Abstract

The modeling of block falls in order to establish forecasts of their scope and magnitude has been evolving for several years, due to the use of new tools and methods for calculating trajectories. In order to confirm the validity of these models, block falls are reproduced on large, medium and small scales in order to acquire data that can be compared to computer simulations.

This work consists of setting up a small-scale experiment allowing detailed observation of the tested trajectories. This, in order to validate a trajectory reproduction model developed at the University of Lausanne. To do so, a setup allowing the 3D reproduction of trajectories involving rebound was developed to observe different types of impacts on soft ground. Rebounds whose incident trajectory is vertical and lateral trajectories on the impacting surface.

A tracking method was used to allow a comparison of the trajectories reconstructed from the raw data from the experiments and those calculated by the model under test. A description of a method for calculating restitution coefficients from the direction and speed of the trajectory of a block was then proposed. The coefficients obtained were compared with the following parameters; the incident and resultant angles of the trajectories and their horizontal deviation on impact. Some parameters directly observed during the experiments, such as the depth of craters or block rotation caused by an impact, were also compared to the restitution coefficients.

The results obtained highlight the influence of the incident direction of a block on the rebounds tested as well as the effect of cratering on the energy absorption of a block during an impact. They will also have made it possible to confirm the validity of a trajectory calculation method based on the relative position of the impact points on a slope.