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Remote earthquake sequence relocation based on two regional seismic arrays and constrain for source depths using later phases of recorded seismograms

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The 1994 Taiwan Strait earthquake is a strong earthquake (ML=6.4) which occurred near the southwestern border of the Strait. Seismic damages were reported by this event. The epicenter is far from two regional seismic networks of the Taiwan Central Weather Bureau and the Fujian Seismic Bureau of China, respectively. Although far from regional networks, this event has been well determined for its focal mechanism and source depth using teleseismic observations. The source is reported as a high-angle, normal fault with two nodal planes striking approximately east-west, implying north-south extension in the source region. The centroid depth is about 13 km, consistent with the PDE report. This event has followed by many aftershocks. With its small magnitudes, those aftershocks have not been reported by the global seismic network. Although those events were dictated by both networks from Taiwan and Fujian, however, during that time, no data exchange or joint relocation were available. The aftershocks were located by individual network and showed a large uncertainty in its spatial and depth distributions. Thus, the fault plan of the 1994 Taiwan Strait earthquake can not be constrained from the reported aftershock distribution. In this study, we collected all available seismic readings from both Taiwan and Fujian networks and processed those data by the backward projection method. This small array processing technique is successfully applied to this data set. Those epicenters were located with relative high accuracy. However, their source depths were still not well constrained for those events far from both seismic networks. Fortunately, one seismic station located inside the strait with epicenter distances about 120 km has recorded clear later phases of P and S arrivals. We identified both phases as the surface reflections of P and S waves, respectively. The extra information from those aftershocks has been used to determine earthquake source depths independently. Results of this study showed the aftershocks clustered in a south-dipping plane and probably indicated the 1994 Taiwan Strait earthquake source rupture plane. The fault rupture plane determination in this study has significant implications for the tectonic evolution and contributions for seismic hazard assessment and ground motion prediction of this surrounding area of the Taiwan Strait.