DEM simulation of growth normal fault slip

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Slip of the fault can cause deformation of shallower soil layers and lead to the destruction of infrastructures. Shanchiao fault on the west side of the Taipei basin is categorized. The activities of Shanchiao fault will cause the quaternary sediments underneath the Taipei basin to become deformed. This will cause damage to structures, traffic construction, and utility lines within the area.

It is determined from data of geological drilling and dating, Shanchiao fault has growth fault. In experiment, a sand box model was built with non-cohesive sand soil to simulate the existence of growth fault in Shanchiao Fault and forecast the effect on scope of shear band development and ground differential deformation. The results of the experiment showed that when a normal fault containing growth fault, at the offset of base rock the shear band will develop upward along with the weak side of shear band of the original topped soil layer, and this shear band will develop to surface much faster than that of single top layer. The offset ratio (basement slip / lower top soil thickness) required is only about 1/3 of that of single cover soil layer. In this research, it is tried to conduct numerical simulation of sand box experiment with a Discrete Element Method program, PFC2D, to simulate the upper covering sand layer shear band development pace and scope of normal growth fault slip. Results of simulation indicated, it is very close to the outcome of sand box experiment. It can be extended to application in water pipeline project design around fault zone in the future.

Keywords: Taipei Basin, Shanchiao fault, growth fault, PFC2D