Ghost town and environmental findings with Electro-magnetic Methods in Dorothy, AB

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Introduction

The survey was conducted in the Ghost Town of Dorothy, Alberta near Drumheller, Often buried ghost town features like house basements, water wells, and environmental features like aquifers can be mapped with Electromagnetic methods which makes ERT(Electrical Resistivity Tomography and Magnetics a great choice of Geophysical methods for the field survey.

The survey was carried under climatic events including rain, shine, hail and thunderstorms. In order to collect the data, the potential difference that emerges due to current injected into the ground with electrodes in schlumberger array was measured; as well as the magnetic field. the following being measured with a proton-precession magnetometer.

Figure 1. GPS map of Dorothy, AB. The main roads are indicated by blue lines. The ERT survey lines are indicated by the yellow lines and the magnetic area of interest is shown in the red box.

Results

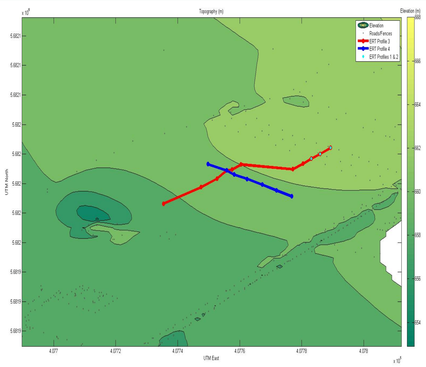


Figure 2. 2-D map view of topography as a function of the latitude and longitude and Electrical resistivity Profile lines. Profile 4 is shown in red and Profile 3 is shown in blue. Profile 1 and 2 are indicated by the three light blue dots.

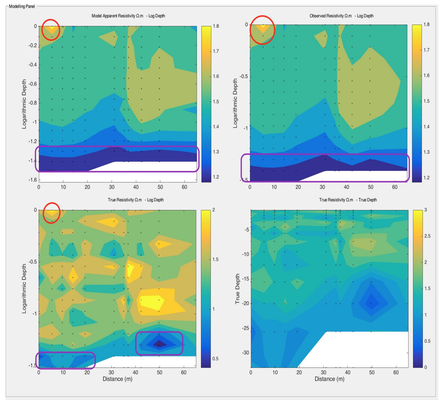


Figure 4: Profile 3 shows a resistive structure in the red circle, this happens at the intersection of the two profiles. Deeper in the section there is a conductive layer shown in the purple rectangle; this is due to water being a conductor.

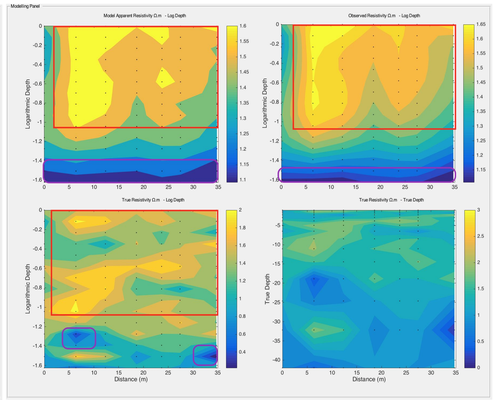


Figure 5: Profile 4 shows two areas of interest. The first is enclosed by the red box and it represents a suspected buried basement. This is an area of high resistivity due to concrete being a poor conductor and due to air filling the pores of the unconsolidated section. The depth of the buried object agrees with that of a basement. Similar to *Figure 4*, the second area of interest is an Aquifer shown in the purple box.

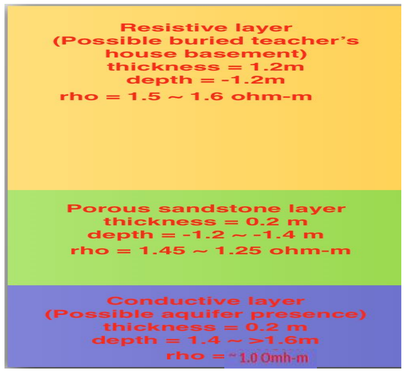
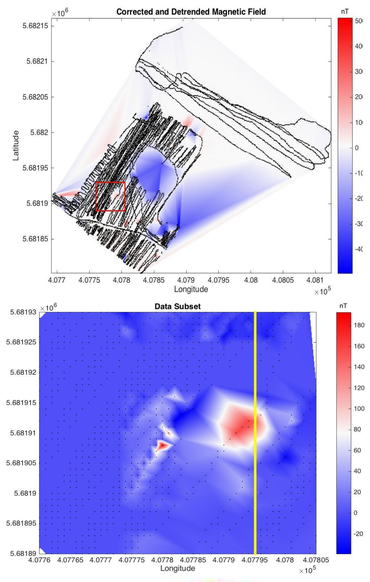


Figure 6: Interpretative Geological Cross Section of profile 4. The resistive layer at the top, as investigated in previous years, is suspected to be buried teacher's house. The layer above has a higher resistivity and the bottom layer with lowest resistivity is the aquifer in *Figure 4 & 5*, shown in the purple box.



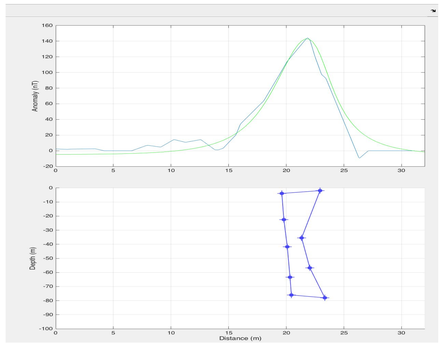


Figure 7.
Top Left : Magnetic survey map from 2016 field school. The Subset area is enclosed by the red frame. The area covered in the survey is shown with black lines.
Bottom left: Cross-Section of the subset area.
Right: Forward model fit.

The shallow anomaly has the shape of a water well, whose metal lid contributes to the positive anomaly *Figure 7. Right*. The water well could be made of cement or iron-like material. Since these materials are paramagnetic, they will contribute to the anomaly.

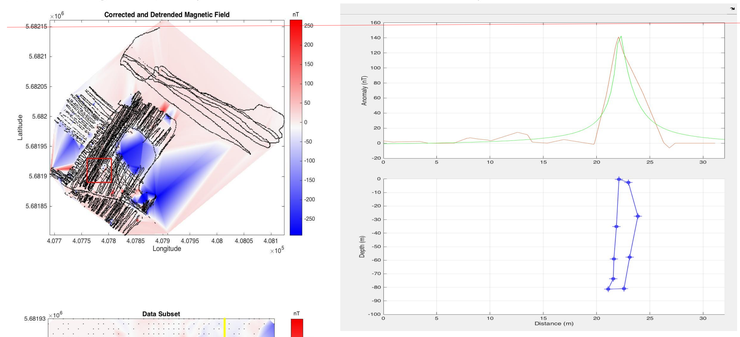


Figure: 8:
Top left: Combined magnetic data from 2014-2016 field school. Chose subset is in the red box.
Bottom left: Cross-Section of the chosen subset for combined data.
Right: Forward model for the combined data

Conclusion

By carrying out resistivity and magnetic surveys we were able to present the location in a Geological section and map view of a house basement, an aquifer and a water well.
The Big picture: Electromagnetic Methods have great potential to be widely used for industry purposes in order to suggest the location of man-made and geological targets which may be interesting to us from a mineral exploration and environmental point of view.
What's next? Perhaps Electromagnetics methods including but no limited to ERT and magnetics will become more popular in industry over the course of the years in areas where a more popular seismic approach may not be possible.

Reference & Acknowledgments

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