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Integrating statistical modelling and remote sensing for the detection of snow avalanches in South Tyrol (Italy)

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Snow avalanches are hazardous phenomena in many mountain environments and can pose a serious threat to people and their properties. Reliable information on the location and timing of past avalanches (i.e. inventory data) is not only decisive to identify susceptible terrain, but also to gain insights into typical avalanche dynamics. The creation of a regional scale snow avalanche inventory relies on reports generated in the field or on the basis of aerial photographs. Particularly for large areas, such manual mapping approaches are known to be time consuming, spatially restricted to a specific area of interest (e.g. nearby populated areas) and subjective. In consequence, the resulting avalanche information is likely to be biased towards an underrepresentation of events in remote terrain e.g., high altitude areas.

This research targets to counteract these pitfalls by testing a novel regional-scale snow avalanche detection approach in the province of South Tyrol, Italy. The methodical framework takes full advantage of already available data (e.g. historical avalanche data, Sentinel-2 imagery) and can be subdivided into two main steps: (1) Statistically based delineation of terrain typically susceptible to avalanches and (2) remote sensing based detection of changes within the previously defined avalanche prone areas i.e. unsupervised binary classification of bi-temporal Sentinel-2 images: avalanche vs. no avalanche.

The produced maps and validation metrics indicate that the approach has the potential to gain systematic information on recently occurred snow avalanches for large areas at a reasonable spatial and temporal resolution. A closer look at the results also revealed potential drawbacks of the developed automatized procedure. This poster contribution will allow insights into the methodical framework, first results and associated pitfalls.