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Editorial

Guest editorial

Snow avalanches are a type of fast-moving mass movement. They occur in snow covered mountain regions throughout the world and have caused natural disasters as long as mountainous areas have been inhabited. Their occurrence affects ski resorts, roads, railways, power lines, communication lines, forests, backcountry recreationists, residential areas and industrial facilities (e.g. mining). The number of fatalities per year due to snow avalanches is estimated to be about 250 worldwide. Most of the fatalities involve personal recreation on public land.

Avalanche mitigation includes temporary measures (forecasting, road closure) and permanent measures (land-use planning, protective means such as snow sheds or tunnels, reforestation). A prerequisite of avalanche mitigation is a sound understanding of the avalanche phenomena including snow cover processes that contribute to avalanche formation.

The General Assembly of the European Geosciences Union in Vienna, 2–7 April 2006, included – within the Natural Hazards Division – two sessions on "Snow avalanche formation and dynamics" with a total of 30 contributions. This Special Issue of Cold Regions Science and Technology contains eight papers based on EGU contributions covering the wide range of subjects that is typical for snow avalanches: from snow mechanics and snow stability to avalanche occurrence and flow characteristics.

Appropriate modeling of snow deformation and settlement are essential for numerical modeling of snow stratigraphy which is increasingly used, for example, to support avalanche forecasting. Navarre et al. present a constitutive model and test it by simulating a snow mechanical experiment where snow is pressed through a convergent channel.

van Herwijnen and Jamieson investigate snowpack properties that favour fracture propagation based on an analysis of snow profiles that were observed next to skier-triggered slopes and on skier-tested slopes that did not release a slab avalanche. They highlight the importance of slab properties for fracture propagation.

Stability indices (and in particular their temporal evolution) derived from local study plot measurements have proven to be helpful for regional avalanche forecasting — despite the obvious scale mismatch. The analysis by Jamieson et al. suggests that due to pressure sintering stability indices for natural avalanches vary less over terrain than the shear strength of the weak layer or the overlying load.

Pulsed Doppler radar measurements provide insight into the flow characteristics of mixed flowing-powder snow avalanches. Rammer et al. show that velocity measurements with a pulsed Doppler radar, a continuous wave radar and optical sensors revealed consisted results noting that the velocity measured with the radar corresponds to the upper surface of the saltation layer. Gauer et al. analyze pulsed Doppler radar data to derive the magnitude of acceleration/deceleration along the track in order to get insight into the friction processes during the flow.

Ignasi et al. investigate the seismic signals of two large snow avalanches artificially released at the Norwegian Ryggfonn test site to derive how much energy was dissipated into the ground during the flow. The amount is small, i.e. significantly less than 1% of the potential energy.

Shock waves generated when a snow avalanche hits an obstacle are investigated by Eglit et al. They present two types of equations of state to describe the moving snow while hitting an obstacle and suggest that shock waves might need to be taken into account for designing structures.

Eckert et al. explore avalanche occurrence data from the French Alps to estimate the return period for an avalanche path. A spatial statistics model is

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used to calculate the avalanche frequency even in case of sparse data for the path under consideration. The spatial scale considered is the area of a community.

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