

An experimental investigation of explosives and snowpack dynamic response

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Explosives are frequently used for avalanche control in public transportation corridors and within ski area boundaries, yet there has been little research into explosive effectiveness with snow. During the 2010 winter, five experimental test sequences were conducted at Bridger Bowl Ski Area to measure snowpack response to explosive charges. Tests were conducted with both single and double 2lb Pentolite cast boosters. Charges were placed in three different locations with respect to the snow surface: 1 meter above the snow, on the surface, and buried below the surface. Snowpack dynamic response was measured at 3 and 7 meters from the explosive, using six bi-axial accelerometer sensors placed at various depths in the snow. Vertical and radial accelerations were recorded at three snow depths at each of the two ranges from the blast, utilizing a high-speed digital data acquisition apparatus. Additionally, blast air overpressure (up to 5 psi) was measured just above the snow surface at a single location. Acceleration data was mathematically integrated to yield snowpack velocity and displacement. The paper describes test set up, procedures and approach along with experimental results. Findings include a discussion of the influence of charge size, and provide details of the attenuation of acceleration, velocity, and displacement with increasing distance from the charge and vertically with increasing snow depth. The periodic oscillatory response of the snow slab during the explosive events is shown and discussed. Measurements support previous studies and field observations of enhanced effectiveness using suspended explosives.