Geophysical Research Abstracts
Vol. 14, EGU2012-2244, 2012
EGU General Assembly 2012

Mechanism of Sinkhole Formation in the Ghor Al-Haditha Based on Geophysical Data

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Dead Sea sinkholes have been forming along the Dead Sea coastal areas in both Israel and Jordan during three last decades. Sinkholes developing in the Ghor Al-Haditha Area affect in roads, agriculture lands, and building foundations by the sudden collapse of the ground surface and cracks with different sizes and depths. If mechanism of sinkhole formation along western Dead Sea shore has been studied goodly enough eastern side requires additional interpretation of data available. The situation in Jordan is complicated by complicated geology and absence of data on salt layers from the verification boreholes.

The exposed walls of sinkholes also demonstrated that much of this geological sequence near the surface is composed of sand, silty sand and gravel, in addition to some evaporates minerals (dominantly salt and gypsum).

It is understood today that sinkholes are formed within Holocene salt layers located after seismic refraction data at shallow depths of 40-50 meters.

Different models suggested by different investigating groups have been suggested. There are models based on surface measurements (InSAR Radar), Microgravity modeling, visual inspection of sinkhole sites etc. The flushing model based on the assumption that turbulent underground water flows associated with a massive mass transport of insoluble fractions (clay and silt) have produced subsurface hollows. These expand upwards and finally appear on the surface as sinkholes.

We develop model based on different geophysical studies using seismic reflection and refraction methods, Magnitometry and Microgravity, Electric resistivity Tomography (ERT) and Ground Penetrating Radar (GPR), Magnetic Resonance Sounding (MRS) method, Transient Electromagnetic (TEM) method etc. These data allows suggesting the geophysical model of sinkhole formation mechanism.

Our model considers the salt edge as a major factor of sinkhole formation with some features associated with tectonic setting and hydrogeology. The salt model is based on the assumption that salt edge is dissolved by flowing water, artesian water and springs. The salt cavern causes the collapse of the overlain strata and finally appears on the surface. It is suggested also that collapse of pre-existing cavities can take place because of the drop in the Dead Sea level.

Acknowledgements

This publication was made possible through support provided by the U.S. Agency for International Development (USAID) and MERC Program under terms of Award No M27-050.