FREQUENCY CONTENTS OF STRONG MOTIONS FROM ROMANIAN SUBCRUSTAL EARTHQUAKES

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ABSTRACT

The earthquakes of March 1977, August 1986 and May 1990 represent the largest intermediate-depth seismic events produced in the Vrancea seismic zone in the past 70 years. Over 90 pairs of horizontal recordings were obtained during these earthquakes and their frequency contents is analysed in this paper. In addition, the characteristics of the most important strong ground motion recorded in Romania – the recording from INCERC station are discussed and evaluated, as well. The analyses of the frequency content of recorded ground motions reveal long predominant frequencies in Bucharest observed during the larger magnitude earthquakes of March 1977 and August 1986. Two definitions of the control period T_C given by Newmark and Hall (1969, 1982) and Lungu et al. (1997) are applied on the available strong ground motion database in order to evaluate the frequency content. The shape of the normalized acceleration response spectra as a function of the cycle duration and number of cycles of the ground motions are investigated using the recording from INCERC station and the recording obtained at Mexico-City SCT station during the 1985 Michoacan seismic event.

INTRODUCTION

The Vrancea seismic source, located at the Carpathian Mountains bending, is a source of subcrustal seismic activity (depths in the range 60 to 170 km), which affects more than 2/3 of the territory of Romania and an important part of the territories of Republic of Moldova, Bulgaria and Ukraine.

The ground motions recordings from the Vrancea earthquakes of March 4, 1977 (M_w = 7.5, h = 109 km), August 30, 1986 (M_w = 7.1, h = 131 km) and May 30, 1990 (M_w = 6.9, h = 91 km) show various frequency contents, from wide and/or intermediate frequency bandwidth ground motions (in hard and/or medium soil conditions) to narrow frequency band ground motions with long predominant periods (T_P = 1.4 ÷ 1.6 s) in Bucharest area or Ramnicu Sarat. The random frequency content of the recorded strong ground motions shows a clear dependence on the earthquake magnitude and local soil conditions, as well as on the epicentral distance.