Seismic transfer function obtained by ACR0SS signal with wide frequency range transmitted from Morimachi

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The seismic ACROSS transmitter installed at Morimachi (MRI) enables us to transmit the signals in wide frequency range by switching two frequency bands. It mainly has conducted in low frequency (3.5-7.5Hz; generated force $4.0x10^{4}$~$1.8x10^{5}$N with the eccentric moment of 82kgm). High frequency transmission (7.5~15.5Hz; generated force $4.7x10^{4}$~$2.0x10^{5}$N with the eccentric moment of 21kgm) was conducted in several times. By combining the data acquired by operations in two frequency bands, we obtain the seismic transfer function between 3.5~15.5Hz, which is wider than the previous works. We will discuss the significance and direction of future work by the spectral feature of transfer function in this presentation.

Continuously recorded seismic data telemetered to JMA were used in this analysis. Stacked time period is 380 days during 453 days after 2007/03/28 for low frequency transmission (5.510+-2Hz). Data of high frequency band is acquired for 57 days after 2007/08/19 (11.510+-4Hz) and 78 days after 2008/08/07 (11.515+-4Hz).The time domain data is given by FFT of the combined transfer function between 3.5 and 15.8 Hz with a Tukey window tapering at the both ends by 10%. Record sections show that the envelopes of P and S arrivals can be traced to long epicentral distance and the wavepackets are more time-localized than those obtained by the previous works with narrower band. However, the later arrival events can not be traced well with distance, indicating that the spatial scale of structural heterogeneity is smaller than ~20 km, spacing of telemetered seismic stations. This demands the denser distribution of observation sites such as seismic array to utilize the high quality data of ACROSS transfer function for structural inversion.

The spectrograms of 6 components tensor transfer function showed following features:

(1) Most of the wavepackets are significantly polarized as indicated by the difference in spectrum for different components of transfer function.

(2) Wavepackets specified by time localization is also localized in frequency, as indicated by distribution of peaks in time-frequency space of spectrogram especially in low frequency.

The difference of transfer functions between components and stations might be due to the difference of velocity structures just beneath the observation stations (site effects), since the most of the peaks on time-frequency space can not be trace well with distance. Sites effects are often modeled by reverberation of seismic waves just beneath the station to fit the spectral amplitude in strong motion seismology. More realistic modeling is demanded to utilize the abundant information embedded in the tensor transfer functions obtained by ACROSS observation.

The analysis of ACROSS data is leading to the presence of various types of wave features, which have not been recognized before by ordinary seismological observations. The spectral localization of wavepackets is one of the prominent features and it suggests the importance of resonance phenomena such as reverberation to analyze the ACROSS data. It is important to seek the new technique to model the resonator by means of denser seismometer network (e.g. small scale array data) in the next step of the analysis.

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