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Discussions

Interactive comment on "Low-cost, on-demand aerial photogrammetry for glaciological measurement" *by* K. Whitehead et al.

Anonymous Referee #2

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The paper addresses the use of photogrammetric methods using low cost sensors and platforms for monitoring glaciers and particularly determining elevation changes and surface motion of an arctic glacier. Comments and suggestions are provided below. It is understandable that there are certain limitations as this is a Brief Communication paper. However, hopefully these comments and suggestions will help to improve the contribution.

References to the term low cost need to be clarified. Cameras and the UAV and its navigation sensors can be considered of low cost. The camera used with the helicopter is of low cost. But the use of the helicopter and the INPHO photogrammetric software do not fall under the low cost umbrella. Pa 2; Lines 10-17. Helicopters should be included in the list of data acquisition platforms. The issue of georeferencing of the

remotely sensed data should be addressed also in the glaciological studies. Pa 2; line 18.. . ...from OVERLAPPING images Pa 2; line 19.. . .. . . SPATIO-TEMPORAL changes Pa 2; line 20. List examples of publically available software with references Pa 2 and 3; line 21-23 and 1-2. The statement is not absolutely correct. Analytical photogrammetric software packages since the 80's handle large rotation angles. So this is not a recent functionality. Pa 3; line 6. Based on the large forward and sidelap overlaps, stereo could be replaced by multiview overlapping imagery. Pa 3; line 7. Please indicate onboard navigation sensors including their positioning and angular accuracies. Pa 3; line8-9. Besides orientation (angular) parameters most probably position parameters are provided as well in the log file. Please clarify the log parameters. Pa 3; line13. Figure 1c Pa 3; line17. Should be digital elevation and orthomosaic image and the digital elevation is a prerequisite for the creation of orthoimages. Pa 4; Line 11. (Figure 1c) Pa 4; line 17. How was f=5.1mm was determined. Was any camera calibration performed? Pa 4; line 19. The FORWARD overlap Pa 5; line 4. Please indicate type of GPS receiver used to determine the coordinates of the control/check points. Pa 5; 3 and 15. Please provide a diagram of the location of the GCP and CHK points Pa 5; line 8, 10, 11, 17. Please clarify the use of the terms Aerial triangulation and block adjustment. Block adjustment is a method of performing aerial triangulation. As INPHO software has been used most probably we are talking about automated image matching for locating tie point among images followed by a bundle photogrammetric block adjustment (block refers to simultaneously adjust the entire block of images). Pa 5; line 12. Is the calibration refinement referred to camera calibration using the camera self-calibration additional parameter. Please clarify. Also clarify if it was photo-variant or photo-invariant approach. Pa 5; line 8. Please give reference for the INPHO Pa 5, line 17-19. It is not clear if the DEM (DSM) generated automatically? If yes how was the point matching performance considering the low texture of the images. Pa 5; line 18. How/what system was used for the manual 3D measurements? Pa 5; line20. Please give an indication of the magnitude of the elevation discrepancies. Pa 5; line 22. Please provide a figure showing the digital surface elevation (raster format) Pa 6; line 7. Please

note camera field of view time 1: ∼96deg; time 2:∼75deg. Please provide examples of the images captured, one from time 1 and one from time 2 covering approximately the same area. Pa 6; line12. What values were used for the angular elements of the camera? Pa 6; line 15. Again please provide diagram with the location of GCP and CHK points Pa 6; line23. Same as in Pa 5; line 8, 10, 11, 17. Pa 7; line 14 and Figure 3a. Please use appropriate scale to illustrate spatial differences for a couple of areas (zoom-in) Pa 8; line 2-3. Was any independent validation performed on the ice flow speed (0 m/yr and 8 m/yr)? Pa 8; line 17. Please provide indicative accuracy results of the bundle block triangulation, such as RMS values of the image coordinates, of the GCPS and of the CHK points. Pa 10; line 7. Equivalency of photogrammetric and lidar data can be achieved under certain conditions. We also need to separate between planimetric and height equivalencies. For example while there is mentioning of vertical lidar accuracies of 0.2m there is no mentioning of the planimetric accuracies in this case. Pa 12; line 17 and Pa 13; line 1. Are the proceedings of the GEO2010 available? Pa 11: References are mainly from the geoscience field. Much and very important work have been done in the field of photogrammetry (e.g., publications by the International Society for Photogrammetry and Remote Sensing (ISPRPS)).

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