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The Characteristics of Seismogenic Zones in SW Taiwan: Implications from Studying Mechanisms of Microearthquakes

Strong Wen (1,2), Yi-Zen Chang (2), Yu-Lien Yeh (1), and Yi-Ying Wen (1)

(1) Institute of Seismology, National Chung Cheng University; 168, University Rd., Min-Hsiung, Chia-Yi County, Taiwan 62102, R.O.C., (2) National Center for Research on Earthquake Engineering, 200, Sec. 3, HsinHai Rd., Taipei 10668, Taiwan, R. O. C.

Due to the complicated geomorphology and geological conditions, the southwest (SW) Taiwan suffers the invasion of various natural disasters, such as landslide, mud flow and especially the threat of strong earthquakes as result of convergence between the Eurasian and the Philippine Sea plate. Several disastrous earthquakes had occurred in this area and often caused serious hazards. Therefore, it is fundamentally important to understand the correlation between seismic activity and seismogenic structures in SW Taiwan. Previous studies have indicated that before the failure of rock strength, the behaviors of micro-earthquakes can provide essential clues to help investigating the process of rock deformation. Thus, monitoring the activity of micro-earthquakes plays an important role in studying fault rupture or crustal deformation before the occurrence of a large earthquake. Because the time duration of micro-earthquakes activity can last for years, this phenomenon can be used to indicate the change of physical properties in the crust, such as crustal stress changes or fluid migration. The main purpose of this research is to perform a nonlinear waveform inversion to investigate source parameters of micro-earthquakes which include the non-double couple components owing to the shear rupture usually associated with complex morphology as well as tectonic fault systems. We applied a nonlinear waveform procedure to investigate local stress status and source parameters of micro-earthquakes that occurred in SW Taiwan. Previous studies has shown that microseismic fracture behaviors were controlled by the non-double components, which could lead to cracks generating and fluid migration, which can result in changing rock volume and produce partial compensation. Our results not only giving better understanding the seismogenic structures in the SW Taiwan, but also allowing us to detect variations of physical parameters caused by crack propagating in stratum. Thus, the derived source parameters can serve as a detail physical status (such as fluid migration, fault geometry and the pressure of the leading edge of the rupturing) to investigate the characteristics of seismongenic structures more precisely. In addition, the obtained regional stress field in this study also used to assure and to exam the tectonic models proposed for SW Taiwan previously, which will help to properly assess seismic hazard analysis for major engineering construction projects in the urban area.