Mapping snow avalanche releases by unmanned aerial vehicles (UAV) in Krkonoše mountain range, the Czech Republic

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Snow avalanche hazard in the Czech Republic is mainly constrained to Krkonoše mountains. Approximately twenty snow avalanches release every year during winter season, usually lasting from November to May. Although Krkonoše belongs to mid-mountain range (highest peak 1602 m a.s.l.) due to its prevailing influence of moist, cold air masses and mean annual temperature about 0 °C climate conditions are similar to high-elevation or subpolar climate. Despite the low altitude, Krkonoše experiences considerable avalanche activity at fifty-five permanent paths and even cause fatalities. The monitoring of avalanche releases has been conducted since 1961, therefore most of the avalanches were reported to the extensive database (> 1100 events). The land use of the mountain range is changing and many areas are being deforested resulting in new avalanche prone areas. The presented research is based on results of previous project focused on the avalanche hazard assessment in the Krkonoše mountains and thus results are extended, and monitoring methods and creation of avalanche susceptibility maps are improved.

It is clear, from abovementioned, that existing avalanche hazard maps have to be reassessed. Therefore, release zones and avalanche susceptibility map must be determined.

Mapping of avalanche activity includes continuous monitoring of the avalanche paths by unmanned aerial systems photogrammetry (UAS-P) and ground GPS measurements of the avalanche path. This data will be used for evaluation of the mass movement dynamic model (RAMMS). Such a monitoring covers:

- Determination of release areas and snow heights must be accurate as the RAMMS result simulations are significantly affected by these inputs. This will be measured by UAV as it represents spatially high-resolution mapping of snow depths (accuracy of one decimetre) and due to safety reasons. Furthermore, snow depth determined by photogrammetry is spatially more accurate than interpolation of the ground GPS measures.
- Mapping the extent and depth of avalanche deposition along the avalanche track and in the runout zones
- Monitoring of snow characteristics in the avalanche prone area and incorporate this data into avalanche susceptibility model
The result of RAMMS model for entire Krkonoše mountain range including czech and polish side will be parametrised and compared to newly obtained data of avalanche releases. The results can be then used by public authorities such as: Krkonoše National Park administrations, Mountain rescue service of the Czech Republic or Institute of Forest Management.