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Generation of response spectrum compatible earthquake seismogram considering phase characteristics of possible earthquake motions of site

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For seismic analysis of complex and non-linear structure system, a seismic code recommends a dynamic time history analysis. In these cases, the input earthquake seismograms should be needed, and these input earthquake seismograms must be compatible with design response spectrum and reflect the site seismic characteristics including information about a fault and wave travel path between the fault and the site. The foreshocks, main shock and aftershocks of earthquake measured in the target area can be assumed to be the output signals of the system consisting of the fault and the wave travel path between the fault and the site. Each earthquake seismogram is considered as a amplitude modulated (AM) signal defined by the magnitude (or energy) and phase function with time. The probability distribution function (PDF) of the magnitude and phase function can be evaluated through the statistical and harmonic wavelet analysis of the measured output signals and these magnitude and phase PDFs include sufficient information to generate the possible output earthquake seismograms of the fault and travel path system for a site, which mean the phase and magnitude PDFs represent a site seismic characteristics.

In this paper, the method to generate the possible design response spectrum compatible earthquake seismograms based on the measured foreshocks, main shock and aftershocks of earthquake is proposed. At first the proposed method generate possible earthquake signals reflecting the phase characteristic of a site, and then modify the magnitude of these earthquake seismograms to determine the response spectrum compatible earthquake motions.