

A field method for measuring slab stiffness and weak layer fracture energy

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Traditional field measurements, such as snow profiles and stability tests, are widely used to provide information on snow cover stability for avalanche forecasting. Considerable research has been devoted to better interpret these measurements. However, these measurements are rather qualitative, somewhat subjective and the relation to the mechanical properties of snow is unclear. The two main mechanical parameters which influence the initiation of failure in the weak layer are slab stiffness and weak layer fracture energy. Recently, a method was introduced to determine the weak layer fracture energy using finite element modelling. This method requires estimating slab stiffness from digital snow micropenetrometer measurements. In this contribution we propose a simple field method which can be used to determine the fracture energy and the slab stiffness independently. Using a digital camera to track the displacements induced by cutting into the weak layer in propagation saw tests, the changes in the mechanical energy prior to fracture propagation can be determined. The fracture energy of the weak layer is thus obtained without requiring the elastic modulus of the snow slab. The same method also allows for the separate determination of an equivalent stiffness of the slab by comparing the measured displacement field of the slab with that of a homogeneous and isotropic Timoshenko beam.