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Non-linear Modelling for Estimating Site Effects in Bucharest, Romania

D. Ehret (1), S. Schmitt (1), D. Hannich (1), and V. Osinov (2)

(1) Department of Applied Geology, University (TH) of Karlsruhe, Karlsruhe, Germany (2) Institute of Geotechnical Engineering, University of Natural Resources and Applied Life Sciences, Vienna, Austria (ehret@agk.uka.de / Phone: +49/721/608-6548)

In order to elaborate building codes for earthquake-endangered cities it is very important to know the local site effects. Site effects can be investigated either directly by measuring response spectra for many sites or indirectly by calculating response spectra based on a geological model. The first approach has the disadvantage that in most cases measurement results exist only for weak motion and not for the more relevant strong earthquakes. Whereas, if enough geological and geotechnical data are already available (which applies to most of the modern cities), the latter approach enables the calculation of response spectra both for weak motion and for strong motion by using constitutive laws, that take as well non-linearity into account.

Bucharest belongs to Europe's cities with the highest seismic risk. The seismicity is caused by the rupture of the subduced East-European plate in the south-eastern part of the Carpathians. During the 20th century four major earthquakes (MW = 6.9 - 7.7) occurred in this 80 - 200 km deep seismogenic volume. The epicentral region of these earthquakes is confined to the Vrancea region, a 30 km wide and 70 km long area about 160 km north of Bucharest. 2007 the 30. anniversary of the last and most devastating strong earthquake will be commemorated and the next strong earthquake is overdue.

At first a 3D geological and hydrogeological subsurface model of Bucharest was developed. To investigate shear wave velocity, density and other geotechnical properties Vertical Seismic Profile- (VSP-), Seismic Piezocone Penetration Test- (SCPTu-) and special seismic Crosshole-measurements have been performed. Subsequently, the ground response was calculated at each of these sites using synthetic signals. For the non-linear modelling the (visco-) hypoplastic constitutive law was used. After valida-

tion of the modelling results the ground response will be calculated and interpolated for the entire city area to produce a microzonation map.

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