Comment on tc-2020-368

Anonymous Referee #1

Referee comment on "Brief Communication: Initializing RAMMS with High Resolution LiDAR Data for Avalanche Simulations" by James Dillon and Kevin Hammonds, The Cryosphere Discuss., https://doi.org/10.5194/tc-2020-368-RC1, 2021

This paper discusses the influence of topography inputs on avalanche dynamic simulations performed with the model RAMMS and the possibility of initializing RAMMS (or in general avalanche dynamics models) with LiDAR data.

In particular, the authors highlight the possibility given by LiDAR Scan to provide useful data for getting the sliding surface of an avalanche. This might be the ground surface (DEM) or different sliding surfaces within the snow cover when the LiDAR scanning is periodically made during the winter period.

Before going into more detailed comments, I have two major troubles with this paper.

First trouble is related to the fact that it seems, from what they write, that we know the sliding surface of an avalanche… this is surely not true. The sliding surface continuously changes during the avalanche motion… Models simplify reality and are able to reproduce avalanches, including all their uncertainties through some model parameters. Well calibrated models (such as RAMMS used in this paper) can reproduce extreme events quite well. Instead, as soon as we go into the details of the physics of a snow avalanche, more processes have to be considered and RAMMS Operational is no more performing well in simulating them.

More physically based models should be used... the SLF itself is developing RAMMS-Extended, where more physical processes are included, such as erosion for example, which is of fundamental importance, also with regards to the scope of your study. To get the sliding surface of an avalanche, the process of snow erosion should be considered.

Therefore, I think that this work is a good exercise to show how the results of RAMMS depend on the topography inputs (still with some weaknesses – see next point), but cannot be suggested for avalanche forecasting and mitigation efforts, as the authors state.

The second trouble (but actually less important than the first one) is related to the fact that the extent of the LiDAR data does not cover the extension of the simulated avalanches. Therefore, the authors needed to force the model parameters as they write at lines 93-96. Even if using a more physically-based model, I think it is necessary to get the whole extension of the avalanche basin, in order to be able to make reasonable sensitivity analysis with respect to the topography inputs.