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Progressive Development of Riedel-Shear on Overburden Soil by Strike-Slip Faulting: Insights from Analogue Model

Pei-Chen Chan (1), Pei-Syuan Wong (2), and Ming-Lang Lin (3)

(1) Department of Civil Engineering, National Taiwan University, Taipei, Taiwan (bluepj@gmail.com), (2) Department of Civil Engineering, National Taiwan University, Taipei, Taiwan, (3) Department of Civil Engineering, National Taiwan University, Taipei, Taiwan

According to the investigations of well-known disastrous earthquakes in recent years, ground deformation (ground strain and surface rupture) induced by faulting is one of the causes for engineering structure damages in addition to strong ground motion. However, development and propagation of shear zone were effect of increasing amounts of basal slip faulting. Therefore, mechanisms of near ground deformation due to faulting, and its effect on engineering structures within the influenced zone are worthy of further study.

In strike-slip faults model, type of rupture propagation and width of shear zone (W) are primary affecting by material properties (M) and depth (H) of overburden layer, distances of fault slip (Sy) (Lin, A., and Nishikawa, M.,2011, Narges K. et al, 2014). There are few research on trace of development and propagation of trace tip, trace length, and rupture spacing.

In this research, we used sandbox model to study the progressive development of riedel-shear on overburden soil by strike-slip faulting. The model can be used to investigate the control factors of the deformation characteristics (such as the evolution of surface rupture). To understand the deformation characteristics (including development and propagation of trace tip(Tt), trace length(Tl), rupture spacing(Ts)) during the early stages of deformation by faulting.

We found that an increase in fault slip Sy could result in a greater W, trace length, rupture density and proposed a Tl/H versus Sy/H relationship. Progressive development of riedel-shear showed a similar trend as in the literature that the increase of fault slip resulted in the reduction of Ts, however, the increasing trend became opposite after a peak value of W was reached. The above approaches benefit us in enhancing our understanding on how propagation of fault-tip affects the width of deformation zone near the ground of the soil/rock mass, the spatial distribution of strain and stress within the influenced zone, and the responses of engineering foundations, which are crucial in evaluating theoretical setback widths.