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Interactive comment on "Optimising 4D Approaches to Surface Change Detection: Improving Understanding of Rockfall Magnitude-Frequency" *by* Jack G. Williams et al.

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Two 2017 papers bring a new dimension to the research in rock slope processes thanks to near-continuous TLS monitoring. The first one is from Kromer et al. (also in Earth Surf Dyn), and the second one is the present contribution by Williams et al.

In this contribution, authors have acquired a unique dataset of terrestrial LiDAR scans (almost 9000 scans of a coastal cliff, with 1 hour interval over 10 months). The present paper is mostly dedicated to the methods that had to be developed to process such an exceptional dataset (filtering, alignment, change detection and volumes estimation). However, from a geomorphological point of view, this contribution already sheds a new

light on an old problem: the rollover effect in frequency-magnitude distributions. In my opinion, main original contributions of this paper are: - Filtering of edges and of bad quality returned pulses before alignment of point clouds - An improved M3C2 algorithm for change detection - Original results on the influence of sampling frequency on (a) frequency-magnitude distributions and (b) cliff retreat rates estimations.

In my view the main limitation of the method proposed here is to pass by a raster to estimate volumes. However this point is properly discussed, and an error on the volume estimation is proposed. Considering the high quality of this contribution, I only have some minor corrections to suggest: - I had to read several times the text of page 5 and the caption of Fig3 before to understand the meaning of this figure. It would be useful to develop a bit more this part. I find it confusing in the present form. - Fig 7: I did not get the complete message of this caption. May be you can split the different elements in several sub-figures (pre vs post, sign ambiguity, sensitivity). Acronym DAN not defined (dist along normal) - Part 3.4 – M3C2: it would help to have an extra figure here to explain the geometry of the cylinder and its relations with the point clouds - Acronyms LoD and CoG are not defined at their first occurrence. - P13, L 23: "N is the number of cells that delimit the event" ; Isn't it a bit ambiguous to use the verb "delimit" to define N, with regards to N_b ? - Complete Eq 16 and 18c with the results of the calculations - P14, L14: I would "remove the areas BELOW the error threshold" (?) - P18 L30: the term "risk" is not appropriate here as it includes many other things than the block release frequency. Suppress this sentence.

Interactive comment on Earth Surf. Dynam. Discuss., https://doi.org/10.5194/esurf-2017-43, 2017.