Geophysical Research Abstracts
Vol. 18, EGU2016-13596, 2016
EGU General Assembly 2016

Destabilization of confined granular packings due to fluid flow

Martin Monloubou and Bjørnar Sandnes
College of Engineering, Swansea University, Swansea, Wales (m.j.j.monloubou@swansea.ac.uk)

Fluid flow through granular materials can cause fluidization when fluid drag exceeds the frictional stress within the packing. Fluid driven failure of granular packings is observed in both natural and engineered settings, e.g. soil liquefaction and flowback of proppants during hydraulic fracturing operations. We study experimentally the destabilization and flow of an unconsolidated granular packing subjected to a point source fluid withdrawal using a model system consisting of a vertical Hele-Shaw cell containing a water-grain mixture. The fluid is withdrawn from the cell at a constant rate, and the emerging flow patterns are imaged in time-lapse mode. Using Particle Image Velocimetry (PIV), we show that the granular flow gets localized in a narrow channel down the center of the cell, and adopts a Gaussian velocity profile similar to those observed in dry grain flows in silos. We investigate the effects of the experimental parameters (flow rate, grain size, grain shape, fluid viscosity) on the packing destabilization, and identify the physical mechanisms responsible for the observed complex flow behaviour.