

**A COMPUTER PROGRAM TO EVALUATE ROCKFALL HAZARD AND RISK AT THE REGIONAL SCALE. EXAMPLES FROM THE LOMBARDY REGION.**

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Rock-falls pose a severe hazard in mountain areas. Despite the fact that rock-falls represent a simple landslide type to model, only few attempts have been made to establish rock-fall hazard and the associate risk at the regional scale. Computer programs currently available for rock-fall hazard assessment work reasonably well in small areas, where detailed topographic and geologic data, and where information on past rock-fall events is available. These programs are best suited for site specific studies, where the rock-fall hazard is known to exist and where remedial measures have to be designed. However such programs cannot be used to ascertain the rock-fall hazard over large areas, such as a province or an alpine valley. We developed a 3-dimensional simulation program that starting from thematic information available in digital format and using GIS technology, generates simple, but meaningful maps useful for assessing rock-fall hazard over large areas. The program requires as input data a DTM, the location of rock-fall starting points, the dynamic friction coefficient used to simulate the loss of energy during the rolling phases, and the coefficients for normal and a tangential energy restitution at the impact points. Outputs of the program are in raster and vector formats, and include: the count of rock-fall trajectories, the maximum computed velocity, and the maximum computed height at each grid cell; and the 3-dimensional trajectories of rock-falls. The program was tested in Val Camonica, an alpine valley that extends for more than 1400 km<sup>2</sup> in the southern Alps, for which a DTM and a detailed landslide inventory and surface geology map were available. Results of the experiment will be discussed, together with a preliminary attempt to estimate rock-fall risk in the area.