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Hydrology and Earth System Sciences
Discussions

Interactive comment on "LiDAR measurement of seasonal snow accumulation along an elevation gradient in the southern Sierra Nevada, California" *by* P. B. Kirchner et al.

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This is an interesting paper that explores the spatial distribution of snow water equivalent (SWE) as a function of topographic controls. I enjoyed reading the paper. The amount of detail provided by the LiDAR data is impressive. I have only a few comments to strengthen the presentation.

It was not clear to me how snow interception in the canopy affects the snow depth measurements and the comparisons with cumulative precipitation. In understand that the comparison are focusing on the clearings and open land, yet one would expect

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some effect due to wind redistribution.

Regarding the assumption of uniform snow density throughout the domain, I am not sure whether it is appropriate (p. 5337). The snow pillow data used in the paper showed very little variation and no significant dependence on elevation (p. 5342), yet there are numerous studies in the literature that did find significant increases in density at peak accumulation with elevation due to stronger compaction effects of deeper snow packs at higher elevation. On p. 5344 the authors note that snow depths from the snow-pillow sites failed to capture the elevation patterns apparent in the LiDAR data. Why would you then expect that they capture the snow density patterns? An increase in snow density may increase the elevation gradients of SWE relative to the results of the paper. There is perhaps no need to change the analysis, but I suggest the authors discuss this point in their revised paper.

Precipitation is a flux, so has units of velocity while SWE is a state variable and has units of length, yet the two variables are directly compared at many instances in the paper. I realize that precipitation has been accumulated over time periods but then it should be termed cumulative precipitation and the time periods should be given. For example, line 19 should read 6cm/time unit?, and there are many more instances of this throughout the paper. p. 5337 has “we then calculated the total seasonal precipitation” - what period?

The figure captions were not always clear to me. First, the dates or periods of the data should be given for Figs. 2, 3, 4, 5, 7, 8, 9, particularly where precipitation is compared with SWE. “Acquisition date” and “accumulation period” is not very informative, give the dates instead in all the figures. Second, the acronyms used in all figures should be explained in the captions. For example, in Fig.9 it is not obvious to which line “SWE reconstructed from daily snowmelt estimates“ refers.

Typo: p.5337 planer – planar?

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 11, 5327, 2014.