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Interactive comment on "Avalanche Impact Pressures on Structures with Upstream Pile-Up/Accumulation Zones of Compacted Snow" *by* Perry Bartelt et al.

Anonymous Referee #2

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The manuscript "Avalanche Impact Pressures on Structures with Upstream Pile-Up/Accumulation Zones of Compacted Snow" by Bartelt et al. discusses an approach to calculate/estimate pressures arising from avalanches hitting stationary obstacles. It presents an interesting mechanical model, the theoretical basis thereof, applied examples and states the limits and shortfalls. The setup of the paper is clear and follows a logical structure. The model seems to be ready to be included in dynamical avalanche models once the necessary basic changes (like variable densities) are implemented. This presents a very promising and needed approach to discuss impact pressures on obstacles.

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Main comments:

- The compaction density Rho_omega lacks the necessary discussion. Since it is one of the main driving factors for the results (e.g. fig 2 / 4) it needs a better justification. Rho_omega is currently not (yet) available from models, and reliable observations are not easily accessible. The other parameters of this approach can be handled by models or observations. So how do the authors suggest to handle this important (tuning) parameter? In the paper the model is sometimes tested with three (arbitrary, if plausible) densities, and sometimes set to a fixed value (e.g. label fig 9). Especially in the case for the Mittelbeda avalanche it is (seemingly) picked at random. This needs to be better justified with observations, or at least the reasoning for this specific value needs to be shown.

- Figures 1 and 3 need to be improved. Figure 1 has separate compacting zone CZ and avalanche core AC in the upper panel. Then in the lower panel CZ and AC are the same, however the v is denoted with t + delta_t. I somehow expect there to be a CZ(t + delta_t) and the same for AC. Or if the authors try to show the "steady" state reached at end of compaction, remove the CZ in the lower panel and make it more clear in the label. The right panel of figure 3 contains basically the same (simplified) information as figure 1, adding only information about stress. Presenting the side view in the same manner as the top view leads to confusion. I suggest either to include the information about stress in fig 1 and reference it, or rotate the right panel of fig 3 by 90 deg to make the "side view" clearer.

Comments:

- On p.4 / l. 4 it is stated "The pile-up height is generally...". How do the authors come to this conclusion? On p.2 /l. 25 part of this is presented as an assumption...

- I suggest moving sentence p.5 / l. 9-10 to the beginning paragraph of section 2. This would be beneficial to the reader wondering about other influencing factors right from the start of the discussion.

- Regarding SC1 by Peter Gauer: I suggest including a short remark about the discussed work in the introduction.

- For easier readability I suggest moving p. 8 / l. 6-12 to the beginning of the section. The information that both cases "are motivated by... " observations is an important one.

- P 9. / l. 5: Remove "somewhat". Very unspecific: either it is unusual or it is not unusual.

- Out of interest: what causes the drop in velocity in fig. 9. a) at approx. 42 seconds?

Minor:

- Label fig. 4: givne -> given

- P 9. / l. 6: betweem -> between

- P 9. / l. 9: "at" missing between density and elevation

- P 9. / l. 11: possibilty -> possibility

All (obvious) typos are in section 4.3, seems to be avoidable by autocorrect.

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