

## ***Interactive comment on “Analysis of glacial and periglacial processes using structure from motion” by L. Piermattei et al.***

### **Anonymous Referee #2**

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The manuscript by Piermattei et al. compares the outcome the use of terrestrial photogrammetry using normal digital images and subsequent Structure from motion (SfM) analysis with laserscans as a benchmark. For geomorphologists working with surface changes and movements SfM combined with careful measurements of GCPs is a highly valuable tool to address surface dynamics easily and with a high accuracy. The manuscript does not give scientifically completely new information or techniques, but reproduces findings by other colleagues, and comes up with useful recommendations. These are certainly helpful for other colleagues, especially when working in high-alpine or arctic environments. Within this respect the manuscript is a valuable contribution for the geomorph community and deserved attention.

The manuscript has some issues which should be addressed before publications. I

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here only focus on general issues, smaller details are already addressed by the other reviewer and needs not to be duplicated:

1. Title: As review 1, change the title, I strongly support this
2. Abstract: The abstract is lengthy and very general, you should give some major results and key numbers there (e.g. some obtained accuracies and major finding etc)
3. Focus: The focus is on the techniques, not necessarily on the interpretation of glacial/periglacial processes. It is enough to write that the measured changes are in line with field-based mass balance measurements, or the velocities obtained on the rock glacier seems ok. P. 1359, the whole paragraph is a method, and should be moved there, but I would simply suggest strongly reducing this part (along with changing the title). If you want to keep it as is, you should also really discuss the geomorphology/glaciology, but this would change focus of the paper.
4. Introduction: Lengthy, lots of citations, and is almost a small review. Maybe there should be a review about SfM applications and limitations in geomorphology, but this is not the focus of your paper. So I would reduce the intro, and really focus on what you want to tell the reader. Your main message is that SfM is “easy” and especially “cost-effective” monitoring for many researchers, even in difficult places. I agree, so emphasize on that, and emphasize to come up with clear recommendations, other colleagues can find useful.
5. Case study: p. 1349, maybe “Setting” is better as heading
6. Method: p 1350, l 5: This introduction is not necessary, takes only space.
7. Results: There are several places, you introduce new methods in the result chapter, this is a bit confusing, like on p. 1356 and 1359. Consider to revise. For the maps of elevations changes, also consider to enlarge a bit the areas without significant changes, or give a reason of choice or the classification in the figure (Fig. 6 etc). As you of course are aware of, considering general error propagation laws, the mean error adds

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up, and this gives large relative errors when subtract things. Like Fig. 14, the colorless class is  $\pm 5$  cm, is this justified or should then class be bigger? And: Be careful with the term “geodetic mass balance” for a one year period, as ice fluxes and varying snow density or re-freezing of melt water is not taken into account. The latter is certainly important on small glaciers in a permafrost environments, however, small glaciers have normally little ice fluxes, probably compensating other factors.

8. Discussion: Could be structured with two headings: Maybe: “Data processing and assessment” and “Recommendations” or so.

9. Figures: These are certainly nice, but unfortunately totally unreadable because of small size. I had to use the original pdf and zoom 589% to read the smallest numbers ..:-) The only figure which is readable is Fig. 14. Therefore it is also the only one I have commented above. Only printing this is totally useless. Maybe the numbers of Figures (#20!) is a bit too much, so check if some of the figures you want to give can be coupled somehow, or if all are really necessary.

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Interactive comment on Earth Surf. Dynam. Discuss., 3, 1345, 2015.