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Estimate of source, attenuation, and site effects from the subduction-zone earthquakes in northeastern Taiwan

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Based on the inversion technique for different seismogenic sources in a single scheme, the estimation of source, attenuation and site effects are derived using a dense installation of 72 free-field strong-motion stations in and around the Taipei basin, which covers an area of about 30 square kilometers at northern Taiwan. The Taipei Basin is specified with sedimentary layers. In the basin, Quaternary sediments lie on a Tertiary basement. The Quaternary sediments are composed of three formations, i.e. the Sungshan, Chingmei, and Hsinchuang formations from top to bottom. The topmost part of the Sungshan formation is a soft layer, which is composed of unconsolidated sand, silt, and clay with a thickness varying from 50 m in the southeast to 120 m in northwest. Seismograms for the 73 subduction-zone events with ML magnitude in range of 5.0 to 7.1 are catalogued into two groups depending on the focal depth, i.e. the shallow focal depth and the deep one, to characterize different seismogenic zones regarding the dissipation of wave propagation away from the seismic source. Results show that: (1) the estimated source spectra follow the w-squared point model; (2) the slight different attenuation patterns are characterizing the geological layers of shallow depth and those of deep one; and (3) site amplification ratios are in agreement of those derived from the spectral ratio technique. The predominant frequencies of site amplification function are associated with the thickness of the sediment over the Taipei basin.