

## A STUDY ON SITE EFFECTS IN ADAPAZARI, TURKEY, FROM STRONG- AND WEAK MOTION RECORDS

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Approximately 7000 people were killed due to collapse of buildings in Adapazari City during the 17 August 1999 Izmit, Turkey earthquake ( $M_w=7.4$ ). Most of the fatalities and damage occurred in the city center. Adapazari City is located on a deep sedimentary basin; the thickness of the alluvial deposits is more than 300 m. A strong-motion observation array was deployed in and around Adapazari City after the earthquake by the University of Bogazici to study the site response that caused considerable damage in the city. The temporary array consisted of nine stations, four of which were located in the heavily part of the city center, and was operated from August 29, 1999 to October 10, 1999. In this study we use records from the four stations in the city center and the adjacent rock site. Eleven aftershocks are selected in our analysis based on the signal-to-noise ratio; these events have a magnitude range of 3.2 to 5.8. We estimate S-wave spectral ratios of the basin site records to the reference site. These spectral ratios show that the basin S waves are amplified by 2 to 5 times compared to the reference site in the frequency range of 0.5 to about 5 Hz but are strongly de-amplified at frequencies higher than 5 Hz. The apparent de-amplification at the basin sites at high frequencies can be attributed to the site amplification at the reference rock site at these frequencies. We confirm the rock site amplification based on the S-wave H/V (horizontal to vertical) ratios; the average H/V ratio shows about unity with weak frequency-dependency in the frequency range of 0.5 to 5 Hz, but it increases from unity at 5 Hz to about 4 around 10 Hz. We also compare the empirical site amplifications (spectral ratios) with the theoretical ones calculated based on S-wave velocity structures; an agreement between them is generally good. In addition to strong S-wave amplifications, the basin site records show strong excitation of long-period (about 2 sec) surface waves after S-wave arrival during the aftershocks with magnitudes greater than 5; these surface waves produce the long duration of shaking (longer than 30 sec). We conclude that severe damage in Adapazari City during the 1999 Izmit earthquake was caused by not only strong S-wave amplifications but long duration of shaking due to basin-induced surface waves, as well.