

Comparison of ground motion parameters from ground motion simulations and the equivalent linear method

Daniela Farrugia, Pauline Galea, Sebastiano D'Amico, and George Bozionelos
University of Malta, Physics Department, Msida, Malta (dfarrugia28@gmail.com)

Site response analysis is an important procedure which helps in seismic design and analysis. The outputs of such analyses are important ground motion parameters for the engineering community, such as peak ground accelerations and response spectra. Currently, there exists various methods to conduct these analyses, and require, among other parameters, a shear-wave velocity profile of the site and an input acceleration time series. In regions of sparse or no strong ground motion records, like Malta (Central Mediterranean), the input motion can be obtained using synthetic ground motion simulations or by choosing real accelerograms from a different area which matches the chosen reference spectrum.

In a comprehensive field survey, 20 shear-wave velocity profiles on sites characterised by a buried low-velocity clay layer was conducted over the Maltese islands. In this study, an attempt has been made to compare three methodologies to obtain output ground motion parameters. In the first method, the amplification curves for each site were obtained using the quarter wavelength approximation (SITE_AMP, Boore 2003) and ground motion parameters obtained from the stochastic simulation, Extended Source Simulation (EXSIM; Motazedian and Atkinson, 2005).

For the second and third methodology, two types of input motions were developed: using the stochastic simulation EXSIM and by finding an adequate real time series using target spectrum matching. These were used as an input in the equivalent linear site response analysis programme SHAKE2000.

The study aims at identifying and understanding the variations in the site response results from the tested techniques, which is very important especially since these techniques are constantly used in the industry.