



Estimates of Source Parameters of the 2010 ML 6.4 JiaSian (Taiwan) Earthquake from Teleseismic P-wave Inversion

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On March 4, 2010, a moderate-sized earthquake ($M_L=6.4$) with thrust faulting struck southern Taiwan. It is called the 2010 JiaSian earthquake. Its aftershocks distributed northwestward. Several institutes reported the focal depths to be 18 km (CWB and IES BATS), 24 km (USGS) and 28 km (GCMT). A 3-D relocation using the regional seismic network showed the focal depth of 23 km (Chang, 2010). Although there was inconsistency in depth determined from those reports, they all revealed a thrust mechanism for the 2010 JiaSian earthquake. However, teleseismic P-waves modeling from those focal mechanisms showed significant divergences between the observed and synthetic P-waves. In addition, an interesting phenomenon is that the intensity to the northwest of the epicenter is larger than that to the southeast of the epicenter by one at an approximate epicentral distance. This might be related to the rupture directivity of source. Hence, as mentioned above, we attempted to reexamine the source parameters of the 2010 JiaSian earthquake by an improved teleseismic P-waves inversion method (Lin et al., 2008), which can determine source duration of each used station, focal depth, fault plane solution, and seismic moment. Results show that the earthquake has the best double couple of $310^\circ/32^\circ/44^\circ$ and $180^\circ/68^\circ/114^\circ$ (strike/dip/rake) and a seismic moment of 2.48×10^{18} Nm ($M_w=6.2$). Rupture directivity analysis reveals that the earthquake is an event with a unilateral faulting on the fault plane of $310^\circ/32^\circ/44^\circ$. The average source duration and rupture length are estimated to be 4.1 sec and 14.8 km, respectively. The analysis also suggests a high rupture velocity, approximate to the crustal S-wave velocity, which probably produces the difference in intensity along the direction of rupture.