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Seismotectonic characteristics of the northernmost part of the Longitudinal Valley suture, eastern Taiwan

C.-F. Chen, J.B.H. Shyu, and Y.-M. Wu
National Taiwan University, Department of Geosciences, Taiwan (r99224207@ntu.edu.tw)

The island of Taiwan is located at the collisional boundary between the Philippine Sea and the Eurasian plates. In eastern Taiwan, the Longitudinal Valley between the Central Range and the Coastal Range is generally considered as the suture zone. The Ryukyu subduction system, on the other hand, extends southwestward from offshore eastern Taiwan, and intersects with the northernmost Longitudinal Valley suture. As a result, this area is characterized by frequent earthquakes and complex geological structures. Although there have been several tectonic investigations in this area, detailed knowledge of seismotectonic characteristics of this complicated region is still very limited. Recently, we have obtained high resolution earthquake data by combining records from seismic stations of the Japan Meteorological Agency (JMA) and data from Taiwan Central Weather Bureau Seismic Network (CWBSN) and Taiwan Strong Motion Instrumentation Program (TSMIP). Therefore, we attempted to analyze this area in detail using these high resolution seismic data, together with tectonic geomorphic investigations.

The distribution of background seismicity shows that many earthquakes occurred at about 10 km deep in this area, and a linear seismicity cluster extends to the surface west of the Hualien City. We infer that this seismicity cluster represents a structure that crops out within the eastern flank of the Central Range. This structure would be different from the Milun fault, which is a known structure in the Hualien area and ruptured during an M7.3 earthquake in October 1951. Another major feature in this area is a listric cluster of seismicity that appears to extend to the surface near the Liwu River mouth, north of the Hualien City. This cluster likely represents an E-W striking structure that dips to the south. Based on the focal mechanisms of several recent moderate earthquakes that occurred within these seismic clusters, we suggest that these two structures are reverse faults. We are currently collecting more data, such as the crustal deformation patterns from GPS networks, 3-D velocity structure, and the bedrock structural features from field investigations, to further understand these two unknown structures and the general seismotectonic characteristics of this area.