Evaluation of Strong Ground Motion using Modified Empirical Green's Function -Part2: Synthesis of Strong Motion at Kaihoku Bridge-

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1. Introduction

The empirical Green's function method evaluates strong ground motion with a relative good accuracy when a record from a small earthquake can be used as a proper Green's function. But in many cases the proper Green's function can not be obtained, especially for evaluating strong motion in a wide area. In this study, we present a method to modify a record from a relatively big event, making it possible to be used as a Green's function to synthesize the ground motion for a scenario earthquake, when there is no small earthquake, only big one, or with a different mechanism. The method is examined by synthesizing ground motion at Kaihoku Bridge during the 1978 Off-Miyagi earthquake.

2. The proposed method

Here, we assume that the big event has a simple source process, or the source process can be separated into simple processes, such as asperities. And we also assume that the records with nonlinear phenomenon can be summed as a Green's function too, with an acceptable error.

The proposed method is shown as follows:

(1) Evaluate the source spectra for the event or for the asperities if possible, using spectral inversion method.

(2) Transform the Records to Frequency domain, dividing the records with the source spectra; the quotient multiplied by the source spectra of the expected small event on the fault of the scenario earthquake; the product is inverse transformed to time domain to obtain the modified empirical Green's function.

(3) Using the empirical Green's function derived at step 2 to synthesize the ground motion during the scenario earthquake.

3. Examination of the method

We apply the proposed method to synthesis the ground motion at Kaihoku Bridge during the 1978 Off-Miyagi earthquake. The Modified Green's function is derived from the records during the earthquake of M7.2 occurred in 2005.8.16. The source model used in the analysis is proposed by the Headquarters for Earthquake Research Promotion. The results show that the synthetic velocity waveform (Fig.1) and PGA, PGV match with the observed ones in the main, implicating that the proposed method is adequate.

4. Acknowledgement

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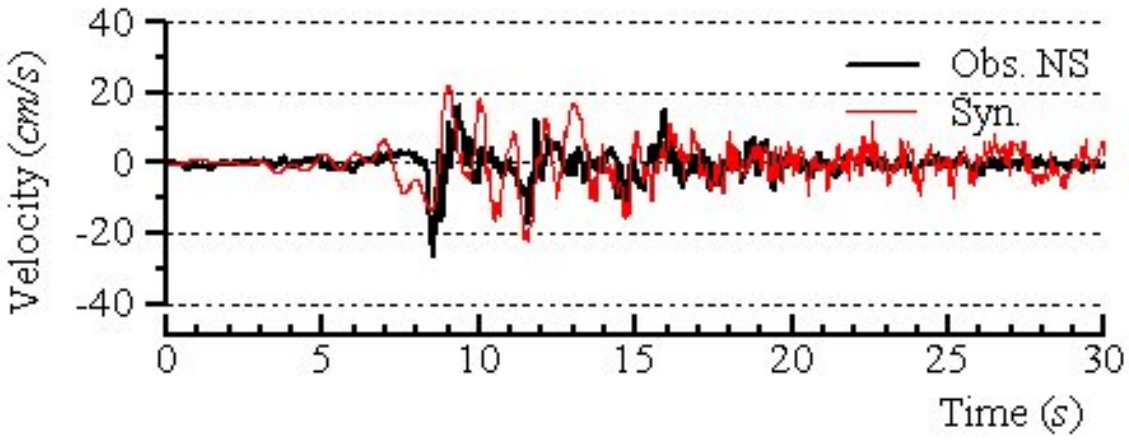

Fig.1 Comparason of the synthetic and observed waveform