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Numerical Simulation Study of the Sanchiao Fault Earthquake Scenarios

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Sanchiao fault is a western boundary fault of the Taipei basin located in northern Taiwan, close to the densely populated Taipei metropolitan area. Recent study indicated that there is about 40 km of the fault trace extended to the marine area offshore northern Taiwan. Combining the marine and terrestrial parts, the total fault length of Sanchiao fault could be nearly 70 kilometers which implies that this fault has potential to produce a big earthquake. In this study, we analyze several Sanchiao fault earthquake scenarios based on the recipe for predicting strong ground motion. The characterized source parameters include fault length, rupture area, seismic moment, asperity, and slip pattern on the fault plane. According to the assumption of the characterized source model, Sanchiao fault has been inferred to have the potential to produce an earthquake with moment magnitude (Mw) larger than 7.0. Three-dimensional seismic simulation results based upon spectral-element method (SEM) indicate that peak ground acceleration (PGA) is significantly stronger along the fault trace. The basin effect also plays an important role when wave propagates in the Taipei basin which cause seismic wave amplified and prolong the shaking for a very long time. Among all rupture scenarios, the rupture propagated from north to south is the most serious one. Owing to the rupture directivity as well as the basin effects, large PGA (>1g) was observed in the Taipei basin, especially in the northwest side. The results of these scenario earthquake simulations will provide important physically-based numerical data for earthquake mitigation and seismic hazard assessment.