

Characterization of earthquakes in terms of high frequency seismic signal durations, velocity and acceleration amplitudes

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Hara (2007a, EPS) developed a magnitude formula, referred to as M_{hdd} (Hara, 2013, SSJ), in which high frequency seismic signal durations and maximum displacement amplitudes measured from tele-seismic P waves are used. Hara (2007b, EPS) showed that tsunami earthquakes were characterized by longer high frequency seismic signal durations and smaller displacement amplitudes. Since there exist events which are not tsunami earthquakes that have similar characteristics, it is difficult to distinguish tsunami earthquakes only by the above observables.

We investigated a possibility to characterize tsunami earthquakes by high frequency seismic signal durations and maximum velocity and acceleration amplitudes. The dataset consists of waveform data recorded at the GSN stations in the epicentral distance range between 30 and 85 degrees for large (the minimum M_w is set to 7.2) shallow events that occurred between 1994 and May 2015, which were used to revise the M_{hdd} formula.

We show that tsunami earthquakes are characterized by longer high frequency seismic signal durations and smaller velocity and acceleration amplitudes more clearly than in case displacement amplitudes are used. This suggests a possibility to distinguish tsunami earthquakes through simple measurements of high frequency seismic signal durations and velocity and/or acceleration amplitudes.

Keywords: tsunami earthquake, high frequency seismic signal duration