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PFC2D Analysis of Frank Slide rockfall deposit (Turtle Mountain, Canada)

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The eastern slope of Turtle Mountain collapse (Frank Slide, Alberta, Canada) involved a total of 30 M m3 of material and caused 70 fatalities in 1903. At the moment Turtle Mountain is one of the most monitored rock-slope sites in the world and several studies and simulations have been published.

Detailed field work on the structural characteristics of the deposit has been performed (block size and lithology distribution, geomorphologic map of the deposit. . .). As an alternative to traditional numerical analysis, such as finite element methods or discontinuum methods, we analyze Frank Slide by means of the distinct element numerical model PFC2D, which considers the rock mass as an assembly of circular particles which can be bonded together and interact with each other and with the boundaries by contact laws.

Assuming an initial configuration (given failure surface) several tests are made; firstly the movement is simulated as a granular flow (with no bonding between particles), secondly rock clusters are defined to match detached blocks identified in the field and thirdly the bonds between particles are enabled in order to account for first failure processes and block fragmentation. In order to simulate fracture, heterogeneity is implemented on bond resistance properties by a statistical function.

Mechanic properties such as stresses, velocities and energy are monitored during the propagation process. Color markers for each lithology enable to identify internal deformation in the rockslide during emplacement. Results permit to compare the run-out distance and deposit configuration with spatial patterns observed in field work and might give insight to the nature of Frank Slide propagation.