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Discussions

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Interactive comment on "Where are the avalanches? Rapid mapping of a large snow avalanche period with optical satellites" *by* Yves Bühler et al.

Anonymous Referee #2

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Avalanche hazard mapping is time consuming and requires avalanche phenomena expertise and a very good knowledge of the terrain. The purpose of this paper is to map avalanche deposits over large areas using high resolution satellite imagery. The authors examined two episodes of high avalanche activity in January 2018. The selected periods were associated with exceptional snowfall over entire Switzerland and with a very high level of avalanche danger scale. The authors manually detected a very large number of avalanches on SPOT6 / 7 images combined with accurate auxiliary information on the topography of the study area. They have shown the full potential of high-resolution optical imaging to help monitoring areas affected by avalanches. This is crucial for many applications including the identification of potentially hazardous areas

and to evaluate and / or validate physical models of avalanche hazard forecasts. The subject treated by this paper is therefore very important and the authors make a very good contribution to this field. The paper is easy to read, contains a lot of information (probably to be reduced) and provides all the necessary details for readers.

I would like the authors to consider some elements of improvement to increase the readability of the manuscript.

General and specific comments:

1- regarding the overall organization of the paper, I consider that there is an imbalance with the highly detailed section 2 relative to other parts of the paper. This section could be well shortened by targeting only the observations used in this study. 2- Figures: Maps are difficult to understand because there is a lack of information: administrative boundaries, elevation lines, names of some cities... 3- this avalanche mapping exercise is very interesting and I wonder how easily it can be replicated elsewhere? apart from financing issues, what could be the limits regarding image acquisition time, the preprocessing, the time needed to identify the avalanche signatures ? 4- As correctly stated by authors, this is a very useful database for many researchers working in this field. Do the authors intend to share it ? 5- Mapping methodology: it is unclear to me if the avalanche mapping was done entirely manually ? If the polygon detection method is completely visual, would some sort of classification based on the NIR band combination be used to pre-select avalanche zones ? 6- Mapped avalanches: I like Figure 4 which shows the density of the avalanche zones. I would be great to have another figure that completes it with some statistics about the altitudes min / max, orientations and the relative size of avalanches. color palettes can be improved. 7- The authors mentioned possible combined use with large scale hazard mapping (RAMMS simulations): could you give more details about it ? 8- Did the authors look at the mapping stats specifically according to the types of forests, the water areas? 9- Age of avalanches: very interesting section. It is indeed important to be able to identify the deposits which remain visible long after their appearance. otherwise we run the risk

of distorting the statistics. The difficulty is to have a set of satellite data with adequate revisit time and an identical observation configuration from one scene to another. This problem also exists for avalanche deposit detection using SAR imaging but with a few days of revisit time it is possible to investigate its effects. For SPOT6-7, what would be the best strategy?

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