

Evaluation of Strong Ground Motion using Modified Empirical Green's Function (Part1)

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Empirical Green's function method is one of estimation method of strong ground motion. But because observed moderate seismogram that is same source mechanism for target earthquake is used as a sub-event for Green's function, it is not applicable for all cases. If it is possible to use a big earthquake or a moderate earthquake with different source mechanism compared to target one, as a modified Green's function, it is more convenient. The propose is to investigate a pertinence of modified empirical Green's function method, comparing between a simulated seismogram of the 1978 Miyagi-Oki earthquake by this method using the 2005 off-Miyagi earthquake Mj7.2 as a sub-event, and observed seismogram. So, source spectrum of the 2005 off-Miyagi earthquake was estimated.

The data used in this analysis were the 2005 off-Miyagi earthquake, its aftershocks and moderate earthquakes in Tohoku area observed by KiK-NET (NIDE) in Miyagi Prefecture and Kaihoku bridge observatory (NILIM). Source spectrum was separated from observed data by spectral inversion (Iwata and Irikura, 1986). Here, the site MYGH11, where the layer with V_s 2500m/s is located the shallowest in this network was considered as a reference, and the site response was calculated by 1D multiple refraction method.

In the first step, a propagation effect, Q was estimated using moderate earthquake data. Q in and around target area was expressed as following equation, $Q=88.9f^{0.878}$. Where, f means frequency in Hz.

Next step, source spectrum was estimated using main shock data that corrected propagation effect. Assuming that source spectrum express omega-2 model, source parameters were estimated that the seismic moment is 1.22×10^{19} Nm and stress drop is 15.1MPa. These values are smaller than another values estimated by F-net, NIED (seismic moment: 5.43×10^{19} Nm, stress drop:35.1MPa). But comparing between source spectrum estimated by observed data and by stochastic simulation (Boore 1983), it is comparable in low frequency band. According to Sekiguchi et. al 2005, seismograms of the 2005 off-Miyagi earthquake observed in Miyagi area by KiK-Net can identify clear two pulses because of multiple shock. Therefore source spectrum of each pulse was estimated. So the difference between two can not be found.

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