



Rapid satellite mapping of a large-scale snow avalanche cycle

Yves Bühler and Elisabeth Hafner

WSL Institute for Snow and Avalanche Research SLF, Snow Avalanches and Prevention, Davos Dorf, Switzerland
(buehler@slf.ch)

In January 2018 two major snow fall periods occurred over Switzerland and the entire Alps. For the first time since 1999, the WSL Institute for Snow and avalanche Research SLF issued warnings at the highest danger level five for a large part of the Swiss Alps. Very high avalanche danger implies that very large and extremely large avalanches can be expected.

To gather up-to-date information on these exceptional events, a rapid mapping process was issued to acquire very high spatial resolution satellite data. For this purpose, satellite data from TerraSAR-X, WorldView IV and Pléiades were acquired after the first snowfall period for selected regions to evaluate its value for avalanche mapping. First satellite datasets were already available 12 hours after the order was issued. SPOT6 data was then acquired over the area with danger scale 5 (very high danger) after the second snowfall period, covering the central part of the entire Swiss Alps with an area of approximately 12'000 km². By comparing the satellite data with field observations acquired from the ground and from helicopter, we analyze the applicability of the different datasets for rapid mapping and documentation of avalanches.

From SPOT6 data we mapped 18'737 individual snow avalanches outlines manually. This unique dataset forms the base for statistical analysis of this large-scale avalanche cycle. We validated the mapping results with observations from the ground. As expected, avalanches in regions with cast shadow are more difficult to map. However, the 12bit satellite data enables the detection in shadowed areas in many cases. This case study demonstrates the value of satellite data for fast, accurate and large-scale snow avalanche mapping. Such data could in the future help to establish more meaningful avalanche databases, which are the base for hazard mapping.