What we learned from the 1999 Chi-Chi earthquake: An overview of active structures and seismic hazard analysis of Taiwan

*J Bruce H Shyu[1]

1. National Taiwan University

The island of Taiwan is the result of the collision between the Eurasian and Philippine Sea plates. Rapid rates of horizontal and vertical deformation and an abundance of seismic activity amply demonstrate the current vigor of the orogeny. The 1999 Chi-Chi earthquake and its unanticipated effects on population and infrastructure focused much scientific and public attention on Taiwan and provided an opportunity for numerous new research efforts to better understand the island’ s tectonic and surface processes, from a thorough study of active structures on the island to the attempt of a state-of-the-art seismic hazard analysis of Taiwan.

After more than 20 years following the Chi-Chi earthquake, significant improvement of knowledge on these subjects has been achieved through a multi-disciplinary effort. Using a systematic mapping of tectonic geomorphic features of the island, for example, many previously unrecognized active structures, especially blind reverse faults, have been identified. Detailed geomorphic analyses of fluvial and marine terraces have greatly furthered our knowledge about characteristics and seismic potentials of these structures. Paleoseismological trenches on selected active faults also enabled us to calculate earthquake recurrence intervals of these faults. All of the new information obtained in these two decades has paved the road for a more complete and systematic analysis of future earthquake hazards of Taiwan.

As a result, geoscientists of Taiwan have been working on such a goal, to understand, assess, and mitigate future seismic hazards of the island, and to establish models of earthquake hazard, risk, and related social and economic impact of Taiwan. Under a multi-disciplinary team work of the “Taiwan Earthquake Model” (TEM) project, we constructed a complete and updated seismogenic source database for Taiwan. A first version of this seismogenic source database, together with the first version of probabilistic seismic hazard analysis (PSHA) model of Taiwan based on the database, has been published in 2016. Our team has been working on refining and updating the database and the model, based on new information that has gradually become available with new investigations and new techniques. With future multi-country and multi-disciplinary collaborations, we hope this will mark the beginning of more decades of fruitful efforts toward better understandings of this important task.

Keywords: active structures, seismic hazard analysis, Taiwan

©2020. Japan Geoscience Union. All Right Reserved.