Geophysical Research Abstracts, Vol. 7, 05943, 2005
SRef-ID: 1607-7962/gra/EGU05-A-05943

Motion of large particles in debris flows

M. Swartz and B.W. McArdell

WSL Swiss Federal Research Institute, Division of Natural Hazards, Gravity Currents Research Group, Birmensdorf, Switzerland (mcardell@wsl.ch)

Observations of the movement of large boulders within debris flows can be used to help constrain the selection of constitutive models used to describe the frictional behavior. Using video recordings from the Illgraben debris flow observation station, Canton VS, Switzerland, we tracked the motion of large particles relative to the front of the flow. For one granular flow, we were able to identify and estimate the diameter of more than 600 boulders (diameter > 0.5 m) and track their trajectory over a 40 m long reach. Within the first 30 to 60 s of the flow as it passed the camera location, all of the boulders near the surface of the flow had velocities larger than and up to twice as fast as the granular front of the flow. At the front itself they were often pushed to the either side of the channel. The motion of individual blocks near the front is irregular, with the particles changing their direction of rotation in response to collisions with other particles. Until about 150 to 250 s after the passage of the front, all objects floating on the surface of the flow (woody debris, small particles) traveled slightly faster than the front itself, while the largest boulders tended to travel more slowly than the debris flow front. After about 250 s, all objects within the debris flow traveled more slowly than the front of the flow, with the largest particles traveling more slowly than objects on the surface of the flow. These observations support the idea that a two-phase treatment of such flows is desirable, but that the relative motion of the solid and fluid phases should be considered in numerical models.