

## **Statistical Assessment of Regional Avalanche Danger Using Parameters From the Snow Cover Model "SNOWPACK"**

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Numerical avalanche prediction with statistical methods using meteorological input parameters has shown insufficient results, mainly since snow cover information was lacking. Snow cover data were not used because they were not readily available (manual observations). With the development and increasing use of snow cover models this deficiency can now be rectified and model output can be used as input for forecasting models. We used the output of the physically based snow cover model SNOWPACK combined with meteorological variables to investigate and establish a link to regional avalanche danger. Snow stratigraphy was simulated for the location of an automatic weather station near Davos (Switzerland) over nine winters. Only dry snow situations were considered. Statistical methods, including classification trees, artificial neural networks, support vector machines, hidden markov models and nearest neighbor methods, augmented with several feature selection algorithms, were trained using the forecasted regional avalanche danger (European avalanche danger scale) as target parameter. The best results were achieved with a nearest neighbor method which used the avalanche danger level of the previous day as additional input. This method was combined with a feature selection based on fisher's discriminant analysis and a genetic algorithm. A cross-validated hit rate of 73% was obtained for all days and 55% for days when the avalanche danger level either increased or decreased. This study suggests that SNOWPACK parameters are able to improve numerical avalanche forecasting.