Back and forward analysis of Kvernhusfjellet rock avalanche in Norway

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Among hazardous gravitational flows, large rock avalanches are one of the less understood. Even after several years of intensive studies they remain a hot topic in rock mechanics and geological risk research. Back analyses of real cases are crucial to improve our understanding of these complex events and to use them with a hazard-predictive perspective by constraining the main input parameters necessary for modelling the potential dynamics of large unstable volumes remaining on slopes. Nonetheless because of the low frequency of occurrence of such large phenomena, well described cases history are difficult to obtain. In Norway though, there is a high concentration of large rock-slope failures that occurred in the past but few of them have been characterized in detail so far. In addition several unstable slopes that could fail catastrophically in the future have been identified. The present study shows results of back-analysis of the Kvernhusfjellet rock avalanche, situated in the Rogaland region. A preliminary characterisation of the past event and of some potential collapses have been done on this site. For current study we intended to model both the past event and the potential collapse, divided in two scenarios. Simulations are carried out with VolcFlow developed at the Laboratoire Magmas et Volcans (Clermont-Ferrand, France, http://lmv.univ-bpclermont.fr/volcflow/), a depth-average approximation model based on continuum mechanics and the St Venant equations of unsteady flow, which considers the granular flow as a fluid with a particular rheology. Most suitable rheology and parameter ranges have been defined based on the pre-historical rock avalanche. In this way we have been able to better constrain parameters to be used in the forward analysis and to build more plausible scenarios.