Universität Rostock Traditio et Innovatio

CHAIR OF LIGHTWEIGHT DESIGN
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The influence of wind slab geometries on avalanche release

Der Einfluss der Geometrie von triebschneegeprägten Schneedecken auf die Lawinenauslösung

(Master thesis)

Dry snow-slab avalanches present a notable risk to infrastructure in mountainous regions, often triggered by the failure of specific layers within the snowpack. These layers typically consist of either persistent or non-persistent weak layers, stemming from surface or depth hoar formation.

To trigger these weak layers, the snowpack must be subjected to overloading while the energy conditions for damage propagation within the slope have to be met. These conditions can be met by additional loads applied to the snowpack, which can result from activities like winter sports. However, natural releases of avalanches often present a greater risk to infrastructure. A critical natural mechanism for avalanche initiation involves the development of wind slabs along ridges during winter storms. These wind slabs can act as an additional load, potentially triggering the underlying snow slab, or they may be released themselves, impacting the snowpack below and triggering an avalanche. Nonetheless, the mechanisms and influencing factors of wind slab formation remain poorly understood, primarily due to the challenging accessibility of regions where snow slabs form and the complex assessment of wind slab properties such as structure, density, and mechanical characteristics.

The objective of this study is to investigate the conditions for natural release within wind-driven snowpack. Together with the Norwegian research partner, a set of typical terrain and snow cover scenarios is to be established, which allow a comprehensive study of the conditions for natural release. For this purpose, the WEAC layered snowpack model will be used to investigate the stress and energy release rate conditions of the considered scenarios. The results should be systematically evaluated and discussed in comparison to literature on wind-drifted snow packs. The established approach should then be used for the exemplary evaluation of real terrain and snowpack information.

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