Sanyi-Chelungpu Fault System : Deformation and Kinematic Analysis by Incorporating GPR, ERT and Outcrop Studies

Gong-Ruei Ho1, Ping-Yu Chang1,2,*, Po-Tsun Chen3, Han-lun Hsu1

1Department of Earth Sciences, National Central University, Zhongli, Taoyuan, Taiwan
2Earthquake-Disaster & Risk Evaluation and Management Center, E-DREaM, National Central University, Zhongli, Taoyuan, Taiwan
3Central Geological Survey, MOEA, R.O.C., Taiwan

This study performs ground-penetrating radar investigations and near surface resistivity imaging surveys, as well as outcrop analysis in the Sanyi-Chelungpu fault system, to study the fault zone geometries in the Fengyuan area of Taichung County in Central Taiwan. The Sanyi fault is regarded as the branch fault of the Chelungpu fault, which activity caused the Chi-Chi Earthquake in 1999. The Pleistocene Kueichulin Formation and the unconsolidated Holocene gravel layers form the hanging wall and the foot wall of the Sanyi Fault, respectively. Images from electrical resistivity surveys in the Fengyuan area reveal that the Kueichulin Formation exhibits a resistivity value lower than 100 Ωm and the Holocene gravel layers exhibit another resistivity value higher than 200 Ωm, individually. Therefore, the resistivity results can delineate the projected fault trace at the regions covered with recent fluvial sediments, and reveal no surface fault outcrop. The geometric characteristics of the Sanyi fault are studied from the outcrop along the Dajia River, and the results indicate that the Sanyi-Chelungpu Fault is composed of two low-angle fold-thrust systems with a rapid fault-erosion-deposition cycle in the Dajia River. These analytical results demonstrate that the Sanyi-Chelungpu fault system extends eastward which indicate an out of sequence, and is located in the area between the hill and the alluvial plain of the Taichung Basin. By combining the outcrop analysis and dating result, the slip rate is measured as 2.5±2.2 mm/yr and the earthquake magnitude (Mw) of Sanyi fault is in the range 6.2–6.5.
Keyword: Sanyi Fault, resistivity imaging, outcrop.