Reviewer 2 answers:

Introduction

Why you go to study sinkholes with EM method Overview literature in this field What principles of sinkhole or karst detection you are using denote goal of your research: methodology of 3D inversion, karst detection.

The main objective of the research was to use EM instead DC resistivity for detecting subterranean rivers. EM is faster and cheaper. Math is a little more complex, but we are providing the equations for future explorers. In the way of the research we found that where subterranean rivers close to surface (we mean 10 m or less), our model look at them with green color or around 50 ohms-m. Meaning that we are looking a kind of average of the thin resistive limestone roof and clear water resistivity. That is happening maybe because our shortest source-receiver distance is too large (10 m). Maybe 5 m would be better, but there is not an equipment of EM with that distance.

We modified a little the abstract to emphasize the objective of the research.

Study area Geology, local conditions Topography

We modified the manuscript in order to say that geology consists of cretaceous limestones everywhere. Also, that topography is very flat in the study area. You can see that in Google Earth with the astronomical coordinates that we give since the beginning.

The Method EM34 device has to be describe:

We added some lines more in order to describe more the equipment.

what parameter is measured conductivity what units you are use (mmho?) How you convert it to resistivity?

We added a sentence in order to specify that equipment measures conductivity, but we represent our results in resistivity that in the inverse and that it is also more understandable.

The equipment measures milimhos or conductivity mhos divided by 1000. Therefore we use to multiply by 1000 the milimhos and then compute the inverse to get resistivities.

Penetration depth of every array (separation, VMD, HMD)

Nabighian published his famous Geonics Short Notes where he computes the penetration depth for VMD and HMD over a homogeneous half-space. In a 3D half-space it is difficult (maybe impossible) to compute a penetration depth. The maximum depth is around 40 m. If there are conductive bodies in subsurface the penetration decreases. VMD penetrates more than HMD but we do not know how much.

We did not want to speak about that in the manuscript with the idea, to not add complexity to the method itself.

Data acquisition. What antennas (separation) you used during data acquisition What dipoles you used.

We used the EM34 from Geonics and this equipment use only 10 m, 20 m and 40 m.

Theory of data inversion

We added a paragraph at the end of the inversion section to speak more about the smoothing parameter.

Results Show primary graphs of measurements along every line Analyse maps generated, sections

We tried to describe a little more on the Results Section.

Discussion. It is important to discuss criterion of detection water saturation May be refer to similar survey You conclude on water saturate tunnels, but what conductivity or resistivity will be in unsaturated rock environment

Here we show you a resistivity section very close to the chac-mool area. This was obtained by DC resistivity inversion of Dipolo-dipole, Schlumberger and Wenner data sets joint inversion in order to get a single resistivity model. Here we used a source-receiver separation of 5m. With this separation was possible to see the dry limestones close to the surface that we call it as *roof*. In x=60m there is a small sinking, meaning that a subterranean river is close and that collapse is possible. However, you cannot distinguish the resistivity change between the subterranean river and the bedrock. Even that here, we used a shorter source-receiver separation. We only see a green color disruption on the dry limestones and a disruption on the red color long body. We can not explain this since the geophysical point of view. Only salt water and shales can low the resistivity in the bedrock. That is why, we think that bedrock is in some way saturated of salty water that lows the resistivity. We have no other explanation. If you have one explanation, we will be very grateful.

In the EM inversion we do not recover the roof thickness sharply because the shortest source-receiver separation (10 m) was to large. The EM34 equipment has only separations of 10, 20 and 40 m.