The Cryosphere

Discussions

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Interactive comment on "Spatio-temporal evolution of snow depth observed by time-lapse laser scanning in the Alps and in Antarctica" *by* G. Picard et al.

Anonymous Referee #2

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The paper presents an emerging methodology to measure snow depth at a plot of 100 m2 based on TLS technology. The majority of the paper is devoted to characterize and evaluate the accuracy of the device, and a shorter part of the manuscript presents the evolution of the snow depth that results particularly interesting when it is referred to Dome C site in Antarctica.

The paper is clear and well written, and a device like the presented here (or similar that are currently being used) seems a much better approach to measure snow depth, compared to ultrasonic sensors or single laser measurements.

-The introduction is well written and concise. I simply add a few references dealing with spatial variability of snow just in case authors consider useful they inclusion in a revised

version: *Clark, M. P., Hendrikx J., Slater A.G., Kavetski D., Anderson B., Cullen N. J., Kerr T., Hreinsson E. O, Woods R.A. 2011. Representing spatial variability of snow water equivalent in hydrologic and land-surface models: A review. Water Resources Research 47: W07539, doi:10.1029/2011WR010745. *López-Moreno J.I., Fassnacht S.R., Begueria S., Latron J. 2011. Variability of snow depth at the plot scale: implications for mean depth estimation and sampling strategies. The Cryosphere 5: 617–629. *Neumann N.N., Derksen C., Smith C., Goodison B. 2006. Characterizing local scale snow cover using point measurements during the winter season. Atmosphere-Ocean 44: 257–269. *Shook K., Gray D.M. 1996. Small scale spatial structure of shallow snow covers. Hydrological Processes 10: 1283–1293.

-I am not sure if this is the first publication in a SCI journal of the application of a device like this, but perhaps authors should clarify this point or mention other similar initiatives or the existence of more commercial products that can be used (see as example: https://cnnweathercenter.wordpress.com/2012/02/15/scientists-deploy-lasers-gps-technology-to-improve-snow-measurements/). - In alpine sites, but specially in Antarctica, is very frequent having blowing snow near the surface, that should affect the collection of proper snow depth data. Although blowing snow is mentioned as a source of failure at the beginning of page 9, it is more related to the jamming of the stages rather than collecting erroneous laser returns. It can be also mentioned.

- Probably the spheres installed in Dome C can be shown in an additional photo in Figure 1. this is just to have a better idea on how they look like.

- Page 12line 28; should be "below" instead of inferior? -Page 13 line 16 GLACIOCLIM stake network, instead of stack.

- Figure 3 and 4 can also show the daily evolution of standard deviation (or coefficient of variation) at the analysed plots. It can be done just adding a new y-axe at the right side.

- Figure 4 could contain also another small panel with the daily temperature to see if

failure of the sensor is related with the very low temperatures mentioned in the text.

C3