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ABSTRACT BOOK

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environment. In this framework, we have simulated a small earthquake of mag□4.0 occured in Marmara Sea and recorded at stations nearby. Observed waveforms are compared to synthetic seismograms computed with the frequency-wavenumber and WPP method and differences are interpreted. Additionally, strong ground motion recordings of the same earthquake are studied in order to form a basis for understanding wave propagation in small basins in metropolitan area of Istanbul using 3D velocity model. In this content, we have investigated that if sediment-filled basins significantly amplify the wave amplitude and represented the requirement of the consideration of 3D propogation path and site effects.

SH4/P4/ID11 - COUPLIG NETWEEN DISCRETE ELEMENT METHOD AND SPECTRAL FINITE ELEMENT METHOD. CONVENTIONAL AND NON-LINEAR TESTS.

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The code Mka3D [1] is initially a code of mechanics using the Discrete Element Method and taking into account non-linear phenomena, as the rupture under shock and impact. This approach can be also used in other domains, in particular the seismic survey, but the consideration of non-linearity, (which entails an important calculation time) is not necessary generally during the treatment of the wave-propagation. So,we have chosen to couple this Discrete Element Method develeopped in the Mka3D code with a Spectral Element method [2]. This Spectral Element method is often used to simulate waves propagation and is «less» expensive in times of calculation.

For the first validations in 2D in the seismic domain, we have resumed the cases-tests of Lamb and Garvin, which are conventional ones often used to measure the precision of a numerical method un the elastic waves-propagation.

Non-linear tests have also been resumed with the Euro-Seistest located in the epicentral area of June 20th 1978 Thessaloniki earthquake (Ms 6,5).

The valley lies between the lakes of Volvi and Langada.

We present 2D calculations including realistic geometry and rheologic layers and also signals of 3 different amplitudes ollowing to model nin-linear effects.

[1] : Mariotti C. (2007) - Lamb's problem with the lattice model Mka3D Geophy. J. Int. (2007) 171, 8567-864

[2] : Komatitsh K., Viltotte J.P., Vai R., Castillo-Covarrubias J.M. and Sanchez-Sesma F.J. (1999)

The spectral element method for elastic wave equations. Apllications to 2D and 3D seismic problems Int. J. Numer. Method. Eng. 45, 1139-1164

SH4/P5/ID12 - HVSR METHOD SENSITIVITY INVESTIGATION FOR THE CORSSA ARRAY IN W. CORINTH GULF (GREECE)

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The Aegion area located in the western part of the Gulf of Corinth, one of the most seismically active areas in Greece, was selected as target area for the EU funded project CORSEIS. Within the framework of this project the Corinth Soft Soil Array (CORSSA) an array of surface and down-hole accelerometers was installed in the hanging wall of the Aegion Fault, a normal type tectonic feature crossing the city of Aegion. The array consists of four 3D down-hole accelerometers and an additional one at the surface. The deepest of the sensors is installed in a conglomerate formation at 178m depth while the remaining three sensors are located within fluvio-deltaic marine deposits at depths of 60, 30 and 14 meters. Detailed geophysical, geological and geotechnical surveys carried out during the CORSEIS project have provided the necessary parameters for the definition of the geological structure and dynamic soil properties at the installation site. The array remains in operation after the completion of the project providing valuable acceleration records.

The ability of the horizontal-to-vertical spectral ratio (HVSR) method to provide credible estimates of amplification properties of soil layers has been debated ever since its original introduction in 1989, although the method is nowadays widely used in microzonation studies. The issues raised are mainly related to the interpretation of the actual HVSR measurements and in particular whether these can be used only as an indicator of the resonant frequency or the interpretation can be extended so that the amplitudes can be considered as representing amplification spectra at the measured site. In the present study amplification phenomena at the various depths and site characteristics of the CORSSA array are investigated using the horizontal-to-vertical spectral ratio HVSR calculated for the recorded events. In addition, the theoretical HVSR are modeled by taking into account the available geotechnical and geophysical characteristics of the CORSSA site soil profile and compared with the observed ones in order to test the accuracy and sensitivity of the geotechnical model and verify the amplification factors obtained from the analysis of the recorded data.

SH4/P6/ID13 - COMPARISON OF FREQUENCY AND TIME DOMAIN OBJECTIVE FUNCTIONS FOR THE INVERSION OF THE SOIL STRUCTURE OF A BOREHOLE STATION

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The assessment of local site effects on seismic ground motions is of great significance in earthquake engineering. With the construction of borehole stations, several inversions techniques and objective functions have been developed in order to determinate the shear-wave velocity and the damping factors from available data. Using a genetic algorithm technique to inverse the problem, this paper compares the use of frequency and time domain objective functions to evaluate the "distance" between observation and theory.A common objective function is the computation of the integrated residuals between an observed spectral ratio taken on the S-wave portion of a seismogram and the one computed theoretically. The shortcoming of this process is not the objective function itself, but the use of a cosine tapered window to smooth to zero both ends of the seismogram in order to compute the Fast Fourier Transform. This paper shows that the length of the window slightly affects the location of the resonant peaks along the frequency axis, and can greatly affect the height of the peaks and consequently can skew the inversion of the S-wave velocity or damping factors.An alternative to this process has been introduced where the objective function is defined as the normalized cross-correlation between observed data and synthetics previously decomposed in the wavelet domain. This process has been proven to perform well; however, the cross-correlation and the wavelet decomposition might increase the computation time of the inversion.Consequently, this paper introduces a simple time domain objective function and compares the results obtained with the common frequency domain objective function.

SH4/P7/ID14 - DIFFERENCES BETWEEN ANALYTICALLY DEFINED ACCELERATION RESPONSE SPECTRA AND DESIGN SPECTRA INFERRED FROM THE ISRAELI SEISMIC CODE

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Seismic wave amplification in soft deposits has contributed to damage and loss of life in a number of earthquakes in the recent past. The resonant periods of urban structures are often close to those of the soft layers upon which many towns are built. Thus, reliable assessment of the frequency dependent site amplification effect is very important for safe design of buildings. In most National Building Codes, including the recently updated Israeli Standard (SI 413), amplification factors short period F_a and long period F_v ground motions are defined as a function of the site class which is based solely on geotechnical parameters of the upper 30 m of the soil profile, as quantified by the average shear wave velocity $V_{s,30}$.

Over the years, we have conducted site investigations in thousands of sites across Israel, including more than 30 towns. These investigations demonstrated the usefulness of using the horizontal-to-vertical (H/V) spectral ratios from ambient noise measurements to identify sites with high amplification effects and to determine their resonance frequencies. Sites exhibited H/V peak amplitudes ranging from 2 to 8 in the frequency range 0.3-14 Hz. These results suggested great variations of the thickness and shear wave velocity in the sedimentary column. For many sites, the H/V spectral ratios show two significant peaks appearing at different frequencies. These are associated with two reflection layers formed by high seismic impedance. This empirical information is correlated with other geological, geotechnical and geophysical data to construct