Extended Column Test Results During Surface Warming: Does Surface Warming Affect Fracture Propagation Potential?

Ron Simenhois 1 Karl W. Birkeland 2

1 Copper Mountain, Colorado, Silverthorne, CO, USA; 2 USDA Forest Service National Avalanche Center, Bozeman, MT, USA

Dry slab avalanche stability typically increases over time in the absence of active loading from new snow or wind. However, field observations suggest that occasionally slopes showing no signs of instability in the morning avalanche later in the day when the snow surface is warmed by the sun. In this paper we present evidence that dry snowpack fracture propagation propensity may increase during sunny days as the snow surface warms up and becomes wet. During four warm, sunny days in the winters of 06/07 and 07/08, we tracked changes in results for both Extended Column and Propagation Saw tests. Our data suggest that snow surface temperature affects fracture propagation propensity on inclined slopes, with fractures more likely to propagate when the snow surface is wet. We support our test results with two case studies where explosives and ski cuts produced no avalanches when the snow surface was cold and dry, but when those same slopes were re-tested after the snow surface warmed to zero degrees they avalanched. In both cases the weak layer was dry and had a temperature below zero. We hypothesize that fracture propagation propensity may increase due to increased surface creep or due to changes in the mechanical properties of the slab.