

Investigation of Site Effects in the Izmit Bay Area

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Abstract

The 1999 İzmit earthquake caused great amount of damage and loss of life. The limited number of strong motion recordings of this earthquake showed low levels of Peak accelerations ($< 0.4g$) taken in the near field. Thus, local geological site conditions and poor enforcement of the building codes probably played a major role in the distribution of observed heavy damage associated with this earthquake. The Bay of Izmit and its extension on land exhibit local depressions and sub basins that are filled with unknown thickness of sediments. Such regions are subject to enhanced earthquake hazard by means of seismic focusing and resonance effects, resulting in heavy damage zones often reported in the literature. We carry out a series of geophysical surveys and geological investigations to obtain information on macro scale geophysical site classification, resonance frequency, and bedrock depth in the region of 1999 İzmit earthquake. These surveys include ambient noise microtremor array (SPAC, f-k) and active source surface wave measurements (MASW) to determine S-wave velocity profiles at 60 different sites selected in various settlement areas. A site classification map of the city of Kocaeli was produced based on average S-wave velocity down to 30 m depth (V_{s30}). We also investigate the deep structure of the İzmit-Sapanca corridor using a joint analysis of the S-wave velocity profiles, microtremor spectral ratio and Gravity data to obtain a map of three-dimensional bedrock depth and sediment thickness. A total of 422 single station three-component microtremor measurements were made to directly obtain site resonance fundamental frequency and horizontal to vertical amplification parameters using the well-known horizontal to vertical spectral ratio method. In this work, we presents results obtained from these methods and discuss their implementation for seismic hazard assesment for the Kocaeli province.