more reasonable.

6. Discussion. As is, the discussion is poor. In order for the paper to be appropriate for publication in this journal, the authors should include a broader and a more scientific discussion of their results. Mainly, they should discuss it in comparison with other studies of groundwater discharge into lake, even if those were not carried out by radioactive

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tracers. They should talk about rates (specific discharge), as well as about the water balance significance. They should discuss discharge into the various types of lakes, e.g. tectonic vs. glacial; high vs. low surface/depth ratio; temperate vs. semi arid lakes, etc.).

7. English. The language is pretty much appropriate. Just one comment: I would refrain from using the term 'radon activity concentration'. Simply use 'radon activity'.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 6, 4989, 2009.

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