Information system for evaluation of avalanche hazard in mountain regions of Czechia

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1. Introduction

In Czechia, there are two mountain ranges (Krkonoše and Jeseníky Mountains), which suffer from regular avalanche activity every year. Mountain Rescue Service is responsible for issuing avalanche bulletins. However, its approaches are still lacking objective assessments and procedures for hazard level estimations. This lack is mainly caused by missing expert avalanche information system. This paper summarises final results of a project focused on the creation of information system for snow-avalanche hazard evaluation in mountain regions of Czechia.

2. Study area

The Krkonoše Mts. is the highest mountain range in the Czech Republic. Despite its low altitude they experience considerably high avalanche activity on 55 permanent avalanche paths, even causing fatalities.

Krkonoše Mts. can be characterized by:
• Small area (454 km²), very well surveyed
• Maximum altitude 1602 m a.s.l. (Sněžka Mt.)
• Climatic conditions on the crest similar like the coast of Greenland (mean ~0°C, 130-180 snowpack days)

Map of Krkonoše Mts. Details of 55 permanent paths are in the insets.

3. Information system outline

The information system uses historical data to predict snow distribution, snow stability and avalanche formation conditions.

4. Historical database

Snow stability and height records (left) from more than 40 years are analysed with meteorological conditions and avalanche falls (right).

Snow avalanche susceptibility model based on morpho-vegetation criteria using: (i) current forest cover and (ii) future deforestation scenario.

5. Avalanche susceptibility

6. Runout delimitation

Snow avalanche runout was modelled with RAMMS code and three runout magnitudes were estimated using Swiss hazard assessment.

7. Avalanche falls and estimated hazard levels

Model works on rectangular grid (upper left) estimating snow height using energy balance calculations (lower Mf). On selected sites, snow stability is estimated (upper right).

8. Snowpack height and stability modelling

9. Hazard level modelling

Comparison of real and modelled hazard levels (using ANN – MARA).

10. WebGIS information platform

Details of 55 permanent paths are available at www.laviny.info/webgis/