# Stochastic Simulation of Spatially-distributed Earthquake Ground Motions

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The present study is among the first attempt to stochastically simulate spatially distributed ground motions over a region using wavelet packets and cokriging analysis. First, we characterize the time and frequency properties of ground motions using the wavelet packet analysis. The spatial cross-correlations of wavelet packet parameters are determined through geostatistical analysis of regionalized ground-motion data. Furthermore, using the developed spatial cross-correlation model and the cokriging technique, wavelet packet parameters at unmeasured locations can be best estimated, and regionalized ground-motion time histories can be synthesized. Case studies and blind tests using data demonstrate that the simulated ground motions generally agree well with the actual recorded data. It is also observed that the spatial cross-correlations of wavelet packet parameters are closely related to regional site conditions based on geostatistical analysis of eight well-recorded earthquakes in California, Mexico, Japan and Taiwan. The proposed method can be used to stochastically simulate regionalized ground motions for time-history analyses of distributed infrastructure and has important applications in regional-scale hazard analysis and loss estimation.

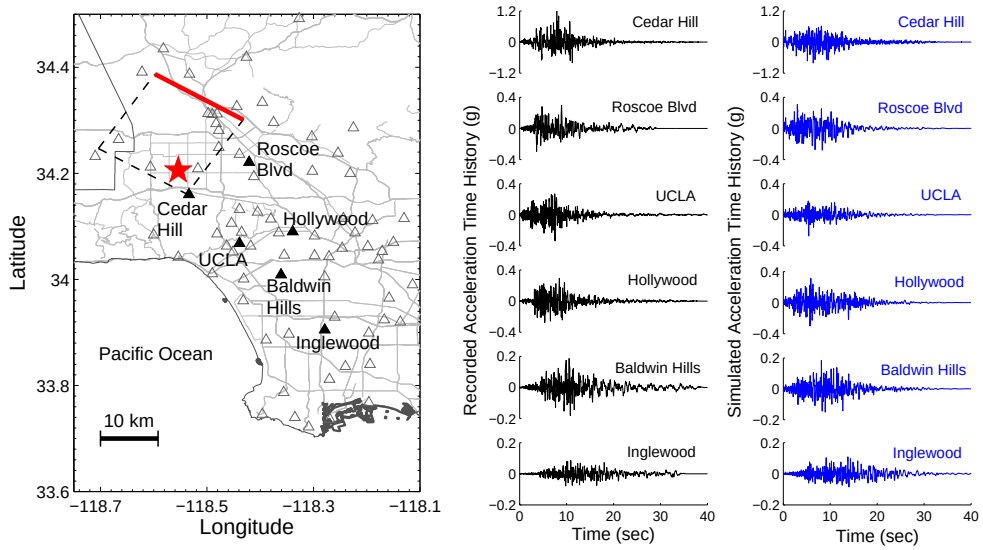


Figure 1. (a) A map of Los Angeles area, showing the six recording stations used in the blind test, the epicenter of the 1994 Northridge earthquake. (b) Recorded and (c) Simulated acceleration time histories at the six stations.

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## References

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