

# Leading Innovation in Deep Geophysical Imaging Technology and Surveying

## An Introduction to Quantec



**QUANTEC**  
Geoscience

World Leaders in Ground Geophysics  
**Since 1986**

# Company Overview – Operating Hubs



1986

2022



DAS

3D DAS

Corporate Timeline

# Three Key Markets

## Mineral exploration

- ❑ Grassroots & brownfield environments

## Geothermal exploration

- ❑ Evaluate potential geothermal resources

## Oil & Gas exploration

- ❑ Image through permafrost, heavy oil & volcanic cover
- ❑ Augment seismic in challenging environments with 3D resistivity



# Core Values at Quantec

## 1. Safe

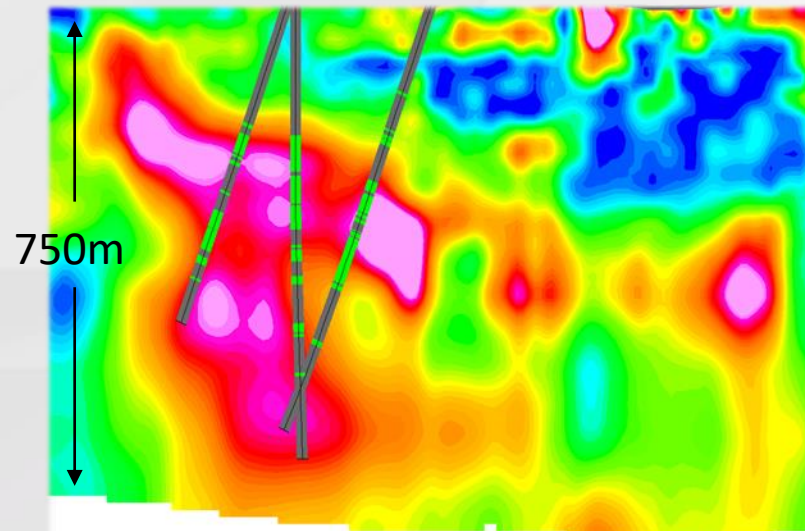
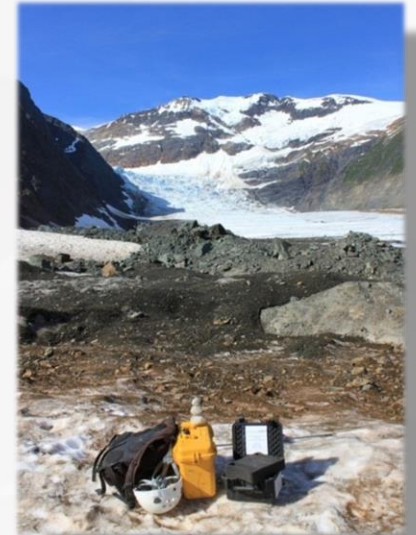
- High standards and safe record
- Training

## 2. Reliable

- Proven record of client successes
- Excellent references

## 3. Accurate

- Proven record of innovation and development
- Track record of drill success and discovery



750m depth is routine with Quantec



# Committed to safe operations



## Safety

- ❑ HSE management system
- ❑ Member of ISNetworld & GGSSA
- ❑ Pre-field risk assessment
- ❑ Training (First Aid, WHMIS, driving, ATV, worker HSE awareness training, etc.)

## Experience

Our safe operations keep our most demanding clients happy. We operate safely for Junior Explorers and are approved operators for Major Mining companies like Rio Tinto, BHP and NEXA.



# Technology and Services



TITAN



ORION 3D



SPARTAN MT

## World Leading Deep Exploration Technology

- ❑ 2D Deep earth imaging – distributed array based data acquisition :  
Flexible deployments of: IP and AMT and MT
- ❑ 3D Imaging – complete **True 3D data acquisition** for complex environments providing accurate surface to depth imaging of IP and MT
- ❑ Flexible 1D, 2D and 3D deep resistivity imaging utilizing high resolution 24-bit AMT & MT

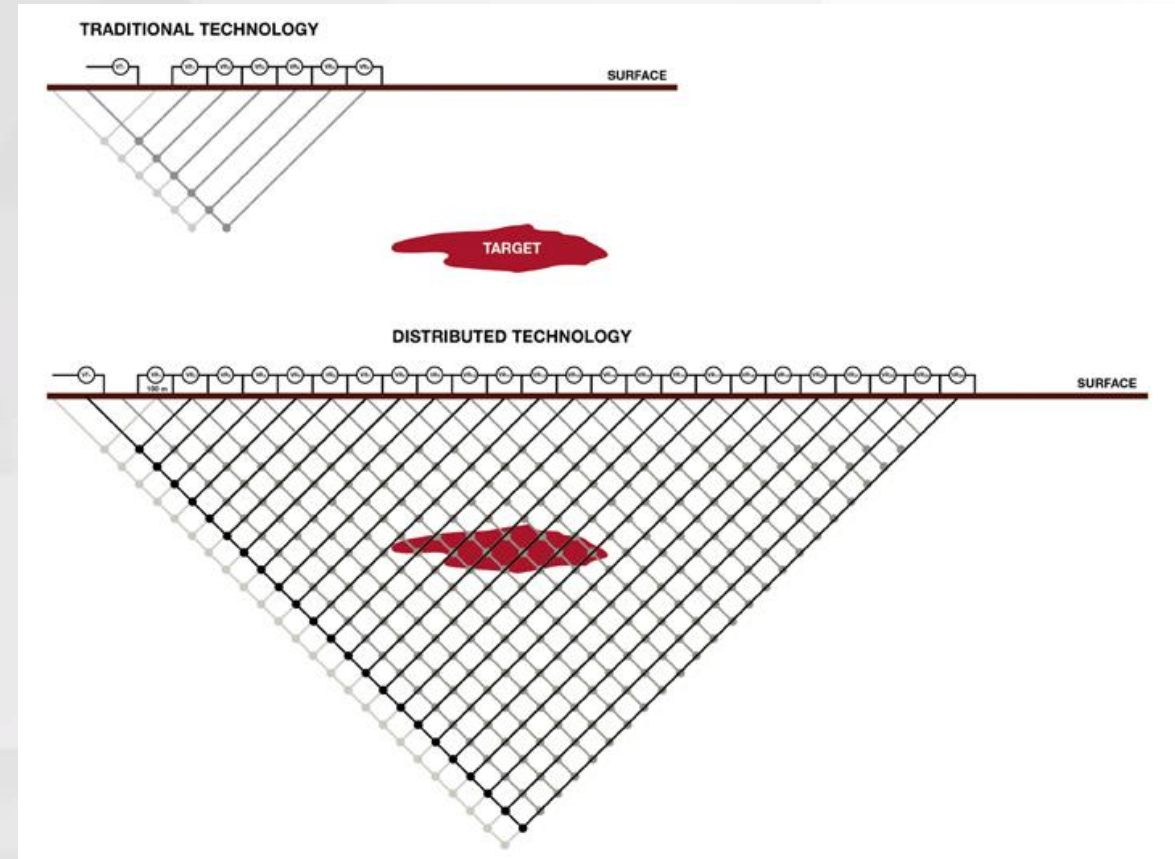
## Broad Range of Geophysical Expertise and Services

- ❑ Survey design, planning, acquisition, QA/QC, interpretation, data integration and consulting services
- ❑ Complete suite of conventional ground geophysical surveys including; gravity, magnetic, radiometric, IP (surface and borehole), TEM (surface and borehole), Max-Min, CSAMT and VLF



# TITAN How we got deeper and more accurate

- ❑ Advent of **DAS**      **D**istributed **A**cquisition **S**ystem Technology
  - ❑ big array geometry
  - ❑ more data
- ❑ Measure many Dipoles simultaneously
- ❑ Typical array lengths were > 2000m
  - ❑ yielding roughly 750 metre depth penetration



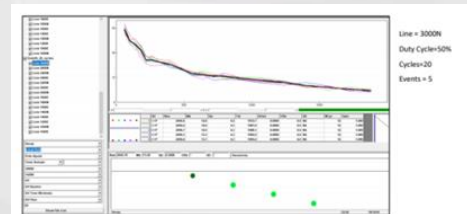
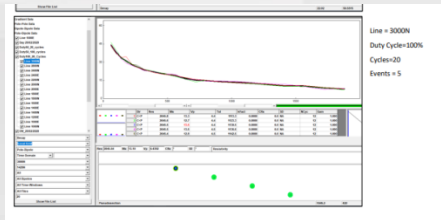
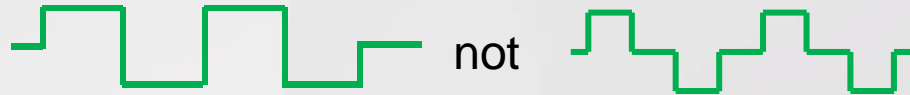
## TITAN defined DAS

# Quality signal at depth and much more sampling of subsurface

## Features:

### ❑ A “real-time” distributed array system

- ❑ Multiple source-receiver combinations sample simultaneously
- ❑ Multiple redundancy resulting in high density data sets
- ❑ Current monitor, real time quality control
- ❑ Easily configured into standard DCIP source-receiver arrays (i.e. Pole- Dipole, Dipole-Dipole, Centre Pole, etc.)
- ❑ 100 percent duty cycle for **cleaner** data

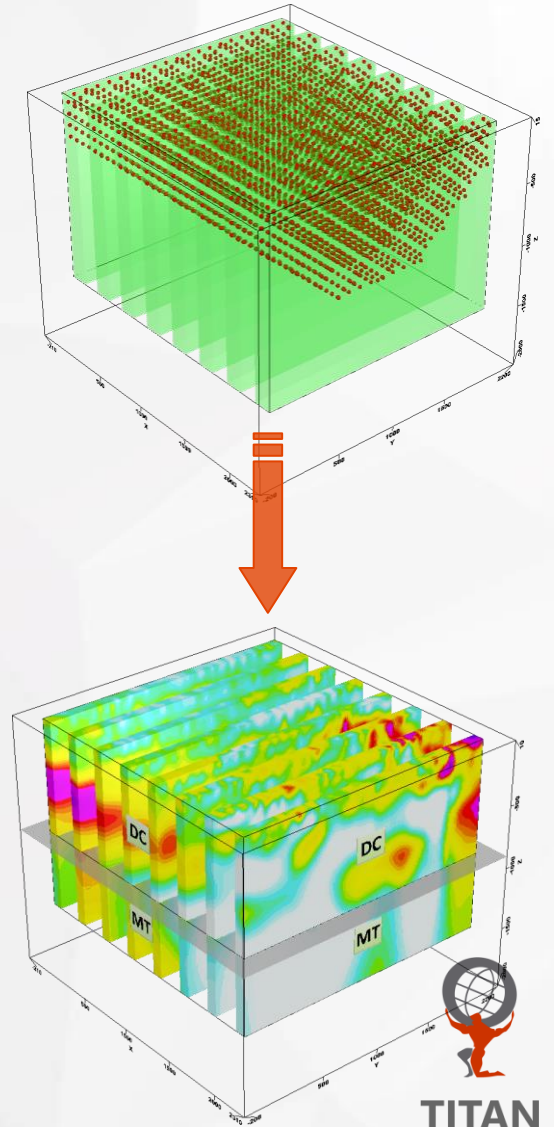


### ❑ Time-series data acquisition:

- ❑ Application of digital signal processing software
- ❑ Full time series recorded, not discrete windows, therefore more complete data acquisition

### ❑ 24-bit sigma-delta filtering

- ❑ Accurately measure very small voltages

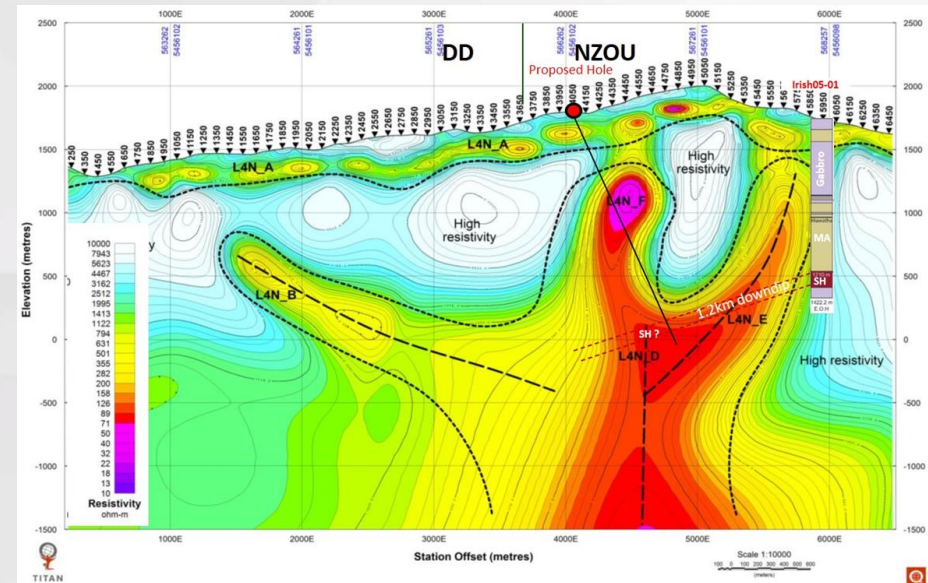
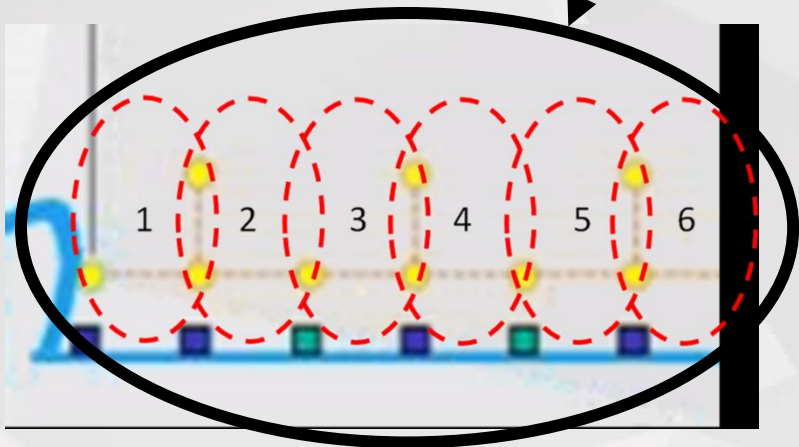
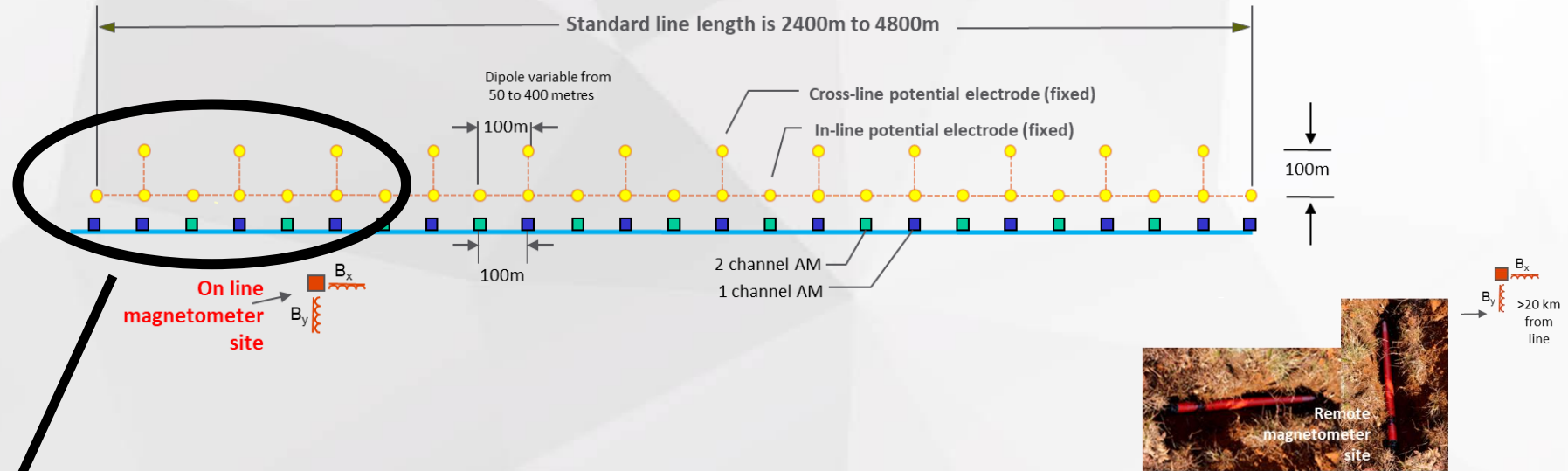


# TITAN is multi parameter - this means it can also be used to collect MT data

Typical station set up



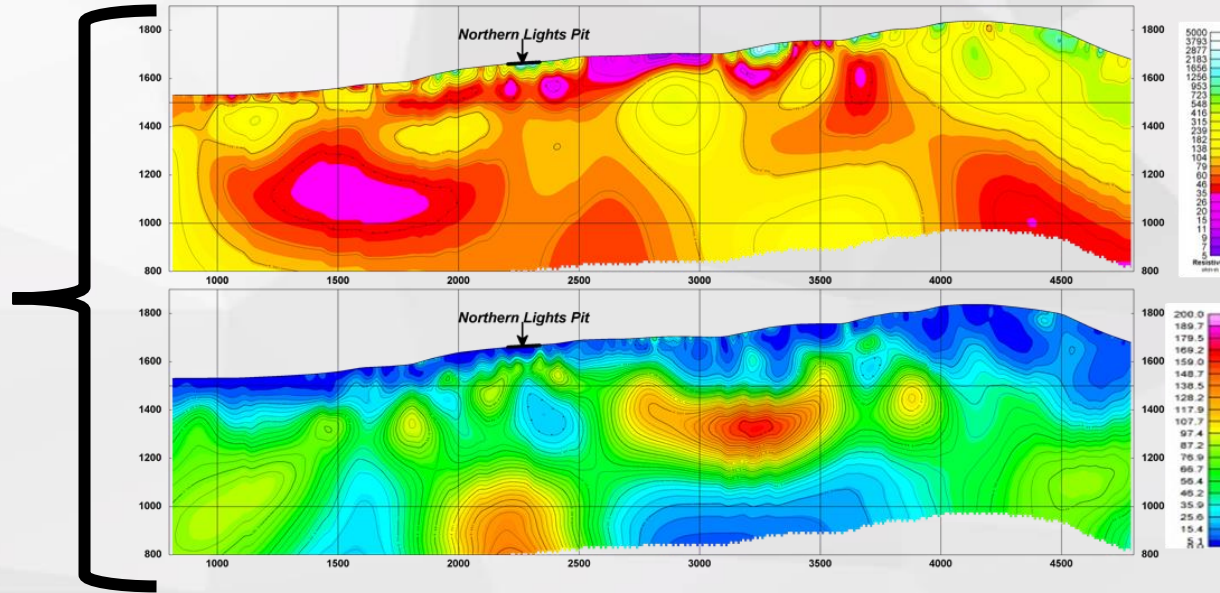
Multi channel acquisition module  
Battery



TITAN

# One big benefit of Multi-parameter Surveys

DCIP

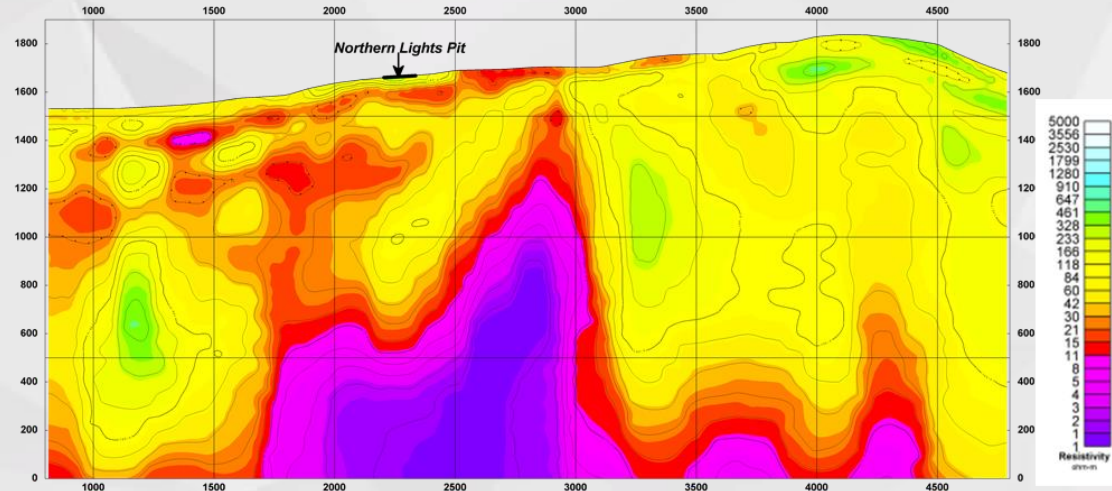


Top panel: DC Resistivity

← Typically 500-750 metres

Middle panel: Chargeability

+ MT



Bottom panel: MT Resistivity

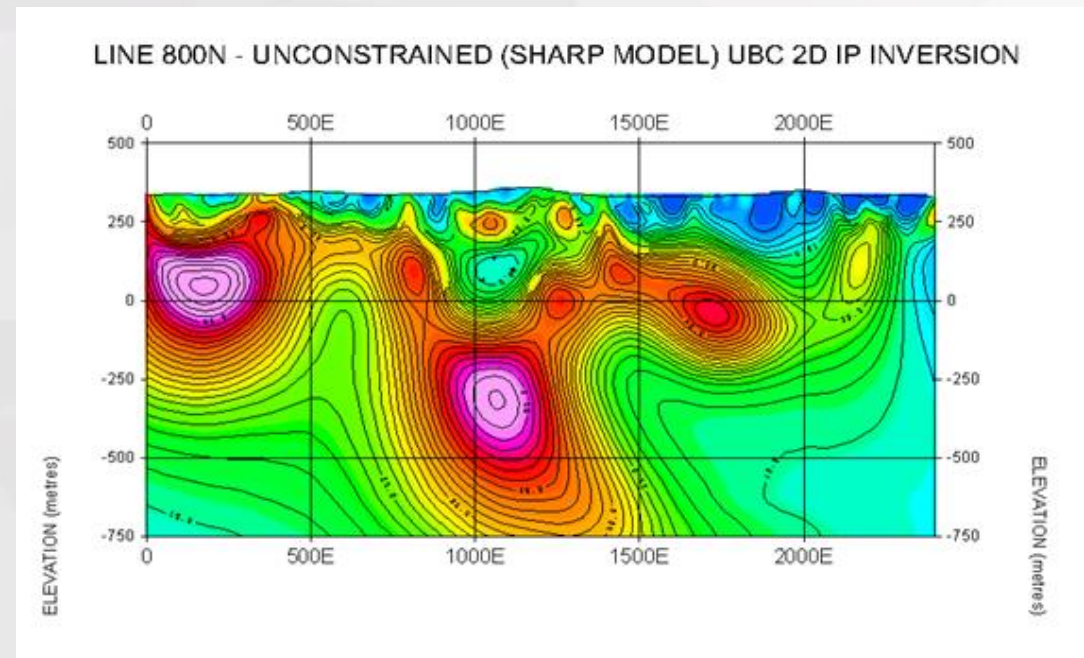
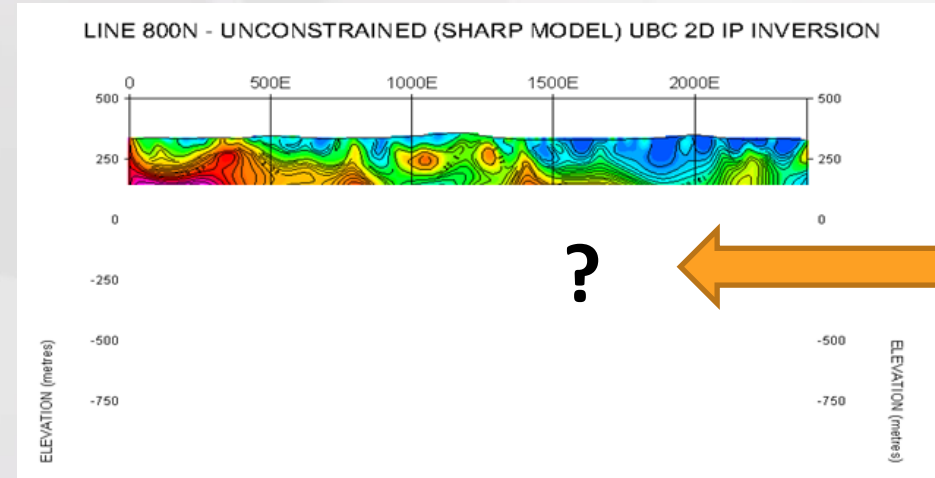
← Typically 1500 metres

PW 2D inversion;

TITAN DCIP & MT

# Real benefits to drilling programs with deeper imaging

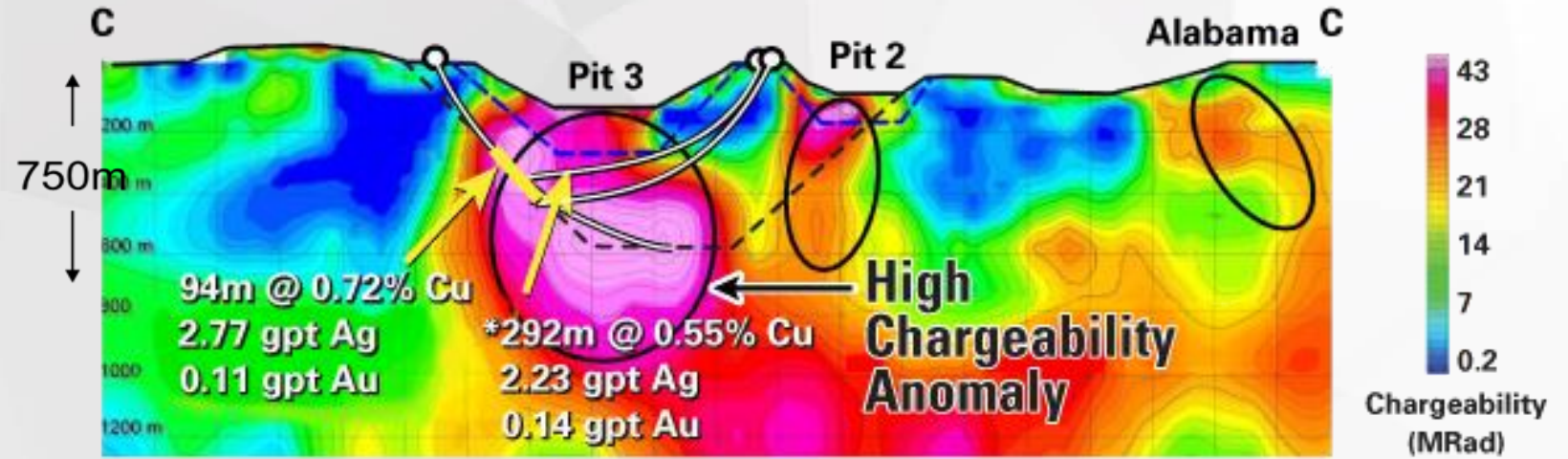
- ❑ Data collected below target depth, is useful to provide best imaging at target depth.
- ❑ More reliable targets at depth
- ❑ Improved decision making



# More than 20 years of proven success

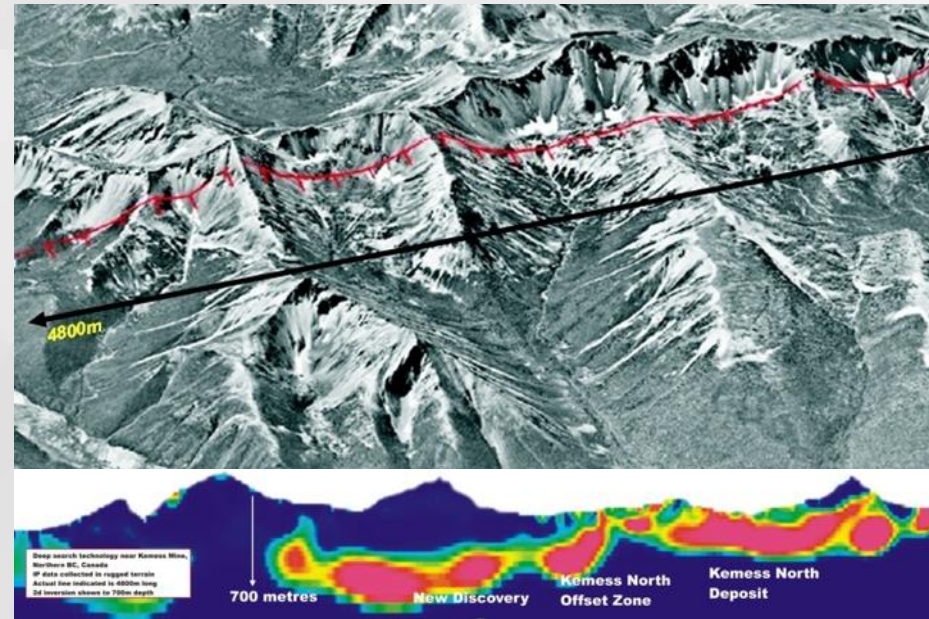
## ❑ Copper Mountain B.C.

- ❑ Changed mine plan
- ❑ Added mine life
- ❑ “Helped raise 50M dollars”  
..Peter Holbek VP EX



## ❑ Kemess North Discovery B.C.

- ❑ Detected deep chargeable features
- ❑ Directly helped geos vector towards discovery



TITAN

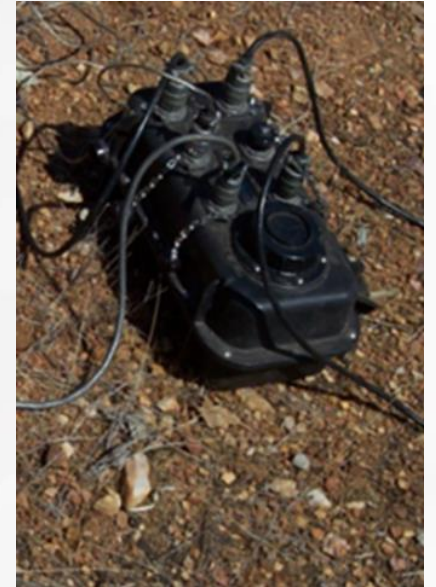
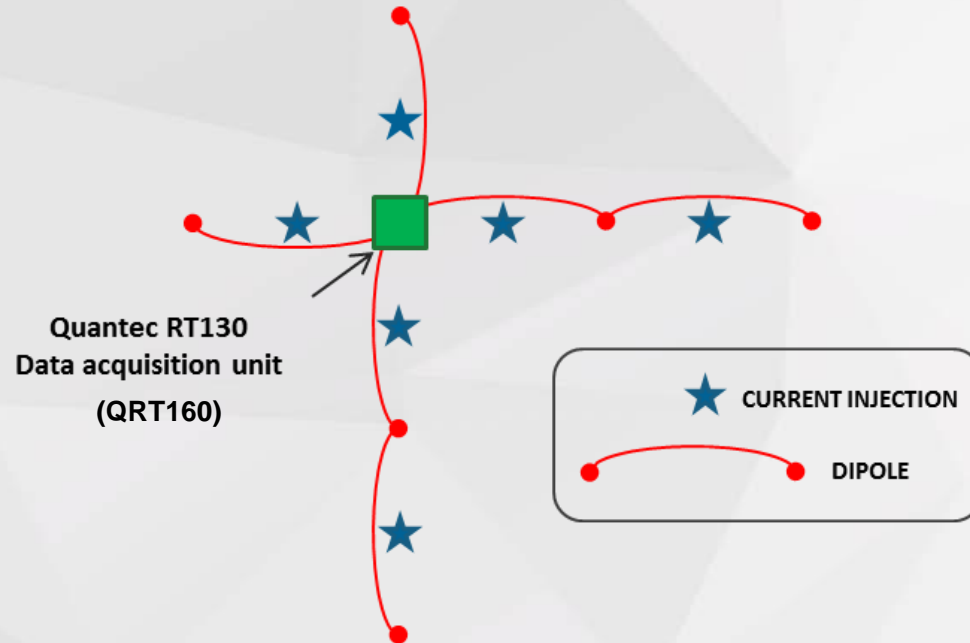


ORION **3D**

# ORION 3D DCIP & MT



# How can we measure orthogonal dipoles?



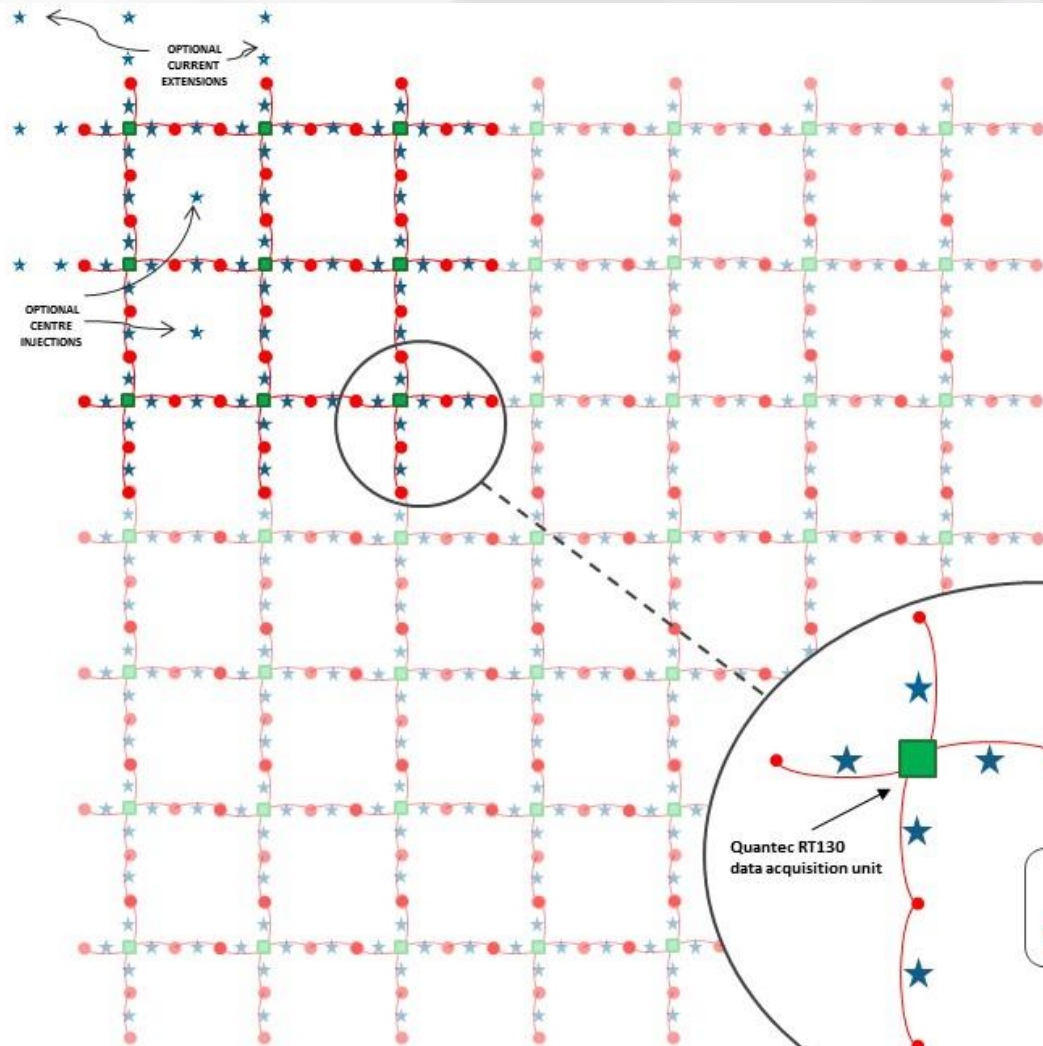
RT 130  
data receiver/logger

## ❑ **ORION 3D & ORION SWATH**

### ❑ Built on the technical strengths of:

- ❑ **TITAN 24** DCIP & MT Technology & Processing (over 21 years of technical **Success** and **Discovery**) (RT 120)
- ❑ **SPARTAN MT** Flexibility (RT130 and RT160)
- ❑ **TITAN 130 & TITAN 160**

# Survey Footprint – Flexible designs for 3D Acquisition



- ❑ Flexible designs
- ❑ Up to **300 receiver channels** for every transmit
- ❑ Unprecedented: equal number of orthogonal dipoles

■ Receiver RT130/QRT160

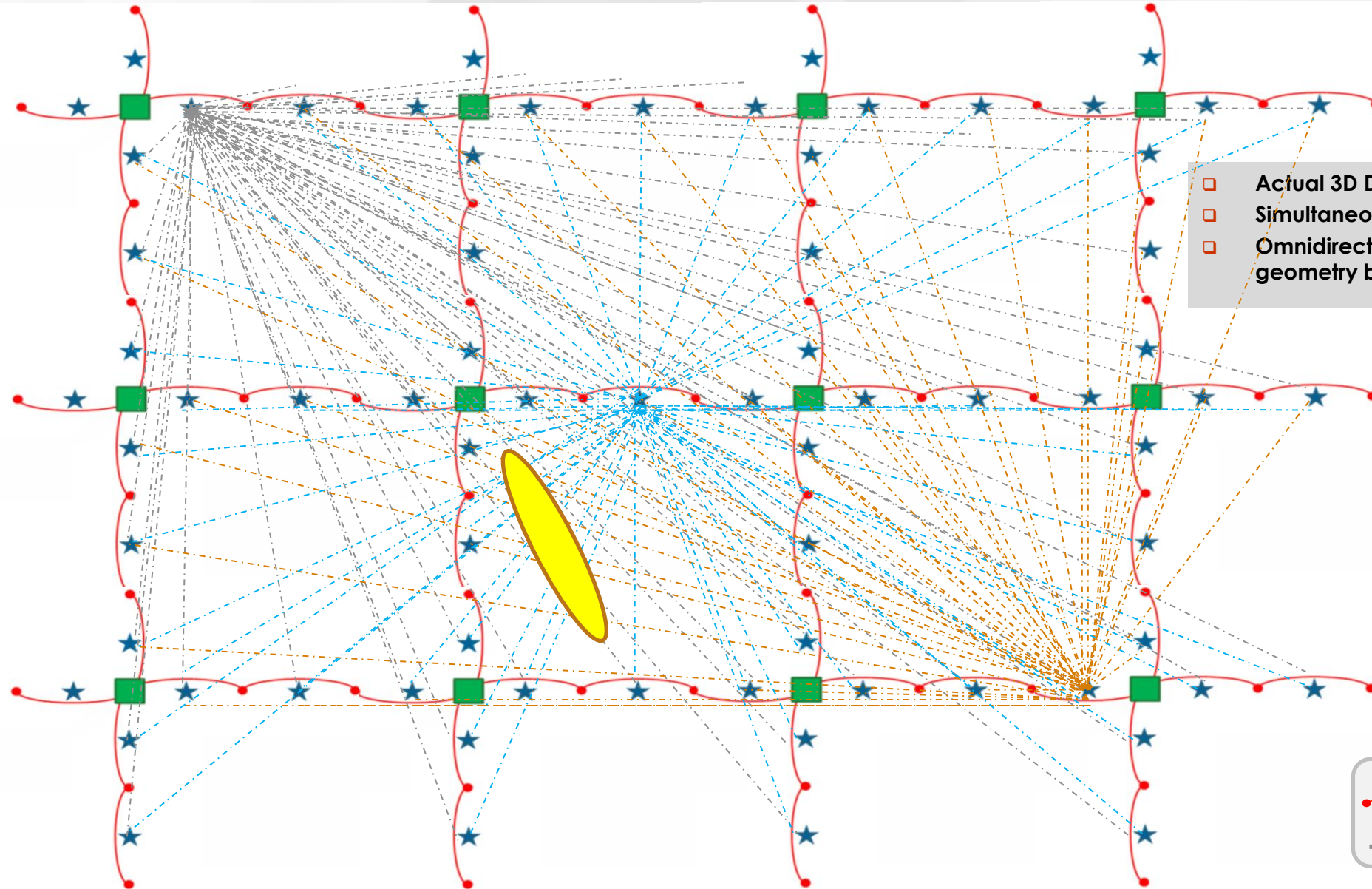
★ Transmit locations

— Measured dipole



ORION 3D

# 3D Acquisition - Imaging all directions

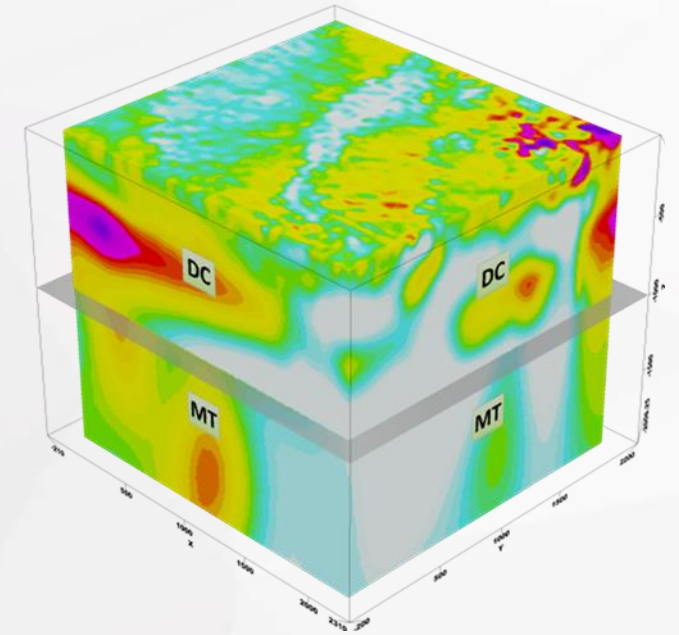
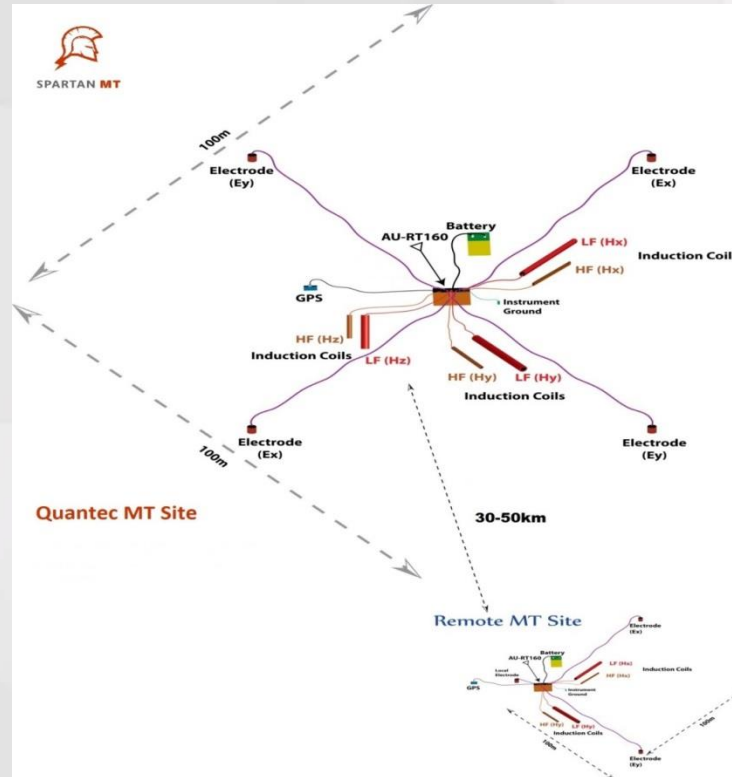


- Actual 3D DCIP measurement
- Simultaneous receiver sampling
- Omnidirectional data free from receiver geometry bias

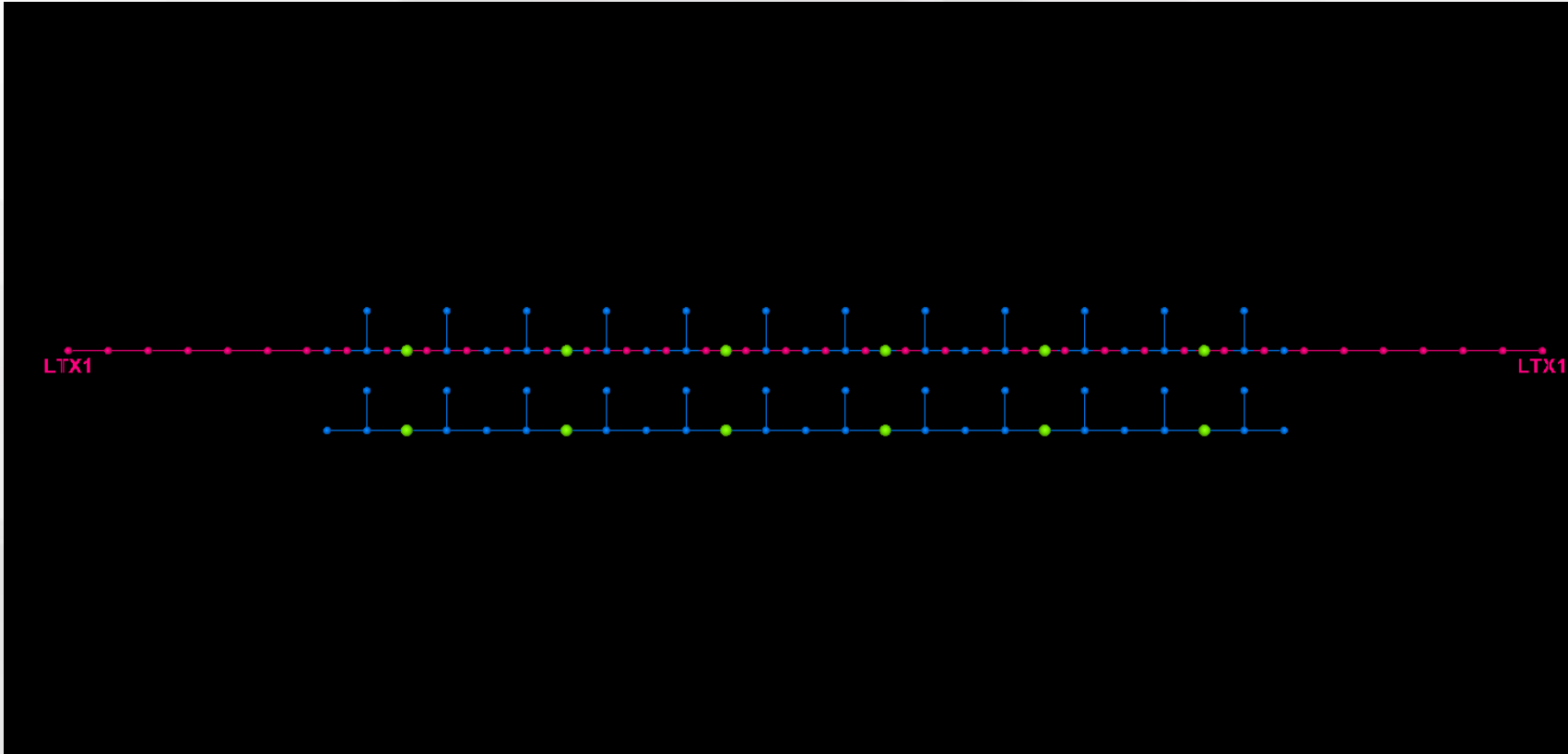
- Current Injection Dipole
- Data Recorder/Receiver
- "Conceptual" current path

# Multi parameter (MT and DCIP capability)

1. QRT 160 can measure Full frequency MT signals
2. RT 130 – low frequency
3. Unique deployments



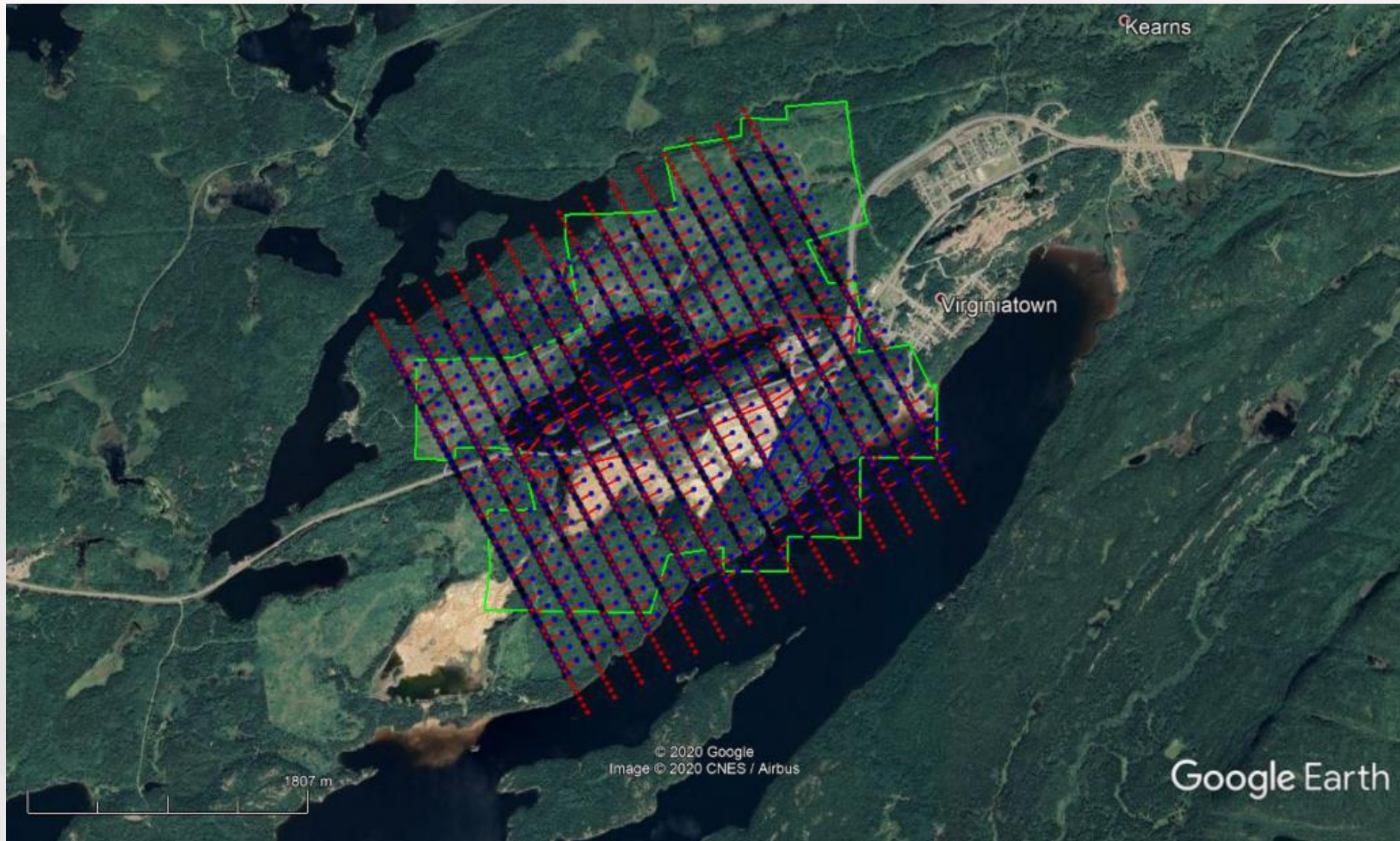
# 2 line SWATH



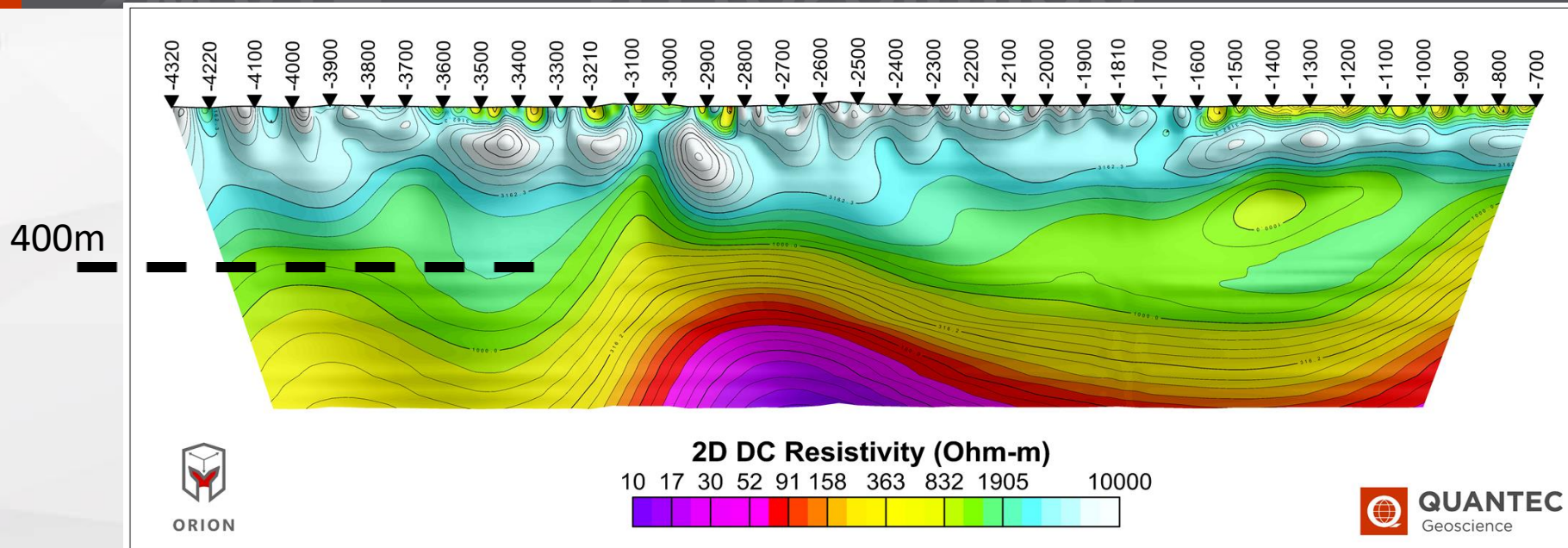
- ❑ Perpendicular dipoles – key for collecting 3D information



# Deployment

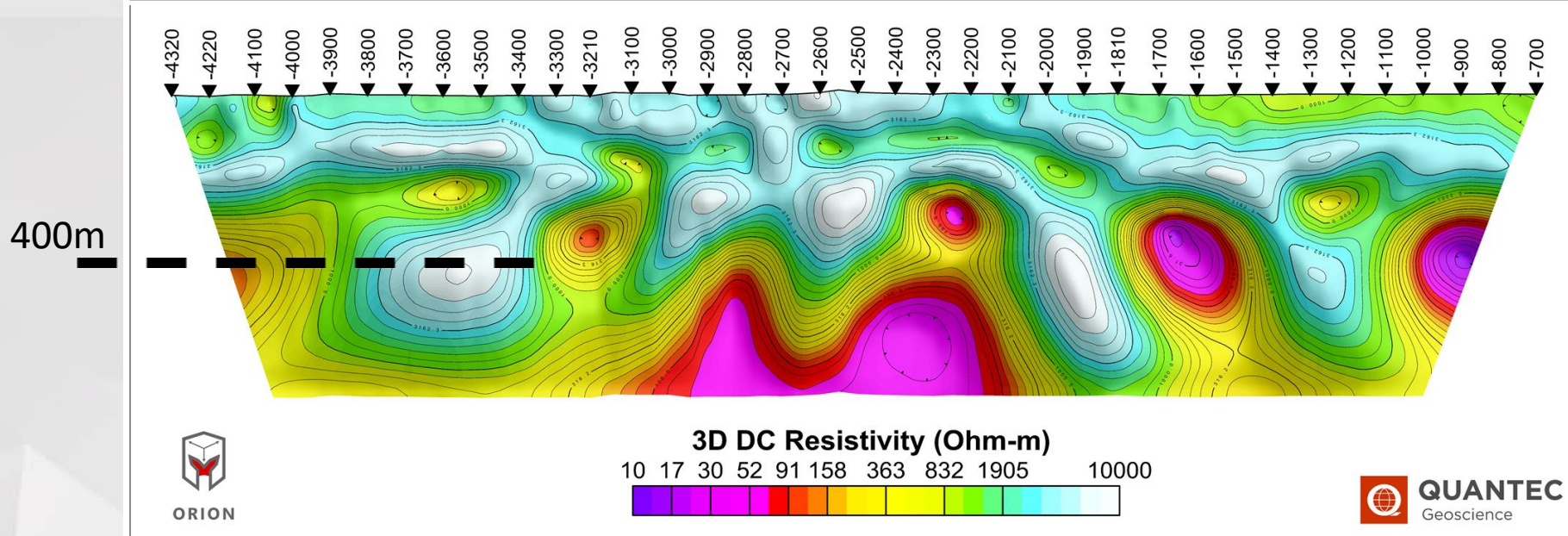


# SWATH 3D resolution



## 2D

Resistivity data acquisition from 1 2D line



## Swath 3D

Resistivity data acquisition from several lines with cross dipoles contribute to an enhanced 3D depiction of the subsurface with more detail



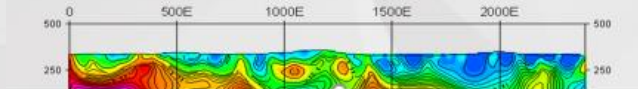
ORION 3D

# Value Proposition - Drill Planning – Increase effectiveness

## 4sq km package imaged from surface to depth

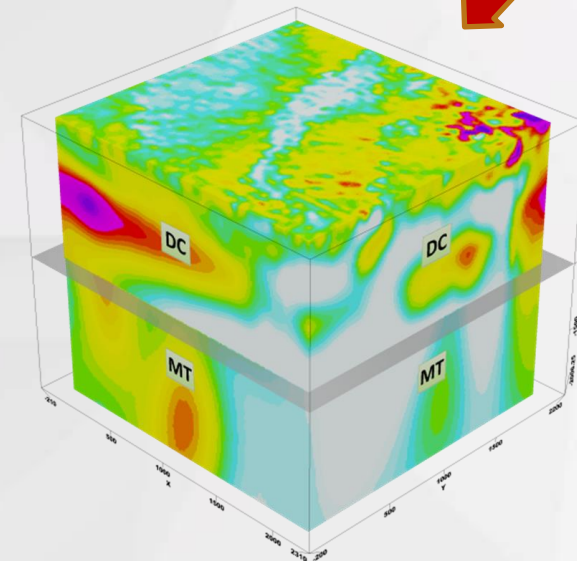
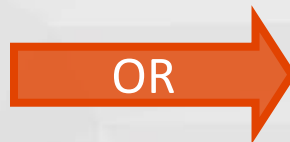
### Traditional approach

- ☐ Geology
- ☐ Geochemistry
- ☐ Drilling
- ☐ Geophysics



### Image before drilling

- ☐ Geology
- ☐ Geochemistry
- ☐ **ORION 3D**
  - ☐ Structure (faults)
  - ☐ Mineralisation (delineation)
  - ☐ Alteration
  - ☐ Condemnation
  - ☐ Discovery
- ☐ Drilling



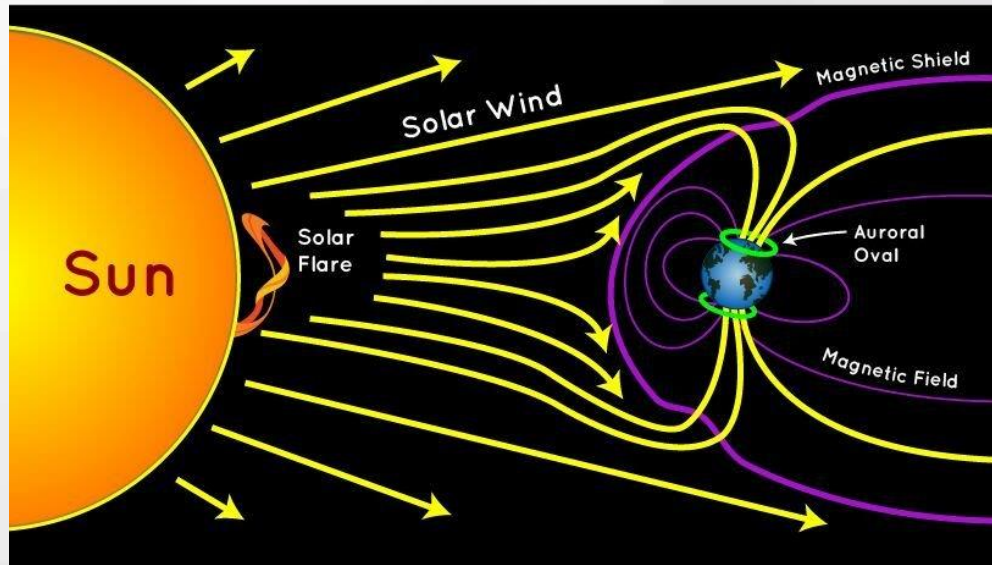


SPARTAN **MT**

# SPARTAN MT full tensor magnetotellurics



# MT natural source fields

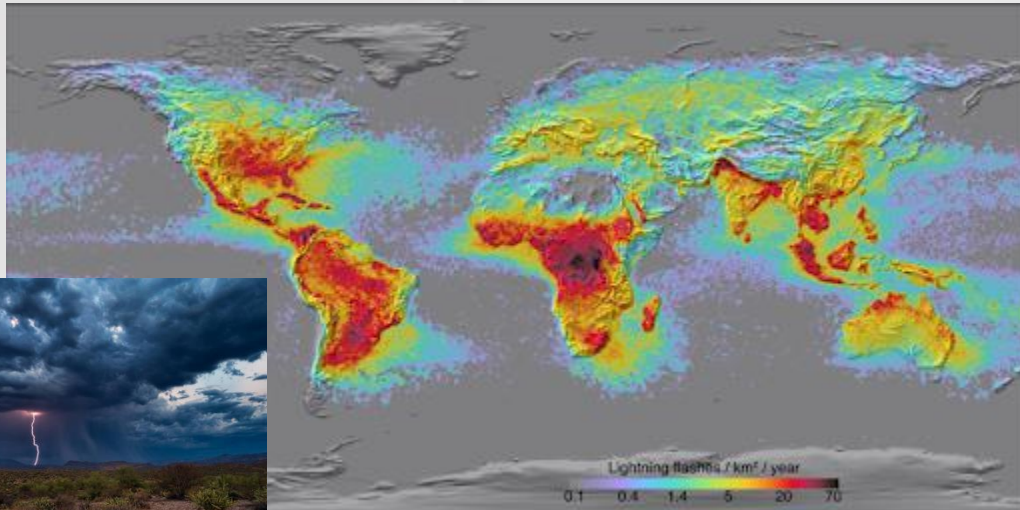


## Solar Wind

- ❑ Lower frequencies:
  - ❑  $f < 1 \text{ Hz}$
  - ❑ Interaction of the solar wind with the earth's magnetic field

## Global Thunderstorms

- ❑ Higher frequencies:
  - ❑  $f > 1 \text{ Hz}$
  - ❑ Lightning activity





# Unique resistivity mapping for a variety of applications

• DATA

$$\begin{pmatrix} 0 & Z \\ -Z & 0 \end{pmatrix}$$

$\rho$

$$\begin{pmatrix} 0 & Z_{xy} \\ Z_{yx} & 0 \end{pmatrix}$$

$\rho_{xy}, \rho_{yx}$

$$\begin{pmatrix} Z_{xx} & Z_{xy} \\ Z_{yx} & Z_{yy} \end{pmatrix}$$

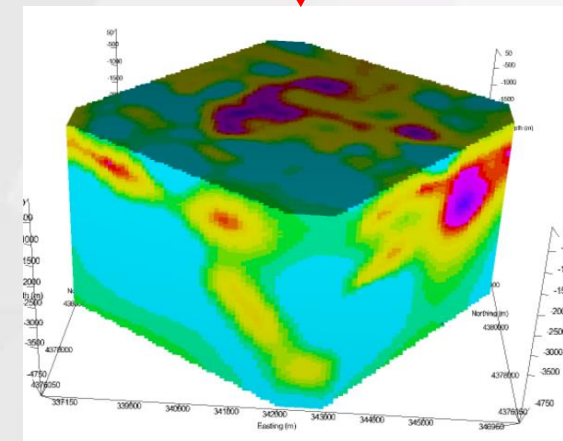
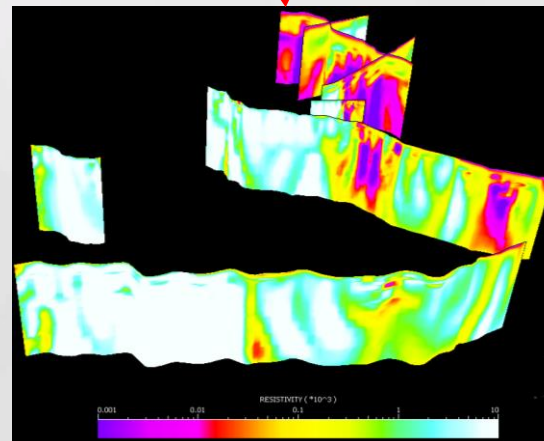
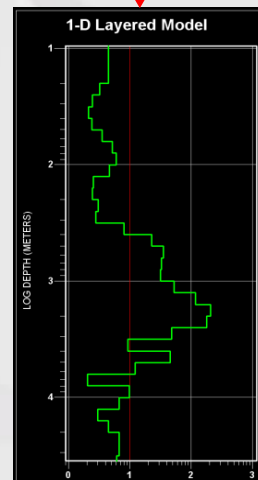
• INVERSION

1-D

2-D

3-D

• RESISTIVITY  
MODEL



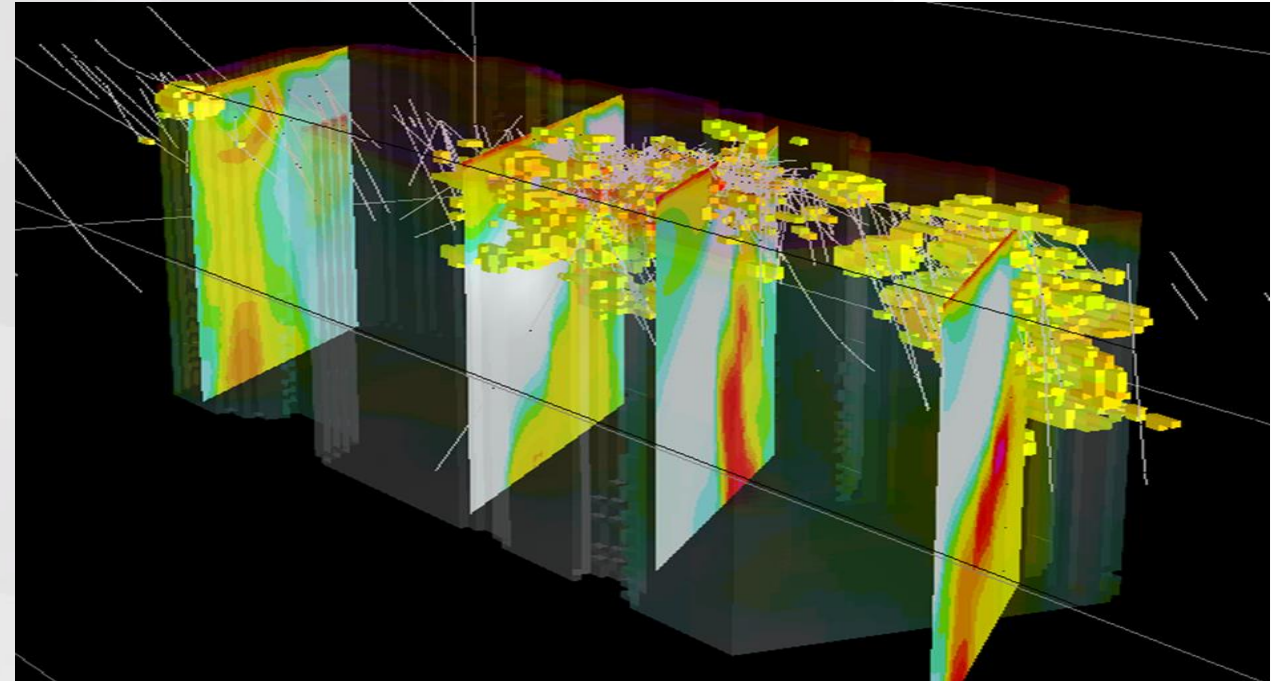
# MT applications - flexible resistivity mapping

## ❑ Mining & Exploration

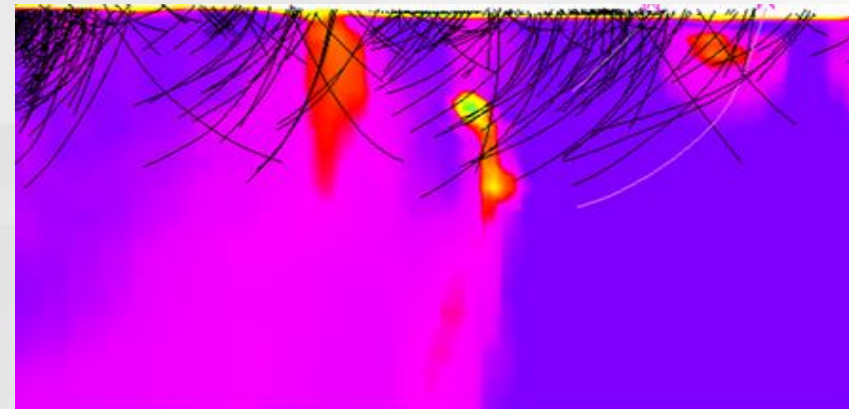
- ❑ Porphyry exploration
- ❑ Gold exploration
- ❑ Structural mapping - Faults/ shears
- ❑ Near-mine exploration
- ❑ Pre-Mine Risk evaluation
- ❑ Regional potential target evaluation
- ❑ Basin mapping (depth of cover)
- ❑ Crustal studies

## ❑ Oil & Gas

## ❑ Geothermal



Timmins Camp, Dester Porcupine fault



Louvicourt (constrained MT inversion)





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# Mine site Imaging

## Innovative Technology Solutions

- Exploration Drill Planning
- Risk Mitigation for mine planning

# Near Mine Exploration

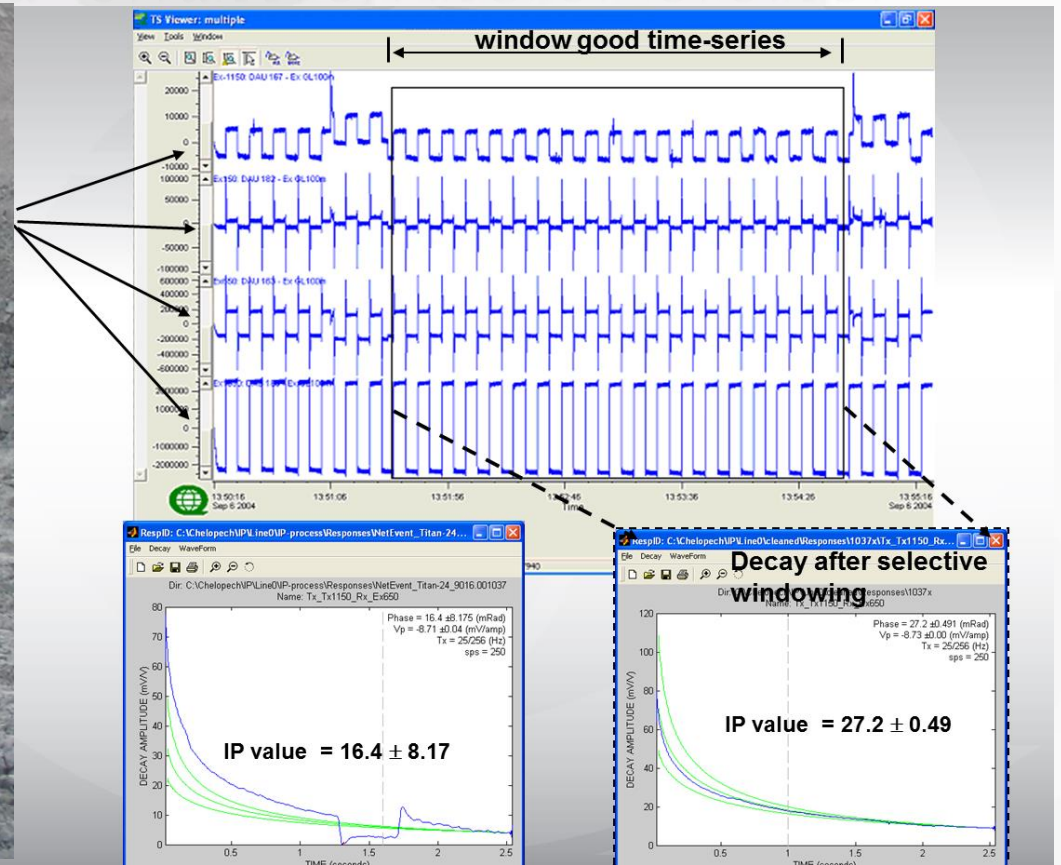
**The Shadow of the Headframe  
(or near the pit!)**

**Highly Prospective Land Holdings**

- At mine, near mine and away from mine, deep imaging technologies can accelerate your exploration efforts.



# High volume time series distributed data



- ❑ E.g. active mine deployment of temporary data receiver network - (4-10 hrs)
- ❑ Allows windowing: needed to minimize cultural noise to obtain accurate responses
- ❑ Small signal monitoring and noise rejection

# Experience at over 60 minesites

## Some of our mine site clients...

- ❑ Copper Mountain
- ❑ Tenke Fungurume
- ❑ Kidd Creek
- ❑ Tati Nickel
- ❑ Raglan
- ❑ Ren
- ❑ Red Lake Gold Mine
- ❑ Geikle
- ❑ Voisey's Bay
- ❑ Levack
- ❑ San Nicolas
- ❑ Black Fox Gold Mine
- ❑ Fortitude
- ❑ Chelopech
- ❑ Borroo
- ❑ Red Chris



ORION 3D

# Simply: Cost effective exploration

- ❑ More knowledge before drilling



- ❑ Improve drill planning



- ❑ More effective drilling

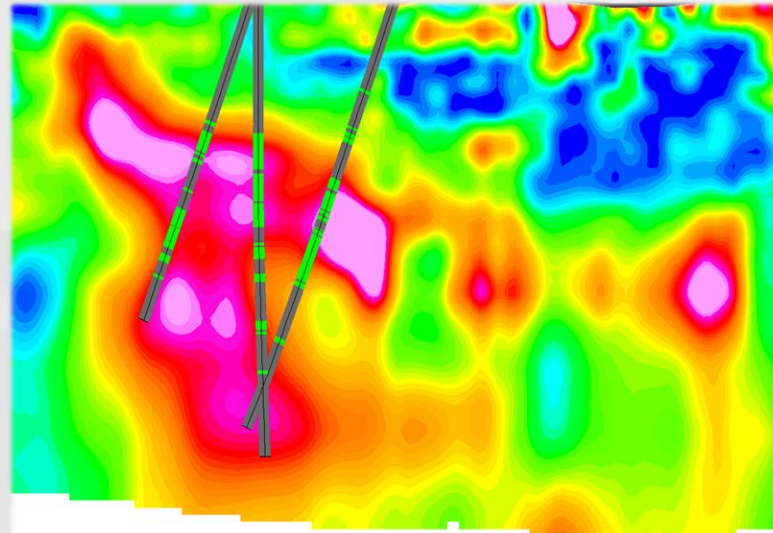


- ❑ **Save money**

- ❑ **Improve success rate**



- ❑ Increase overall likelihood of success... **Discovery**





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Geoscience

*Revealing the Earth's resources through performance, teamwork and technology*

**Safe Reliable Accurate**

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