Interactive comment on "The role of geomorphology, rainfall and soil moisture in the occurrence of landslides triggered by 2018 Typhoon Mangkhut in the Philippines" *by* Clàudia Abancó et al.

Anonymous Referee #1

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The study concentrates on predisposing and triggering factors that caused a large population of landslides during the 2018 Typhoon Mangkhut, in the Philippines.

The manuscript is quite clear and not difficult to read. The structure can be a bit improved, but already acceptable. Data and analyses are of some interest but there are weaknesses, in particular in the critical evaluation of the result, that makes the discussion in some parts superficial and ambiguous, also the literature review in the introduction can be improved with some more references better linked to the topic.

My main concerns are:

I have not found any clear connection between the meteorological information and the geo-environmental information as if they were two different topics. Is that a choice because lack of connection evidence? Are the resolutions too different for a proper comparison?

Some points related to the sampling methods are unclear (to me), need for further clarifications

Some of the comparisons between the results obtained in this work and elsewhere should be better contextualized, in particular when obtained with different methods or data.

Connected to the previous point, results are depending on some of the preliminary assumptions, including the definition of rain event. This is ok, but the impact of the choice should be better discussed, and can we compare products obtained with different definitions of the initial settings?

Specific comments

Introduction

25 46% of rainfall-triggered landslides: I suggest to add 'known', probably that database is incomplete

30 in the Philippines has still received little attention: do we know why? Just a curiosity

30 results in hazard and risk assessment techniques: what techniques are the Authors referring to?

35 landslide inventories are often not available due to incomplete event records: not sure I understand. Are the inventory missing, or incomplete?

40 Actually the relative literature is very rich, and I don't think that this list is adequate

to intercept the concept.

40 It is particularly challenging in regions hit by the passage of typhoons...: why more challenging?

45 landslide magnitude distribution: is it true for all the types of landslides?

65 geographical distribution: sorry, of what? Do the authors mean the size of the study area?

70 resolution: uncertainty on the resolution. Can the Authors please unravel this concept?

80: about this concept, I suggest you have a look at here.

85 high spatial: compared to? I actually suggest to clarify the concept, since it was told that the resolution is not enough to catch convective processes. Is the fact of working over large areas enough to consider the problem not impacting on the final results?

85 In some regions of the world: it is too generic, isn't it?

100 for the first time: do move it earlier

100 producing one of the first complete inventories: this sentence sounds a bit weird to me: how can more than one complete inventory exist? How do the Authors define 'complete' (and how verified...)

2 Study Area 2.1 Geological and geomorphological settings

110 steep slopes: I suggest to provide here some quantitative info about the slope

120 The study area can also be described as seismically active: according to....

2.2 Climate

2.3 Landslide activity: not sure I would use 'activity' here

140 simultaneous in 2009: overlapping or in two different parts?

150 The rapid urbanization, together with the ongoing mining activity also represents a relevant factor in landslide risk in the area, though these factors were not considered in this study (Mines and Geosciences Bureau, 2018). : this sentence, here, is out of context.

2.4. Typhoon Mangkhut (13-15 September 2018)

155: The highest observed 4 day rainfall total (12 to 15 September 2018) of 794 mm in Baguio City PAGASA weather station was recorded due to the passage of Typhoon Mangkhut (Weather Division PAGASA, 2018).: I suggest to re-phrase

3 Data and methods

3.1 Compiling a landslide inventory and magnitude-frequency analysis

170 We experimented with an automatic landslide mapping tool to map landslides more efficiently: this sentence is too generic and probably in the wrong place (maybe discussion?). What tool? Set up? How did the Author manage the different images? What does the success rate was low mean? And compared to what?

175 limitations: or problems? I also suggest to refer to optical remote sensing here, SAR is starting to provide some alternatives, also for such large events. I suggest to have a look at:

Measures of spatial autocorrelation changes in multitemporal SAR images for event landslides detection (2017) AC Mondini. Remote Sensing 9 (6), 554.

180 have been used to cross-check part of the inventory: and the result is...

3.2 Analysis of landscape controls on landslides

200 governing: I suggest to change the term

3.3 Analysis of rainfall and soil moisture

215 total rainfall (from the start of the rainfall until it finishes): It sounds contradictory

with "These data are of particular interest to identify any correlation between the spatial variability of the rainfall associated with Typhoon Mangkhut and the distribution of landslides, instead of having only the point-based data from Baguio city rain gauge". I suggest to better specify that you are doing a zoom in.

220 total rainfall (from the start of the rainfall until it finishes): I suggest to define here what start and end mean

225 did not trigger landslides: this is a critical point, how to make sure that landslides did not occur? Please, do see a previous comment on the inventory check.

225-230 relevant: the previous numbers are objective, this sentence is relevant. I suggest to explain better why this is relevant. Furthermore, can this rule be applied to all the other events? Perhaps rules should change according to the type of rain event. . . 4 Results 4.1 Landslide characteristics

General questions:

1) for every single landslide, all the pixels were used, or only one 'representative'? 2) are the pixels inside and outside landslides comparable in number? Normalized?

245 figure 3: actually difficult to see the rollover. I recommend to add information about the quality of the fit (uncertainty)

245 maximum in elevations: the peak of the normal distribution?

4.2 Rainfall and soil moisture conditioning and triggering of landslides 4.2.1 Rainfall

275 timing: time of occurrence?

4.2.2 Soil moisture

5 Discussion

315 Using a landslide inventory based on a single event provides information that is strongly influenced by the event characteristics itself: I suggest to re-phrase.

5.1. Landslide characteristics and landscape preconditioning

325 we fill this gap in the literature here: it is actually an example, I would be a bit less 'absolute'. . ..

330 small landslides are more frequent than larger ones: in fact, it is difficult to see the rollover. I think this comparison is interesting, but it is missing a few of elements: type of used data, mapping methods, fitting procedures (the constrains imposed by the fitting), and others should be better unraveled.

330 Further mapping in the region and across other regions of the Philippines will help to refine these distributions and exponents: this sentence sounds a bit weird. The distribution here is related to this event and in the local geo-settings, while the sentence seems to look for a general behavior.

335 aspect: how about anaclinal, cataclinal??

360: how local are these effects?

5.2. Rainfall and soil moisture conditions leading to landsliding

365-380: I have some concerns about this sub-paragraph because it is unclear to me whether the different results can be really compared since the definition of the events are different, but more critical, the data are eventually different!!

385 This value is actually a reasonable value for the porosity of clays,: perhaps, but I think this should be supported by evidence, papers, references..

5.3. Potential of satellite-based rainfall and soil moisture data for landslide early warning

395 Alternatively, it may be that satellite-based rainfall and soil moisture data do not adequately: see one of my previous comments. Not adequate, or not comparable...

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2020-259, 2020.