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SNOW AVALANCHE DETECTION AND MAPPING BY SATELLITE REMOTE SENSING

Abstract

World-wide, snow avalanches are one of the main natural hazards in cold-climate mountainous regions, leading to the interruption of transport lines and supply chains, and threatening life and infrastructure.

In many countries, regions requiring avalanche forecasting are vast and the assessment of the snow avalanche situation over areas of several thousand square kilometres is an enormous task. For a snow avalanche expert, it takes several hours to days, to visually inspect and map individual snow avalanche paths out in the field or from remotely sensed imagery. At times this task cannot be accomplished for several days after a snow avalanche cycle.

Several studies have shown that data from space-borne optical sensors, as well as from radar sensors, can be used to detect and map snow avalanche debris. The good spatial resolution, the large spatial coverage, and the reliable, regular data acquisition provided by recent satellites (both optical and SAR) is seen as a much-needed and valuable new source of information for tasks related to avalanche hazards assessment and forecasting. Being able to remotely detect and record snow avalanches aids to target mitigation strategies.

Here we present several examples on how the analysis of optical and radar satellite data can yield hindcast snow avalanche inventory observations on a regional scale. Automatic snow avalanche mapping in very high resolution optical imagery is seen as the most applicable method to update avalanche databases, e.g. after large avalanche cycles. In contrast, for more near real-time and real-time oriented applications, such as snow avalanche danger forecasting, the use of SAR data is seen as most feasible, among others due to the independency of clear sky and illumination conditions of SAR sensors and the free access to data with sufficient resolution and high temporal area coverage.