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Interactive comment on "Spatially distributed water-balance and meteorological data from the Wolverton catchment, Sequoia National Park, California" *by* Roger C. Bales et al.

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Authors' response to Interactive comments on "Spatially distributed water-balance and meteorological data from the Wolverton catchment, Sequoia National Park, California" by Roger C. Bales et al.

Note: some formatting modifications were made to the referee's comments in the attached file to move each comment to a separate line.

Author response: We appreciate the time and consideration of this review from Anonymous Referee #1. We have responded to individual comments and made changes as

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indicated below and in the attached PDF file for this response. With the comments, there is a graph in the attached file that responds to reviewer comments on the data (regarding their supplement).

Anonymous Referee #1 Received and published: 7 August 2018 This is a very unique set of microclimate data from the Sierra Nevada of California. The data will be of interest to a fairly large group of ecologists, ecosystem scientists and hydrologist working in western mountain catchments. In particular, the soil moisture and temperature data are fascinating and have relevance for understanding the recent large-scale die off of conifers in the Sierra Nevada. I applaud the authors' dedication in installing and operating these stations. I think the paper and datasets should be accepted after the correction of a few minor technical errors.

Comments on written article: 1. Page 2 line 14. "Rapidly" is vague and unneccesary. Response: Removed the word.

2. Page 3 line 14. Define the acronym WRCC. Response: We removed the acronym and corrected the operator name to the Sequoia and Kings Canyon National Parks. The National Parks are the correct operator, while the Western Regional Climate Center aggregates the data from the full network.

3. Page 3 lines 21-24. There are errors somewhere in the elevations of the stations. For example, the text says that the Wolverton met station lies at 2180 m, but on Figure 2, the elevation is given as 2206 m. Similarly, for Panther, the elevation is given as 2750 m in the text, but 2618 m in Figure 2. Please correct. Response: The elevations included in the text were erroneous; we have corrected these elevations and the text is now consistent with the figure. We also confirmed the elevations for each of the snow depth clusters; these have been corrected to the exact elevations listed in figure 3a and 3b (the elevation of the control box and center of each site) instead of approximations.

4. Page 4, first lines. This seems like a sentence fragment. Please improve. Response: The last two sentences of section 3 (page 4, lines 1-2) were rewritten for clarity.

5. Page 4 lines 13-17. Please discuss how the volumetric water content sensors were calibrated. Response: The Campbell Scientific 616 Water Content Reflectometer sensors for VWC were not specifically calibrated to each soil type at each location, which is one of the flaws with the original experiment design. They were programmed using the standard calibration, which can be further documented using the sensor manual and CR basic program from the sites. Sensor accuracy with the standard calibration is $\pm$2.5%. It is noteworthy that these are all very sandy soils and as such have a pretty narrow range of dielectric constant between zero and saturation for VWC. The standard calibration should be close to accurate and the response pattern is informative. We have added a note to the text on the use of the standard calibration and its accuracy.

6. Page 4 lines 18-19. Please state the scan frequency from which the hourly data were computed (5 second, 10 seconds, other?). Response: The scan frequency is 1 hour. While best practices recommend averaging of multiple scans to compute hourly values, the remote location required less frequent scans for conservation of battery life. We added “scan” after “60-minute” to clarify this in the text.

7. Pages 4 and 5, Example data section: The section mentions discharge data and level-loggers, but I could find no discharge data in any of the files or in Figure 3. Please add discharge data to the files or else remove discharge measurements from this section. Response: Mention of discharge data was removed from section 7, and in section 5, “level-logger” was corrected to “logger”.

8. Acknowledgements: The Park name should be Sequoia and Kings Canyon National Parks. Response: Corrected in text.

9. Table 1. The instrument column is awkwardly aligned with the other rows. Response: The vertical justification of that column has been aligned with the other columns.

10. Figure 2. In the uppermost image, there is a blue shaded region that is not defined – is this the region surveyed by LIDAR? Response: Yes, this is the region surveyed

by LIDAR, indicated by the callout line between the LIDAR surface (middle image) and that area on the regional map. That region is now indicated by a black outline with hatching, we added a second callout line to the other end of the region, and updated the legend with the symbology for the lidar extent.

11. Figure 4. In the legend for the figure, the upper elevation, 2245 m, is less than the lower elevation, 2640. This seems like an error.

Response: That error has been corrected in the figure, and the elevations changed to the exact mean elevation of the distributed clusters, rather than an approximation.

Level 1 Data Issues

1. In both the Wolverton and Panther met data, there are columns with no data. Response: The columns that we have in the Wolverton and Panther met data are not empty columns but do have -9999 in Level 1 data record, which indicates that we have the sensors deployed there but the sensors do not function properly. In the README metadata file, we indicate missing readings would be marked by "-9999" in the Level 1 and Level 2 data. We will make an addition to the metadata file that indicates that some sensors are deployed but the data was not processed, as well as the reasons why.

2. In the Wolverton data, there is a redundant air temperature column with no data. Response: This value is from the snow depth sensor and is used to correct the distance calculation for snow depth. There is raw data from this sensor and the corrected data will be added to the Level 1 and Level 2 data files. The variable names files now indicate that the temperature value derives from the snow depth sensor.

3. In the Panther data, what is the difference between average and mean windspeed? The data are identical, so one of the columns should be deleted. Response: The mean windspeed is an intermediate value used to calculate the wind direction. Since it has almost no variation (infrequent differences of less than one-ten-thousandth) from the

measured average windspeed, we will remove this column from Level 1 and Level 2 data.

4. At Sites 1 and 2, I noted some negative snow depths. Perhaps an offset could be applied? Response: Because the baseline is not always stable, some negative values of snow depth persist in Level 1 data after the known offset (from site-visits) is applied. These are addressed in Level 2 data by adjusting the baseline based on the values before the snow season and after snow melt. We will add additional information to the metadata to enumerate the steps taken at each level.

5. At Site 3, there seems to be an issue with soil temp_P3_0_10 cm. The values seem too high, relative to the other sensors, for _ October 2011 through June 2012. Response: Yes, the values for the soil moisture sensors are higher than those at the same depth at P4 and P5 (at the same site), but the moisture wet-up and drying patterns at the sensor in question track well with sensors in the same pit at 30 cm and 60 cm (See Figure 1). There was no obviously erroneous data to remove, and there are pit siting variations that may explain the differences (for instance, P3, or pit at point three, is located closer to boulders and exposed bedrock that may funnel water to the pit, and it may receive more solar energy than P4 as it is further from the tree bole). Instead, the patterns could indicate that sensors at some depths in P4 and P5 may be aging and yield suppressed values, but we have no indication that these are clearly erroneous data. With no obviously erroneous data, we present the data we gathered (with QA/QC for each data processing level).

Figure 1. The soil volumetric water content (VWC) data from points 5, 4, and 3, have been graphed here for depths of 10 cm, 30 cm, and 60 cm.

6. I have attached a Word document with graphs of air temperature and humidity at Wolverton and Panther. Please address the issues raised in the document about site differences.

Response: The evaluation of temperature, instead of showing “temperatures at

Wolverton can be 8 to 12 degrees warmer than at Panther," seems to indicate that Panther Met reads (∼10°C) higher temperatures in the middle of the temperature range than at the same time measurement at Wolverton Met. This variation may be explained considering the placement of each tower. Panther Met is at a sunny, upland area that is generally open, while Wolverton Met is sited at a low spot between a creek and a meadow-like drainage. Cooler temperatures may be expected given the proximity to the water bodies and cold-air drainage effects that Wolverton Met might experience. Regarding the Relative Humidity values, we will correct those erroneous values that were over 100% for Panther Met (when our data manager returns from vacation). The Wolverton Met station is sited between the Wolverton Creek and a small meadow area, which likely increases relative humidity. Cold-air drainage and the temperature-effects of creek proximity could also contribute to the high relative humidity values.

Please also note the supplement to this comment:
https://www.earth-syst-sci-data-discuss.net/essd-2018-70/essd-2018-70-AC1-supplement.pdf

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