

W Phase Inversions and Seismic Tsunami Warning System in Taiwan for Manila Trench Earthquakes

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Abstract

The Manila trench offshore south Taiwan, with its NS stretch more than 1000 km, is a potential zone of significant tsunamigenic earthquake to occur, which will cause widespread tsunami hazards for countries around the South China Sea. In this study, we propose to establish a seismic tsunami warning system in Taiwan for earthquakes in the Manila trench by combining W phase inversion and unit tsunami method. W phase is suitable for a rapid determination on the tsunami generation aspects of a large earthquake because it is a long period (100s ~ 1000s) phase with relative fast group velocities (4.5~9 km/s). The unit tsunami method, on the other hand, is able to quickly predict the tsunami waves of a given source by linear combinations of pre-calculated unit-source tsunamis, as pull from the database. In this study, we first test the applicability of W phase for past earthquakes in the South China Sea region, using regional seismic array (Broadband Array in Taiwan for Seismology), with the expectation that the array is currently under extension that will encircle the South China Sea area in the future. Secondly, we divide the source region of the Manila Trench into squares (0.5° in dimension) of unit source whose tsunami wavefields at current tidal stations in Taiwan are calculated and store in database. Finally, given earthquake source parameters determined from W phase inversion, we are able to calculate the weighting of each unit source and predict the amplitudes and arrival times of approaching tsunamis to tidal stations in Taiwan. The tsunami warning system in Taiwan for Manila trench earthquakes is thus established.