Geophysical Research Abstracts
Vol. 20, EGU2018-9450-1, 2018
EGU General Assembly 2018

Quantifying the significance of collisional flow on the mobility of dry granular landslides using a Smart Rock sensor

Scott Coombs (1), Artur Apostolov (2), Andy Take (3), and Jean Benoit (4)

(1) GeoEngineering Centre at Queen's-RMC, Queen's University, Canada (scottcoombs.94@gmail.com), (2) College of Engineering and Physical Sciences, University of New Hampshire, USA (aapostolov@geocomp.com), (3) GeoEngineering Centre at Queen's-RMC, Queen's University, Canada (andy.take@queensu.ca), (4) College of Engineering and Physical Sciences, University of New Hampshire, USA (jean.benoit@unh.edu)

Current methods of landslide modelling used in practice tend to rely heavily on empiricism, as mechanistic flow behaviour is highly complex and difficult to simulate. Although empiricism is often necessary in practice to provide some relative sense of real-world accuracy, numerical modelling techniques can be improved by calibration with high-quality data which highlight the influence of mechanistic properties on landslide mobility. To this effect, a series of monodisperse dry granular flow experiments was conducted in a large-scale landslide flume, with a 6.73 m long inclined section, 30° to the horizontal. Each landslide experiment was conducted using a constant source volume of 0.4 m3. The landslide materials were pseudo-spherical ceramic beads with nominal grain dimeters of 3 mm, 6 mm, 13 mm, and 25 mm. Using high speed cameras operating at 100 and 500 frames per second, the entirety of each flow event was captured from top-down and side-profile perpendicular viewing angles. These images were used to calculate flow velocity and flow thickness profiles for each landslide experiment. Highly-instrumented particles (i.e. "Smart Rocks") were embedded within the landslide flows to quantify the collisional nature of such flows, and to understand the influence of collisional flow on the mobility of landslides. Smart Rock data indicate that flows of larger particles tend to be more collisional in nature than flows of smaller particles which, for the same initial source volume, tend to be more frictional. Terrestrial laser scanning data of the landslide deposits permitted measurements of travel angle, which indicate that increased collisional activity corresponds to increased landslide mobility.