Broadband strong motion simulation and prediction for great earthquakes based on strong motion records

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Broadband strong motion simulation and prediction methods based on strong motion records are developed and improved, and the physical parameters used in the methods are estimated and modeled. The methods and models are applied to strong motion predictions of great earthquakes.

Firstly the stochastic Green’s function method, which has been applicable to predict short period ground motions, is extended to predict long period ground motions and extremely near-fault ground motions. This development enables us to predict high accuracy broadband strong motions influential in structures. The broadband ground motions of the 1923 Kanto earthquake and a M7 class Metropolitan area earthquake are simulated and predicted using this method. We also estimate the source model and predict broadband ground motions of the 1855 Ansei-Edo earthquake which caused severe damage in Metropolitan area and the 2011 M9 Tohoku earthquake using the empirical Green’s function method. In addition the empirical method to predict long period and long duration ground motions is developed by modeling phase spectra as well as response spectra and applied to M8-9 class Nankai Trough earthquakes. This empirical method contributes to establish of the design long period ground motions for the Nankai Trough earthquakes to super high-rise buildings and base-isolated buildings.