

Rapid assessment of a large-magnitude snow avalanche event in Colorado

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Abstract. The 2010-2011 winter was a season of record snowfall and snowpack accumulation for many mountain areas in Colorado. Large, destructive avalanches were reported from locations across the state. For example, on April 29, 2011, an impressive slide damaged high voltage power lines along Peru Creek, near Montezuma, CO. The large avalanche destroyed a power line tower that had been in place since the 1970's, and deposited massive piles of snow, rocks, and woody debris in the runout zone. The slide created fresh trimlines, widening the existing avalanche path area by uprooting, stripping, and breaking trees. The disturbance event left behind numerous mature downed trees and extensive areas of vegetation damage, providing a unique opportunity to improve our knowledge of local avalanche frequency and magnitude. Initially, we gathered historical records of avalanche incidents and observations, and used repeat photography to track changes in the avalanche path vegetation over time. Next, we used field measurements to survey the extent of vegetation damage, assess relative tree ages, and estimate maximum runout distances. We also collected discs and cores from downed trees to detect signals of past avalanche impacts recorded in woody plant tissue. Then, to provide insight on the avalanche dynamics, we used terrain features and local snowpack observations as inputs in a one-dimensional model to estimate the avalanche velocity, height of the flowing snow, impact pressures, and mass of the debris. For Colorado, and perhaps elsewhere, we conclude that several vegetation ecology methods can be used to characterize and map local avalanche frequency and magnitude.

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