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Identification of relevant scale effects in surface representations for numerical rockfall modelling.

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Today highly detailed surface representations are available. These data stem from Laser scanning, photogrametry or different surveying methods and is formulated as digital surface models. Modern computer technology allows to incorporate this surfaces representations without further adaptation in simulation software. First experiences with rockfall simulations based on digital surface models showed the scale dependency of the modeled process. The interaction between Block and surface is highly dependent of block form and surface features in the magnitude of the block size. Therefore modelers are not free to choose a scale as can be done within certain limits in other fields of numerical modeling.

The rockfall process is a series of sliding, toppling and impacts on the subsoil. With higher velocities and steeper gradients of the slope the rock can entirely lift of from the surface and follow a ballistic trajectory until impact on the slope again. Rolling, which is a possible movement in most simulation algorithms, is already an idealization of the natural process. In nature it will not occur in this form, because rocks blocks are rarely spheres or have any circular forms. Neither is the surface exactly level. In recent years one of the possible strategies was the representation of the slope profile in a macro scale which was overlain by a micro roughness in the magnitude of the block size. Micro roughness was the stochastic model of zigzags. The spikes were characterized by length and amplitude. This let to a rather detailed, explicit and computer power consuming simulation strategy. The roughness representation was and is due to the estimation and experience of the modeler.

The nowadays available higher resolution of surface models let to the hope that it may be possible either to identify the relevant characteristics from the surface representations or to model the rockfall path on the actual real life surface without a stochastic model of surface roughness. The following article will discuss these possibilities. The latter approach is not considered as leading to a successful direction. The first approach requires a smoothing of the surface representation. The smoothing process in it self can result in the identification of the relevant surface roughness, if a sufficient resolution of the surface representation is given. Furthermore the discussion of the influence of surface representation in different scales is leading to a better process understanding. This may open the way for model approaches, with a higher degree of abstraction.