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Nøkkelord

1. Debris flows
2. Entrainment
3. Flow basal stresses
4. Physical flume modelling
5. Flexible barriers

Sammendrag / Abstract

Title: Measurements of debris flow entrainment and dynamics

The dynamics of debris flows is still not well understood. Among the research challenges, only few entrainment measurements are available in literature, as entrainment is often masked by deposition on top. Furthermore, the magnitude of stresses at the base of debris flows may significantly change depending on the degree of flow liquefaction and pore pressure dissipations in the debris flow. Both the entrainment and the magnitude of the flow basal stresses have significant implications to calibrate debris flow numerical models for hazard mapping.
In this work, I present a simple, cheap, and effective method to measure the entrainment depths. Flume experiments have therefore been performed to assess the influence of the initial debris flow volume. The experimental results show a positive correlation between debris flow volume and entrainment depths. To better understand the debris flow dynamics, the flow basal stresses have been measured. A high degree of liquefaction at the base of the debris flow is observed. The apparent friction at the base

of the debris flow is back-calculated and appears to be significantly different over the fixed and erodible bed.
A mitigation measure to reduce entrainment has also been studied. A compact flexible barrier was installed in the upstream part of the channel and is observed to deflect the flow along a curvilinear path. High normal stresses are measured at the base of the overflow, which are caused by the additional centrifugal stresses from the overflow. The results from the flume tests suggest that the flow interaction with an upstream flexible barrier may significantly influence the debris flow dynamics both upstream and downstream of the barrier.