Rapid Detection of Earthquake Rupture Directivity Using Strong Ground Motion Data in Taiwan

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In the past decade, there have been several disaster earthquakes occurred in Taiwan. From the observed data of the disaster earthquakes, the stations located in the source rupture direction have obvious directivity pulses, and the distribution of the earthquake disaster is related to the peak ground velocity. Therefore, how to use a large and high-dense seismic database to develop a near-real-time detection system on the earthquake rupture directivity, which is a very important task in Taiwan. In this study, we determine the earthquake rupture directivity using near-field velocity data from 1991 to 2018, which were collected under the Taiwan Strong Motion Instrument Program (TSMIP). The used method is mainly constructed in the interpolation of the peak-ground-velocity map and the directional attenuation regression analysis. Through the analysis of moderate-to-large magnitude (M $L > 5.5$) seismic events, the source rupture directivity can be detected effectively and quickly by the applied method. The detection results are also comparable with those from the previous source studies. We also find out a linear relationship between the directivity effect and earthquake magnitude. Since the TSMIP station may provide real-time services in the future, the detection system proposed by this research can quickly provide disaster prediction information, which is of great importance for earthquake emergency response and hazard mitigation.