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Geomorphological mapping and numerical modelling of the Becca France rock avalanche (Aosta Valley, Italy)

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The Becca France rock avalanche is an example of a large historical event causing damages and casualties. The rock avalanche occurred on July 6th, 1564 and claimed about 500 lives by destroying the Thora village, close to Aosta (Northern Italy, Aosta Valley). Then, this seems to have been one of the most catastrophic rock avalanches in the Alps (Mount Granier, France, 1248, 1,500 ˜5,000 deaths; Zarera, Switzerland, 1486, 300 deaths; Kienholz, Switzerland, 1499, 400 deaths; Biasca, Switzerland, 1515, 600 deaths; Hofgastein, Austria, 1569, 147 deaths; Schwaz, Austria, 1569, 140 deaths; Corbeyrier-Yvome, Switzerland, 1584, 328 deaths; Piuro, Italy, 1618, 1,200 deaths; Salzburg, Austria, 1669, 250 deaths; Gero Barcone, Italy, 1762, 115 deaths; Goldau, Switzerland, 1806, 457 deaths; Antelao Massif, Italy, 1814, 300 deaths; Elm, Switzerland, 1881, 115 deaths; St. Gervais, France, 1892, 177 deaths). The detachment area is located at the eastern limit of a very large deep seated gravitational slope deformation that develops between the Leysser peak, the Tsa de la Comba and the Becca France (2312 m s.a.l.). The landslide scar is about 950 m wide and about 600 m in relief. The landslide material (about 30*106 m3, covered 1.4 km2), run up for about 150 m on the opposite side, spread over a total length of about 2550 m along the valley bottom, and dammed the Clusellaz valley. A large lake developed upstream and the lake survived for about 300 years when on June 10th, 1851 a major flood occurred along the valley. We collected geomorphological and geological data in the entire area to detail both the characteristics of the detachment zone and of the accumulation. The involved lithologies are: calcschist, marble, prasinite, with minor gypsum lenses. The accumulation presents well developed longitudinal ridges parallel to the valley and a clear vertical and horizontal lithological zonation. We reconstructed a DTM for the actual and the pre-failure topography starting from topographic maps, field survey-

ings, and a few geophysical data available for the accumulation area. We simulated the spreading of the material by different 1D and quasi 3D numerical models and this allowed us to verify the validity of some assumptions concerning the physical properties of the materials and the geometry of the failed mass. No total duration constrains exist for this landslide, but the destruction of the village and the loss of so many lives, suggest the extreme velocity of the movement.