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Recent advances in applied avalanche research in Norway

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Snow avalanches are a significant natural hazard and common phenomenon in Norway. Applied research on avalanches and their societal impact has been conducted at the Norwegian Geotechnical Institute (NGI) for nearly half a century.

Recent activities within the applied avalanche research group at NGI have focused on four areas: (1) Improved understanding of is sought through the application of simple probabilistic release models and local wind modelling. Encouraging results are obtained by analysing and refining publicly available climate time series for temperature, snow depth and precipitation on a 1 km² grid. A major remaining challenge in view of elaborating realistic large-area avalanche hazard indication maps is the a priori determination of the size of release areas as a function of return period. (2) Different aspects of are investigated by means of a wide array of experimental technologies at the Ryggfonn full-scale test site, application of aerial survey methods to derive snow distribution, and investigation of the scaling behaviour of avalanches with extreme runouts in many different paths. The results of all these analyses point towards the need for a departure from modelling avalanches with Voellmy-type models in favour of models encompassing multiple flow regimes, a more realistic rheology and entrainment as well as deposition. (3) To improve risk assessment and mitigation measures, with structures are studied by documenting destructive avalanche events, constructing vulnerability curves for persons inside buildings based on historic avalanche events, improving methods for evaluation of individual risks, and development of criteria for physical mitigation measures against powder-snow avalanches. (4) Current efforts in focus on the one hand on simple block models for studying scaling behaviour on idealised and natural slopes and on the other hand on an advanced multi-flow-regime model that also incorporates different effects of the snow cover. Ongoing work aims, among others, at an entrainment and deposition model that is dynamically consistent and only depends on measurable snow properties. This contribution will present an overview of recent activities and advancements in applied avalanche research in Norway. It is hoped that it will serve to facilitate future international collaborative efforts to address challenges in applied avalanche research.