An attempt to refine rock fall hazard zoning based on Swiss recommendations

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Rock-fall hazard zoning is usually achieved using a relative hazard scale, combining different parameters (probability of propagation, energy, height of flight etc.). In Switzerland, danger maps replace hazard maps. The danger map corresponds to a hazard zoning (frequency of events) depending on kinetic energy of blocks. For instance all events with energy higher than 300 kJ and more frequent on average than once 300 years are considered as highly hazardous. On the other hand events with energy > 30 kJ occurring on average once during 100-300 years are considered as low hazard. This principle may apply to other energy values than those proposed in Swiss recommendations.

First the rockfall hazard (H = Pr x Pf) is the product of the failure probability (Pr) and the block propagation probability (Pf). The 2D and 3D zoning is performed using the distributions of the energy stop points. This is determined by assuming that the last point of the trajectory is above a threshold energy value.

The geometry of the hazard zoning defined by the Swiss codes is affected by the slope morphology and frequency of rockfall. The low, medium and high hazard zoning changes shape depending on the rockfall frequency. The passage from 2D trajectographic zoning to 3D is not straightforward if the cliff lateral extent is not infinite and linear. The zoning is also quite simple in the case of conic slopes.

The generalization in 3D implies a geometrical rule in order to obtain operational zoning.

This approach is preliminary especially for high-populated region, because, the hazard zoning has to be very precise in order to obtain the greatest area containing acceptable risks.