Virgin River DCIP Report

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Applied Geophysics, 2010
Outline

1. Data Acquisition
   - Location
   - Survey Specifications

2. Inversion
   - Data Errors
   - DCIP2D
   - DCIP3D

3. Interpretation
   - Correlations
   - Snowbird Tectonic Zone
### Outline

1. **Data Acquisition**
   - Location
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   - DCIP2D
   - DCIP3D

3. **Interpretation**
   - Correlations
   - Snowbird Tectonic Zone
Regional
Athabasca Basin, Northern Saskatchewan

- Northern Saskatchewan
- South Central Athabasca Basin
- NTS Reference 74 G/12
Local
Wide Lake Grid

- 10 Lines running NW-SE
- Approximately 4km long each
- Approximately 40 line-km total
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Electrode Configuration
Pole-Pole

- Collected in Summer 2007-2008 by Patterson Geophysics Ltd.
- Pole Spacing $a = 150m$
- 12 Stainless Steel Electrodes (Including Infinites)
Electrode Configuration

Current Advance Protocol

For Electrodes n=1:6
Advance in Increments of 75m

For Electrodes n=7:10
Advance in Increments of 150m

Data Collected at Current-Potential Electrode Spacings of...
75m, 150m, 225m, 300m, 375m, 450m, 525m, 600m, 675m, 750m,
825m, 900m, 1050m, 1200m, 1350m, and 1500m.
Hardware
Instrument Specifications

- Walcer TX9000 9.0 kW IP Transmitter
- Walcer MG-12 Motor Generator
- Two IRIS Instruments ELREC Pro Time Domain IP-Resistivity Receivers
## Data

### Files Provided to UBC-GIF

#### RES2DINV File (.dat)
Reduced data format for RES2DINV software

#### Excel Spreadsheet (.xls)
File containing most of the raw data:
- Voltage (mV)
- Current (A)
- Self Potential (mV/V)
- 20 Chargeability Channels (mV/V)
- Local Tx/Rx Electrode Coordinates

#### Reduced Excel Spreadsheet (.xls)
Reduced data format for plotting pseudo-sections from Excel
### Duplicates
- Data are mostly duplicated
- Typically very similar

### IP Data
- Very noisy
- Not very useful

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Errors

- Noise floor + 5% of each Datum
- 2D: Noise floor calculated as 90% of smallest value along line
- 3D: Noise floor calculated as 90% of smallest value
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Survey Lines
Local Grid: Default Parameters

Data

Virgin River DCIP Data File: pole-pole: 728 data
Observed Apparent Resistivity

Predicted Data
Local Grid: Default Parameters

Resistivity Model

Iterations done: 26

Data misfit vs. Model Norm

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Local Grid: Default Parameters

Inversion Results

Resistivity Model

Iterations done: 26

Data misfit

Model Norm

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Virgin River DCIP2D Standard Format Data File (UTM Coords): pole-pole: 728 data

Observed Apparent Resistivity

Predicted Data
UTM: Fine Mesh
Inversion Results

Resistivity Model

Iterations done: 26

Data misfit vs Iteration #

Model Norm vs Iteration #
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UTM: Default Parameters

Inversion Parameters

Data 3582
Mesh 175,712 cells
Core Cell Size $75m \times 75m \times 37.5m$
Reference Model $1000\Omega m$
Misfit 4059
UTM: Default Parameters
Vertical Slice through Line 1200N
UTM: Default Parameters
Surface View
UTM: Default Parameters
375m Depth Slice
UTM: Default Parameters
750m Depth Slice
UTM: Default Parameters
Resistivity Cutoff of 300\(\Omega m\)
Problems
Topics worth Revisiting

- Duplicated Data
- IP Chargeability
- Noisy Surface
Duplicated Data
Comparison at 600m Depth Slice
IP Chargeability
Decay Curves
IP Chargeability

Inversion

Datum 554
Mesh 165,528 cells
Core Cell Size $75m \times 75m \times 37.5m$
Misfit 2539
IP Chargeability
600m Depth Slice: Useful...?
Surface Weighting

Surface View
Surface Weighting
Vertical Slice through Line 1200N
Surface Weighting
375m Depth Slice
Surface Weighting
750m Depth Slice
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ZTEM
Recall From Elliott’s Presentation...
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Snowbird Tectonic Zone
Graphitic Fault Offset

Data Acquisition
Inversion
Interpretation
Discussion

Correlations
Snowbird Tectonic Zone

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DCIP Report
Snowbird Tectonic Zone
Graphitic Fault Offset
Discussion
Feedback, Questions & Opinions

What Do You Think?