

## ABSTRACT

### THE DIRECT BOUNDARY ELEMENT METHOD APPLIED TO LOCAL SITE EFFECTS ESTIMATION ON EARTHQUAKE GROUND MOTION

Recent and destructive earthquakes have shown significant features on the ground motion, due to soil and topography conditions at the recording site which are known as *site effects*. In this work the problem is approached by the application of the *Direct Boundary Element Method (DBEM)* to the numerical estimation of 2D site effects. The method solves the basic elastodynamic integral equation based on the reciprocal theorem in elastodynamics. The auxiliary problem considered is the whole space fundamental solution. Currently the situations investigated are 2D time harmonic problems. The computer code is developed for the treatment of irregular multi-layered viscoelastic media, thereby site-models with intrinsic attenuation can be examined. The boundary discretization is based on constant elements.

By means of this theoretical approach, the calculation of 2D seismic wave diffraction, due to the incidence of P and SV waves on irregular surfaces has been performed. Theoretical models of concave and convex topographies, such as canyons and mountains, in presence of complex geological media, are tested. The comparison between the transfer functions obtained, and results arisen from the application of other techniques validates the method and makes the technique a good tool for estimating the range of site effects.

The technique has been applied to compute the seismic response at the Volvi sedimentary basin (Greece). 2D equivalent models that display the local geological and topographical information have been designed. The correlation between the theoretical local response obtained, and the main geometrical and dynamical features of the site, are discussed in combination of published empirical local response. The method's formulation developed has been shown to be adequate for site effects estimation at real sites.