Simulation of Rupture Directivity Effect for the February 6, 2018 Hualien, Taiwan Earthquake

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The Hualien earthquake (M_W 6.4) occurred off Taiwan’s eastern coast on February 6, 2018. This earthquake has struck the eastern Taiwan and also caused several houses collapsed and casualties. From the observed strong motion data at the disaster sites, an obvious directivity pulse appears in the velocity waveform and the peak ground velocity (PGV) exceeds 50 cm/s. In order to further investigate the strong ground motion characteristics of this earthquake, we perform the broadband (0.1-10 Hz) strong ground motion simulation using the stochastic Green's function method. About the source parameters, we adopt the empirical formulas. Besides, the slip distribution on the fault plane is calculated by using the hybrid k-squared slip model. By comparing the simulation results with the observed data, we get the best slip model from the hypothetical slip models. Moreover, we effectively simulate the directivity pulses at several stations at the south of the earthquake. The disaster areas are located near and above the asperity of the fault plane. According to simulation results of different velocity structures, the addition of the shallow velocity structure makes the synthetic waveforms more similar to the observed data at most stations. The amplifications of the PGVs are about a factor of 2.0 at the stations near the disaster areas. Therefore, the disasters of the Hualien earthquake could be caused by the forward-directivity and site amplification effects.

Keywords: Hualien earthquake, ground motion simulation, stochastic Green's function method, hybrid k-squared slip model

