Dear Referee,

Thank you for your kindly providing all these helpful comments. Our replies and the corresponding future works are all listed below.

Comments to author:

No.	Comment	Reply
1	The main issue of the work is the lack of a **real validation**, since authors consider only rainfall events that triggered landslides, but they should consider, if possible, even events that not triggered landslide, to validate the early warning system in terms of **false alarms, missed alarms and correct alarms**. To identify these categories, they should **define a threshold** to identify a "no alarm zone" and an "alarm zone" (e.g. green area of fig. 6, 8, 9 could be considered as no alarm zone, while yellow to red areas as alarm zone). Without such a validation a functional EWS cannot be considered as effective or ineffective.	Thanks for the comment. We agree the real validation is needed to evaluate whether this EWS is effective or not. We will define the threshold for identifying a "no alarm zone" and an "alarm zone." After that, the number of false alarms, missed alarms and correct alarms will be calculated to evaluate the effectiveness of this EWS.
2	Another important point author should clarify is how they identified **the exact time of landslide**, since it is necessary to calculate the 3-hours rainfall intensity. They located landslide with several approaches as the use of SPOT5 satellite imagery, but in this case is not possible to identify the exact occurrence time of the landslides.	Thanks for the comment. During field investigation, we not only verified the correctness of landslide inventory but also tried to inquire the exact time of landslide from residents lived around. The accuracy of exact time of landslide is hard to evaluate, however, we tried to interview residents whose family was injured or house was destroyed by the landslide, so that the quality of landslide occurrence time might be improved.

Comments in PDF file:

No.	Comment	Reply
1	[Page 2, line 8] Please add Rosi et al. 2012;	Thanks for the comment. We will add this reference.
2	[Page 2, line 14] (1) Modified as "Segoni et	Thanks for the comment. We will modified

	al, 2014, 2015" (2) Add also "Rosi et al. 2016." Rainfall thresholds for rainfall-induced landslides in Slovenia. https://doi.org/10.1007/s10346-016-0733-3	and add these important references.
3	[Page 2, line 27] "region" replace with "mosaic."	Thanks for the comment. We will use "mosaic" instead of "region."
4	[Page 2, line 29] "Geological settings" replace with "Lithological units."	Thanks for the comment. We will use "Lithological units" instead of "Geological settings."
5	[Page 3, line 1] I suggest splitting this chapter into two chapters. 3: Available data. 4: Methodology. This will increase the readability of the document	Thanks for the comment. We will split "Data and methodology" into "Available data" and "Methodology" to increase the readability.
6	[Page 3, line 3] Please change the number of the paragraphs according to the new chapter division	Thanks for the comment, we will correct the number of each paragraphs.
7	[Page 3, line 5] all the approaches you used to create a landslide DB are right, but they have a major issue: the date of the landslides are approximated and this is will affect the identification of the real rainfalls responsible of the initiation of the landslides. If you use 3 hours rainfall you need the exact time of landslide triggering. Please clarify these points.	Thanks for the comment. We agree that it is impossible to get the exact time of landslide from landslide DB, therefore, we tried to inquire the exact time of landslide from residents lived around during our field investigation. We will emphasize this in the revised manuscript.
8	[Page 3, line 21] Exact date is usually hard to identify and the exact hour is even more difficult. Do you consider the uncertainty of triggering time? How do you manage it?	Thanks for the comment. We believe that the uncertainty of triggering time is hard to evaluate due to the lack of video records. However, we tried to interview residents, especially whose family was injured or house was destroyed by the landslide, to get the occurrence time of landslide during field investigation. Based on these impressive memories, the quality of landslide occurrence time might be improved.
9	[Page 3, line 25] Please describe how you performed the reduction to 10 m resolution and the smoothing. Did you use a simple	We developed a Fortran program to obtain the smoothed and resolution-reduced 10m DEM by calculating the average value of

	GIS resample technique? Have you considered the effects of smoothing the DEM on the morphological analyses? Please clarify.	each 2 by 2 grid in the 5m DEM. The smoothed DEM might generate some differences on the morphological analysis. However, the expected scale of our landslide susceptibility is set to 1:25,000, so we may be able to ignore the differences that smaller than 12.5m according to the regulation.
10	[Page 3, line 26] the procedure you cited (Xie et al, 2004) identify slope units from DEM, by the use of Arc Hydro tool. Each slope units is characterized by several homogeneous parameters. I believe that a more accurate description of the whole procedure you used to identify slope units is required, to better understand the paper.	Thanks for the comment. Slope units were delineated according to the ridges and gullies as well as their aspect and gradient. Besides, slope units that delineated by parallel drainage on a dip slope should united as one slope unit. Moreover, the area of each slope unit is set to around 5 ha. Therefore, some smaller slope units were united to adjacent slope units. We will add these parameters and a more detailed procedure to the revised manuscript.
11	[Page 4, line 2] What do you mean with total rainfall? How long is the period you considered to calculate it? How did you decide to use 3 and 24 hours rainfall? Please clarify.	Thanks for the comment. Whenever a typhoon attacks Taiwan, Central Weather Bureau will issue alerts for typhoon. We therefore take the time of the first alert issued as the beginning of rainfall event and the time of canceling alert as the end of rainfall event to calculate the total rainfall. For the decision of 3 and 24 hours rainfall, we calculated I_1, I_2, I_3, I_4, I_5, I_6, R_6, R_{12}, R_{24}, R_{48}, R_{72} and total rainfall to check their relation with landslide. We found that there were 218 landslide cases occurred within 3 hours right after the highest rainfall intensity and 242 cases occurred within 3 hours right after the 2^{nd} or 3^{rd} highest rainfall intensity, accounting for nearly 49% of landslide cases gathered in this study. These results indicate that I_3 is the most key index for landslides induced by short duration but

		high intensity rainfall in Taiwan. On the other hand, we found that the lowest coefficient of variation is 0.38 for 24-hour accumulated rainfall. This indicated that R_{24} was less dispersive than other indexes and might be more suitable for serving as accumulated rainfall index in establishing rainfall thresholds.
12	[Page 4, line 12] what do you mean "The ratio of steep slope was calculated by dividing the area that greater than 30 degrees by total area of slope unit."?	Thanks for the comment. As we know, shallow landslides are prone to occur on steep slopes. Therefore, we used "the ratio of steep slope" to present how many steep slopes are there in a slope unit. We calculated the area where gradient is greater than 30 degrees ($A_{>30}$) and the total area (A_{total}) of each slope unit. The ratio of steep slope can therefore be calculated by $(A_{>30})/(A_{total})$. Besides, after trial and error, we found that the threshold of 30 degrees has a higher relationship with landslide susceptibility.
13	[Page 4, line 17] Kriging interpolation method is very effective, but it has to be properly performed. You should describe how you applied it.	Thanks for the comment. We collected the rainfall data from more than 700 rain gauges in Taiwan. After analyzed the I_3 and R_{24} of each rain gauge, we used linear mode of ordinary kriging and applied default setting in Surfer software to obtain rainfall distribution of the whole study area.
14	[Page 4, line 23] & [Page 4, line 25] "required" → "require"	Thanks for the comment. We will correct this in the revised manuscript.
15	[Page 4, line 35] please clarify how you defined the coefficient *w* in LR function.	Thanks for the comment. We used landslide and non-landslide samples for the training of logistic regression in SPSS software. After training, the coefficients of each factor were reported in the software and can be used for the prediction of landslide susceptibility.
16	[Page 5, line 18] Why did you not use the	Thanks for the comment. We agree that

	cumulative rainfall of 3 hours? It is the same.	using cumulative rainfall of 3 hours is similar to 3-hour mean rainfall intensity (I_3). We choose I_3 here for the purpose of emphasizing the short duration but high intensity rainfall. Similarly, we choose R_{24} for the sake of emphasizing the long duration but low intensity rainfall. We will add these descriptions in the revised manuscript.
17	[Page 7, line 16] for a complete validation you should use also rainfall events that not triggered landslides, to calculate False alarms, correct alarm and missed alarm. See Segoni et al. 2014, Rosi et al, 2015, etc.	Thanks for the comment and kindly providing relevant references. We will define the threshold to identify no alarm zone from alarm zone and calculate the number of false alarms, correct alarms and missed alarms to make a complete validation of our EWS.
18	[Page 7, line 25] I believe this happened because you used rainfall intensity. If rain stops, intensity decreases, but if you try to use 3-hours cumulative rainfall you should avoid this problem.s	Thanks for the comment. If rainfall stops, not only 3-hour mean rainfall intensity (I_3) but also 3-hours cumulative rainfall (R_3) decrease because only the rainfall in the nearest 3 hours (h, h-1, h-2) are taking into consideration. Besides, in this study, rainfall thresholds were set according to the I_3-R_{24} diagram shown as Figure 5. If 3-hours cumulative rainfall (R_3) were used to replace I_3, the scale of y-axis and the value of new threshold will also be 3 times higher in R_3-R_{24} diagram. It means that no matter in the I_3-R_{24} diagram or R_3-R_{24} diagram, for the same rainfall events, the snake line will all turned back to yellow when the rainfall let up.
19	[Page 14, Figure 3] this Figure is missing of some elements: scale bar, legend, orientation (North direction).	Thanks for the comment. The other reviewer suggests deleting this figure because it is not useful for the discussion. We will delete it in the revised manuscript.