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Comparing different block propagation modelling approaches using the Platrock simulation platform

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Block propagation models are routinely used for the quantitative assessment of rockfall hazard. In these models, one of the major difficulties is the development of physically consistent and field applicable approaches to model the interaction between the block and the natural terrain. For most of propagation models, a thorough calibration of the input parameters is not available over the wide range of configurations encountered in practice. Consequently, the parameters choice is strongly depending on expert knowledge. In addition, most of models exhibit substantial sensitivity to some parameters, i.e. small changes of these parameters entail large differences in the simulation results.

The trajectory analysis platform Platrock, freely available upon request (contact: franck.bourrier@inrae.fr), allows performing 2D and 3D simulations using both material point rebound models and models, based on non-smooth mechanics, that explicitly account for block shape. This platform provides several simulation tools for detailed analyses of block propagation on study sites.

The possibilities of the predictive capabilities of different block propagation modelling approaches integrated into the Platrock platform have been assessed on a well-documented study site, where a benchmark of propagation models has been done in the context of C2ROP research project. This analysis emphasized the capacities of trajectory analyses to traduce block propagation but also demonstrated their substantial sensitivity to model parameters. The results from these simulations cannot be relevantly interpreted if they are not accompanied with calibration proofs, sensitivity analysis, and detailed interpretation of the results from the expert in charge of the study.