Hydrol. Earth Syst. Sci. Discuss., 10, C4647–C4649, 2013
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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Water balance and its intra-annual variability in a permafrost catchment: hydrological interactions between catchment, lake and talik" *by* E. Bosson et al.

Anonymous Referee #1

Received and published: 5 September 2013

General corrections

Page 9275, Line 12: There is no Frampton et al. 2013 in References. P 9277, L 15: What is the correct spelling of Alexanderson, two s's in the References. P 9278, L 1: To me, exposed slope is the windward slope and the windward slope is generally exposed to erosion (scouring) while leeward slopes experience drifting (deposition). Here you say that drifting occurs on exposed slopes, is this what you meant? P 9279, L 24: You should indicate here that the hydraulic head of the lake is greater than the hydraulic head of the borehole. P 9280, L 20 and P 9281, L 6: When deriving these equations, the direction of flow is unknown and therefore some of these terms should be preceded

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by ±. For example in equation 2 you have + Rgw, it would be better to express this as ±R+gw+ (it turns out it is actually negative). Again in equation 4, it would be clearer to express it as ± ΔSal. P 9281, L 5: I was confused for quite a while about what area you were considering the lake catchment to be, you should make it clear that it does not include the lake, just the land area surrounding the lake. P 9282, L 5: It is not clear to me what point you are trying to make here, rewrite. P 9282, L 13: Should indicate that ΔH is positive (anyway I think it is). Section 3.2: I assume all of these values are for the surface area of the lake (should make this clear). Section 3.3.1: indicate that fp stands for frozen period. P 9285, L 18: Should show units (m/s). P 9288, L 14: What is the definition of a snow blowing event? P 9288, L 19: Change smaller to thinner. P 9291, References: I did not see the following citations used in the text: Bense et al., 2012; Lyon et al., 2010; Penman, 1948. P 9293, References: Delete Hiroyuki et al., 2004. The correct citation is the reference above on L 15 (Hirashima et al., 2004). P 9296, Table 1: Relief implies a range, so it should be "Catchment relief, m 337-505" or "Catchment elevation max, m 505" and "Catchment relief min, m 337" P 9297, Table 2: Capatalize Ingoing (column 2) and CS (column 3). P 9301, Figure 1: Figure is quite small and difficult to see the details. P9302, Figure 2: Why doesn't the water balance of the catchment surrounding the lake show up in this conceptualization? P 9304, Figure 4B: You show melting (two events) of the snowpack in March, does the air temperature confirm that it was warm enough for melting (versus blowing away at the site). P 9306, Figure 6: Why not show all the relevant fluxes in this figure? P 9307, Figure 7: For the lake evaporation, shouldn't the values be 156070 (one to many zeros) – 164010. P 9308, Figure 8: I think the wind and SWE data should be plotted on a separate figure as it is not directly related to the other terms plotted in this figure. Also, what does m vp stand for?

Comments

The hydraulic connectivity of the lake to the subpermafrost groundwater is one of the highlights of this study. The fact that a talik through the 300 m thick permafrost exists

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is more interesting than the magnitude of the relatively small groundwater flux to the subpermafrost aquifer. I think it would be a valuable contribution to this paper if you could include a discussion of the temperature regime of the surrounding permafrost and the temperature at the bottom of the borehole in the talik (it was indicated in the paper that the talik temperature was measured via the borehole).

This study is basically a water balance of a closed watershed where $P - ET = \Delta S$; at least this is what it appears to be during the short one year field study. In such a setting one would expect that certain chemical ions would demonstrate increases in concentration resulting in higher values of variables such as electrical conductivity. Is the electrical conductivity of this lake comparable to other land locked-lakes? This would give some insight into whether the pattern of flow observed in this short study is typical over the long-term.

There are two weaknesses in this study that limit the conclusions that can be drawn. First is the short duration of the study, basically one year. This does not allow for any examination of the year to year variation that may be observed in the various fluxes and storage terms. For example, it was indicated that there was evidence of past outflow from the lake, are these outflow fluxes significant some years relative to other fluxes? The second weakness is that not all the terms in the water balance equation were measured; the equation was used to determine one or more fluxes. For example, for the catchment surrounding the lake, the ET was estimated to be equal to the residual of the water balance equation. This means that all of the error generated in performing the water balance calculation ends up in the ET term. The longer you implement a water balance study, the better you will understand the magnitude of the error you are facing. Is there meteorological data from nearby sites (Kangerlussuaq) that might shed some light on whether the year of your study was typical?

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 9271, 2013.