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The study of Rockfall in Keelung Mountain Area of Northeastern Taiwan

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This study focused on the case of rockfall in the Keelung Mountain Area in the northeastern part of Taiwan. To explore the different trajectories and range including free fall, bouncing and rolling when the rocks fall down, this research tried to analyze the local geomorphological characteristics, distribution of geological materials, and the extension of the discontinuities.

In the results, "coefficient of restitution " and "coefficient of friction" are the most important factors which affect the movement trajectory of bouncing and rolling. The coefficient of restitution is mainly affected by the three factors, such as the strength of slope surface's material, incident angle, and collision speed. In the situation when falling rocks descend from 2m height, and setting the incident angles as 30°, 45° and 60°, we observed the coefficient of normal restitution as 0.18, 0.12, and 0.10. These results showed that, the coefficient of normal restitution of the rockfall inversely decreased with the incident angle. When fixing the incident angle at 90°, the coefficients of restitution were observed as 0.41, 0.35, and 0.31 when the rockfall from 1 m, 2 m, 3 m. This research found that the coefficient of restitution inversely decreased with the collision speed of rockfall. The size of the falling rocks which was related to the size of the block on the slope, also affected the path of the rockfall based on the bouncing movement. When the size of the rock was smaller than the size of the block at the bottom of the slope, the trajectories were influenced by undulation. When the size of the rock was larger than deposited one, the rock was hard to be affected by slope fluctuation, and continue to keep scrolling. At this situation, the movement of the rockfall was mainly affected by the coefficient of friction rather than the coefficient of restitution's impact. The simulation is carried out using the Rocscience Rocfall program, which depicts the path and energy of rockfall, these data can be used as important reference basis of prevention of rockfall hazards.

Keywords: Rockfall, Coefficient of Restitution, Coefficient of Friction, Free Fall, Bouncing , Rolling

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