Team TBL # 5: The 7 steps for DCIP surveying (revisited)

DUE: November 8th, 2017

Overview

In this assignment, you will work within a team to re-enforce your knowledge of DC resistivity and IP surveying. Here, we focus on important decisions/considerations you would need to make at each of the 7 steps.

Instructions

- Answer the following questions as they appear in the exercise.
- Discuss the questions as a team before coming to concensus.
- Write your answers in the space provided. Answers should be quite brief.
- You are only required to hand in one copy of this exercise per team.
- You will hand this in at the end of the class.

Resources

- GPG:DC Resistivity
- GPG:Induced Polarization
- DCIP lecture slides

Setup

1. In the setup, we identify the geological/geotechnical problem we intend to solve using geophysics. Here, you will demonstrate that you know some common application for DC resistivity and DCIP surveys.
   (a) Name **four** applications for DC resistivity surveying (Hint: see lecture slides):

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   (b) Name **two** applications for DCIP (you can repeat answers from previous question):

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Properties

2. DCIP surveys exploit contrasts in electrical resistivity and chargeability. Below, a simple geological scenario is presented. You will be responsible for characterizing each rock type in terms of its electrical resistivity and chargeability (i.e. high/medium/low).
   (a) Consider the case where are you exploring for sulfide mineralization within a granitoid host. Within your survey region, there is also a thick, clay-rich overburden. How would you describe the electrical resistivity and chargeability of each of these rock types?

- Sulfide mineralization is
- Granitoid host is
- Clay-rich overburden is

Survey

3. When planning a DCIP survey, you must choose an appropriate electrode configuration (pole-pole, pole-dipole, dipole-dipole) and electrode spacing.

   (a) What is **one advantage** and **one disadvantage** that pole-pole surveys have compared to dipole-dipole surveys?

   - Advantage:

   - Disadvantage:

   (b) What is the most important thing you must consider when choosing the electrode spacing for a profiling survey?

Data

4. How we represent our data is very important when trying to understand geophysical responses from the Earth. Whereas DC resistivity data are plotted as apparent resistivities, IP data are plotted as integrated chargeabilities.

   (a) Why are DC resistivity data plotted in terms of apparent resistivity and not as raw voltages? (Hint: what doesn't the raw voltage account for?)

Processing

5. Geophysical inversion is a numerical algorithm that returns a geologically plausible physical property model which explains the data sufficiently. To carry out a DC resistivity inversion, we require 5 things.

   (a) Name **three of the five** things that are required to perform a DC resistivity inversion. (Hint: see the lecture slides)

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Interpretation

6. Interpretation directly from the data (pseudo-section) is efficient but not always ideal. The output from inversion algorithms is much easier to interpret, but may not provide the entire geological picture. Here you will demonstrate that you know the limitations of pseudo-sections and geophysical inversion for interpreting DC resistivity and IP data.

   (a) When are pseudo-sections no longer an effective tool for interpreting DC resistivity or IP data?

   (b) What is the primary reason why the DC resistivity or IP inversion may not recover a certain geological structure

Synthesis

7. An important part of the synthesis is assessing your confidence in the final geological interpretation. This can be done by comparing the geophysical interpretation to other pieces of available information. For example, does the geophysical interpretation match available geological surface maps?

   (a) Name another way you could confirm your final geophysical interpretation.

   (b) If you identified multiple physical property contrasts during the properties step, what other way might you confirm the interpretation results from the DCIP survey?