Slip distributions of the December 26, 2006 PingTung earthquake doublet from teleseismic waveforms

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Abstract

We investigated the spatial slip distributions of 12:26(UT), Dec. 26 PingTung earthquake and the following aftershock occurred at 12:34 (UT) on the same day to understand the possible association of these earthquakes to the tectonic setting and the interference of these two earthquakes. We consider these earthquakes as a doublet due to their close occurrence in time, magnitude and location difference of about 30 km. The locations of this doublet are near the subducting front where the South China Sea plates(SCS) subducted underneath the Philippine Sea plate(PHS). We inviestigated the P-wave teleseismic waveforms from 16 stations recorded by IRIS (Incorporated Research Institutions for Seismology). For resolving optimal and realistic model, we only consider the stations with high data quality and good azimuthal coverage to the events. Through the examination of the similarity in waveforms related to earthquake from the well converage tetelsismic stations, we considered the time window for the P-wave of 35 and 40 seconds, respectively, for the doublet and the data were bandpass filtered for 2 to 100 second. The finite-fault approach was used in the modeling. We reference the experimental relations of fault dimension to the earthquake magnitude for finite-fault analysis. As the result, the faults dimensions of 60 x 70 km^2 and 100 x 80 km^2, respectively, were considered. We divided the fault into several subfaults with dimension of 5 x 5 km. A point source Green's functions for teleseismic P body wave synthetic seismograms are computed using the generalized ray method for each subfault. Lastly, a least square iterative procedure is used to solve the spatial slip distributions on the finite-fault . Focal mechanism is usually sensitive to the inversion results due to the effect of real fault geometry. Thus, the mechanism solved by USGS (United States Geological Survey) and Harvard University was adjusted for the optimal solution in the inversion. To allow the change in slip direction through rupture, we consider the slips in strike-slip and dip-slip components. The analyses of inversion from teleseismic waveforms reveal an asperity near the hypocenter and its largest amount of slip is about 0.5 m for the first event. For the second event, there are two asperities locating below the hypocenter and at 35 km northwest of the hypocenter and their largest amounts of slip are about 0.5 m. Further investigation on the interaction of these two events in their slip distributions and scaling will be addressed.