Comments		Response
Major comments		
1	The authors present new inventories but there is a lack of description of mapping: what about amalgamation of landslides (cf Marc and Hovius 2015)? What about the mapping of debris flow ? etc What about the mapping resolution effects on the size distribution roll-over? With airphotos and Google Earth what was the highest altitude where comprehensive mapping could be performed? Also I think a brief comparison of the ETL mapped by the authors with the public dataset of Roback et al., (2017) would be useful to validate mapping.	Thank you for your answer. We have addressed the issue of amalgamation of landslides as one of the issue involved in analyzing area-size distributions in the introduction. We did not separate the landslides in erosional and accumulation areas, and therefore we are not able to analyze this effect quantitatively in this study. Based on your suggestions we have decided to use the earthquake induced landslide inventory from Roback et al. (2017) as this was much more complete then the one we generated. See Line 156-162
2	In the introduction the authors state that susceptibility comes from Internal and External factor, but later you use no external factor for Rainfall. This is a problem I would say because your susceptibility maps for EQIL and RIL have all internal parameters in common, so it is a bit as if you assumed rainfall forcing was homogeneous across the study area, while it is not. I think it would be worth to try to constrain your RIL with a long term average pattern of Rainfall (i.e. climatologic mean summer rainfall?). This can exactly be done with a TRMM climatology, as presented by Bookhagen and Burbank 2006. Other option may also be possible. This would be a great	Thanks for your suggestion. We agree that precipitation plays an important role in the occurrence of rainfall-triggered landslides. During our research we found that rainfall intensity has a stronger effect on landslide occurrence than long term precipitation, like annual precipitation. But due to the limitation of precipitation data in Nepal, we were not able to represent this spatially. Therefore we used a dataset representing the average precipitation during the monsoon season from ICIMOD and the National Meteorological information Center of China. This data is the average precipitation for the period 1991-2010, for the monsoon season from June to October. We used this dataset in the analysis, and adjusted the text, tables and figures accordingly . See Line 287 Fig. 6

	improvement for the paper, and should be at least mention and discussed. In any case, the comparison of the two susceptibility model does not necessarily depends on the different trigger but very possibly on the relevant landscape properties, as the coverage zone for the two model are very different. I strongly think that this possibility needs to be quantitatively assessed before possible publication.	
3	The author spend quite some time discussing size-effects in the introduction and in their analysis, but their is almost no explanation on how they choose/find their threshold for small or large landslide size. Second : In Fig 5, 6 and 7 (and maybe 8 at least for ETL) there is nothing that strongly suggest any significative difference between small and large landslide. The statement that "size matters" in the title, abstract and conclusions is for me completely unsupported. Further, I do not see really any place where the authors summarize in what size would matter (in the result section) and why it could (at least in discussion).	For defining the threshold of landslide size, we based ourselves on the area-frequency distribution analysis. We used the cut-off point, the point where the distribution starts to deviate from a power-law relation as the threshold value to differentiate between small and large landslides. The results showed that the cut-off points for the two rainfall induced and the earthquake induced inventories were quite similar, and a threshold of 30,000 m^2 was used. We modified the text and figures to incorporate this. See line 211-229.
4	I think the purpose of the paper and its relation to the state of the art literature is not very clearly presented, and would suggest that the authors try to clarify several parts of the introduction (cf. Minor comments).	We have improved the introduction section and incorporated more literature to better represent the state of art and the issues related to the differences in earthquake and rainfall induced landslide inventories and susceptibility. We wanted to highlight that there actually very few studies that have compared susceptibility maps from different triggers in the same area, in an independent manner (So not specifically post-earthquake rainfall induced landslides), and also the limited role of landslide size in landslide susceptibility modeling.

		See Line 58-73.
5	The discussion and conclusions section is using vague or inaccurate formulations and is missing a lot of references (there is only 1 on the rainfall pattern !!) on the importance of the seismic shaking pattern for example, on the elevated landslide susceptibility caused by loose landslide deposits or by slopes damaged by the shaking but unfailed. Potential model bias or difference in the mechanics of small or large landslides are also not discussed. Significant improvement are possible and needed (cf. Minor comments).	We have now rewritten the discussion and conclusions section and we added a number of relevant references.
	Detailed comments	
1	L47 "To investigate whether earthquake- and rainfall-triggered landslides inventories have similar area frequency distributions, area-volume relations and spatially controlling factors, it is important to collect event-based landslide inventories. The difficulty is to collect complete inventories that are independent for earthquakes and rainfalls. Many studies that compare the characteristics of earthquake- and rainfall triggered landslide inventories focus on mapping landslides triggered by rainfall after major earthquakes." >> The question underlying this study is unclear. The literature overview seems biased and inexact. Since	There are undoubtedly many independent inventories of earthquake and landslide triggered landslides available, but rather few that come from the same study area. Even more so independent inventories that are not rainfall induced landslides inventories in the years after an earthquake. Ideally one would like to have several complete landslide inventories produced by rainfall events with different return periods, and several earthquake induced landslide inventories produced by different earthquake scenarios in the same study area. So we do not want to study the post-earthquake

	decades they are indepedent rainfall inventories : New Zealand, Taiwan, Guatemala (Hovius 1997, 2000, Malamud, 2004) and others... The study cited on L51-60 presumably looked at rainfall associated to EQ on purpose, to study whether or not an earthquake affected the properties of subsequent rainfall induced behavior.	
2	L68 "There are fewer studies that compare the two triggering mechanisms in an independent manner." Fewer? Then cite them or say No studies. Malamud 2004 did. Meunier too. Again, it is unclear in the introduction what the author want to compare? I recognize that there is a value into comparing rainfall and EQ induced landslide in the same area, to normalize for landscape properties. But if this is the aim of the authors this is not clearly stated. I also do not see the problem of the study of Lin 2006 and Chang 2007 in Taiwan : They mapped rainfall landslide before the EQ exactly has the author are doing here	Thank you for your comment. We have tried to make a more clear that the main aim of this study is to compare how earthquake and rainfall triggered landslide inventories lead to different susceptibility maps, and that also different landslide size classes have different causal factor combination and lead to different susceptibility maps. See line 74-79.
3	L71-72: I am not sure "potential causal factor" are appropriate terms, given the trigger could also be considered a necessary term to "cause" the landslide. In-situ properties maybe although this is almost identical to internal factors... I also note that from a physical point of view I would say that landslide occurrence is the convolution of a susceptibility term (due to in-situ/internal factor) and a forcing or triggering term. This may be the most adequate	We have adjusted this in the text. We agree with the observation that the susceptibility takes into account the spatial patterns of contributing factors and triggering factors. Landslide inventories for specific earthquake and rainfall events are required to estimate the landslide density for specific return periods.

	view point for a landslide event analysis (e.g. Meunier 2013, Barlow 2016). From a probabilistic point of view, used for hazard analysis, the landslide susceptibility does not design the intensity of the response of a slope to a given forcing, but the long-term probability of landslide occurrence, including both in-situ properties, and the probability of various trigger. This is most suited for historical landslide inventories, where individual triggers are not or poorly constrained. The authors do not really stick to one frame that makes the term susceptibility ambiguous in their study. Indeed in they state in essence in L70-71: Susceptibility (probabilistic sense) depends on internal factor(that makes area susceptible (physical sense)) and triggering factors. This sentence and probably couple of others could be rephrased to avoid this ambivalent and possibly confusing uses.	
4	L83 : "There is no clear evidence shows the difference on morphology between rainfall-triggered landslide and earthquake- triggered landslide" >> Unclear statement. Could the authors specify what they mean with morphology ? Also incorrect grammar :"that shows" or "showing"	We have adjusted this in the text, and modified the introduction
5	L84 : also unclear. Rephrasing needed. Which statistics?	We have adjusted this in the text, and modified the introduction
6	L92: huge slides ? Give a size range maybe.	We have adjusted this in the text, and modified the introduction
7	L95: "whether it is possible to utilize inventories of	Many landslide susceptibility maps are generated by making a statistical relation

	earthquake triggered landslides (ETL) as inputs for analyzing the susceptibility of rainfall-triggered landslides (RTL)." Depending on what authors means by the "susceptibility" here (cf comment above), the problem can be ill-posed given that obviously Rtl and ETL depends on a different trigger and thus will likely show different patterns (as shown by other studies: Meunier et al., 2008, Marc et al., 2018)	between landslide occurrences and contributing factors. There are many instances where there are no separate inventories available for individual triggering events, and where it is not possible to separate landslides triggered by earthquakes from landslides triggered by rainfall. If a susceptibility map that was generated from multi-temporal landslides is used as the basis for hazard and risk assessment and land use zoning, it might result in very wrong predictions in case of an earthquake. And vice versa, if an earthquake induced inventory is used as the basis for a landslide susceptibility for the period after, say a decade, it might also be quite wrong. Furthermore we also address in this research that apart from the trigger, also size matters.
8	L151: It is unclear what you did with Landsat and ASTER DEM. ? Map or only adjust locations of landslides mapped with Google Earth or topo maps? The use of "therefore" is confusing. The author should precise (in Fig 1?) where Topo maps where used and where Google Earth. With overlap or not ? Is the mapping style in topo maps consistent with Google Earth ?	Our description was not clear. We changed the sentence to *Images from Google Earth were downloaded and geo-referenced and landslides were mapped using visual image interpretation and screen digitizing*
9	L155 : resolution of satellite ?	For this paragraph, we changed the method and description. After the 2015 April 25th Gorkha earthquake, earthquake-triggered landslides were mapped by Roback et al.(2017) using high-resolution (<1m pixel resolution) pre- and post-event satellite imagery. 24,915 landslide areas were mapped, and 1,4000 landslides were distributed in Koshi river basin. Chinese GaoFen-1 and GaoFen-2 satellites imageries (with 2.5m resolution) of the CNSA (China National Space Administration), which are part of the HDEOS (High-Definition Earth Observation Satellite) program, were employed to validate this landslide inventory. These

		images were captured during 27 April, 2015 to May 14 2015. Finally 15 landslide areas were deleted, and 120 landslide areas were added to the inventory.
10	L159 : Confusing sentence, clarify or rewrite	We have rewritten this sentence.
11	L160 : consider replacing "rainfall impact to landslide" by something clearer, like : new or reactivated landslide due to subsequent rainfall.	We have adjusted this
12	L161 : which pre EQ image ? Google Erth or other... Estimation of the areas where pre or post EQ imagery did not allow mapping (because of clouds or shadows)	We have adjusted this
13	L164 : You said above you did not separate different zones of the landslides. How did you choose where was the initiation point? Is it the highest point? Taking a single pixel as source or scar zone may bias your statistics. Why not considering a scar surface in the upper part of the polygon?	This due to the limitation of our landslide inventories. For the Gorkha earthquake triggered landslide inventory, Roback et al (2017) identified the scarp areas of the landslide separately. For the RTL inventory we didn't do this. For the susceptibility assessment, we extracted the point located in the highest part of the landslides, as indicative of the initiation conditions.
14	L166 : Line 151 you said you use ASTER GDEM (30m). Be consistent. There is absolutely no reason to use a 90m dem while SRTM 30m is available. For quantitative slope assessment it will make a difference and analysis should be re performed with the highest possible resolution.	Different DEMs, such as ASTER GDEM, and SRTM Digital Elevation Model with both 90 m and 30m spatial resolution were evaluated to use in this study. After careful analysis however, both ASTER GDEM and 30m SRTM contained many erroneous data points, which forced us to use the more general 90m resolution SRTM DEM in our previous work. During revising this paper, we got another dataset, ALOS PALSAR DEM with resolution of 12.5m, which cover the whole study area. So the high resolution DEM was employed in this paper at last. See line 163-169.
15	L167 : Explain how you determine where the river network	Base on the DEM, the streams were obtained using GIS modeling tool in ArcGIS

	start, as this is not done by arc GIS.	and ILWIS software, and the drainage density was calculated.
16	L172: you mean it is from Shakemap ? At which resolution ? In any case a few sentences on how shakemaps are derived and on what are their limitations (no topographic amplification, no constraints on site effects within mountainous area, interpolation with heavy weight given to station measurements even in areas with very different setting) is needed, together with a couple of references. I also think a map of the shaking in the Koshi, with landslides indicated, should be shown at least in supplement.	The Peak Ground Acceleration data for the Gorkha earthquake were obtained from USGS Shakemap, which was designed as a rapid response tool to portray the extent and variation of ground shaking throughout the affected region immediately following significant earthquakes (Wald et al., 1999). We include the map in Figure 6
17	L183: Did you use distance to river (as suggested above) or not? What is relative relief, computed at which scale? Same drainage density? Distance to fault, which faults? I think a supplementary figure with the different (relevant) susceptibility factor would be useful.	According reviewer's suggestion, we added a figure (Figure 6) that shows all contributing and triggering factors. See Line287.
18	L207-210: which method did you use to determine the Beta exponent and the threshold size ? Clauset et al. 2009 is the recommended approach (and they provide script to reproduce their analysis). Are the different estimates significatively different (i.e., what are the uncertainty on them)? ETL-All and the two RTL dataset have very close exponents.	Indeed we used the method by Clauset et al (2009) , based on a script developed by Tanyas et al. (2018). From our new analysis based on the new landslide inventory for Gorkha earthquake, we found that, the ETL-All and ETL-Koshi have similar Beta exponent with value of 3.22 and 2.85, and the RTL landslide inventories have lower value of 2.38 and 2.44. What interesting is that all of them have similar cut-off value which round 30,000 m^2
19	P9 214: landslide size definition : is there a mistake or this classification is discontinuous ? small <1000 ; 1000< medium <10,000 ; <100,000 large...	We have adjusted this. See line 226-229.

	What about landslide between 10,000 and 100,000??	
20	L216: why 6000? you say it is based on FAD but without explanation... The sentence above is meaning less, which FAD analysis? Which field exp ?6000 i the power-law cutofffor ETL but is in the roll over of RTL.... Also a few sentence on the meaning of the roll-over (and its sensitivity to resolution censoring) and of the Beta exponent and how it may be linked to physical properties is needed ! Cf Pelletier 1997, Stark and Hovius 2001, Stark and Guzzetti 2009, Frattini and Crosta 2013,	We have adjusted this. Based on the use of the ETL inventory (Roback et al, 2017) for the Koshi Basin we derived similar cut-off values of 30,000 m^2 for ETL and RTL. Koshi River basin show similar cut-off value, which was around 30,000 m^2. So we defined the cut-off value as the threshold for large size landslide and small size landslide. See line 211-229.
21	L224: For this initial correlation did you use ETL or only RTL ? If ETL was used what about PGA ?	We took PGA and precipitation factors as triggering factors, other factors we took as contributing factors. There are many groups during these factors. Here we only analysis some contributing factor to show the difference of different triggers and different sizes of landslides.
22	L229-231: I am not sure this comparative analysis in terms of altitude or other parameters make any sense : because the difference will not have any thing to do with EQ or Rain , just to the fact that one dataset (RIL) covers 10-20 times more area, with a vast area at low elevation. Instead the ETL are limited, because of the fault location, to a small zone with high elevation. I think all this analysis should be redone : ETL and RTL should be compared to the landscape within which they occur, so that it is not absolute elevation or slope or aspect that is analyzd but fraction of the lanscape (percentile of landscape elevation for exemple, or analysis	We agree that, the number of landslides in one landscape class can't show the correlation of landslide with the parameter, the density or frequency ratio could be better to show the impact of factor to landslides. Frequency Ratio was employed to show the impact of each factor groups on landsliding(Lee and Min, 2001; Razavizadeh et al. 2017). $FR=(E/F)/(M/L)$ Where E is the area of landslide in the conditioning factor group, F is the area of landslide in the study area, M is the area of conditioning factor group, and L is the area of study area. Fig. 5 was redrawn and is now showing the Frequency Ratio for two combinations of contributing factors: elevation&slope and lithology&slope.

	of oversampling or undersampling of given slopes or aspect. Cf Meunier 2008, Barlow 2016 etc). Fig 5 should also be updated.	See section5.2.
23	L234: Is this based on the land cover maps ? Or is this from the imagery ?	This conclusion was drawn from image interpretation and field work.
24	L244: Missing word...to the?? direction ?	The word *South* was added
25	L264: gully density ? Or drainage density ? Be consistent !	The word gully density was changed to drainage density.
26	L267-269: Could you comment on the values given for the different model ? It reaches 24 / 22 for ETL against 7 /6 for RTL. The methods sequence could include some more details to allow the author to have an intuition about the relative importance of different parameters	The coefficients for the contributing and triggering factors in the landslide susceptibility models show differences between triggers and different sizes of landslides. Curvature, altitude and slope gradient have a high impact on the susceptibility of RTL, while curvature, PGA, relative relief, and slope gradient have high impact on susceptibility of ETL. The size classes of RTL show larger differences in weight of curvature, relative relief and altitude. For ETL the difference between size classes are largest for factors of PGA, curvature, and relative relief. See line 279-283.
27	L284: Obviously landslide susceptibility of ETL is giving only high suscptibility where you had data... As mentionned above you should also show the Shaking map ...	We add PGA map in the new figure, Fig 5.
28	L289 : EQ without effect on large landslides ? The argument that large landslides occur only close the fault may be true for very large landslides but seems unikely for landslides down to 6000m2 that is not so large.	After the new analysis, we obtained a threshold of 30000m^2 for large size landslides. The characteristics and susceptibility zones show significant differences for small size and large size landslides.

29	L335 : I think this conclusion is erroneous, or at least not demonstrated by the authors. Because the ETL model includes PGA, and also because it is based on a much smaller part of the landscape, a subarea where landslide are located in a different environent copared to the zone affected by RTL. I think only by limiting the model development in an area where both RTL and ETL are widespread could the authors try to test this hypothesis. *The conclusion that can be drawn is that the regions with very high and high suscepbility to ETL are not prone to RTL. This might change however, in the coming period, as the earthquake triggered landslides are bare and often the source of loose debris, that can be reactivated by extreme rainfall events.*	We fully agree with your statement and adjusted the text accordingly. See line 371-436.
30	L340: You repeat this result that is completely obscure in the main text. There was no reason given to this threshold value	After reanalysis we are using a different threshold based on the cut-off points of the FAD's for both ETL and RTL, and explained this in section 5.1.
31	L342 : You never demonstrated the correlation in altitude and aspect was due to precipitation... The following sentences are interesting but a bit weak. The use of some rainfall climatology (as existing with TRMM for example, would be an actual demonstration).	We add the average precipitation data during the monsoon season in Figure 6J. And we also added text about this in the document in several section, including the discussion and conclusions.

32	L349: Should be rephrased. The epicenter is extremely far from your study area and seismic waves propagates in all directions. Second part may refer to seismic directivity that relates to wave interference. I think a discussion in terms of the ground motion pattern is what you mean. (and it is difficult to discuss without showing the shaking in a figure...)	We add the PGA map in Figure 6h.
33	L365: The forcing extent are different within this catchment. You need to discuss it, and for that you need to show shaking and rainfall pattern, both essential information that are missing !	See above
34	L368: "Some more detail information could be included in large scale research" >> Like what ? why would it help? and why didn't you include it ? As of now this sentence does not bring anything to the reader.	Due to the new organizing of the manuscript, this sentence was deleted.
35	L376: "Whereas, the use of rainfall-triggered landslide maps can be of some use for predicting the occurrence of earthquake-triggered landslides, one should be careful, as the specific location of the earthquake plays a dominant role." >> Not sure Whereas is the proper word. Anyway I do not think there is anything new for the community in a sentence like that	Due to the new organizing of the manuscript, this sentence was deleted.
36	Fig 5 : Why show Altitude vs other param? This display does show nicely the difference in altitude between datasets	As mentioned earlier we have reanalyzed this and now show the Frequency Ratio for two combinations only : elevation&slope, and lithology&slope for both size

	but not really with the other parameters. Further it is hard to interpret anything when the distribution of landscape parameters is not shown... I think the authors must show the distribution of landscape properties (as classically done in the literature) slope gradient, aspect, altitude; stratum etc in the study area in black and then the ones of landslide RTL/ ETL in red / yellow on top for comparison.	groups and triggers, which is clearer. See section 5.2
37	Fig 6 : I suggest that you put all RTL in the left column and ETL in the right. It will make the figure less confusing and subplots easier to compare.	As reviewer's suggestion, we put all RTL in the left column and all the ETL in the right column, the figure is much clearer than before.
38	Fig 8 : large RTL are better predicted. Do you think this is physical or it may be a bias due to the higher difficulty to map small landslides? Also is there any ROC difference between RTL at any size and the 1992 or 2015 inventories ?	The large landslides are fewer, but seem to be related to a more defined set of combinations of contributing and triggering factors. This makes that the AUC's are higher. We didn't check the difference between the two RTL inventories separately.
39	Fig 9 : Comparison is not ideal : ETL susceptibility is likely driven by the fact landslides are limited to a very small subset of the Koshi.	According to the new inventories, the subset is not so very small: out 25,020 landslide, 14,127 were located in the Koshi river basin
	Technical comments	
1	L85/86 : "are" missing between volume smaller/larger	"are" was added in this sentence.
2	L97 -> hazard and risk assessment (i.e. remove 1 assessment)	The extra assessment was deleted.
3	L214: From the Biblio it should be Tong et al. 2013. Given that this is a book in Chinese I doubt that this references will be accessible by much reader... and not	We added in the text that this is considered a main reference in China for defining the size thresholds

	sure it is essential .	
4	L 385 : Weather > Whether	The word weather was changed into whether.
5	Fig 7 caption : "Statistics" ; susceptiblity x2 > missing "i"	The word susceptibility was revised.