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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Quantification and analysis of geomorphic processes on a recultivated iron ore mine on the Italian island Elba using long-time ground-based LIDAR and photogrammetric data by an UAV" *by* F. Haas et al.

Anonymous Referee #2

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Quantification and analysis of geomorphic processes on recultivated iron ore mine on the Italian island Elba using long-time ground-based LIDAR and photogrammetric data by an UAV.

Haas et al.

This manuscript presents a full processing workflow of terrestrial laser scanner and

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Discussion Paper

photogrammetric derived 3D data to quantify erosion and deposition patterns over a slope. The topography of the area of interest has been reconstructed at different years using TLS derived point clouds and photogrammetric data obtained by processing UAV-collected photographs using a Structure-from-Motion approach. The authors adopted due care in ensuring high quality of data by measuring the surface from different position to reduce shadowed area, by post-processing and filtering the results to enhance their quality, and by the use of an error propagation framework to set a limit of detection threshold. The article is well written and pleasant to read. The scientific approach is rigorous and described in detail. The debate between the advantages/disadvantages between TLS and SfM applications (especially using UAV devices) is a hot topic in geomorphology, and I think that this contribution would be of great interest for many readers.

I have a number of minor suggestions that could hopefully improve the already good quality of the paper. The only major one rises from the observation of the volume estimations. These are very different between TSL and UAV data, and the authors highlight this fact and discuss it in detail. Looking at figure 13, we clearly see the underestimation of the TLS of slope erosion and of AUV data of deposited volumes. Why this happens for the "cut" part is shown in figure 12. However, the "fill" difference is very high despite good densities. This is partially justified by the UAV LoD. But one could wonder if it is only because of that, and the doubt would be justified given the high differences. The authors argue that there is no systematic error detectable, and I agree with them on the basis of their results. Nevertheless, would it be possible to produce an image that compares TLS and UAV DEMs for the same year (e.g. Apr 2013 or Apr 2015)? It is clear that even if this highlights a systematic difference between TLS and AUV that could mean nothing, because the two would still be relatively well registered and so restitute the good DEMs of Difference visible in figure 13. However, if no systematic error is detected, then logically we would observe the differences in the same locations as the differences between figure 13a and 13b, and in some way confirm the observation made in the text. In conclusion, I think that this is the major and

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more puzzling result of the paper and it is worth investigating a little bit more, since one might wonder how a result for either method could be trusted if even with such rigorous approaches discrepancies are so large. This is not easy though, since as I mentioned the authors made a great effort in optimizing the data, so it is definitely possible that these high differences are solely due to point densities and LoD thresholds.

My minor suggestions (please take with care my suggestion about the English, as I am not a native speaker and could be wrong):

Abstract: write out and define UAV as you did with TLS

Abstract line 6 and in other places: I would incline towards putting process dynamic in plural.

Page 6273, L 18: could you please provide a reference for natural landscape as well?

Page 6273, L 18 and 19: repetition of “conditions”

Page 6273 L24: this is a very long sentence, and I suggest splitting it.

Page 6274 L28: I would delete “in this study” and “the methods”

Page 6275 L11: by leaving → and left?

Page 6275 L18: Mine → mine , delete “not or”

Page 6276 L14: I do not think that it is necessary to mention that it was done with students.

Page 6276 L21-23: I suggest deleting this sentence and inserting a small paragraphs describing the chapters at the end of the Introduction section instead.

Page 6277 L11 and 21: I would move the (3-D scanner software) at line 11.

Page 6277 L23: Are the authors sure that we are talking about accuracy here? In my experience, Riscan Pro provide a standard deviation value in the MSA module, and I would therefore talk about precision here (as in the next line).

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Page 6281, L3-4: I would delete “in fact”. I would also delete the “!” here and in all other instances, I do not think that they are necessary to stress your point.

Page 6286 L 12: typos: bee → be

Page 6286 L18-19: I would delete “the reservoir... and as a consequence”, as it is already clear and implied and it causes only the sentence to be longer without need.

Page 6289 L1: delete “in fact”

Page 6290 L 13: would it not be sect. 4.1 as well?

Page 6294 L 6: could you mention some advantages/disadvantages of airborne LIDAR in one sentence as well here?

Page 6294 L17: “if this would lead..” ?

Table 5 is a bit redundant, as the same information is shown in table 6. I think it would be better to leave table 6 only, and refer to the first line of it instead of table 5 where necessary.

DEMs of Difference images: I would insert a small white/grey bar near the 0 m value in the DEMs of Difference legend. This would make more clear that values between –LoD and +LoD are not in colour.

Figure 7: specify in the caption that these results are from TLS data.

Figure 13: add a short sentence in the caption explaining what could be observed in the two squares.

Congratulation, this is very interesting and rigorous work!

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., 3, 6271, 2015.