## Authors response to Editor 03.07.2021

Dear Editor,

herewith I would like to send you the revised version of the manuscript “GIS-based topographic reconstruction and geomechanical modelling of the Köfels Rock Slide”.

All comments to reviewer #3 are added by red coloured text.

Thank you very much and best regards

Christian Zangerl, on behalf of the co-authors

## Comments on Reviewer 3 - Anonymous (Referee RC3)

I enjoyed reading the second revision of the paper. I found the article to be well written and informative. I especially liked the idea that modern remote sensing techniques (and DEM) can be used to "revisit" the major rockslides. Indeed, much progress has been made in thiese areas.

Some minor points:

Line 160 Instead of 1.6(10^16) J, maybe write 1.6(10^7) GJ. Maybe GJ is a better unit.
Comment: Changed by the authors

Line 280 I read the recent Science article concerning the Chamoli rock/ice avalanche. There the authors reported the volume to be about 27 mio m3. The Piz Cengalo slide was approx 2 mio m3. Here the volumes are reported in km3 = 10^9 m3. Therefore the volume is 3100 mio m3? This is immense. Perhaps the authors should write 3.1 km3 = 3100 mio m3 to give the reader an impression of the volume.
Comment: Changed by the authors

Discussion of the DEM method. There are problems with the DEM method. For example, all the stresses are based on an accurate calculation of the elastic strain. As long as the material remains "in place" and deformations are small this is not a problem. However, when deformations become large, the calculated state of strain/stress are approximations at best.
Comment: The authors fully agree that the DEM method has its limitations and DEM models can only address selected research questions. Due to the extreme challenges in determination the boundary conditions and rock mass properties as well as assigning appropriate rock mechanical material laws for such a large-scale rock slide event, numerical modelling – and this case the DEM method – can only provide approximations and insights in possible failure and deformation processes.

The qualities of the figures is excellent. Very clear.
Comment: No changes needed

I wonder about the conclusions. The last line of the paper is insightful: "Thus, a particular geological disposition ... responsible for the ... slide" That is, we were unable to model the slide with resonable parameters, therefore we must search for other triggers --seismic, progressive strength degradation ... etc. Couldn't there be another conclusion. There is something wrong with the model? Something is

missing. If other researchers will confront this problem again (they certainly will), what modelling advice would you provide? Or, are the boundary conditions/material parameters too unknown to improve the modelling?

Comment: Additional explanations were attached to the manuscript.

Since DEM modelling can only consider some aspects of the expected rock mechanical processes, it makes sense to carry out additional numerical modelling studies based on other approaches and loading conditions. In addition, subsurface investigations and rock mechanics tests would help to better determine the parameters of the rock and the discontinuities as well as the structure of the rock mass. Due to the exceptionally large volume of the rock slide, it should also be examined whether the classical laws of rock mechanics can fully represent the natural event.