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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Detection of collapsed buildings due to the 2016 Kumamoto, Japan, earthquake from Lidar data" *by* Luis Moya et al.

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We express our gratitude to Mr. Milad Janalipour for his comments. Please kindly find our response below. The updated version of the manuscript, after considering your comments, is attached.

(1) COMMENT

-Abstract: I think the first sentence is not necessary

AUTHOR'S RESPONSE

As mentioned in the paper, having a pair of Lidar data, before and after the earthquake, is not often. A pre-event Lidar data is available here because the strong foreshock (April

14). That is, the first mission was sent to record the effects of the foreshock. Therefore, we believe the first sentence is important to gives an overall view to the readers.

CHANGE IN MANUSCRIPT

No changes

(2) COMMENT -Abstract: "Different methods for extracting the collapsed . . ." please revise this sentence

AUTHOR'S RESPONSE

Following the comment, the sentence has been modified to: "Different methods were evaluated to extract collapsed building from the DSMs. The change . . ."

CHANGE IN MANUSCRIPT

The modified sentence is located at Line 13 Page 1.

(3) COMMENT

-Introduction: The authors can use the following papers in the literature review to improve it: ∼Rehor, Miriam, et al. "Contribution of two plane detection algorithms to recognition of intact and damaged buildings in lidar data." The Photogrammetric Record 23.124 (2008): 441-456. âĹijSchweier, Christine, and Michael Markus. "Classification of collapsed buildings for fast damage and loss assessment." Bulletin of earthquake engineering 4.2 (2006): 177-192.

AUTHOR'S RESPONSE

As suggested by the reviewer, we have included the mentioned papers.

CHANGE IN MANUSCRIPT

The paper of Schweier and Markus (2006) is referred at Page 2 Line 8-10: "Schweier and Markus (2006) pointed out Lidar data can be used to classify collapsed buildings. Thus, they proposed a modification of previous damage classification types (Okada

and Takai, 2000) and suggested features that can be extracted from Lidar data to classify collapsed buildings. However, applications of the framework were not provided."

The paper of Rehor et al. (2008) is refereed at Page 2 Line 14-16: "Rehor et al. (2008) proposed the use of a planes-based segmentation method to detect damaged buildings, where the number of unsegmented pixels in damaged buildings is larger than in undamaged buildings."

(4) COMMENT

-Page 2, Lines 26-31: the presented aim is not clear.

AUTHOR'S RESPONSE

The sentences have been rephrased to; "Therefore, this study explores the potential use of Lidar data to extract damaged buildings over the affected area. The difference of elevation, the standard deviation and the correlation coefficient were tested to obtain information regarding the damage state of buildings."

CHANGE IN MANUSCRIPT

The modified sentences begins at Page 2 Line 33.

(5) COMMENT

-Page 3: "(i.e., the reduced polygon is located inside a building footprint)" there is no need to use parenthesis.

AUTHOR'S COMMENT

With all due respect, there is not infraction on the use of parenthesis. It is only a matter of writing style.

CHANGE IN MANUSCRIPT

No changes.

(6) COMMENT

-Page 4: BDSM?? ADSM??

AUTHOR'S COMMENT

BDSM and ADSM represent the pre-event and post post-event digital surface models. The terms were introduced for the sake of brevity at Page 3 Line 8 of the original Discussion Manuscript.

CHANGE IN MANUSCRIPT

No changes

(7) COMMENT

-I think it is possible to present "Detection of damaged buildings" section in a better and logic manner. For example, they firstly provided accuracy assessment measures and then presented SVM method. Their positions can be changed.

AUTHOR'S COMMENT

One of the first steps on classification techniques is to evaluate the input features. In this case: ΔH, σ, and r. I believe it is important first to evaluate their level of uncertainties before applying any classification method. Thus, we first evaluated our features. Then we applied some classification methods. Finally, we evaluated the accuracy of the classification. With all due respect, I do not think it is logic to switch the order.

CHANGE IN MANUSCRIPT

No changes

(8) COMMENT

-Although SVM is a famous classifier, it is necessary to provide some descriptions about that since it is directly used in the methodology.

AUTHOR'S COMMENT

Few comments regarding on the methodology are located at Page 6 Lines 9-13 of the original discussion manuscript.

CHANGE IN MANUSCRIPT

No changes

(9) COMMENT

-Please express parameters selected for implementing SVM and K-Means over the study area. How could you adjust their parameters?

AUTHOR'S COMMENT

Following the reviewer's suggestion, we have included some words regarding to the classification methods. For the case of k-means cluster, the only setting possible to manipulate is the initial values of the centers of each class. Here, we used a suggested k-means++ procedure to set the initial values, which makes the centers to be distant from each other. For the SVM classifier, considering we used a linear kernel, there is only one parameter that must be evaluated. We performed a cross-validation analysis for that purpose and concluded that there is not effect of the C parameter on our results. The result of the cross-validation is shown in a new figure (Figure 11)

CHANGE IN MANUSCRIPT

The information regarding k-means cluster is located at Page 7 Line 9: "The result is highly dependent on the initialization of the centroids. Here, k-means++ initialization scheme was used. K-means++ initializes the centroids to be distant from each other (Scikit-learn, 2017b)."

The information regarding SVM is located at Page 6 Line 19: "For a linear kernel SVM, the parameter C is the only value that must be considered. The parameter C trades off misclassification of training examples against simplicity of the decision surface. A

low C value makes the decision surface smooth and a high C value aims at classifying all training examples correctly (Skit-learn, 2017a). In this study a value C equals to 1 was used. In order to evaluate its effects, a cross-validation procedure was performed. Here, a range of C values are evaluated. For each C value, 80% of the surveyed data is selected randomly and used to calibrate the SVM classifier. The rest of the surveyed data is used to calculate a score that represents the accuracy. The overall accuracy was chose as the score. The procedure is repeated 5 times and the average is stored. Figure 11 shows the cross-validation accuracy. It is observed the accuracy remains mainly constant with small fluctuations at lower values. However, a difference of approximately 3% is observed between the worst and the best accuracy. Therefore, it is concluded that the C value did not affect the SVM classifier in our study"

(10) COMMENT

-Conclusion: Please provide some future studies.

AUTHOR'S COMMENT

As suggested by the reviewer, a future study is included.

CHANGE IN MANUSCRIPT

Page 8 Line 16: "It is expected that the use of Lidar data to extract damage areas will eventually increase in the near future. However, because of the current lack of data, the extraction of collapsed building using only post-event Lidar data will be addressed in a further publication."

Please also note the supplement to this comment:
https://www.nat-hazards-earth-syst-sci-discuss.net/nhess-2017-186/nhess-2017-186-AC2-supplement.pdf

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