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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Potential of kite-borne photogrammetry for decimetric and kilometre square 3D mapping: an application for automatic gully detection" *by* Denis Feurer et al.

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AUTHORS Many thanks for your interest and for your work. Your remarks help us in improving the paper and each of these will be answered above. A revised section is proposed in the supplementary material attached files.

REVIEWER This paper presents a review of modern techniques in kite aerial photography and photogrammetric/structure-from-motion methods for producing high-resolution topographic data of landscapes in a cost effective manner. As the paper describes, the techniques presented and discussed have been presented in past work in various forms, in applications within and outside of the geosciences. The paper discusses

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these methods in the context of erosion and gully monitoring in a semi-autonomous way, for which the techniques described are particularly well-suited. The paper does a good job of describing issues around equipment setup and considerations for the use of commonly available software for processing images from kites and other aerial platforms.

The paper discussed the outline of an automatic gully detection methodology based on high-resolution topographic data, which seems novel, but isn't explored in great depth. This is one area of the paper that could be elaborated on.

AUTHORS RESPONSE Many thanks for these comments and for suggesting this improvement. We propose to add a figure that represents the full flowchart of the gullies mapping method (see new proposed figure refered to as Fig. 1 at the end of this document) and that would be placed in section 2.5. We propose to replace the current section 2.5 with a revised version, which comprises a detailed description of the flowchart, along whith the concepts on which it is based upon. The new section is attached to this comment in the supplementary material pdf file. The proposed caption for the new figure is: "Flowchart of the method used to map gullies from the kite DEM. Letters associated with each step are referenced in the text describing the method in section 2.5"

REVIEWER There are a number of other areas in which the discussion could be improved: (1) Section 1: Structure from motion (lines 27-30): This is incorrect. The study described in Bryson et al., 2013 used a single line kite to collect images, not a UAV.

AUTHORS RESPONSE Many thanks for having pointed this mistake. We propose to replace the lines 27-29 by the following text : "Bryson et al. (2013) surveyed a 200m by 30m large area with a kite. They calculated sub-centimetric details based on a set of 295 images."

REVIEWER (2) Section 1: KAP (lines 5-15): Beyond the desirable qualities discussed in Nex and Remondino, the authors should also discuss the limitations of kites, with

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respect to UAVs. For example, kites have minimum wind-speeds for operation and are difficult to position over terrain that is difficult or inaccessible on foot, two situations in which UAVs excel.

AUTHORS RESPONSE The reviewer is perfectly true and we propose to insert the following text in the section (KAP) of the introduction on p.4 l.9 so that comparison between kites and UAV would be more detailed : "Beyond these qualities, kites also have limitations. The three main ones are absence of wind, particular terrain configurations and difficulties to achieve a correct flight plan. The first issue can be tackled as in Vericat et al., (2009) by adding a small blimp to the kite to make it fly in no-wind conditions. The second one may not have solutions considering that kite operator must at least have access to areas near to the targeted survey area. Addressing the third issue is one of the goals of this paper and will be described in more details below." NEW REFERENCE : Vericat, D.; Brasington, J.; Wheaton, J. & Cowie, M. Accuracy assessment of aerial photographs acquired using lighter-than-air blimps: low-cost tools for mapping river corridors River Research and Applications, John Wiley & Sons, Ltd., 2009, 25, 985-1000

REVIEWER (3) Section 4: DEM quality: Another work in which externally validated elevation points have been used to assess accuracy for KAP/structure-from-motion is: M. Bryson, S. Duce, D. Harris, J.M. Webster, A. Thompson, A. Vila-Concejo and S.B. Williams, "Geomorphic changes of a coral shingle cay measured using Kite Aerial Photography", Geomorphology, vol. 270, pp. 1-8, DOI:10.1016/j.geomorph.2016.06.018, 2016.

AUTHORS RESPONSE Many thanks for this information. We propose to add the missed reference, to delete "Finally, " on l.33, and to add the following text (after p.15, l.35 of the submitted manuscript): "Finally, Bryson et al., (2016) surveyed a 50 by 150 m area. DEM quality was evaluated with 86 independent validation points acquired with a RTK DGPS. Images had an approximate ground resolution of 0.004m. The DEM was computed with a ground sampling distance of 0.05m. Mean error was -0.019m and

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standard deviation of the error was 0.055m."

REVIEWER There are a number of grammatical and spelling mistakes that should be addressed (see for example section1, line 5 "hazard", section 2.3, line 27 "however" etc.

AUTHORS RESPONSE Thanks. These mistakes will be corrected.

ADDITIONAL NOTE FROM AUTHORS Please note that for some parts of the manuscript, remarks from both reviewers implied to modify these parts concurrently. Reviewer #1 may be interested in reading the corrections/rewritings proposed in answer to the comment of reviewer #2.

Please also note the supplement to this comment:
http://www.nat-hazards-earth-syst-sci-discuss.net/nhess-2017-60/nhess-2017-60-AC1-supplement.pdf

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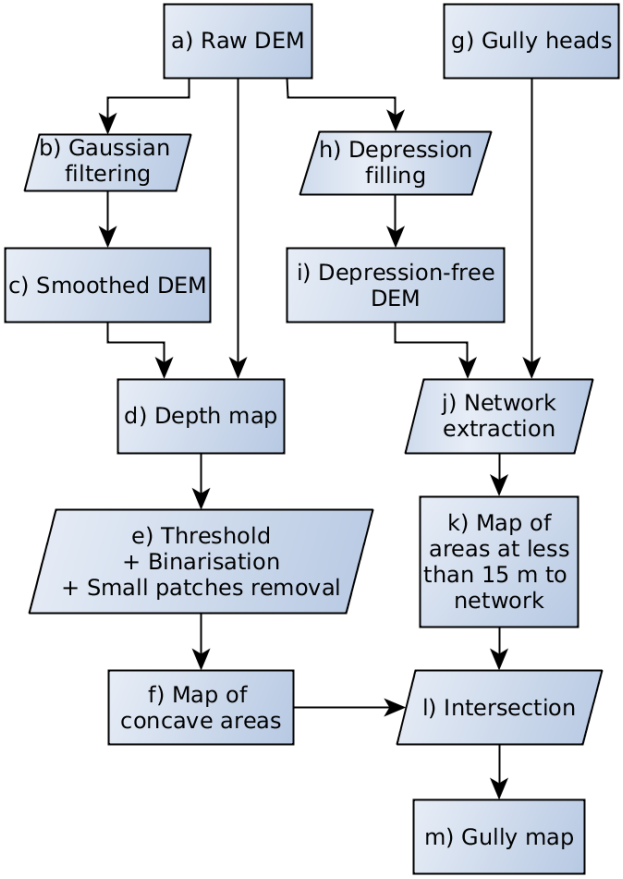

Fig. 1. Flowchart of the method used to map gullies from the kite DEM. Letters associated with each step are referenced in the text describing the method in section 2.5

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