Geophysical Research Abstracts, Vol. 9, 02272, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-02272

Urban Seismology Research in the Metropolitan Area of Bucharest

S.F. Balan (1), C.O. Cioflan (1), B. Apostol (1), D. Tataru (1), J.R.R. Ritter (2)

1. National Institute for Earth Physics, Magurele-Bucharest, ROMANIA, (2) Geophysical Institute, University of Karlsruhe, GERMANY (sbalan@infp.infp.ro)

Continuous seismological recordings (24 hours/day) were performed during almost 10 month (from October 2003 to August 2004) in the framework of a collaborative work between the National Institute for Earth Physics and the University of Karlsruhe – Collaborative Research Centre 461 (CRC 461). The recordings were done at 34 sites with 31 seismic stations that were equipped with broadband velocity sensors (KArlsruhe BroadBand Array, KABBA) uniformly spread over Bucharest city and its adjacent zones. During the considered time interval several eartquakes occurred in the Vrancea seismic zone: 4 seismic events with $M_W > 4$, 48 seismic events with $M_W > 3$ and 67 seismic events with $M_W > 2$.

We determined the spectral ratio H/V, the horizontal (H) to vertical (V) component of the Fourier spectrum for these low intensity seismic events. Japanese scientists emphasized the scientific relevance of this ratio and its relationship with the elliptical trajectory of the Rayleigh waves. In their conclusion, this ratio may be used to identify the fundamental frequency of the soft soils by noticing that the vertical component of the Rayleigh wave vanishes in the vicinity of the fundamental frequency of the S waves. Meantime, making use of qualitative arguments, Nakamura showed that the H/V ratio is a reliable tool for estimating the seismic response at a given site. According to this author, the H/V ratio gives us not only information about the resonance period but also on the corresponding wave amplification. In his opinion, due to the vertical component, the effects of the source and Rayeigh waves are diminished. There is a consensual conclusion that the H/V ratio for soft soils exhibits a peak (maximum amplification) value correlated with the resonance frequency. At the same time the experimental observations supports the H/V spectral ratio method: the comparison between fundamental frequencies obtained from the H/V ratio of micro-earthquakes

and transfer functions for earthquakes or explosions allows us to conclude that H/V ratios for micro-earthquakes give us reliable data regarding fundamental frequencies for soil deposits.

The earthquakes with $M_W > 4$ that occurred on 21.01.2004, 07.02.2004, 17.03.2004 and 04.04.2004 will be used as input to compute H/V ratios for each site of a URS station in the area of Bucharest city. Computation of H/V spectral ratios are performed by means of SeismicHandler and J-SESAME software showing the reliability of the method applied for the sites located in Bucharest. The fundamental period obtained for the majority of sites is in accordance with already known scientific results. By obtaining now the fundamental period at much more and different sites in the area of Bucharest, we cover also zones where such data did not exist before. Thus our study is of great significance for seismic risk mitigation for the area of Bucharest city, for a safer seismic design and for the improvement of microzonation efforts.

The URS experiment is funded by the Deutsche Forschungsgemeinschaft and the National Institute for Earth Physics at Bucharest Magurele. Microzonation activities are funded by NATO through Science for Peace Project grant SfP981882.