Geophysical Research Abstracts
Vol. 15, EGU2013-3303-1, 2013
EGU General Assembly 2013

The Preparation of Microzonation Map of the Gulf of Buyukcekmece using results obtain by Vertical Electrical Sounding Measurements with Multi-Channel Analysis of Surface Wave and Microtremor Array Method

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Istanbul is a megacity with 17 million inhabitants. After the 17 August 1999 earthquake, many researchers have focused on the mitigation of earthquake hazards in the Sea of Marmara and its vicinity. If we want to lessen the effects of such an earthquake, we have to learn about three different types of problems which are properties of the earthquake's source, whether of site effect or properties of engineering structures. When İstanbul Metropolitian Municipilaty obtained a World Bank Credit 5 years ago, they had a microzonation report for only a limited area which finished at Har amidere in the western site of Istanbul. Because they will not have any new project, the western side of Haramidere hasn't been studied by any scientist. For this reason, we focused on the Gulf of Buyukcekmece which is located on the western part of Haramidere and suffered in the 1999 earthquake. There are five geological units in the study area such as Bakirkoy formation, Gurpinar formation, Çukurçeşme formation, Güngören formation and Alluvial deposit. We conducted some measurements which are multi-channel analysis of surface wave (MASW), microtremor array method (MAM) and vertical electrical sounding(VES). The aim of using VES data is to determine bedrock depth, learn whether there is a new fault and learn the electrical properties of each layer of bedrock. The MASW method is so attactive, cheap and fast. According to seismic refraction, it has some advantages that are determining the deeper part of sub-surface, lower velocity layers and velocity contrast. Especially, we use natural sources; MAM methods are more useful method in the city. For all of these purposes, we collected MASW and MAM measurements at 80 sites and VES measurements at 20 sites.

As primary results for VES measurements, we determined the bedrock depth by evaluating the VES measurements for the central, eastern and western part of Buyukcekmece Gulf. Bedrock depth is 308 meters in the central and eastern part of the Gulf and it reaches up to 448 meter in the north-eastern part. Its value obtained 471 meters in the western part of the Gulf. The depth of bedrock is determined as approximately the same on both sides of the Gulf. We collected only one VES measurement in the central part of the Gulf where the Buyukcekmece lake meets the Sea of Marmara. The bedrock depth is determined as 52 meters at this point.

As primary results for MASW-MAM measurements, we determined Vs30 as average 311 m/s. Due to the frequency range being different for MASW and MAM measurements, wavelength is also different. For this reason, we evaluated both measurements together. Shear wave velocity is greater than the other parts in the study area. Especially, the north-west side (District of Tepecik) of the Gulf is the maximum value. The central part of the Gulf close to the Sea of Marmara decreases to Vs30 value.

Key Words: Gulf of Büyükçekmece, Vs30, Depth of Bedrock, MASW, Microzonation,Site Effect,NAFZ