Sinkhole Imaging With Multiple Geophysical Methods in Covered Karst Terrain

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Abstract

A suite of geophysical surveys was conducted at the site of the University of South Florida sinkhole (USF) for the purpose of imaging sinkholes and fractures beneath the site’s overlying structure. Geophysical surveys conducted during the 2016 season included seismic reflection, radar, magnetic, gravimetric and electrical surveys. These results were compared with field observations to evaluate the ability of these methods to detect and map sinkholes at the site. Seismic reflection results will be discussed in a separate paper. This paper will describe the results of the radar, magnetic, gravimetric and electrical surveys. Ground Penetrating Radar (GPR) and electromagnetic (EM) methods were used to identify sinkholes and cavities beneath the USF sinkhole. The results of the EM surveys were used in the evaluation of the magnetic data collected at the site. The EM response of the magnetic data collected at the site was compared with the EM survey results and sinkhole locations were identified. The results of the magnetic data were then used to supplement the EM data and enhance the ability to identify sinkholes and cavities beneath the site. The results of these surveys will be used to develop a better understanding of the geology and structure of the site and to develop a better understanding of the potential for sinkhole development.

Background

A suite of geophysical surveys was conducted at the site of the University of South Florida sinkhole (USF) for the purpose of imaging sinkholes and fractures beneath the site’s overlying structure. Geophysical surveys conducted during the 2016 season included seismic reflection, radar, magnetic, gravimetric and electrical surveys. These results were compared with field observations to evaluate the ability of these methods to detect and map sinkholes at the site. Seismic reflection results will be discussed in a separate paper. This paper will describe the results of the radar, magnetic, gravimetric and electrical surveys. Ground Penetrating Radar (GPR) and electromagnetic (EM) methods were used to identify sinkholes and cavities beneath the USF sinkhole. The results of the EM surveys were used in the evaluation of the magnetic data collected at the site. The EM response of the magnetic data collected at the site was compared with the EM survey results and sinkhole locations were identified. The results of the magnetic data were then used to supplement the EM data and enhance the ability to identify sinkholes and cavities beneath the site. The results of these surveys will be used to develop a better understanding of the geology and structure of the site and to develop a better understanding of the potential for sinkhole development.

Discussion

Constraints:

1. Precipitation: The sinkhole is located in a region with high annual precipitation, with average annual precipitation ranging from 24 to 50 inches (600 to 1220 mm). The site is located in a region with a high water table, which may contribute to the formation of sinkholes.
2. Topography: The site is located in a region with a high topographic relief, with a difference in elevation of up to 500 feet (150 m) between the highest and lowest points. The site is located in a region with a high ground slope, which may contribute to the formation of sinkholes.
3. Geology: The site is located in a region with a high geologic diversity, with a variety of rock types and sedimentary deposits. The site is located in a region with a high geologic complexity, including features such as faults, tectonic plates, and folds. The site is located in a region with a high geologic activity, including features such as volcanoes, earthquakes, and tsunamis. The site is located in a region with a high geologic potential, including features such as mineral deposits, coal seams, and oil fields. The site is located in a region with a high geologic risk, including features such as landslides, mudslides, and avalanches. The site is located in a region with a high geologic hazard, including features such as submarine volcanoes, tsunamis, and earthquakes.
4. Land use: The site is located in a region with a high land use, with a variety of land use types, including residential, commercial, and industrial. The site is located in a region with a high land use density, with a high population density, which may contribute to the formation of sinkholes.