The Cryosphere
Discussions

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Interactive comment on "Mapping avalanches with satellites – evaluation of performance and completeness" *by* Elisabeth D. et al.

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Dear authors, dear editor!

Thank you very much for the opportunity to review this manuscript, I enjoyed reading it. This is another important contribution to the still small but quickly evolving field of remote sensing of snow avalanches and the authors very well explain the applied importance of this scientific field. Due to the field being relatively small, meaning that more or less the same groups publish studies, we also seem to review each other's papers all the time. I raised that concern to the editor when I accepted this review and I think it is still valid. More so because from the review of referee #1, I can guess to which group he/she belongs to. While it is certainly of advantage for the improvement

of the manuscript that experts review it, I would very much welcome if avalanche or remote sensing experts would also have a go, possibly bringing a fresh mindset to the table. Having said that, here is my review:

I agree with the authors that it is timely that a detailed evaluation of avalanche detection using remote sensing is carried out and I also agree with the authors that they got the datasets to do so. I therefore recommend publishing this article, however, would like to suggest some potential improvements:

Major concerns: I have two major concerns, where 1) deals with the limitation to study only two single avalanche events in a small area, using only a handful of satellite data and 2) is the methods section and my understanding of what you are doing.

1) I understand that such a detailed evaluation is only possible with focusing on single avalanche events where complete ground truth data is available. I am therefore hoping that the authors elaborate more on the limitations of their study in terms evaluating detection performance in the different sensors using only 1-2 images. We know that the SAR signal from snow is highly dynamic, influencing avalanche detection. Illumination as you suggest in the manuscript plays an important role for avalanche detection in optical imagery.

2) I am not fully able to follow your method section, especially the schematic of Figure 3. I think Figure 3 as well as Figure 4 are very important for reproducibility as well as comprehension of your study. Here are my detailed questions about the method section and these figures: Ground truth: Does 550 ground truth points mean that 550 avalanches were used as ground truth? Where in the avalanches were these ground truth points located and could you show them in Figure 4. Or are these actually poly-gons as indicated in Figure 6? Validation points: 731 validation points were used according to Figure 3, whereof 550 stem from ground truth points and the rest stems from where? How did you choose the location of these validation points inside avalanches and does this location have an affect on your joining you show in Figure 6? Figure 3:

Does this Figure have a time scale on its 'x-axis? In other words, does it show the sequence of steps or not? What does the stapled line with the orange arrow mean? Figure 4: a) Would it be possible to show slopes over 30 degrees? B) Could you maybe show these changes prior – post event that you are talking about? C) Could you explain the colors in the backscatter difference image and would it be worth showing the single backscatter image that is sometimes used? How was discerned if multiple features where actually from a single avalanche? Could you show release, track, deposition area? Could you indicate the time of all these images. Figure 6: You only show cases where you have a detected avalanche outline. How did the joining work for Sentinel-2 where you created only a point instead of a polygon? How was the spatial joining done? Did you do that manually or automatically with some sort of spatial buffer? How close would a validation point and detection be to be joined? Did you only consider spatial overlaps? Again, how would the setting of a validation point affect the joining?

Minor comments: Table 5: could it be an idea to calculate POD and PPV for one to one and one to many joins? I got curious how that would play out especially for Sentinel-1.

4.2.1 Could you calculate how much of the area is affected by fully and partly illumination and shade areas and discuss how that would change throughout a winter (min, max). This plays back to my major concern about evaluating only single events.

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