Please note that all line numbers in the following responses relate to the original manuscript.

Comment: The authors attempt to estimate the DEM uncertainty through stochastic simulation and access the impacts of topographic uncertainty on simulation-based landslide run-out analyses. The subject is likely to be able to attract a broad range of the engineers and geoscientists. Overall, the article is well organized and scientifically sounds, in general. However, the 5m and 2m DTM datasets used in this study may not be the best choice. More detailed, high-accurate DTMs are recommend, such as free access Airborne LiDAR, even though the main findings by the authors may not been affected.

Response: Many thanks for the overall positive feedback. We totally agree with the reviewer that other high-accurate DTMs like free access Airborne LiDAR should be used eventually. High-accurate airborne LiDAR datasets are at present mostly available in developed countries, like Finland, US, Spain, etc. As stated in the introduction, "despite the broad variety of existing DEM sources, however, we are still facing (and will face in the near future) a very limited availability of high-accuracy DEMs for some regions that are particularly prone to landslide hazards, e.g. in Asia" (line 52-54). In this paper it was our goal to assess the impact of DEM uncertainty through stochastic simulation using a benchmark case that is well-known to the community. We hence decided for the 2008 Yu Tung Road landslide. To our knowledge, there was no free access Airborne LiDAR covering the area of interest when we conducted the study. Considering that the main findings may not been affected, as the reviewer points out, we still use the 5 m and 2 m DTM datasets for our current study that demonstrates the principal feasibility of our approach. Meanwhile, we are in active discussion with collaborators to apply our developed workflow to cases in which high accurate LiDAR datasets are available.

Comment: The influences/effects of elevation, slope, aspect..., should be clarified.

Response: We thank the reviewer for this comment. In the manuscript, terrain characteristics (e.g. elevation, slope, aspect, and ruggedness/roughness) were used for two purposes:

1) to determine the required number of DEM realizations for the stochastic simulation (in section 5.2.3), and
2) to analyze how DEM uncertainty affects landslide runout modeling results (in section 6).

For the latter, we didn’t find obvious trends or relationships between landslide runout modeling results and terrain characteristics at a specific location (on a cell level). One obvious reason is that a simulation result at one location is affected not only by terrain characteristics at the specific location, but by the complete upstream and surrounding terrain. We rather included a discussion of the effects of terrain by identifying several compound terrain characteristics and their impact on how DEM uncertainty may affect landslide runout modeling results. The compound terrain characteristics include: a) banks of the channel, especially the north bank near area 1 and south bank near area 2 (line 473, line 479-480, figure 8); b) relatively high elevation area at the end part of the channel that holds back flow material (line 473-474); c) topographic roughness (line 474); d) relatively flat area 3 (line 482, figure 8).

Due to DEM uncertainty, above compound terrain characteristics represented in DEM realizations vary with respect to the original DEM (line 471-472), which further affects landslide runout modeling results. Specifically,
a) tend to be dampened out from DEM realizations (line 472-474). Deteriorated channel bank representation makes flow material spread out along channel cross section direction, travel shorter distance (line 485-486), and leads to smaller ensemble-based mean of flow dynamic properties at channel bottom locations (line 543-544).
b) also tends to be dampened out from DEM realizations (line 472-474), which makes flow material travel further (line 486-487).
c) tends to increase (line 474), which leads to higher simulated momentum losses, shorter travel distance (line 487-488), and smaller flow dynamic properties on average (line 550).
d) area 3 is relatively flat (namely, slopes in the area are relatively small). Thus, it is sensitive to DEM uncertainty (line 482-483). Furthermore, it locates near the deposition, around which the impact of upstream DEM uncertainty seems to accumulate (line 496-497). Both explain the impact of DEM uncertainty in that area.

As a summary, we discussed the effects of terrain characteristics on simulation results in terms of compound terrain characteristics (e.g. banks of the channel, relatively high elevation area at the end part of the channel, topographic roughness, and relatively flat/small slope area 3) rather than the effects of terrain characteristics at the cell level (e.g. elevation, slope, ruggedness/roughness at a specific location). As regards to aspect, we didn't find a clear relationship between this terrain characteristic and simulation results. Therefore, we didn't discuss it in section 6.

We agree that our text can be improved to convey our ideas and improve the readability. We therefore modify our manuscript as follows.

1) To avoid confusion, we keep the terminology "roughness" consistent throughout the manuscript. Namely, we change all the word "ruggedness" to "roughness" (in line 272, line355, line 361, line 364, and legend of figure 5).

2) We add the following paragraph before we start the discussion (after line 470) to explain why we discuss the effects of terrain characteristics on simulation results in terms of above-mentioned compound terrain characteristics.

   "As stated in section 4, analyzing terrain characteristics of the original DEM and DEM realizations may help us to interpret simulation results. By a preliminary analysis, we didn't find obvious relationships between landslide runout simulation results and terrain characteristics at a specific location (on the cell level). One obvious reason is that a simulation result at one location is affected not only by terrain characteristics at the specific location, but by the complete upstream and surrounding terrain. Instead of discussing the effects of terrain characteristics at the cell level, we therefore focus on several compound terrain characteristics that help us to understand how DEM uncertainty may affect simulation results. The compound terrain characteristics include: banks of the channel, especially the north bank near area 1 and south bank near area 2; relatively high elevation area at the end part of the channel that holds back flow material as shown in Fig. 7 (b); topographic roughness; relatively flat area 3 (namely area with relatively small slope)."

The following sentence and content are accordingly removed to keep the manuscript coherent and concise.

"This can be explained as follows." (line 469-470)
"as shown in Fig. 7 (b)" (line 474)

Comment: Table 1 is not easily to read or understand, if the manuscript is not well followed.
Response: we thank the reviewer for pointing this out. To improve the readability, we modify Table 1 as follows.

Table 1 Scenarios for stochastic simulation

	method to generate DEM realizations	input to generate DEM realizations
scenario A)	USS	RMSE=3.3; d=180
scenario B)	CSS	semivariogram; $\varepsilon_{KK}^{*}\{K=180\}$
scenarios for *unrepresentative RMSE*	USS	RMSE=0.5, 1.5, 2.5; d=180
scenarios for *subject d*	USS	RMSE=3.3; d=0, 90, 270

Note: in scenario A) and B), the inputs to generate DEM realizations are obtained from higher accurate reference data at the 180 reference locations.

Comment: Line 218, figure 4 appeared before all the other figures in manuscript.
Response: We thank the reviewer for noticing this. We originally referred to figure 4 in line 218 to give the readers who are not familiar with semivariogram models a direct impression. To avoid confusion, we replace the notation "(see Fig. 4)" with "(see section 5.2.1)" in line 218.

Comment: In fig 9, the figure caption is not proper. The main findings should be noted in manuscript.
Response: We thank the reviewer for this comment. To avoid redundance, we remove the main findings in the caption of figure 9 according to the reviewer's comment. We accordingly remove the main findings in the caption of figure 8 as well. Both have already been noted in the manuscript (line 556-560 for figure 9 and line 507-510 for figure 8).