Study Title

Effects of Explosives on Avalanche Frequency and Magnitude

Brief Type

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Effects of Explosives on Avalanche Frequency and Magnitude

Study Objectives

The objective of this study is to examine the effect of explosive mitigation on seasonal avalanche frequency and magnitude in a given set of avalanche paths. It will challenge the long-held belief that regular pro-active explosives control performed consistently throughout the season leads to more frequent but smaller avalanches and ultimately reduces the frequency of avalanches reaching further into the avalanche path runout zone where transportation corridors are typically located.

Background

The application of explosives for avalanche control is a widely used avalanche risk mitigation method in North America. It is considered as a short-term risk management method in that it acts on the immediate hazard when required during the winter. However, the effects of such practices on seasonal avalanche frequency and magnitude are complex and involve multiple factors. It is assumed that the frequent application of explosives to trigger avalanches results in more frequent but smaller events (e.g., Simioni & Schweizer, 2018), thereby affecting (and potentially reducing) seasonal risk. However, to our knowledge, no formal publications provide data supporting this assumption.

Methods

This work will involve several components. It will start with completing a comprehensive literature review of published research on the effects of explosives on avalanche frequency and magnitude. Subsequent to this, the analysis will involve collecting and compiling datasets of individual avalanche program records (e.g., avalanche occurrence and explosive use records) from participating TARP members. In order to strengthen the results of the analysis, TARP members with datasets from a variety of snow climate regimes within North America will be considered.

The analysis will then identify representative avalanche paths, or groups of paths, that have sufficient records before and after regular explosives control for statistically significant results. Any data gaps in historical avalanche frequency prior to regular observations will be filled with aerial photograph analysis and/or dendrochronological surveys. The analysis will then employ standard statistical techniques and hypothesis testing to determine how regular explosives control impacts the magnitude and frequency of these events.

Anticipated Results

The anticipated results will answer the question: how does the application of explosives impact the frequency of large avalanche events? The study will explore this question for different snow climate regimes and avalanche path characteristics.

Research Benefits

The results of this study are expected to help inform long-term planning decisions pertaining to investments into explosives avalanche control infrastructure (e.g., Is it more valuable to invest in an avalanche forecast/closure program rather than install Remote Avalanche Control Systems (RACS)?).