

Nat. Hazards Earth Syst. Sci. Discuss., referee comment RC2  
<https://doi.org/10.5194/nhess-2021-49-RC2>, 2021  
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## Comment on nhess-2021-49

Jessica Ball (Referee)

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Referee comment on "Quantifying location error to define uncertainty in volcanic mass flow hazard simulations" by Stuart R. Mead et al., Nat. Hazards Earth Syst. Sci. Discuss., <https://doi.org/10.5194/nhess-2021-49-RC2>, 2021

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This paper is a valuable contribution to debrisflow modeling on volcanoes, and takes important steps toward crafting a method for the quantification of uncertainty in debris flow modeling results. The results of this study will help make model results more robust and contribute to better hazard maps, and it is nearly ready for publication; addressing the comments below will strengthen the writing and make it easier for other practitioners to make use of the methods described. In addition, some minor modifications to the figures will make them easier to read and interpret. Minor typos are noted at the end of the more substantive comments.

### *Comments*

Line 104 (Figure 1): This figure contains multiple sets of black dotted lines (crater outlines, debris flow deposit, contours, and spurious elevation zone), which is confusing to interpret. The craters are apparent and only need labeling (and perhaps arrows); the contours, deposit, and spurious zone should all be different designs and/or colors; and all of the labels need to be larger in order to be readable.

Line 227 (Figure 2): Using a single color gradient rather than a rainbow here would make this figure much easier to interpret. Rainbows are subject to misinterpretation (see <http://iis.seas.harvard.edu/papers/2011/borkin11-infviz.pdf>) and it's not easy to see the subtle variations in these simulations based on a rainbow colorscale.

Line 237 (Figure 3): There's no depth comparison going on here, only a comparison of inundation limits. Can you show the difference between the simulated and actual deposit depths as a gradient layer? Additionally, this is a different gradient than in the previous image. It's better (see comment about rainbows) but it would be nice to see some consistency in colors depending on the variable being shown (depth, PPV, etc.) Also, the

outlined/white dotted zone at the bottom right needs a label, assuming it is the source zone for the simulations.

Line 276 (Table 2): Why do the basal & internal friction angles and the solid volume fraction parameters vary between these two models? In a first-order comparison of their ability to accurately represent a flow deposit, wouldn't you want to make sure that all the shared parameters are consistent between the different models? If not, the reason for these choices needs to be documented in the methods section.

Line 283 (Figure 6): The debris flow outline is difficult to see here. Perhaps a colorscale that's less saturated on the high end, or a diverging one?

Line 321-322: What are 'reasonable' values? What is reasonable to one practitioner may not be for another, or in a different setting.

Line 336 (Figure 8): How did you choose 0.25 as your fuzzy quantity limit? What makes this value important from a hazard zonation standpoint? Additionally, the figure appears to show hazard zones overlain on the debris flow deposit outline, but there's no label distinguishing the two outlines or pointing out the source area (assuming it is the cross-hatched zone at the upper end of the flow).

Line 337: Is the 'length scale' being referred to here the length scale of the correlation function? You may wish to specify so as to avoid confusion.

Line 345: When you say "map scale", do you mean the resolution of the model results, or the DTM? Can you explain how you derive the map scale, since the reference you include is old and not available online? It may seem simplistic to an experienced practitioner, but going into more detail will mean that other researchers will be able to more easily apply your methods.

Line 350-352: I find this wording confusing. Why else would you put the effort into evaluating the output of models if they aren't going to be used to generate hazard zones in the long run? Do you mean instead, "this method is useful for quantifying the uncertainty of modeling output, which can be assist in generating hazard zonations according to specific risk tolerances, but does not produce raw data appropriate for public products"? Lines 367-370 are a less confusing way of stating this, and would do better in place of the current text.

Line 363: Worded confusingly - break this up into a couple of clear statements to drive the point home.

### *Text errors*

Line 32: 'models' should be 'model's'

Line 335 (and others): 'hazard zonation's' should be 'hazard zonations'