FRACTURE MECHANICAL MODELS OF DRY SLAB AVALANCHE RELEASE

By David M. McClung

(Environment Canada, Canmore, Alberta ToL oMo, Canada)

Abstract. Experimental evidence shows that snow is a pressure-sensitive, dilatant, strain-softening material in slow, constant-rate shear deformation. When strain-softening initiates in a weak layer underneath a snow slab, avalanche release is hypothesized to be possible with or without loading. Specifically, two cases are discussed: (i) a shear-crack-like disturbance can initiate by formation of a slip surface in the weak layer and traverse the layer by a self-propagating progressive failure with or perhaps without loading; (ii) a self-propagating shear instability can develop when a region of the weak layer is driven past peak shear strength by loading. These cases represent the extremes in weak-layer deformations under which strain-softening failures might precipitate avalanche release. For these cases the associated fracture sequences, fracture geometry, time scale of release, and temperature-related effects are consistent with the known facts of dry-slab avalanche release.

SPATIAL PATTERNS OF SNOW ACCUMULATION IN THE ALPINE TERRAIN

By Donald Alford

(Water Resources Research Institute, University of Wyoming, P.O. Box 3067, University Station, Laramie, Wyoming 82071, U.S.A.)

Abstract. A model, relating spatial patterns of snow accumulation in the alpine belt of major mountain ranges to the angular relationship which exists among terrain features such as cirque basins, mean storm-path trajectories, and incident solar radiation, is presented together with a limited amount of relevant empirical data. It is suggested that an "orientation gradient" exists in both the temporal and spatial variation of accumulation and ablation in the alpine terrain, the importance of which varies as some function of the relative control exerted by wind redistribution of snow and of direct incident solar radiation on the accumulation and ablation processes. The data obtained to date suggest that the importance of the orientation gradient varies widely among the mountain ranges studied, being a good predictor of snow distribution patterns in the Front Range of the Colorado Rockies and the Snowy Range in southern Wyoming, both of which are relatively windswept, while in the much less windy Bridger Range, in south-western Montana, both orientation and elevation appear to contribute on an almost equal basis. An indirect method of estimating relative amounts of annual mass turnover, using eleven glaciers located in the Wind River of west central Wyoming, is presented.