From the studies of historical earthquakes to the implication of single fault to multiple fault segments ruptures in seismic hazard analysis

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Historically, significant crustal damaging earthquakes in Taiwan mostly were from complicated fault system rather than from a single fault segment, which was not incorporated in the seismic hazard analysis of TEM PSHA2015, but, included in current developed new seismic hazard map of TEM PSHA2019. The 1906 M7.1 Meishan earthquake, recently, had been resolved to be from a fault system of blind NE strike thrust with EW surface breaching fault (one of the identified seismogenic structures). And, the 1935 M7.1 was occurred with bilateral rupture from a blind fault to strike-slip mechanism to the south and thrusting mechanism to the north. We employed the rupture kinematic modeling to the historical geodetic data with comparison to the intensity pattern to understand the possible involvement of the fault system. In addition to the damaging earthquakes from seismic active region, an ancient 1604 M7.5-M8.0 Quanchao damaging Earthquake in southeastern coast China region was also explored from literature intensity to understand the seismic potential of less seismic active regime in Taiwan strait. These historical and past events suggest that a single fault segment evaluation for seismic hazard might be inadequate. But, we have not yet had solution to solve this inadequacy to pin down the partition of slip rate within an identified fault system. We examined the fault rupture system from kinematic and dynamic modeling of the historical events, and examined the possible partition in slip rate for the fault segments in this identified fault system. We, further then compare its influence to the estimation of seismic hazard analysis. For development in PSHA and its application, we suggest the importance of resolving historical damaging earthquakes from modern developed seismology to seismic hazard assessment and risk management.

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