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Quantitative parameterization of mid-magnitude rockfalls at a sensitive stage of failure in the Bavarian Alps (Berchtesgaden)

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Rockfall hazards regularly affect railways, roads and other key infrastructure. Rockfall modeling allows for analyzing, assessing and anticipating rockfall detachment and trajectories. Significant improvements of parameter estimation have been achieved for the rockfall modelling in 2D and 3D, i.e. in terms of roughness and vegetation. These parameters enable a detailed analysis of the falling, bouncing and rolling processes on vegetated slopes. However, we hypothesize that the failure process and fragmentation have not been covered sufficiently. Here, we apply multiple methods to parameterise the detachment and fragmentation processes exemplified for an approximately 250 m3 single limestone block in a critical state of failure preparation above a highly-frequented federal road. The detachment analysis framework is a limit equilibrium study assessing total friction of the rough failure plane and cohesive properties of the remaining rock bridges. The total friction is assessed in terms of profile gauge measurements determining the joint roughness coefficient (JRC) whereas the basic friction angle is assessed in a direct rock shear testing device. The joint wall compressive (JCS) is approached in situ with 200 clustered Schmidt Hammer rebound values and in the laboratory performing uniaxial compressive strength testing of 15 samples. Fragmentation scenarios are anticipated in terms of a 3D fracture analysis including joint persistence and mechanical performance assessed at the surface and along the accessible 40% of the failure plane. The current research fields do not cover mid-magnitude rockfalls, their failure mechanics and possible fragmentation processes. Therefore we suggest trying to link the field of failure mechanics in steep rock slopes to the topic of rock fall modelling by posing the following key questions:
• How can a detailed field analysis of joint persistence and joint distribution contribute to magnitude assessment in terms of rock fall modelling?
• How can we provide a mechanical model for a critical limestone block by providing accurate results from fieldwork?
• Based on the approach of Barton & Choubey (1977): Can we back calculate to the amount of cohesive rock-rock contacts?
In this contribution, we aim to demonstrate an effective methodology to generate reproducible geological, geotechnical data to yield an enhanced reconnaissance of mid magnitude rockfalls endangering vulnerable infrastructure.@END_ABSTRACT@