Slab avalanche tensile fracture toughness estimated from field measurements

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Dry slab avalanches release by propagating shear fractures within thin, weak layers under thick, strong, cohesive slabs. Avalanches form when the propagating shear fracture initiates tensile fracture at the crown perpendicular to the shear fracture surface. Thus, in order for avalanches to occur, tensile fracture in the slab must be overcome. In this paper, we present calculations of tensile fracture toughness estimated entirely from field measurements from avalanche fracture line data. We make use of a fracture mechanical one-dimensional size effect law for tensile fracture calibrated from laboratory measurements of the tensile fracture toughness of alpine snow. The results suggest that slab tensile fracture toughness is scale invariant with respect to snow density. We suggest our results are fundamental for the estimation of slab avalanche dimensions (length and width). We also briefly mention an alternate size effect law for tensile failure based on Weibull=s strength prediction.