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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Brief communication: 3D reconstruction of a collapsed rock pillar from web-retrieved images and terrestrial LiDAR data – The 2005 event of the West face of the Drus (Mont-Blanc massif)" *by* Antoine Guerin et al.

Anonymous Referee #2

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The manuscript by Guerin et al. describes an interesting and potentially important possibility to reuse historical images for landscape reconstruction. In this study the volume of a collapsed rock pillar is reconstructed using TLS data for the post-event and using historical photos to perform image-based surface reconstruction of the pre-event. The introduced method should be very relevant for many geo-scientific applications when aspects of landscape evolution are of interest. Already Bakker & Lane (2016) showed the potential using archives of aerial images. Expanding it to terrestrial cases is another great opportunity.

The manuscript is well structured. However, there are some issues regarding accuracy assessment, especially considering the SfM point cloud from historical images. The study shows that it is possible to reconstruct the surface but due to missing GCP implementation and long distances between camera and object well-grounded accuracy estimation would be desirable to reveal if the reconstruction is also veritable. To me, the used reference of a former study seems to be critical because there are no statements regarding its reliability. If this issue is accounted for the paper would make a great contribution in the field of natural hazard investigations.

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Detailed comments:

Page 1 line 29/30: Please, be more specific about the approach to estimate rock thickness from historical images without doing 3D reconstruction. How reliable is it? This is also relevant because you will compare your own results to this study.

Page 2 line 14 -21: Maybe, also refer to Eltner et al. (2016) because the authors give a review on SfM used in geosciences and furthermore summarise accuracies achieved at different scales. As well, Smith et al. (2015) could be cited as they review applications and explain the workflow.

Page 3 line 27: If you merge scans from 2005 to 2010 to achieve a detailed 3D model of the upper face, how certain are you that no changes occurred between 2005 and 2010 to allow for a reliable model?

Page 4 line 2: Could you geo-reference with ICP because the source cloud for alignment was already geo-located?

Page 4 line 3: What do you mean by accurate GPS? Do you refer to dGPS? Furthermore, what did you measure with GPS? The scan position or marker positions?

Page 4 line 6: subtracted

Page 4 line 14/15: Did you identify stable areas and subsequently use these to perform ICP? If not, how did you account for potential errors in this regard (e.g. see Wujanz et al., 2016)

Page 4 line 22-26: I am afraid, I did not understand the procedure. Is the point extraction performed with the point cloud containing the cloud-to-mesh information? Thus, does it account on point cloud distances or solely the topographic information of a single cloud?

Page 4 line 24: How did you define the LoD (what is your accuracy measure)? Chapter 2.4: What is the average deviation between SfM and Lidar in the stable areas? This could be helpful information to better assess the performance of SfM. Furthermore, the accuracy would be interesting because many images seem to be taken from similar perspectives leading to an unfavourable base-height-ratio potentially resulting in lower accuracies.

Page 5 line 12/13: Why do you choose this as average volume? Furthermore, the random selection of image number (84% and 67%) does not seem to be sufficient to allow for the statement of a relative error. This also accounts to page 6 line 5-7, when the Ravanel & Deline (2008) value is chosen as reference.

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References:

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Smith, M. W., Carrivick, J. L., & Quincey, D. J. (2015). Structure from motion pho-

togrammetry in physical geography. Progress in Physical Geography, 1–29.

Wujanz, D., Krueger, D., Neitzel, F. (2016): Identification of Stable Areas in Unreferenced Laser Scans for Deformation Measurement. The Photogrammetric Record, 31(155), 261-280

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