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The Use of Terrestrial Laser Scanning for the Characterization of Debris Accumulation Patterns in the White Canyon, British Columbia

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Within the Thompson-Fraser Rail Corridor in interior British Columbia, Canada, debris flows are one of the dominant mass movement processes and geohazard. Basal entrainment of channel-bed material can be a common feature of debris flows. Debris flows often consist of colluvium and other types of coarse sediment, which can be partially or totally incorporated into the flowing mass. The entrainment of loose and unconsolidated material along the flow path affects fundamental parameters used for debris-flow hazard assessment, since it directly influences the volume and flow dynamics. Entrainment can also significantly contribute to the total volume of a debris flow. In 1995, a debris flow on Hope Creek, British Columbia obtained 90% of its material through entrainment of fan sediments.

As part of the Rail Ground Hazard Research Program (RGHRP), terrestrial laser scanning (TLS) has been completed at various sites along the Thompson-Fraser Rail Corridor in interior British Columbia since early 2012. The White Canyon, 250 kilometers northeast of Vancouver, BC; is a notorious 3-kilometer stretch of rail line which is prone to rockfall and debris flows. In this study, we use high-resolution TLS datasets to analyze a series of debris flow events which occurred in February 2017. TLS scans taken before and after the events provide insight into the degree of entrainment which occurred in a number of the channels in the White Canyon. We demonstrate how we can leverage this series of scans to provide insight into the amount of debris accumulating in the channels prior to failure. We additionally analyze the climatic signature leading up to the debris flow events. A deeper understanding of these relationships will improve an engineer's ability to forecast and plan for future debris failure events at this site and others adjacent to linear infrastructure.