Natural Hazards and Earth System Sciences Discussions

Nat. Hazards Earth Syst. Sci. Discuss., referee comment RC1
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Comment on nhess-2022-256

Anonymous Referee #1

Referee comment on "Instantaneous limit equilibrium back analyses of major rockslides triggered during the 2016–2017 central Italy seismic sequence" by Luca Verrucci et al., Nat. Hazards Earth Syst. Sci. Discuss., https://doi.org/10.5194/nhess-2022-256-RC1, 2022

General comments:

The manuscript presents an interesting approach for analyzing earthquake-induced wedge failures, modeling the evolution of the factor of safety during earthquakes using instantaneous pseudo-static analyses, while taking into account real seismic records and topographic amplification for the ground motion inputs. The methodology and results are a contribution to the knowledge of coseismic landslides. The paper relies too much on previous publications from some of the authors, such as it lacks the necessary context for the reader. Some of the assumptions made for the analyses and some figures need some further justification or explanation (see below). These changes can be achieved with a moderate revision.

Specific comments:

Lines 59 to 62: This paragraph is insufficient. A summary of the geology, seismotectonic setting including the faults where the earthquakes originated, and a description of the 2016 earthquake sequence are required. The reader needs some context to understand the analyses without referring to other publications.

Line 74: Check redaction. "Ground modification induced by stratigraphic conditions were not considered because all slides are in bedrock...."?

Line 90 and Table 3: explain the scaling procedure to obtain S

Lines 98 to 105: How steep are the slopes? You may add that slope gradient data in Table 3, or some cross sections of the landslides, to justify that the vertical cliff model is a reasonable approximation for all the analyzed landslides.

Line 108, Figure 5 caption and elsewhere: you use the term "horizontal rigid outcrop" to refer to site of the reference ground motion for topographic amplification calculation. I presume this is at the base (the top is also horizontal), and at some distance from the cliff (it can be attenuation at the slope toe). Please clarify this location and maybe use a different name for it.

Line 139: check the phrase "the inverse Fourier transform to the (1) and....", should be "to equation (1)"?

Lines 144 and 145, Figure 5. You say that "The alteration of the motion is usually significant for periods lower than 1-2 s, while it is negligible for periods higher than the fundamental period T0...". However, in Fig. 5 it does not look negligible between To and 2 seconds in some of the charts, which agrees your first phrase. Check the description and correct the second part if needed.

Lines 174 to 182. Please comment on the validity of factors of safety below 1.0 after the first time this value is reached and some sliding occur.

Lines 196 to 201: Please add which software or code did you use to make the factor of safety calculations.

Lines 201 to 203: The last sentence of this paragraph could go in the Discussion section

Lines 215 and 216: "the geometric layout of the rockslide scar suggests that the wedge should have experienced displacements as large as to
break a constraining rock spur at its highest part" That´s vague, how large is that? an estimate at least? What size is the "spur"?

Lines 237 to 246: The whole paragraph should better go in the Discussion section.

Figure 3: Please enlarge the size of blue dots, they are hardly distinguished.

Figure 7 caption: Indicate what is the meaning of the black lines at the top of each chart (mechanism).

Table 2: I suggest adding the distance between the seismic station and the landslide of interest for which you use the ground motion records.

Table 2: Better use units of "g" for accelerations, to be consistent with Table 3.

Table 3: add average slope gradient at each rockslide site

Table 5: Add the cohesion values, even if it is the same for all.