



Influence of weak layer heterogeneity on slab avalanche release. Finite Element Modeling.

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Slab avalanches generally result from the collapse of a weak layer underlaying a cohesive slab. The two key ingredients for the mechanical description of slab avalanche release are the heterogeneity of the weak layer and the redistribution of stresses by elasticity of the slab. We use the finite element code Cast3M to build a complete mechanical model of the {slab - weak layer} system at the full scale and including inertial effects. We model the weak layer as a cohesive Mohr-Coulomb interface with a shear softening. The softening accounts for the shear induced collapse of this layer. The overlaying slab is represented by a brittle elastic layer. The weak layer heterogeneity is modelled through a Gaussian stochastic distribution of the cohesion with a spherical spatial covariance. The system is loaded by increasing the slope angle until the rupture. We first study the effect of the heterogeneity and slab depth on avalanche release for a simple geometry of uniform slope. We observe two types of releases as a function of heterogeneity parameters. "Global" releases are initiated by a shear rupture in the weak layer which propagates in the whole layer, corresponding to a crown rupture. "Partial" releases are initiated the same way, but the local heterogeneity is sufficient to generate a traction rupture in the slab and thus only a part of the slope is released. We then analyse the influence of slab depth and heterogeneity correlation length on avalanche release angle distributions. Finally we show how to obtain release slab depth distributions which belong to the class of power laws and we compare them to experimental data.