Review of "Satellite-based emergency mapping: Landslides triggered by the 2015 Nepal earthquake" by William et al.

General summary:
The paper by William, et al., reports on the experience of the authors on mapping and publishing emergency maps odof earthquake-induced landslide after the Gorkha earthquake in Nepal 2015. They summarize the challenges asssociated with the effort of delivering products useful to humanitarian practitionner and propose and discuss approaches to tackle them.
Although limited to the description of a single case studies, I think this paper is of intereste for the natural hazard community and for the interaction between the communities working on landslide processes and the one interested in disaster relief. It is well written and contains clear figures.

Generally, this discussion is important because many errors and issues in scientific report on EQIL may often relate to some confusion or mixture about the aim and the use of an inventory: that is the attempt to produce an inventory somewhat for science and somewhat in an emegrency phase, whether for humanitarian response of for other rapid evaluation. As pointed out by the authors the methods can be quite opposite between an inventory to be used by reasearchers or by emergency relief practicioners. Therefore clarifying the aim and applicability of inventories that are published rapidly after a disaster would indeed be valuable and could be informed by this paper.

My comments below mainly concern some clarifications or some improvement on introduction and discussion, and should be easily addressed by the authors.

Major comments
1/ Could more discussion be added on how specific to Gorkha / Nepal some arguments are ?
For example it is clear that the combination of rupture size (and thus affected area) and the occurence just before the monsoon, but when convection and cloud presence was already ramping up, makes the mapping and the selection of images difficult.
Earthquake in drier regions may be less affected. Smaller rupture may produce most landslides in an area covered by a few images footprints.

2/ I think the automatic landslide mapping is dismissed too rapidly in the main text, and for unconvincing reasons : "The variety and complexity of terrain and imagery makes both manual and automated mapping difficult". I appreciate that more details and discussion exist in the Table 2. But still, I think some discussions should be added on this topic.
With 5 days revisit and 10m multispectral imagery Sentinel 2 offers good prospect for medium resolution, large swath automatic detection of affected areas. Of course issues remain like the differentiation of channel bank erosion or sedimentation and landslide, or the proper detection of reactivation. Also many automatic detection methods are based ona training set and thus will need some manual mapping.

3/ As underlined by the authors, clouds are one of the most limiting factor for landslide identification. In this sense some comments on the potential of landslide detection from SAR data is missing. The recent work of on detecting landslides with Mondini 2017, suggests that such methods is within reach, even if it may mostly locate intermediate to large landslides.

Minor comments

P2 L 26-30 : " In the longer term, these initiatives can result in multiple inventories for the same event, further adding to the confusion. For example, Xu et al. (2014) described 14 separate landslide inventories compiled after the 2008 Wenchuan earthquake in China.After the 2015 Nepal earthquakes, there was a five-fold increase in landslide numbers between the inventories reported by Kargel et al. (2016; 4 312), Martha et al. (2016; 15 551), Roback et al. (2017; 24 915), and Tiwari et al. (2017; 14 670). "

>> This presentation is somewhat misleading : In both cases some inventories were produced and published rapidly (partly as an emergency mapping effort, for humanitarian or scientific rapid evaluation) and not necessarily in the aim of being complete. Then resolution and coverage of images mostly explain these differences. So even if more standar techniques or mapping methods are propose they may be different team publishing different partial catalogues at different time.
The author could insist here or elsewhere in the text, that better flagging of the aim and validity of an inventory should be considered good practice. Additionally an evaluation of how adapted or not to humanitarian need an inventory is would certainly be positive.

P4 L 12 : focus on populous area, where landslides are " more likely to directly impact". True, but is there a discussion on the indirect impact of upstream landslides, that can also be significant, by propagating along the river system (dams, debris flow, floods).

P6 L 25- L30 : What is affected area ? The region within which landslides occured ? This one remain unknown until mapping is complete. Just above you mention the region with shaking above a limit ? On this recent work by Marc et al., 2017 propose a simple equation predicting the area of occurence of earthquake induced landslide, based on hypocenter depth, magnitude and fault location.
In any case, why is the area changing from 35000 to 7500 km² ?

P7 Line 3-4 : I understand what you mean but I think the syntax is awkward. Consider rewriting with something like: "For example, with WV2 and WV3, [...], the ability to distinguish [...] was reduced due to the lack of multispectral imagery."

P8 L 9 : I think you mean Marc et al., 2016 (seismological expression for EQIL) rather than Marc et al. 2015.

P8 L 15 : Maybe some of this discrepancies should be recall here, as well as there implications. In which case, and to which level of details should such rapid empirical model be trusted when deciding where to acquire satellite images or where to focus mapping effort ?

P8 L 27 : I don't think "verifying " is appropriate, given the example refer to a single, distant area, for model with complex distribution of landslide probabilities. Maybe "supporting" .

P10 L10 : Using difference in number of landslides is uninformattive given landslide numbers varies across several orders of magnitude. 19 000 sounds big, but for the Wenchuan earthquake it would be reasonable (only 10% of ~200 000). I think saying that you underestimated the actual numbers by a factor of ~5 is more reasonable.

Then the obvious question is, whether this was mainly due to resolution (i.e., underestimation of landslide density) or coverage (i.e., correct density but within too few mapped areas). You somewhat suggest in the next sentence that coverage and relative density is ok but absolute intensity is not.

P10 L 27 : I think that this sentence is incomplete: "[...], particularly if this area is otherwise." ?

P11 L 1 : Word missing. "Seeding an empirical landslide [model ?] with the initial rapid mapping...."

P 11 L 4 : I think it should be recall that such extrapolation based on a mapping sample, is likely to succeed only if the 100 landslides are distributed across the rupture area (not in a single catchment), and maybe across diverse setting : diverse lithologies may matter for example ...

P12 L 17-35 : Summary of automatic mapping. Ok. But constellation with high revisit frequency and medium resolution (e.g. Sentinel 2, 5 days, 10m, or Rapid Eye, ~5 days, 5m) do offer a good balance between swath size, revisit and detection capabilities. This is useful for manual mapping, but also potentially for automated detection and delineation (e.g., Stumpf, 2017), even if it may need some manual correction and edition of the detected polygons. Indeed, to me this method provide a pre classified image, allowing faster mapping, but needing significant edition.

I think such aspects may be better inroduced in the introduction and in the discussion they are also relevant to your section 4.4, because some automated classification of the image may well shorten the analysis time when cloud free images are available.

P13 L 10-15 : Sentinel 2 A and B are now operating. So I think these sentence could be shorten.

TABLE 2 : Keefer 1984 i snot in reference list. Marc et al., 2016 and Marc et al., 2017, provides considerably improved estimates of total landsliding and landslide distribution area with initial earthquake parameters and preferably some assumptions on fault rupture location (informed by moment mechanism and scalings available in the literature)

Discussion of the potential of SAR analyses exist in this table but not in the main text. A short discussion in the main text, including comments about Mondini 2017, is missing. see major comments.

The term "full inventory" is ambiguous as it described all attempt at systematically mapping landslides. But Kargel 2016, This Study, and Roback 2017 / Martha 2017, do not only differ by the way landslide are mapped (points, polylines, polgons, respectively) but also by their completeness, with the latter two having 5 times more slides than the former two.

FIGURES
Fig 1 : Decision tree for image selection... Could you mention quantitative criterion ? Angle of Nadir ? Resolution ? 0.5m ? 5 m ? 15m ? I know such values are not necessary strict but some indications could be given.

Figure 2: Interesting.

Figure 3-4-5-6 : I think it may be very interesting and visually effective to show in this figure the

footprints of images progressively used for mapping, maybe color coded by their resolution.
See for example Fig 2 B in Xu et al 2014.
It would allow to visualize the evolution of the area mapped at various resolution.

REFERENCES
Budimir 2014 : Something strange in author list. 3 authors but no initials for the last 2 ?

Kirschbaum 2010 : Given that you cite this work referring to the landslide database, I think you should cite the following references, and not the one you do (that is an analysis of the global dataset).

Kirschbaum, D. B., Adler, R., Hong, Y., Hill, S. and Lerner-Lam, A.: A global landslide catalog for hazard applications: method, results, and limitations, Nat Hazards, 52(3), 561–575, doi:10.1007/s11069-009-9401-4, 2009.

Parker 2017 : Is in NHESS Discussion, so far, although it may complete publication before this study.

Other references used in this review :

Marc, O., Meunier, P. and Hovius, N.: Prediction of the area affected by earthquake-induced landsliding based on seismological parameters, Nat. Hazards Earth Syst. Sci., 17(7), 1159–1175, doi:10.5194/nhess-17-1159-2017, 2017.

Mondini, A. C.: Measures of Spatial Autocorrelation Changes in Multitemporal SAR Images for Event Landslides Detection, Remote Sensing, 9(6), 554, doi:10.3390/rs9060554, 2017.

André Stumpf, O. Marc, J-P. Malet and D. Michéa, Sentinel-2 for rapid operational landslide inventory mapping, EGU2017-4449

Xu, C., Xu, X., Yao, X. and Dai, F.: Three (nearly) complete inventories of landslides triggered by the May 12, 2008 Wenchuan Mw 7.9 earthquake of China and their spatial distribution statistical analysis, Landslides, 11(3), 441–461, doi:10.1007/s10346-013-0404-6, 2014.