

Micro Structural Snowpack Parameters Associated With Fracture Character in Compression Tests

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Compression tests are snow stability tests which are widely used by avalanche professional and snow researchers to identify potential weak snowpack layers. The test score, i.e. the loading step at the moment of failure, provides information about the strength of the weak layer. It therefore relates to fracture initiation, which is the first stage of avalanche release. The addition of a description of fracture character improves the interpretation of compression test results since certain types of fractures, i.e. sudden fractures, are more often associated with skier-triggered avalanches. Distinguishing between different types of fractures presumably provides information on fracture propagation, which is the second stage of avalanche release. The SnowMicroPen (SMP) was used to measure high resolution penetration resistance profiles. Using field data from over 100 such penetration resistance measurements observed in conjuncture with two compression tests, micro structural parameters associated with different types of fractures were identified. More than 300 fractures were classified as either Progressive Compression (2.2 %), Resistant Planar (7.6 %), Sudden Planar (60.3 %), Sudden Collapse (21.1 %) and non-planar Break (8.8 %). A method based on the autocorrelation of the signal was used to identify the failure layers (found with the compression tests) in the resistance profiles. Special attention was given to the micro structural properties of the failure layer, the layer adjacent to the failure layer and the slab above the failure layer. Sudden fractures were found to have typical micro structural snowpack parameters which are generally associated with unstable snow conditions, such as large differences in penetration resistance between the failure layer and the adjacent layer.