Remote sensing of snow avalanches: recent advances, potential, and limitations

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Remote sensing of snow avalanches: recent advances, potential, and limitations

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Abstract

Snow avalanches are the main natural hazard in snow covered mountainous areas worldwide, frequently threatening lives and infrastructure. Avalanche research is inherently risk research, working towards avalanche risk mitigation and accident prevention. The pondering research questions have not changed much in the last decades; however, methods to approach these research questions have improved substantially. Remote sensing enables objective, safe, and spatial continuous observations of snow avalanches at different spatial scales. Today's abundance of sensor platforms and their sensitivity to a broad range of wavelengths allows for detection of avalanches and associated snowpack processes. This review paper highlights advancements in instrumentation, data analysis, and automatisation efforts in detecting avalanches, applying ground based, air-, and space borne optical, laser and radar sensors. We further discuss opportunities and limitations of the instruments and techniques, as well as state where we see the most important future challenges. We focus on the applicability of the reviewed sensors and methods for avalanche detection and mapping in an operational context.

Keywords: snow avalanches; remote sensing; optical; SAR, Lidar, snow avalanche detection; avalanche mapping;