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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 #3

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General comments

The paper presents hydrometerological dataset for one year and water balance calculations based on collected data. It identifies and analyses qualitatively and quantitatively the processes of water balance formation of small lake and its catchment.

The weakest point of the study is a short time period of data – only one year. It hardly could be used for comprehensive data analysis, the identification of dominant hydrological processes and the evaluation of water balance components and their uncertainties with high degree of confidence.

The uncertainly estimation of defined water balance components seems to be based on pure assumptions of possible error sources that do not lead yet to using additional data or conducting new measurements. Why did not the authors consider calculated PET, the assumption of invariable lake area, the processes of water freezing and thawing in active layer and existence of Ral during the part of the frozen period as possible sources of uncertainty?

The paper in present shape does not significantly contribute to the understating of the Arctic hydrological system. The possible ways of the increasing scientific importance of the research could be the extension of studied period, upscaling the results to larger areas and/or involvement of additional data and methods (isotopes, mathematical modelling, etc.)

Specific comments and questions:

Section 2.1 includes many details about the catchment's climate, geology and topography that are not used for further analysis. It does not contain any information about active layer depth and its variability within the catchment that seem to be important for evaluation of Ral.

Section 3.1 and Fig.5: The term "conceptual model" usually refers to mathematical models that use simple empirically-derived equations for the process representation. It's better to use the term "perceptual" or "descriptive" model for description of hydrological system that the authors present in Section 3.1 and Fig.5

Section 4 should also include a comparison of presented results with similar studies from other catchments.

Page 9273, line 29: The authors could cite some of mentioned "few previous studies". Page 9276, lines1-3: Does slope aspect and inclination influence the precipitation, vegetation and active layer depth?

Page 9276, line 10: What is a depth of the drilling? Does it confirm the presence of

open talik?

Page 9277, line 13, Table 3: How was the precipitation correction factor determined?

Page 9282, line 5-8: Do the authors have any evidence of described process of lake water flowing into active layer in transition period between “active” and “frozen” periods? Did the authors consider possibility of opposite-direction process – push-out of water in active layer during the ground freezing?

Page 9282, line 15: Did the authors use 2–5$\times$10$-$8 ms$-$1 as the values of K? How could the authors assess the uncertainty associated with K except water balance calculations?

Page 9276, line 21; page 9280, line 13; page 9282, lines 20-21: How did the authors estimate the PET? As it can be understood the authors assumed that actual ET is equal to the PET which may be questionable for the frozen period when the lake surface is covered by ice and snow and the air temperature is negative.

Page 9287, 2nd paragraph: Suggested relationship between the decrease in lake water head and the number of wind events should be further checked, for example by using the information from the time lapse camera.

Page 9290, line 23: The conclusion about the importance of sublimation from snow and snowdrift in water balance during the frozen period seems to be not enough justified because these values were determined as the residuals in water balance calculation for studied year.

Figures 2, 3 and tables 1, 4 are not necessary as they do not contribute to the manuscript substantially. Figure 6 could be more informative if the precipitation and SWE added.

Technical corrections

Figure 7: All calculations in the paper are presented in mm, but the Fig.7 shows

m3/year. It complicates the understanding of the Figure 7.

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