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Determination of Sinkholes with Different Geophysical Techniques; A Case Study in Yarımburgaz, Küçükçekmece Lake NW Istanbul, Turkey

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The Yarımburgaz cave which is located in the city of Istanbul, NW Turkey plays an important host to the first human culture and preserve significant archaeological and paleontological resources. The cave was formed as a result of a subterranean stream erosion on the limestones of the Eocene Kırklareli formation. It has been reported that a double cave with upper and lower entrance chambers exist, although no geophysical research was conducted to detect the cave's trunk passages and the extend of the sediment fill inside the cave.

The aim of this study was to test the preferred order for detection the response to different geophysical methods applied on the cave. We therefore carried out an a series of geophysical study to determine the size, position, and depth of sinkholes inside the caves. Integrated methodological approaches including multichannel analysis of surface wave (MASW) 2- microtremor array method, 3-single station microtremor measurements, 4-electrical tomography (ET) measuruments and 5-microgravity imaging showed that the geophysical response was succesfully applied.

Based upon the flow-chart we concluded that the microgravity survey should be applied as a first step to detect the air-filled void and the geometry of the cave. The electric tomography method was well applied showing high resistivity values across the voids. The surface wave method showed that the low-velocity zones are detected in various locations of the cave. In addition we the results of MASW and ReMi methods showed clearly the density variation in the lateral direction. Fundamental frequency value above void decraese according the properties of geological units in lateral directional, especially when they are engineering rock like limestone.