



Characterization of site-effects in the urban area of Canakkale, Turkey, using ambient noise measurements

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The local site conditions can cause variations in the ground motion during the earthquake events. These local effects can be estimated by Nakamura method (1989) which is based on the analysis and treatment of earth vibration records by calculating the ratio of horizontal spectrum to vertical spectrum (H/V). This approach uses ambient noises and aids to estimate the dynamic soil conditions like fundamental vibration period and soil amplification of the surface layers, to characterize the seismic hazard during earthquakes and to provide detailed information for seismic microzonation in small scale urban areas. Due to these advantages, the method has been frequently used by a great number of seismologists and engineers. In this study, we aimed at explaining the soil conditions in Çanakkale and Kepez basins by using H/V technique.

Çanakkale and Kepez (NW, Turkey) have fairly complex tectonic structure and have been exposed to serious earthquake damages in historical and instrumental period. Active faults, which have influence on the Çanakkale and Kepez settlements, are the Yenice-Gönen fault, Saroz-Gaziköy fault and Etili fault. It is well known that, these faults have produced high magnitude earthquakes such as 7.2 in 1912 and 7.3 in 1953.

The surface geology of the surveyed area is covered by quaternary aged sediments. Sariçay river, which originates from the eastern hilly area, accumulates sediment deposits and forms this alluvial basin. Considering the geological conditions, ambient noises were recorded at 88 measurement points which were selected to provide good coverage of the study area. All records were acquired during the midnight (between 1:00 am and 6:00 am) to reduce the artificial effects in the urban area. Taking into account the effects of undesirable traffic and industrial noises in the vicinity of measurements stations, record lengths were chosen in the range of 25-75 minutes with the sampling rate of 100 Hz.

Once the required signal processes have been applied to raw ambient noise records, fundamental vibration periods and relative soil amplification factors were calculated at the each measurement points. Fundamental vibration periods were determined in the range of 0.15-1.13 sec. The periods values between 0.7 and 1.13 sec., showed that soft alluvial layers have been observed in the middle and south part of the Sariçay basin. Amplification factor values indicated that these parts of the study area amplify the amplitude of the earthquake waves fourfold compared to the most compact zone of the study area. Additionally, small period values ranging between 0.1 and 0.4 sec. which indicate relatively compact zones were observed at the high altitude areas consisting of relatively older geological units. The relative soil amplification factors have a good agreement with the fundamental vibration period values. As a result of the study, it is strongly suggested to research alternative settlement areas or apply ground improvement techniques at the planning stage of engineering structures in the middle of the basins due to the unfavorable ground conditions.

Keywords: Ambient noise, Çanakkale, Kepez, Fundamental vibration period, soil amplification factor