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Comment on nhess-2021-85

Anonymous Referee #2

Referee comment on "Multiscale analysis of surface roughness for the improvement of natural hazard modelling" by Natalie Brožová et al., Nat. Hazards Earth Syst. Sci. Discuss., <https://doi.org/10.5194/nhess-2021-85-RC2>, 2021

I have completed my review of the manuscript, 'Multiscale analysis of surface roughness for the improvement of natural hazard modeling' by Brožová et al. With the data set, the authors seek to quantify the effect of change in the spacing, interpolation of DSM on surface roughness for the improvement of

landslide modeling. By using the observational dataset in two Alpine areas with different land covers, the results seem to show the **reappear** geomorphic processes under different surface roughness algorithms. As a worker who is passionate about digital terrain analysis and landscape evolution, I am very grateful for a related study. However, I have some questions and comments that should be answered and addressed by authors, namely:

- Now that the author has realized that the spacing of DSM will affect the results of terrain analysis, especially the primary terrain attributes: local slope gradient, roughness, curvature. In fact, the relevant study has existed in this field for decades. Therefore, why didn't the author use the Root mean square slope (Hutchinson, 1996) to find the optimal resolution at the beginning? In this way, a lot of calculation costs can be saved, and different land uses and topography should be suitable for different resolutions. Plus, a fine spatial resolution of DSMs is no longer an issue, as the author mentioned in the introduction.
- I have a high interest in directional roughness, and I would be happy to see related calculation methods and literature reviews.
- From figure 5, there seem to be two clusters of results, one group consisting of area ratio, SD of residual topography, terrain ruggedness index, and vector dispersion. This group has lost a lot of details, especially in the lower-left corner of the image. I would like to see the explanations of the results (difference) of these seven algorithms firstly.
- In the 4.3 Application, I read it several times. It is really difficult to follow the author's logic. I still don't know how the author wants to apply the results. I can vaguely know

that the author wants to apply to the ecosystem, but how?

- The author mentioned that a relatively low-resolution DSM (1 m) can achieve better surface roughness (although I don't know how the author judged it). if the direction did so, has the author tested other lower-resolution data? For example, a global scale of 15m, 30m, etc.