

Comments to the paper 'Assessing the quality of Digital Elevation Model obtained from mini-Unmanned Aerial Vehicles for overland flow modelling in urban areas'

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This paper attempts at assessing the quality of DEM generated by means of SfM from images collected from a UAV. It does so comparing the DEM generated by structure from motion with a DEM of the same area generated using Lidar technologies and methods.

This manuscript has a very good aim and develops an interesting topic. However I feel that it falls short in details, especially considering a primary property of a scientific paper: reproducibility.

- 1) This manuscript presents the results of SfM vs Lidar DEM: in both cases none of the parameters used in running methods is explained. In this way it is impossible to replicate the experiment. Both SfM software (in this case Pix4D, but could also be valid if using, for instance, Photoscan) have many small parameters that can be chosen and that make a large difference in the final output. Just to mention one of these is the number of triangular faces in the TIN generation.
- 2) The study uses an off-the-shelf point and shoot camera (in this case the Canon Ixus 127 HS). Being this a fully automatic camera it is plausible to assume that during the flight the camera has acquired photos using different focal length, shutter time and possibly ISO. The GSD of pixels is a function of focal length, elevation, ccd sensor size, and number of pixels on the sensor. None of these parameters have been presented nor discussed in this paper. On the other hand the research only explores 4 flight parameters such as: (1) altitude (very relevant), (2) overlapping (relevant), (3) pitch (irrelevant, due to the fact that SfM can take any camera pitch in the processing), and (4) weather conditions (slightly relevant, due to the fact that some darker spots could affect the recognition of pixelpairs, but it is not significant as weather conditions do not change rapidly during the flight of such a small area). More relevant would be to know the time of the day to be able to understand the amount of shadowing from tall objects.
 - a. In my opinion the paper should discuss more in detail the camera parameters that are responsible for the determination of the pixel size.
- 3) The accuracy of the DEM is largely influenced by the accuracy of the GCP (in xyz). There is no information about the method used to georeferenced the GCPs nor to their accuracy.
 - a. Add details and description of this parameters.
- 4) The UAV-SfM generated DEM has been resampled to 2 m pixel size. There is no mention to which method has been used
 - a. My suggestion is to be more accurate here and describe which spatial analysis method has been used.
- 5) To compare two DEMs you need an as accurate as possible co-registration of the two DEMs. In this manuscript there is no mention to coregistration procedures.
 - a. My suggestion is to add a description of this process.
- 6) It is not clear why you did not perform a disaggregated analysis of slope and aspect (as you did for elevation)? I mean why did you analysed Elevation differences on different portions of the study area and you did not do it for slope and aspect?

- 7) Under paragraphs 4.2.4 for the first time in the manuscript you mention also two other pixel sizes of the DEM downscaled from the UAV-SfM (that is of 0.5 m and 1.0 m). Why you did not use these resolution before? And what is the meaning of using these to delineate flow path if you want to compare the UAV-SfM DEM with the Lidar that comes only at 2.0 m pixel size?
- 8) Chapter 4.3 is not a Discussion, as already mentioned by other reviewers.
 - a. My suggestion is to improve it or redistribute some of its content to Introduction.
- 9) Comparing Lidar against any other DEM Generation method is a general approach in many studies attempting to compare the quality of DEM. Nevertheless this is only partially valid, in this specific case, due to the different ways of DEM production and different type of errors implied in the DEM generation processes.
 - a. My suggestion is to limit the comparison to open air areas like the one identified with a dotted line in figure 7. The other areas by design would have very large differences, so are not worth the comparison.