

The Cryosphere Discuss., author comment AC3
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Reply on RC3

James Dillon and Kevin Hammonds

Author 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-AC3>, 2021

The authors would like to sincerely thank Anonymous Referee #3 for their thoughtful comments and careful review of our manuscript.

Per your first major comment, we agree that the LiDAR field-of-view being unable to capture the entirety of the runout zone is an unfortunate byproduct of our study site and scanning location, however, we contend that the ad hoc friction coefficient adjustment was a suitable solution for the purposes of our study (see reply to Referees #1 and #2, lines 2 and 1, respectively). Furthermore, regarding operational value of initialization via LiDAR, we again refer you to our reply to Referee #1, paragraph 1. We maintain our position that RAMMS, or any other avalanche dynamics model, would most likely only benefit from the incorporation of high spatial and temporal resolution model inputs, whether derived from LiDAR or any other high spatial resolution remote sensing system (e.g., SAR or SfM). Although we are unable to conclusively show this at this time, relative to operational improvements, once additional data of other more well-documented avalanches becomes available, this will be able to be more thoroughly investigated.

Regarding your 2nd major comment, we again refer you to our response to Referee #1 (paragraph 1), who registered a similar concern on snow erosion. We agree that processes such as snow erosion and entrainment can significantly alter the sliding surface topography within the track of the avalanche. That said, the snow surface in an avalanche track and runout zone –the initial conditions of the sliding surface at the time of avalanche onset - is often quite different topographically from the ground surface beneath due to variable snow accumulation and redistribution. A better representation of those initial conditions is useful and a relevant consideration given RAMMS' sensitivity to such inputs. This is in support of previous work (Buhler et al. 2011), where higher-spatial resolution DEMs were suggested, as it was noted that coarser resolution DEMs failed to represent complex topography in release and transition zones.

Your recommendations on how to improve the figures are appreciated. We will incorporate your input on these figures as well as additional technical details on georegistration and scanning specifications into our revised manuscript, per your comments.