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Seismic Microzonation based on geotechnical Parameters - Estimation of Site Effects in Bucharest (Romania)

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Romania frequently is hit by strong intermediate depth earthquakes occurring in the Vrancea area (SE Carpathians). During the 20^{th} century four major earthquakes (moment magnitudes between M_W = 6.9 and M_W = 7.7) occurred in this region. They strongly affected the Romanian capital Bucharest (1.9 mio inhabitants), which is situated approximately 160 km south of this epicentral region in a Molasse basin composed of poorly consolidated Tertiary and Quaternary sedimentary formations. Due to the relatively large hypocentral distance influences of source directivity and travel path effects are assumed to be constant in the entire city. Therefore significant lateral variations in ground motion must be caused by local site effects, related to the near-surface geology, which is mainly dominated by large alluvial and diluvial deposits and anthropogenic backfill.

The objective of this study, which is part of the German Collaborative Research Center (CRC) 461 'Strong Earthquakes: A Challenge for Geosciences and Civil Engineering', is to quantify the local influence of site effects on earthquake triggered ground motion and to generate a microzonation map of Bucharest.

At first a digital subsurface model based on geological and geotechnical data from numerous boreholes was developed. A numerical ground response modelling was per-

formed by using one-dimensional linear-elastic approaches and geotechnical data, derived from the digital geological subsurface model. The analysis of ground motion was carried out for discrete points. For these raster dots the transfer functions were computed and parameterised by characteristic shake parameters (e. g. dominant frequencies, peak amplifications or spectral amplifications at characteristic frequencies). After spatial interpolation of the computed values these parameters could be presented in continuous microzonation maps.

Further the surficial ground motion was computed using a novel (visco-) hypoplastic constitutive law that also takes non-linear soil behaviour into account. The results of both approaches were compared with each other and indicate, that the consideration of non-linear effects is required to get more realistic results for the microzonation.