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Use of Microgravity Survey in the Dead Sea Areas Affected by the Sinkholes Hazard

A. Al-Zoubi (1), E. Abueadas (1), E. Akawwi (1), L. Eppelbaum (2), E. Levi (3), and M. Ezersky (3)

(1) Al-Balqa' Applied University, Surveying and Geomatics Department, Al-Salt, Jordan (al-alzoubi@bau.edu.jo), 0096253539110), (2) TAU, (3) GII

The microgravity method has been used for decades in oil and mineral exploration. Advances in microgravity equipment have improved the accuracy and efficiency of obtaining. Microgravity is a geophysical method that is increasingly being used for environmental and geotechnical investigations. Microgravity measurements respond to changes in subsurface density, and are a non-invasive way to effectively delineation of subsurface density variations. and identify the characterize subsurface voids and cavities. The integration of microgravity with other geophysical methods and geologic information will provide a more complete and accurate assessment of subsurface voids and cavities.

A microgravity survey consists of making sensitive gravity measurements at discrete points on the ground surface. Spatial changes in gravity are referred to as gravity anomalies and are directly related to subsurface features with a measurable density contrast.

Detection and delineation of subsurface cavities are the most common applications of Microgravimetry. Microgravimetry comes closest of all the geophysical methods to allowing a positive statement regarding the presence or absence of subsurface cavities at a site. Portable gravimeters are extremely sensitive instruments that measure relative differences in gravity from station to station. Gravimeters measure changes in the vertical component of gravity by balancing gravitational forces with a spring and mass system.

Microgravimetry has shown itself as very sensitive tool in the western Dead Sea shore in Israel. Comprehensive anomaly of 80x50m in plane was detected from surface in the Nahal Hever south area. The great sinkhole formed at the place of the anomaly during some consequential years. The similar some less anomalies were discovered in the Ein Gedi site. From the Jordan side first Microgravity surveys were carried out in beginning of 2000th. Our studies were started in 2010 at the north of the Ghor Al-Haditha area where sinkhole development was delayed with respect to more southern areas. Microgravity study was carried out in parallel with the Micromagnetic and other surface methods (ERT, GPR etc) that allows combined interpretation of results. Some anomalies of the microgravity and Micromagnetic fields have been detected, which would be evidences of possible future collapses.

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