Geophysical Research Abstracts,
Vol. 10, EGU2008-A-07362, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-07362
EGU General Assembly 2008

On the deposition of granular surface flows

Y.-C. Tai and Y.-C. Lin

Department of Civil Engineering, National Chi Nan University, Nantou 545, Taiwan
(yctai@ncnu.edu.tw / Fax:+886 49 291 8679)

The prediction of the paths of the gravity-driven mass flows, maximum run-out distances and threatened areas is a key part of hazard assessment and they are of considerable interest to civil engineers and civil servants of municipalities responsible for the planning and development in populated mountainous regions. Taking into account the deposition and erosion processes, the gravity-driven mass flows can be seen as surface flows over free bottom. However, the deposition or erosion processes have still to be fully modeled. Using moving curvilinear coordinates, a combination of coordinates for arbitrary topography (Bouchut and Westdickenberg, 2004) and unified coordinate system (Hui, 2004), the depth integrated mass balance and momentum balance equations are derived (Tai and Kuo, 2008), where the evolving curvature effect is neatly included in the total derivative operator of the moving terrain-following coordinates. The motion of the basal interface is postulated by a most simplistic approach.

The investigation is focused on the deposition processes. Experiments of granular flows moving down an inclined chute into horizontal run-out zone were preformed, where the evolution of the varying basal surface, due to the deposition processes, was captured by a high-speed digital camera. Numerical simulations demonstrate that the theoretical prediction and experimental observations are generally in good agreement. In addition, numerical analysis reveals the advantage of describing the angle of repose of a pile at rest and shows that the deposition processes play an important role for determining the run-out distance.