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Multidisciplinary approach (geology, geomorphology, geomechanics, geomatics) for the characterization of the Blais Creek DsGSD (Monashee Mountains, BC, Canada)

Danilo Moretti (1), Marco Giardino (2), Doug Stead (3), John Clague (3), Dan Gibson (3), Monica Ghirotti (4), and Luigi Perotti (1)

(1) geoNatHaz c/o University of Torino, Earth Sciences, Torino, Italy (www.geonathaz.unito.it), (2) NatRisk, Interdepartmental Centre for Natural Risks, University of Turin, Italy (www.natrisk.org), (3) Department of Earth Sciences, Simon Fraser University, Burnaby, Canada (www.sfu.ca/earth-sciences/), (4) Alma Mater Università di Bologna, Italy, (monica.ghirotti@unibo.it)

Field investigations, including detailed geological and geomorphological mapping have been coupled with stratigraphic and structural studies of the Blais Creek Deep-seated Gravitational Slope Deformations (DsGSD), Monashee Mountains, British Columbia (BC). To reconstruct the DsGSD evolutionary stages and to evaluate its controlling factors, a complex methodology has been applied, integrating orthophotos, stereo models and 3D models of the DsGSD with field and literature data concerning tectonic and glacial history of the Seymour Valley. General geomechanical properties of the deforming rock mass has been then evaluated for using in numerical models of the failure mechanism at Blais Creek and to define a broad geomechanical characterization of different portions of the DsGSD.

The combination between the aerial and terrestrial photogrammetry was appropriate in terms of the quality of the information obtained more than the quantitative information. Several Ground Control Points (GCPs) and Tie Points (TPs) were selected from the original DEM received by the BC Government. The use of a multitemporal aerial triangulation gave the possibility to minimize the error relative to every single block of images. Couples of oriented photos were used to create stereoscopic models. Multitemporal variations of the Blais Creek slope were observed and compared to the actual situation of the slope.

The use of terrestrial photogrammetry through Adamtech software confirmed some of the qualitative data obtained from aerial interpretation and from field survey. The limited use of terrestrial photogrammetry was due to the impossibility of orienting the 3D terrestrial models. Anyway these models were also useful to confirm one of the possible mechanisms used to describe the evolution of Blais Creek.

Geomechanical analysis was performed through field work and laboratory tests to characterize the entire slope and to produce some of the values useful for a possible numerical analysis of Blais Creek. It showed interesting differences in geomechanical properties between the calc-silicate and quartzite/gneiss.

The kinematic analysis showed very the different instability areas along the slope, even if variations in landforms and rock masses volume weren't widespread along Blais Creek slope during the time span covered by aerial photographs (1973-2007). Indeed, the multitemporal analysis outlined very active instability along the large upper trench and the lateral active slopes of Blais Creek. Even without significant level of risks in the area, considering the remote area involved in this instability, some relevant hazards could occur, related to the possible collapse of SE side of Blais Creek DsGSD.

Regarding the long term evolution of the DsGSD, the extensive network of linear features at Blais Creek is of a large deforming rock mass. Movement probably began with the retreat of valley glaciers during deglaciation when the oversteepened valley sides were debuttressed. By these evidences it is possible to theorize that the post-glacial retreat of the rock face and removal of the ice buttress from both the Seymour and the Blais Creeek Valleys lowered the factor of stability of the mass as a whole, allowing a deep-seated shear surface to develop gradually over time by progressive creep.