Spectral Characteristics of Events from the 2004 Mid Niigata Earthquake Sequence

Reiko Tajima[1]; Fumiko Tajima[1]

[1] Hiroshima U. Department of EPSS

The scaling laws of earthquake source parameters have been debated using recent high quality waveform data. As pointed out, moment rate spectra become complex in the vicinity of corner frequency (fc), and the typical omega^-2 model is not necessary applicable but a more suitable model of omega^-a (a = from 1 to 3) is suggested. This is critical in estimating radiated seismic energy. The structure of seismic wave propagation paths and station (receiver) sites may affect the spectral properties. The recent Mid Niigata earthquake (October 23th 17:56 (JST) of 2004) produced a number of aftershocks including six events with a moment magnitude (Mw) greater than or equal to 5.5, preceded by several foreshocks. We analyzed spectra of broadband waveforms which were recorded at four common stations (ADM, ASI, SBT, YMZ) of the F-net of NIED to study the scaling laws. We selected events which are located within 20km from the center of the aftershock area (37.30degN,138.93degE) with Mw were determined by the F-net (Mw = from 3.5 to 6.6), resulting in 121 events to satisfy this condition. The 484 waveform data of the 121 earthquakes were grouped according to Mw's (67 for Mw = 3.5 or greater but smaller than 4.0, 39 for Mw = 4.0 or greater but smaller than 5.0, 15 for Mw = greater 5.0 but smaller than 6.6), and the spectra of each Mw were evaluated at four common stations. Since the earthquakes have the same Mw, a similar focal mechanism solution and are located close to each other, the spectra and fc should look alike at the same station. However the spectral amplitudes vary in the range between the frequency band of the moment tensor determination fm (fm is 0.1Hz or lower) and fc substantially while the amplitudes in the frequency band lower than fm are constant. This tendency can be also seen in the spectra averaged at four stations.