

Nat. Hazards Earth Syst. Sci. Discuss., referee comment RC1

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## Comment on nhess-2022-163

Anonymous Referee #1

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Referee comment on "Deadly disasters in southeastern South America: flash floods and landslides of February 2022 in Petrópolis, Rio de Janeiro" by Enner Alcântara et al., Nat. Hazards Earth Syst. Sci. Discuss., <https://doi.org/10.5194/nhess-2022-163-RC1>, 2022

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### Summary

This is a very interesting and well-written article that thoroughly describes the causality, process, and consequence of the catastrophic landslide events over Petrópolis, Rio de Janeiro recently. Explanations for the different driving factors including meteorological conditions, topographic layout, land use changes etc. are well presented. I think this paper is a significant contribution to the community and worthy of prompt publication after a minor revision.

### Major comments

- The introduction of the meteorological background is a little weak. Some in-depth description like synoptic pattern, mesoscale discussion, and most importantly, the mesoscale convective cell that brought the torrential rainfall should be added. In this way, the weather extreme could become more tangible to the readers than just a number of precipitation amount. In addition to the spatial distribution, the vertical extent of the mesoscale convective system could also be indicative of the severity of the event. Therefore the authors may look into the weather radar data if possible.
- The inhomogeneous distribution of landslide occurrences of west-facing vs. east-facing slope is interesting. In addition to the listed multiple reasons, could the orographic barrier effect also play a role in the difference of landslide susceptibility on the lee side of hill vs. the windward side, given the prevalence of easterly wind? (Kumar et al., 2017)

### Reference:

Kumar, A., A. K. L. Asthana, R. Singh, R. Jayangondaperumal, A. K. Gupta, and S. S. Bhakuni, 2017: Geomorphology assessment of landslide hazards induced by extreme rainfall event in Jammu and Kashmir Himalaya, northwest India. *Geomorphology*, 284, 72–87, <https://doi.org/10.1016/j.geomorph.2017.01.003>.

#### Minor comments

- Line 26, this sentence is awkward, consider rewriting it.
- Line 27, the average 'monthly' rainfall.
- Line 42, missing space between 'city' and 'is'.
- Line 44, missing space between 'on' and 'February'.
- Line 45, by rain gauges?
- Line 46, change 'combined' to 'accumulation'.
- Line 53, missing space between 'away' and 'cars'.
- Line 58, change 'some' to 'more than'.
- Line 60, change '1.161' to '1,161'.
- Line 61, change 'heavy rain' to 'torrential precipitation'.
- Line 101, change 'worse' to 'worst'.
- Line 137, it is difficult to locate the rain gauges from Figure 1d.
- Line 165, what resampling method was used?
- Line 192, 'the beginning of 2022'.
- Line 256, 'Figure 2 shows the January-February daily rainfall distribution from 1977 to 2022'.
- Line 265, it's better to include the description of what the box and whisker stands for.
- Line 271, change 'accumulated' to 'accumulation'. Change 'biggest' to 'largest'.
- Line 279, 'Figure 4a depicts the station-based 24-h rainfall accumulation over Petrópolis'.
- Line 285, no need to show so much blank before the events. May consider shrinking the temporal duration to 2/15/2022 12:00.
- Line 289, it's two 3-h intervals from 16:00 to 21:00.
- Line 350, panels in Figure 7 are not aligned well.
- Line 427, the description of the mesoscale convective cell needs to improve.