

Nat. Hazards Earth Syst. Sci. Discuss., author comment AC2  
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## Reply on RC2

Luuk Dorren et al.

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Author comment on "Delimiting rockfall runout zones using reach probability values simulated with a Monte-Carlo based 3D trajectory model" by Luuk Dorren et al., Nat. Hazards Earth Syst. Sci. Discuss., <https://doi.org/10.5194/nhess-2022-32-AC2>, 2022

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Dear referee,

First of all, we would like to thank you for the valuable comments and suggestions for improvement. Below, you'll find our answers listed point-by-point:

Fig2 – Consider adding field photos for each topography type above or below the panel. Add image resolution/source.

>> We considered adding photos, but since the three example sites in the Fig. 2, but also most of the other study sites, are covered by forests below the rock cliffs, one cannot see the details of the topography which are clearly visible in the hillshades. It would result in three photos showing just a cliff and forest below. Therefore, we decided to leave the photos out. We will of course add the image resolution and source in the revised version.

Fig 3 – delete the word "ancient" or define it.

>> we'll delete it in the revised version

I suggest somewhere in section 2.2 include some references to previous work using Rockyfor3D model to assess rockfall hazards. How does this study build on previous efforts using this model?

>> we added additional references and explained better the history of Rockyfor3D and its use for this study

Line 104 – The model requires the number of trees – Does this include tree density/spacing? If no, how does this may impact your model?

>> The model does include tree density and spacing using positions and diameters of individual trees. These are derived from tree detection based on LiDAR Canopy Models or detailed forest and forest gap polygon maps. As such, we reproduced the existing forest structure at each site as realistically as possible. We will explain this point better in the revised version.

Line 121 – Explain why micro topography should not be taken into account when assigning surface roughness values. Small topographic or morphological irregularities may influence rockfall trajectory. How is this considered in this study?

>> Since we use digital terrain models (elevation models) with a resolution of 2m, many topographic irregularities that influence trajectories are taken into account. What we meant with micro topography are landscape features such a cattle trails, which are often

included in the roughness parameters by users of the Rockyfor3D model. To some extent, these are already included in the 2m terrain model and rather result in additional rebounds than in energy loss during an impact. The reason for feeding roughness parameter maps to the model, is to take into account energy loss during impacts on rock material that has previously been deposited and which are not represented in the digital terrain model. We will revise the paper accordingly.

Line 149 – Include a few references here.

>> we will revise our statement slightly and improve its precision and we will include relevant references.

Line 158 – Assuming that these SW are fragments of larger blocks might work for some slopes, but it may not be entirely correct for vertical/steep cliffs where detached rockfalls may not interact with the slope (wall) before deposition. Did your study sites include such vertical or almost vertical cliffs?

>> The study sites include almost vertical cliffs, but none with an almost horizontal deposition area below leading to short propagation distances. All sites had a relatively steep (in general 30° - 40°) transit zone below, leading to trajectories with intermitting flight and rebound phases causing fragmentation.

Fig 4 – Please add units for volume on the y-axis. What are the black dots, individual rockfall events? Can you add the number of rockfalls above each yes/no box? Overall, this figure is hard to understand and needs to be properly labeled and explained.

>> We will revise the labelling and the explanation of the figure following these suggestions

Line 183 – Insert confidence interval for the difference so readers know what significant difference refers to.

>> We will add the significance level

Fig 6 – Not everyone is familiar with reading box plots. Can you label or include in caption the following: show the median value for reach probabilities of all events at all sites (1.41%, e.g., drawing this as a horizontal red line on the plot), what are the gray dots (individual SW?), highlight the boxes for Claro and Taesch (the 2 sites that significantly differ from the rest – maybe coloring them in gray). Consider adding the same labels as Fig 1 (e.g., CH1) under each site name along the x-axis. Y-axis should be labeled the same way in both Fig 6 and 7.

>> We will revise the labelling / explanation of both figures following these suggestions

Fig 7 – Draw the medium line for P(reach) across the plot.

>> We will add the line representing the median value and make the Y-axis label consistent with Fig. 6.

Line 192 – What do you mean by “relatively high correspondence” here? Insert values here and in fig 9.

>> We will revise this paragraph and improve the explanation

Line 197 – Block volume?

>> we'll correct it in the revised version

Line 223 – Explain what you mean by “long term practical experience” or delete.

>> we'll delete it in the revised version

Line 224 – define what you mean by abundant data (no. of SW?)

>> We will revise this paragraph and improve the explanation

I encourage the authors to make the rockfall data and codes used in this study available upon request or provide a link to an open-access repository where the data are stored.  
>> we will make the data and the analysis code available via Github. The used rockfall trajectory model Rockyfor3D is available via <https://www.ecorisq.org/ecorisq-tools>