



0.1 Local site effects in Ataköy, Istanbul, Turkey: empirical data vs. synthetics from hybrid modeling

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Since the 1999 Izmit earthquake, many seismic hazard studies have focused on the city of Istanbul. An important issue in this respect is local site effects: strong amplifications are expected at a number of locations due to the local geological conditions. The present study aims at estimating the local site effects in the Ataköy area located in southwestern Istanbul. The H/V spectral ratios method is applied to microtremor data recorded at 30 sites. At three sites, ambient noise synthetics are simulated using a 1D approach. Observed and simulated data are compared in terms of H/V spectral ratios peak frequency and amplitude. In addition, spectral amplifications are calculated covering the Ataköy area. We deploy a hybrid 3D finite difference approach that combines a complex source and wave propagation for a regional 1D velocity model with site effects calculated for a local 3D velocity structure. The local velocity model is built from a combination of geological, geotechnical and geomorphological data. The results indicate that strongest amplifications in the area occur around a frequency of 1 Hz and that amplification levels are largest for alluvial sites where amplification up to a factor of 2-2.5 can be expected in case of a large earthquake. Because the applied methods complement each other, they provide comprehensive and reliable information about the local site effects in Ataköy. Our results have also significant implications for the southwestern parts of the city of Istanbul built on similar formations, for which therefore similar amplification levels are expected.