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Interactive comment on "Water-balance and hydrology research in a mountainous permafrost watershed in upland streams of the Kolyma River, Russia: a database from the Kolyma Water-Balance Station, 1948–1997" *by* Olga Makarieva et al.

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The authors thank Referee # 1 for his valuable comments. The responses are provided below. The changes are made in the text which is attached.

Major comment: The discussed data set is called "Kolyma water-balance station" implying that the water balance has been calculated here. However, only the different components of the water balance are presented in this manuscript, but not the bal-

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Discussion paper

ance. I know, it is very difficult to do that for such a location where winter conditions are extremely harsh. Nevertheless, I wonder whether or not the annual water balance has been calculated and suggest to include such results if available. Else you may explain why the term “water balance” is so prominent in the name of the station.

Response: Water-balance stations are a historical name of the network of the research watersheds that existed in former USSR. The overall goal of the water-balance stations network was detailed study of water balance components on slope and small scales in different environmental settings for the development of methods of hydrological forecast and flow characteristics assessments for engineering design. The KWBS was one of 26 water-balance stations of the USSR and the only located in the zone of continuous permafrost. The explanation is added to the text. Lines 48-55

Additional section 5 is added (lines 540-623). In this section the results of rough estimation of mean annual water balance for three micro-watersheds with area less than 1 km2 and representative for main landscapes of studied territory (Severny, Yuzhny, Morozova) are presented and compared with the assessments made by other authors. The estimation of water balance for the whole watershed of Kontaktovy cr. requires special analysis and does not lie in the scope of this paper; only the results obtained by other authors are shortly summarized.

Minor comments: - In the abstract you state that “the data are representative for the vast territory of the North-East of Russia”. What is this claim based on? Response: Nasybulin (1976) showed that runoff characteristics at the KWBS are representative for the upper Kolyma River area. Taking into account the similarity of main landscape types across mountainous regions of North-East Russia to those found at the KWBS, the conclusion can be made that the KWBS hydrological conditions are actually representative for larger areas than described by Nasybulin (1976). These explanations are given in the text (lines 93-97)

“the data are representative for the vast territory of the North-East of Russia” was

changed to “the data are representative for the mountainous territory of the North-East of Russia” in the abstract (line 18)

The reference is added to the reference list Nasybulin, P.S. (1976) The representativity of runoff characteristics at the Kolyma Water Balance Station for the upper Kolyma area. Natural resources of the USSR North-East. Vladivostok, AN DVIS IBPS, 32-41 (in Russian)

You mention different types of evaporimeters (Rykachev, Gorshenin, GGI-500), some of them used also for snow evaporation measurements. Could you briefly explain how these evaporimeters differ from each other. Response: Evaporimeter GGI-500-50 is a standard device for the soil evaporation measurements in Russia and former USSR. It consists of two cylindrical vessels, one inside the other, and a water-collecting vessel. The bottom of the inner cylinder has openings; the core sample is placed in it. The quantity of water evaporated is determined from the difference in weight of the sample as measured over two successive observation periods. Rykachev evaporimeter was used for the soil evaporation measurements in 1950s. It consists of a sealed square rectangular box with a core sample. The box was placed inside another box installed in the ground. Since the inner box is sealed the device doesn’t account for infiltrated water. We could not find any information about Gorshenin evaporimeter. We continue searching. The clarification is given in the text (lines 335-346)

Also, when you measure snow evaporation, is this representative for snow on the ground? I assume (and know from our own longterm observations) that snow evaporation from trees (interception) is more relevant than from the ground. Can you comment on that? – Response: This measurement accounts for the snow evaporation on the ground only. In the conditions of KWBS with the larch as the main tree type, intercepted snow was only temporary phenomena because of cyclonic activity in January and February. Wind during the cyclones blows away snow from all trees except dwarf cedar that is under snow for the most part of the winter. The clarification is given in the text (lines 368-32)

I guess that most readers of this journal don't know what a Danilin cryopedometer is. I understand that it measures the thaw depth of the active layer, but how exactly? – Response: Danilin cryopedometer (frost tubes) was designed by Danilin (Snyder et al., 1971). Cryopedometer consists of a rubber tube 1 cm in external diameter and calibrated to an accuracy of 1 cm. The tube is filled with distilled water, closed at both ends and lowered into a casing (an ebonite pipe) installed in a borehole in the soil. In order to measure the depth of freezing, the rubber tube is taken from the casing and the lower end of the ice column in the tube was determined (Lebedeva et al, 2014). The explanation is introduced in the text (lines 387-391)

Lebedeva L., Semenova O., Vinogradova T. (2014) Simulation of Active Layer Dynamics, Upper Kolyma, Russia, using the Hydrograph Hydrological Model // Permafrost and Periglac. Process. 25 (4): 270–280 DOI: 10.1002/ppp.1821 Snyder F, Sokolov A, Szesztay K. 1971. Flood Studies: An International Guide for Collection and Processing of Data. Unesco: Paris; 52pp.

Some of the figures are just too small. For example, the map of Fig.2 should be enlarged to become readable. Also the very nice photos in Fig. 6 showing the hard work of measuring snow would deserve a larger format. Response: Figures are corrected.

Different types of rain gauges and shields are mentioned in section 3.2 (Nipher, Tretyakov, Kosarev and pit rain gauge), and a reference is made to Fig. 5. But which one of these types are actually shown in Fig. 5? Please clarify in the figure caption. The Figure 3 presents the photos of different types of precipitation gauges and the caption is clarified (lines 975-977)

And, if possible, could you shortly explain how these specific types differ from each other. Response: More details about precipitation data and its correction is provided, as well the description of different precipitation gauges and their use at KWBS. Lines 269-315

- line 260: "correspond to" instead of "account for" - line 275: "amount to" instead of

“account for” – line 309: add “the” after “published in” – line 415: remove “could” – Table 2: you may include the lower caption into the table

Response: corrections were made according to the comments

Please also note the supplement to this comment:
https://www.earth-syst-sci-data-discuss.net/essd-2017-125/essd-2017-125-AC4-supplement.pdf

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