

***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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Referee # 2 turned out to be the most tough and requiring in his comments. It was the pleasure to look for the responses which really helped us better understand and even more appreciate the data. The responses and description of made changes is given below. Corrected manuscript is attached.

The manuscript is well written and structured, however the authors should consider

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doing some structural edits according to suggestions below. Also, the title of the manuscript is misleading the reader since no water balance is presented for the study site. The different components of the water balance is presented, but no suggestions on how to set up the WB is given. I would recommend to change the title in order to better describe what is included in the manuscript.

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 km<sup>2</sup> 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.

Specific comments: 1. Introduction: I recommend to go through the already published data sets in ESSD related to hydrological data in permafrost and arctic areas. It would be nice to get a more thorough picture of available data and how the data in the present manuscript complement already published hydrometeorological data from the arctic regions. Response: The changes to Introduction are made accordingly (lines 69-91)

2. Site description: The permafrost conditions is described. How about taliks in the area? Taliks have great impact on the interaction between permafrost and hydrological flows, describe shortly the presence of taliks in the areas and where they are found (under lakes or rivers) and what type of talik that is most common (open, close, through)

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Response: No talik data is presented in the paper, so very short description of talik processes at the studied watershed is given at lines 153-159 "Along the whole length of the Kontakovy Creek, channel taliks can be found. They go all the way through the layer of alluvial sediments and their depth may reach 15 m in the cross section of the Nizhny hydrological gauge (Mikhaylov, 2013) and 5 m on the flood plain (Glotov, 2002). In summer, the talik forms a single hydraulic system with waters of active layer and the creek channel. In winter it freezes only partially. In the talik located below Kontakovy-Nizhny gauge, flow exists till the beginning of snowmelt, which is evidenced by continuous drop of levels in hydrogeological wells (Glotov, 2002)."

3. Data description: The data description and main results are given in the same section. I would recommend the authors to separate the technical description of equipment, installation techniques, measured time periods etc from result presentation of the collected data. A new chapter 4 presenting the main results for each parameter should facilitate for the reader. Inter- and intra annual patterns in the data should be presented in the results section and not in section 3 as it is presented in the present version of the manuscript. Response: We divided data description and main results into two different sections.

4. A table early in chapter 3 summarizing the measured parameters including details of measurement period, periods of data gaps and used equipment and/or methods for evaluation of data would give a better overview of the presented data, reference to observation points in the map in Figure 2 could also be listed in the table. Response: The details of measurements such as the periods, gaps, etc. are presented in the database additional files. We do not think it would be appropriate to present this rather long piece of information in the paper. Also the database contains detailed figures with all observation points and their references. In the paper we present just general figure with all observational points without their references to give the idea how dense the observational network was at the KWBS.

5. There is no or very little information about uncertainties and accuracy for the equip-

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ment used in the investigations. If information is available (given that the measurements were performed long time ago and technical descriptions of used equipment can be hard to find) a complementary section about uncertainties would rise the quality of the manuscript. Response: In the description of the data and measurement equipment the accuracy of measurements was specified where it was possible. For streamflow observations we analyzed and described the accuracy of data for the period 1984-1997 which was available in Observation Reports for several gauges in terms of 1) percentage of extrapolation of stage curve, 2) difference between measured and estimated instant maximum and minimum discharges. Additional Fig 7 with the boxplots of those characteristics was added.

6. Precipitation data: No details are given about the correction of precipitation data. I guess the data presented are uncorrected for wind and adhesion losses. Given that much of the precipitation fall as snow, the under-catch might be high and the errors due to this have to be discussed. Motivate why data is not corrected and provide the reader with necessary information about the location of the precipitation bucket/meteorological station to a proper correction can be made. The under-catch in wind exposed areas can be as high as 30-40% during the snowy season. References to methods for correction and how this has been handled in other hydrometeorological studies should be given. Response: More details about precipitation data and its correction is provided, as well the description of different precipitation gauges and their use at KWBS. Short introduction into the problem of precipitation correction is given. Lines 269-315

7. The data in Pangaea: A complementary data set with maps in ArcGIS format would facilitate the use of the data-set in future studies. A base set of catchment geometries, land use, soil distribution, location of lakes and rivers, topography etc would make it much easier for data-users to set up proper hydrological models of the study site. Response: The maps presenting DEM, river network, location of observation gauges, main landscape distribution in ArcGis were added to the database.

8. Tables: The sites referred to in the tables are in general hard to find in the map

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in Figure 2. A clear coupling between site ID and the map must be given. The map, including the labels and legend, have to be enlarged. Figure 2 gives general view of the station. All maps with labels and references are attached in the database, now in ArcGis format as well. Figure 2 was enlarged.

9. Row 261: "Snow cover at KWBS is formed in the first weeks of October". . .based on data for which period? Give correct reference. Response: Corrected. Line 460-461 Stable snow cover at KWBS in average is formed in the first weeks of October, and melts in the third week of May (1949-1996).

10. Row 271: How is the SWE quantified? By weighing the snow or by calculation? Response: Based on the data about measured snow height and snow weight with the account for landscape and elevation distribution average SWE for individual watersheds and landscapes was calculated and published in the Observational Reports. Clarification is added at lines 328-330

Please also note the supplement to this comment:

<https://www.earth-syst-sci-data-discuss.net/essd-2017-125/essd-2017-125-AC5-supplement.pdf>

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