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Discussions

Interactive comment on "Hourly mass and snow energy balance measurements from Mammoth Mountain, CA USA, 2011–2017" *by* Edward H. Bair

Anonymous Referee #1

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Bair et al. present a six year dataset of snow and energy balance measurements at Mammoth Mountain, California. The data include: (1) daily precipitation and hand-weighed SWE at the Sesame Street Snow Study Plot, (2) hourly temperature, relative humidity, and snow depth at Sesame, and (3) hourly uplooking shortwave, longwave, albedo, air temperature, wind speed/direction, relative humidity, air pressure, and snow depth data at the nearby CUES site. The authors describe the data sources, instruments, and processing routines and discuss a subset of variables over the presented record (water years 2011-2017), which include extreme wet and dry years.

Given the notable lack of energy balance measurements in the Sierra Nevada, I think this dataset fills a clear gap and would be useful to the community. I recommend publishing it in the journal after attention to the comments below.

COMMENTS

- My most major comment is that I think the dataset may have limited usefulness for evaluating snow models. The authors argue that the dataset is useful for running models (e.g., abstract and introduction) and it is true that they are providing all required data to do so (e.g., temperature, humidity, wind, precipitation, radiation). However, the main problem with the dataset is that it has the bare minimum in evaluation data. Depending on whether the albedo is used as a model input or model evaluation dataset, there are only two or three datasets to check the snow model (e.g., hourly snow depth, event-based SWE from hand measurements), and that will only provide limited insights into model behavior (in my opinion). The hand measurements of SWE and snow density are really only useful at the time of the storm event, and provide no information about what is happening to the existing snowpack in time. Hence, the presented data really provides no direct way of checking the model representation of the mass balance and energy states through time, and other data would be needed (e.g., snow pillow SWE, snow surface temperature, snow pit profile data, etc.). Unless the authors are willing to include the snow pillow data (albeit incomplete) and any other relevant evaluation data, I am not really sure how this problem can be adequately remedied. At a minimum, the authors should at least detail ideas on how the dataset could be used not only to run models but also to evaluate them, given minimal evaluation data. A direct demonstration with a snow model and the dataset would be instructive and would match other snow data papers.

- Introduction: It would be useful to identify other similar snow datasets available (and cite the data papers), for example at Reynold's Mountain, Senator Beck Basin, and others. Highlighting the unique attributes of Mammoth relative to these areas would be helpful to the community.

- I think the paper would be more useful if more specific guidance/recommendations were provided to scale the daily precipitation data to hourly. This is not trivial, given that mixed precipitation and rain are possible and hence assuming uniform precipitation

over all 24 hours is not necessarily a robust approach.

- While the snow pillow measurements do not span the entire period, I think they still hold enough value that they should be included in the dataset, without having to request from the authors. For long-term purposes, it would be more ideal if researchers ten years from now do not have to track down the authors to obtain these snow pillow data.

TECHNICAL CORRECTIONS

- P2.L4-6: While interesting, this would be more relevant if you actually detected any such events in the snow albedo dataset. Please comment.

- P.2, L.7-9: Given the winter recreation, please comment on what measures (if any) were in place to prevent humans from impacting measurements (e.g., skiing underneath the snow depth sensor).

- P.2, L.20: Awkward wording here because the phrase "to accurately weigh" splits the phrase "snow falls". Please rephrase.

- P.3, L.1: "on as" reads oddly to me. Delete one word?

- P.3, L.7: Recommend starting a new sentence at the semicolon: "one minute readings. The measurements from these gauges. . .".

- P.9, L18-25: It is not clear what "peak base depth" or even "base depth" means. Please clarify.

- P.12, L1-4: This is a long sentence that really would be better framed as two sentences.

TABLE AND FIGURE COMMENTS

- Figure 10: Please confirm these are hourly values and the period of record included in this figure.

DATASET COMMENTS

- In the daily precipitation table, please include measurement units with each variable name in the header. Also, it may help to have a metadata file describing what each of the columns means, as there are some that I think are not necessary self-evident. It would be useful to have some guidance on how to use the precipitation data, as only days with precipitation appear to be recorded in the table. Is it safe to assume these are all 24 hour measurements and days not in this table have no precipitation?

- There is a value of 90% snow density on October 19, 2015 which is physically unlikely, as it is close to the density of pure ice. Please check.

- At both sites, there are RH values exceeding 1.0. Please provide additional quality control.

- At Sesame, there are wildly varying RH values in July 2017 and early August 2017. Please provide additional quality control.