

## **Slope-scale snowpack stability derived from multiple SnowMicroPen measurements and high-resolution terrestrial FMCW radar surveys**

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Slope-scale stability assessments from SnowMicroPen (SMP) profiles and from remote sensing techniques would support avalanche forecasting operations, as they provide the ability to quantitatively estimate snow properties much faster than traditional methods. Stability information can be gathered more objectively and representatively with these new techniques than with standard stability tests, however signal interpretation remains challenging. Previous SMP studies have related SMP-derived snow properties at failure planes to observed point-scale (compression test) stability and rutschblock-scale stability. The goals of this study are to relate SMP derived properties to rutschblock test results (93 sites) as well as to extended column test (ECT) results and to include information about all layers in the SMP-stability classification scheme. Measurements at 61 different sites are used for the comparison with ECT results. 15 sites from the Swiss Alps and 10 from the Colorado San Juan Mountains, USA with up to 35 nested SMP measurements are used in the slope-scale analysis. A FMCW radar survey, taken coincident with a slope-scale SMP survey, shows the potential for obtaining additional information about the slope-scale variability of layer thicknesses. While radar profiles can not directly estimate strength, they can be used to quantify the variability of overburden stress and continuity of stratigraphy.