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# Near Surface Electrical Tomography to Detect Hazardous Areas in Guatemala City

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From the geological point of view, Guatemala City is considered as a pull-apart basin. Such basin had been filled up with a thick layer of volcanic sediments (ash mainly), between 100 m to 200 m of thickness. The upper layers are associated with a system of normal faults; induced by the 1976 earthquake and with a great influence over Guatemala City.

Two subsidence phenomena ocurred in February 2007 and May 2010 in the urban area of Guatemala City. Both episodes were located over the westside drainage main collector and with a few blocks apart from each other. The first one presented 25 m diameter and 60 m depth; the second 15 m and 48 m respectively. Human casualities and urban damages resulted from these incidents.

In order to avoid the population's risk in the near future EMPAGUA (Empresa Municipal de Agua de Guatemala) requested to UNAM (Instituto de Geofísica de la Universidad Nacional Autónoma de México) make the geophysical study. An Electric Resistivity Tomography was carried out along the collector trace with three different arrays (dipole-dipole, Wenner-Schlumberger, and Wenner). The field work developed during September 2010.

A total of 1777 m were measured and distributed into six different profiles, ranging between 110 and 960 m. Therefore the investigation depth varies between 30 and 100 m.

A SYSCAL 48 channels pro-switch (IRIS-France) was used to perform the study. A comercial inversion software (Earth Imager 2-D) based in the Oldemburg and Li (1994) algorithm gave the imagery for final interpretation.

In general terms, it is possible to see several areas that could represent a risk to urban facilities. By one hand there are high resistivity anomalies related to a poor volcanic consolidated material, with presence of gas or high probability of irregular caves. Other resistivity anomalies were related to high water saturated zones suggested from the observed anomaly geometry. The water flow seems to follow the direction of natural topography that decreases from West to East (Rio Las Vacas).

The proposal of future actions suggested to EMPAGUA according to the results of this geophysical study involves the evaluation on specific sites, in order to find possible presence of saturated areas. caves, subsurface water and gas flows by means of drilling in different depths.

By the other hand it seems that the water saturated areas are not hazardous so far, nevertheless in case that the interstitial water flow away, would leave an empty porous media, triggering a liquefaction process and a possible subsidence process.