WESTERN KIDD RESOURCES INC.
Loveland Project (CA00516T)
Timmins, Ontario. Canada

Re-Processing of
MT data using EVA rotation
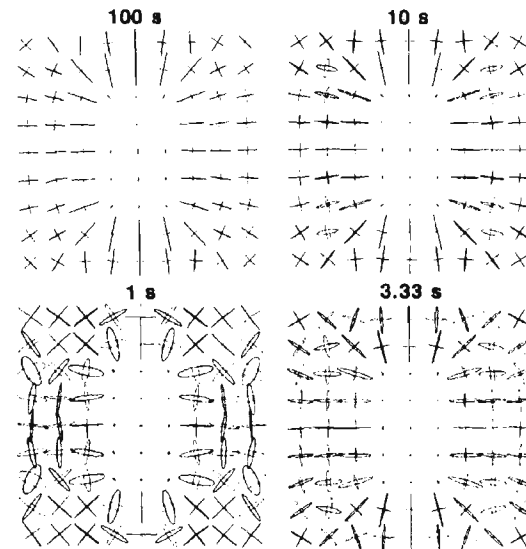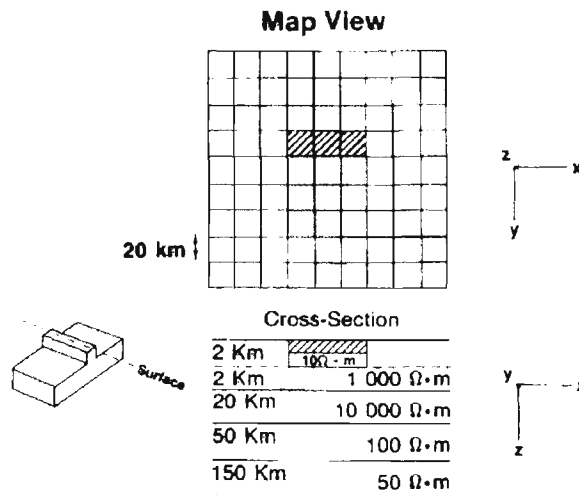
Karl Kwan and Robert Hearst, August 2008

EVA rotation

LaTorraca, G.A., Madden, T.R. and Korringa, J. (1986), An analysis of the magnetotelluric impedance for three-dimensional conductivity structures, Geophysics, vol.51, no.9, p.1819-1829.

MT Rotation (LaTorraca) Explained

3D MT model – a conductive block embedded in layered earth. (LaTorraca, 1986, p.1823)

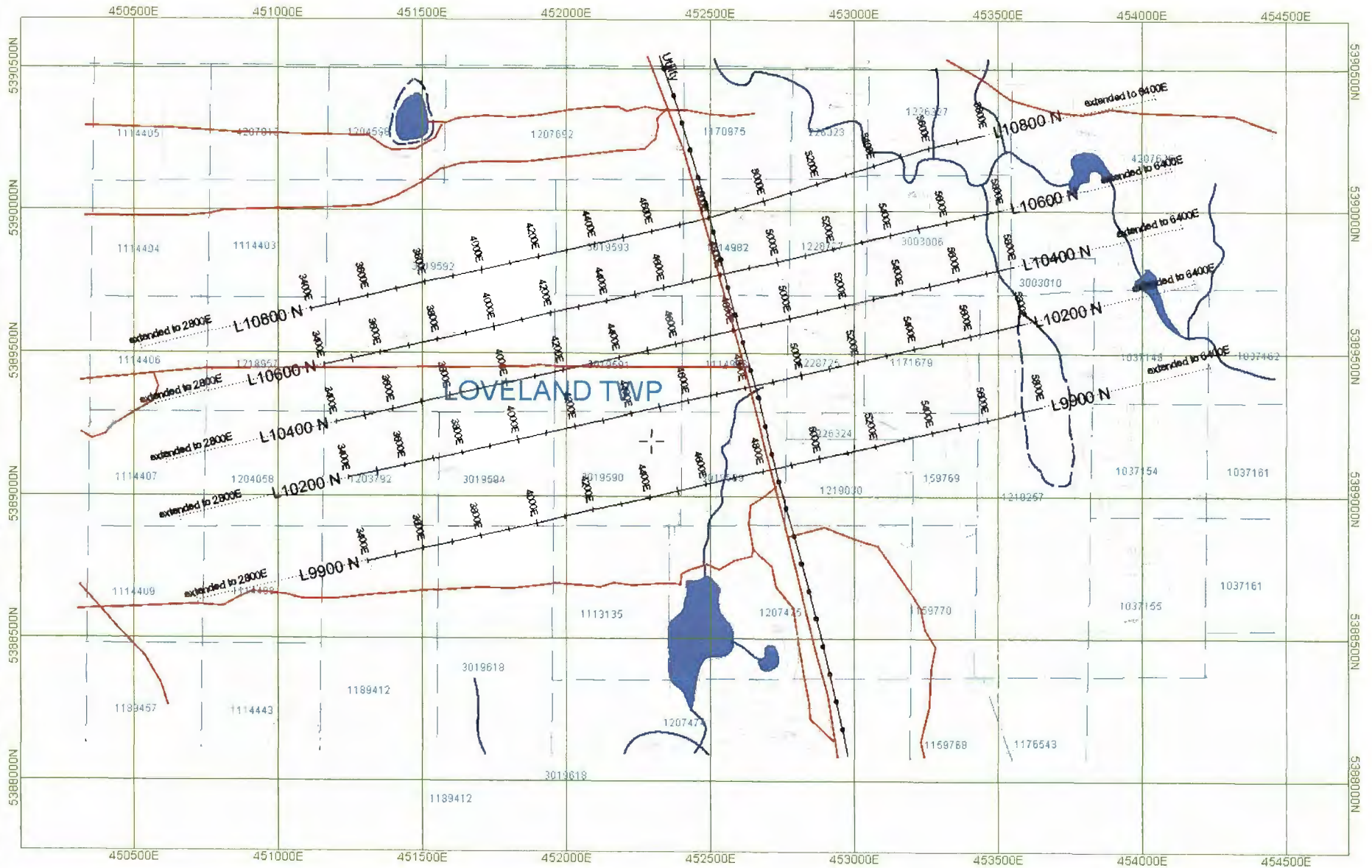E1 (TE),E2(TM) vectors. (LaTorraca, 1986, p.1825)

In 2D world:
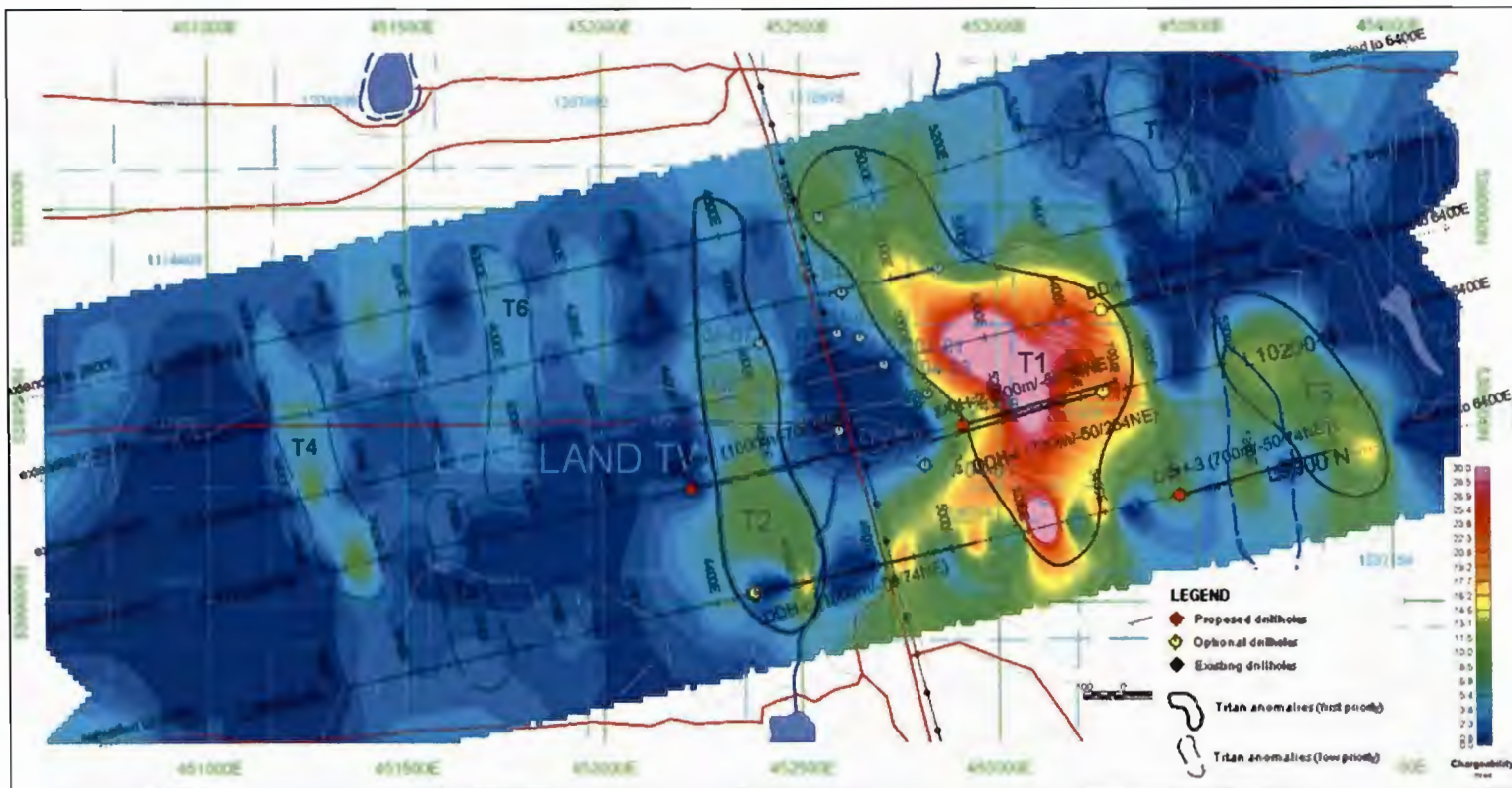**Un-rotated, TE's measured in X (assumed strike direction);**
Rotated, TE's aligned with actual strike direction!
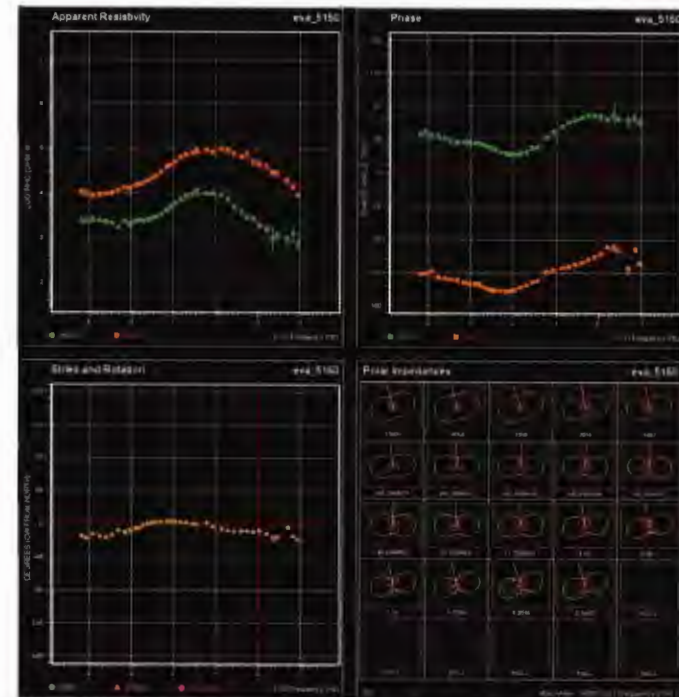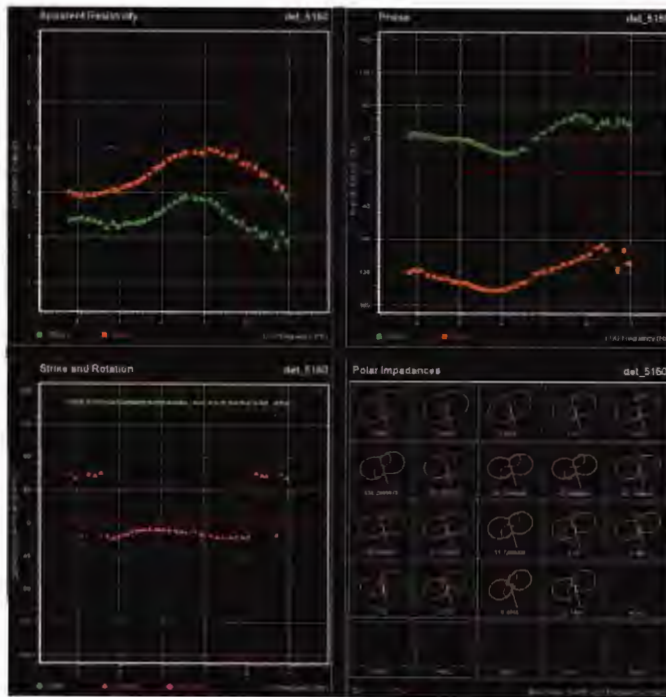
Loveland Project – Line Location Plan

Historic drilling locations in the survey area

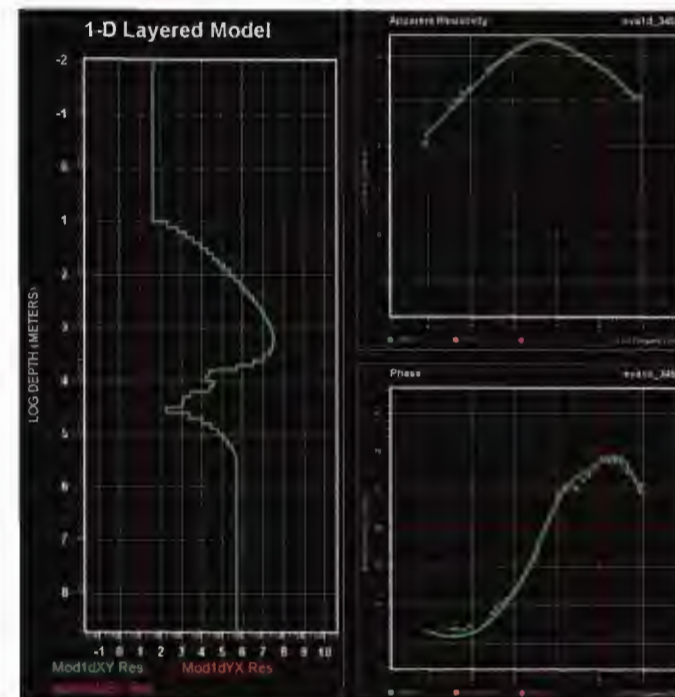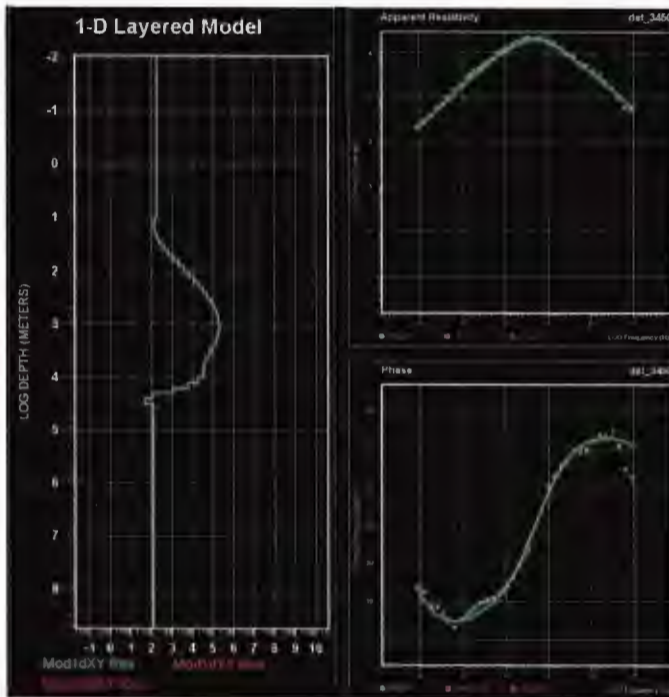Previous interpretations over 2D chargeability inversions at 100m depth

EVA Rotation

Copy det (XY swapped) to eva;
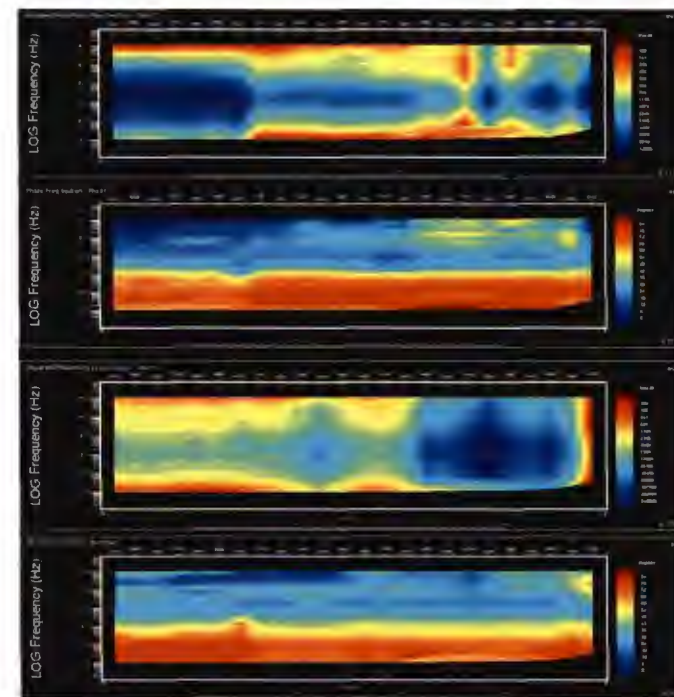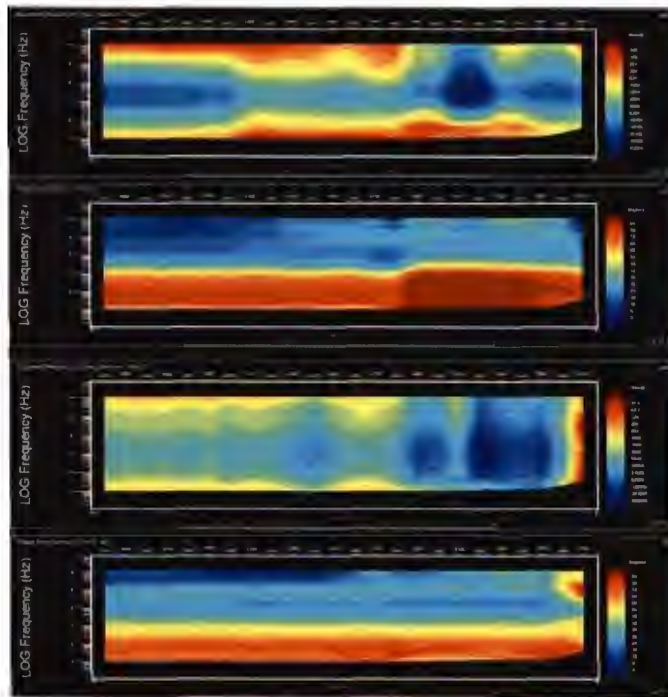Batch convert LaTorraca;
QC EVA results;

MT plots, site 5150, L9900N, before and after EVA rotation.

Occam 1D Model (XY) for Site 3450, L10200N: previous (left/no EVA), current (right/EVA)
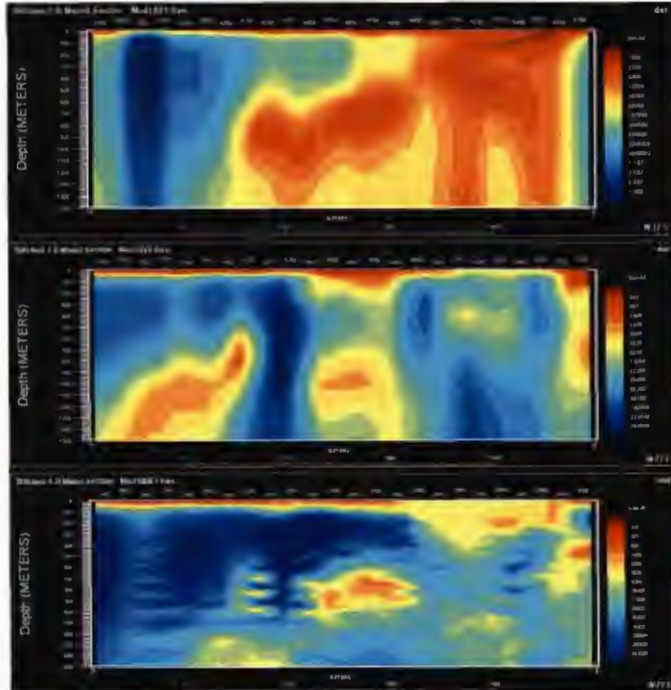
Pseudo-sections, Un-rotated (left) and Rotated (right)
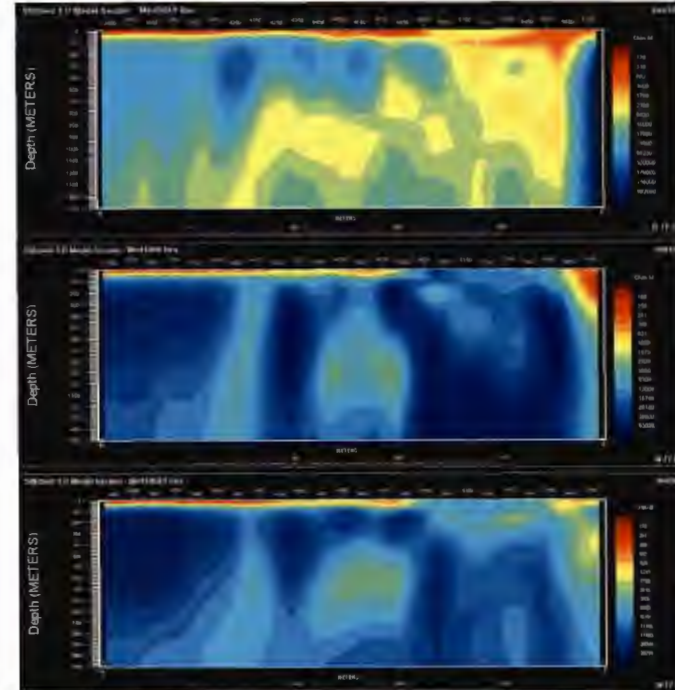(Top to Bottom: XY (rho/phs) and YX (rho/phs)
L10200N

Stitched Occam 1D Sections – L9900N
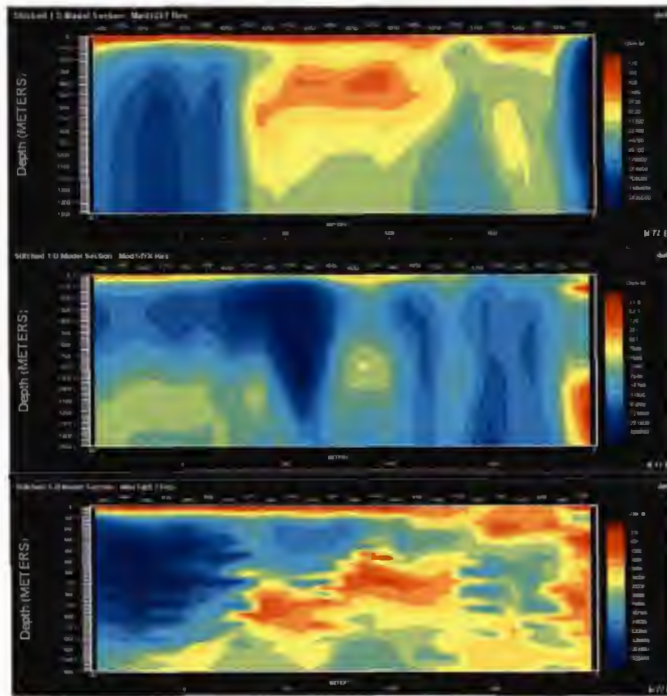
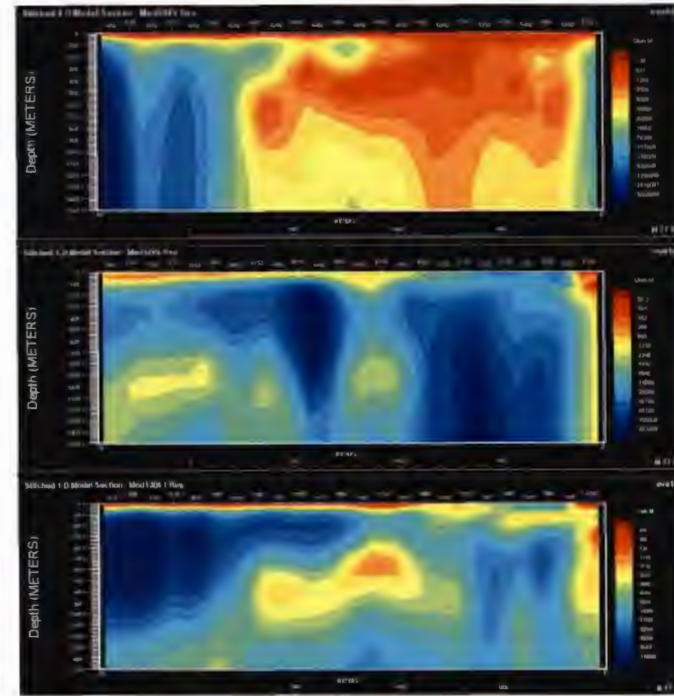**Un-rotated (XY, YX and Determinant)**　　　**Rotated (XY, YX and Determinant)**

Stitched Occam 1D Sections – L10200N

Un-rotated (XY, YX and Determinant)   **Rotated (XY, YX and Determinant)**

Stitched Occam 1D Sections – L10400N

Un-rotated (XY, YX and Determinant)   **Rotated (XY, YX and Determinant)**

Stitched Occam 1D Sections – L10600N
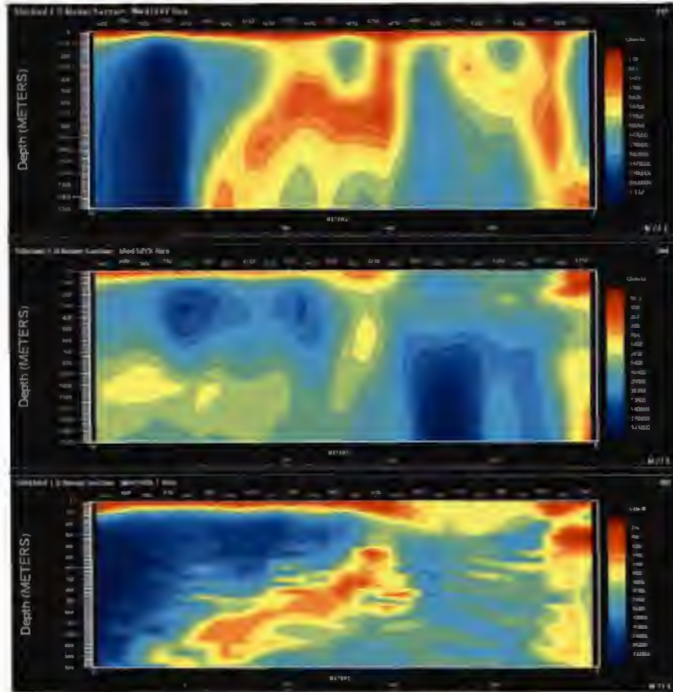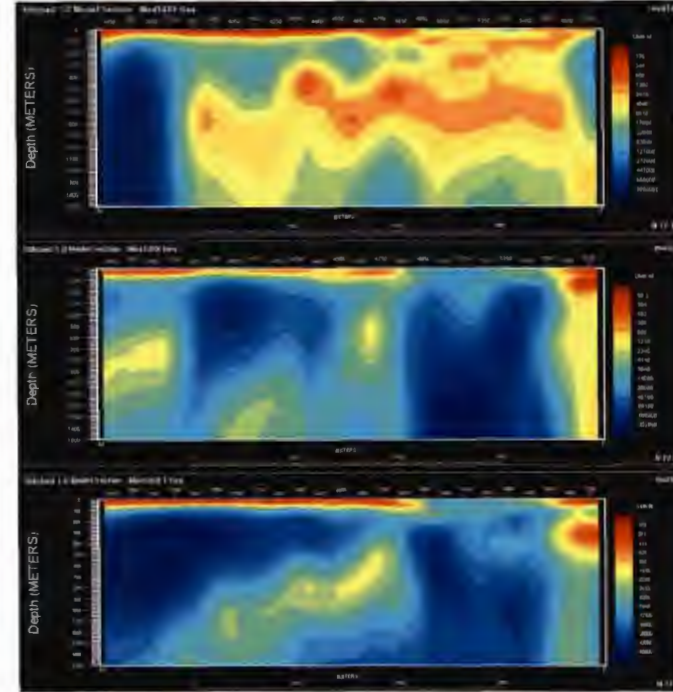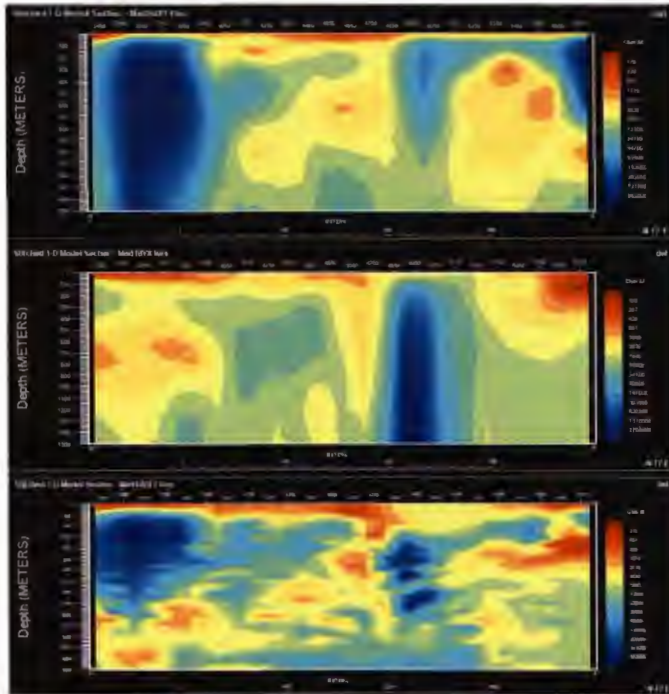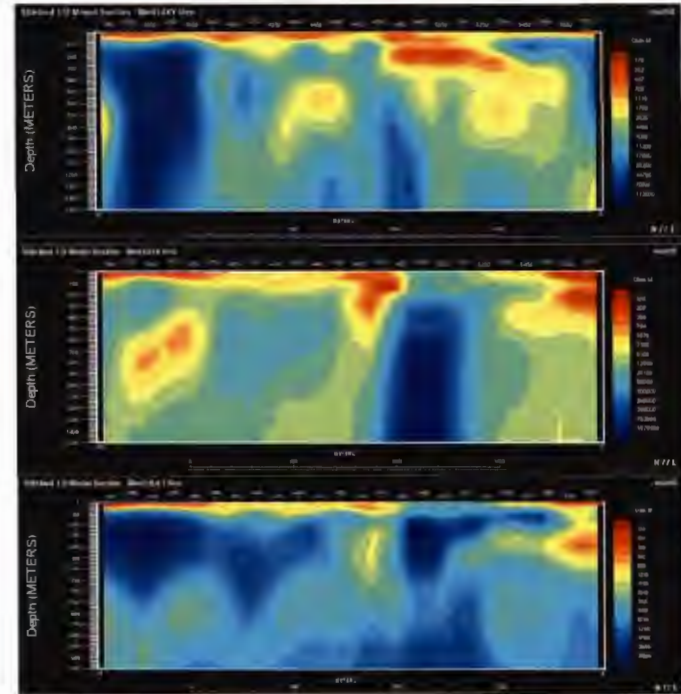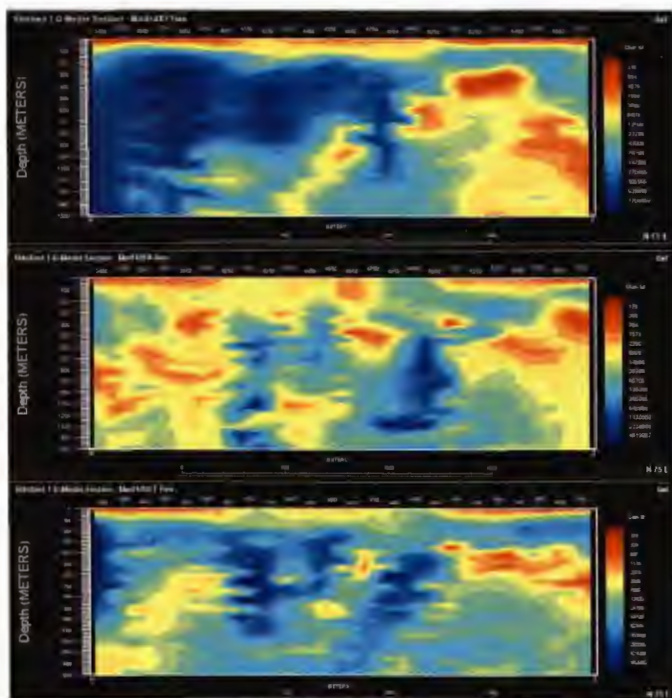
Un-rotated (XY, YX and Determinant)   **Rotated (XY, YX and Determinant)**
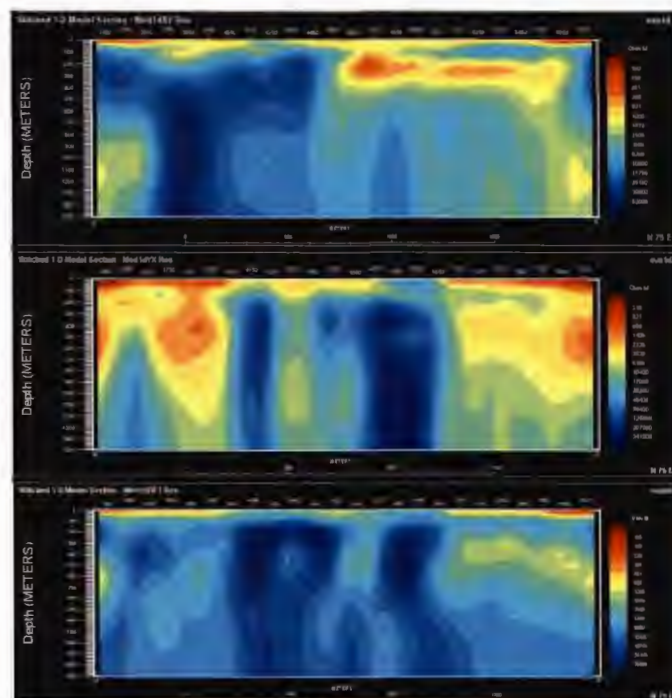
Stitched Occam 1D Sections – L10800N

Un-rotated (XY, YX and Determinant)   **Rotated (XY, YX and Determinant)**

General 2D Inversion Parameters

Data
> EVA rotation and Occam applied;

Frequencies
> Every second frequency from 10,000 Hz to 0.1 Hz;

Stitched 1D
> X, Y smoothness = 0.02;
> Stitching factor = 0.8;

Half-space
> 2,500 Ω-m resistivity

RLM
> max. iteration=50, rms=1% and Tau=3;

PW
> max. iterations=50 and default settings;

2D Inversions (RLM)

Different data set

   TM –rho/phs– & TE –rho/phs–

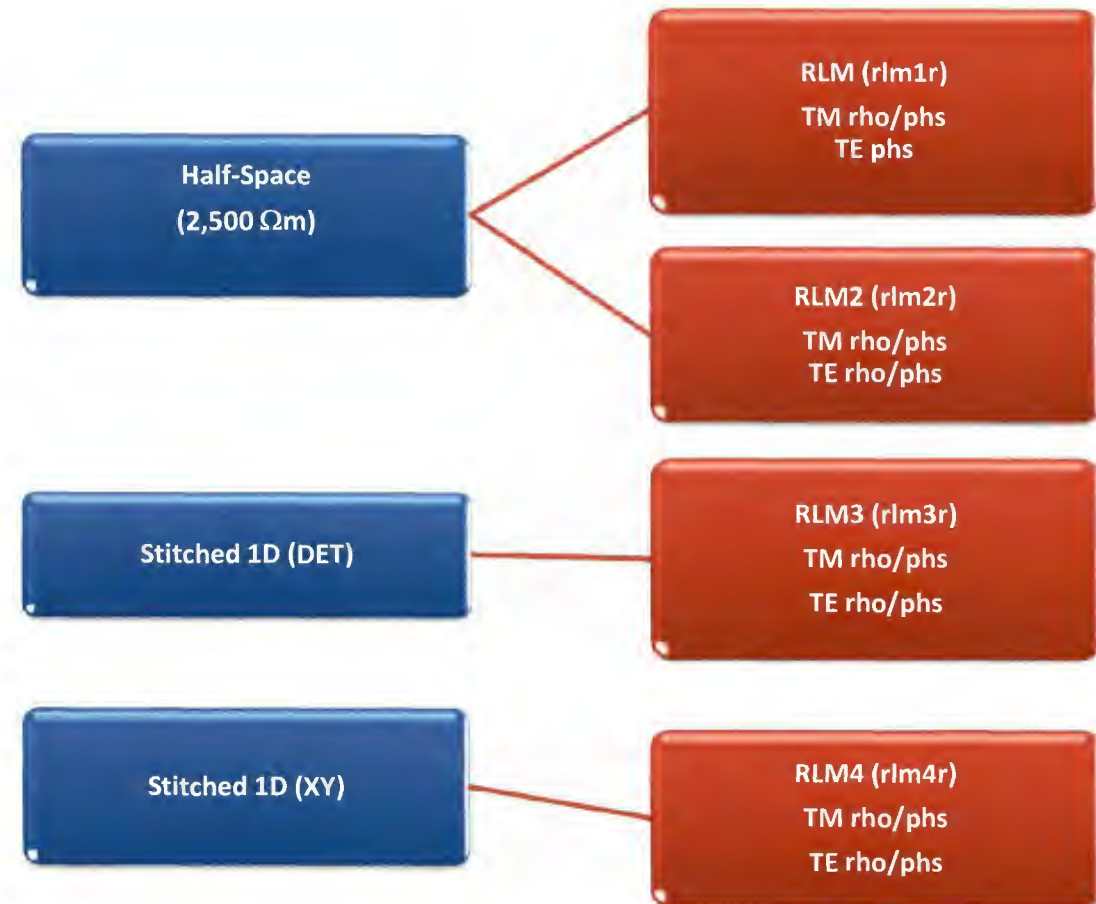   TM –rho/phs– & TE –phs–

Starting model

   Half Space or Stitched 1D

RLM code

   Rlm2dim

RLM:
Rodi, W., and Mackie, R. L. (2001). Nonlinear conjugate gradients algorithm for 2D magnetotelluric inversions: Geophysics 66,174–187.

Half-Space (2,500 Ωm)

- **RLM (rlm1r)** — TM rho/phs, TE phs
- **RLM2 (rlm2r)** — TM rho/phs, TE rho/phs

Stitched 1D (DET)

- **RLM3 (rlm3r)** — TM rho/phs, TE rho/phs

Stitched 1D (XY)

- **RLM4 (rlm4r)** — TM rho/phs, TE rho/phs

2D Inversions (PW)

Different data set

    TM –rho/phs– & TE –rho/phs–

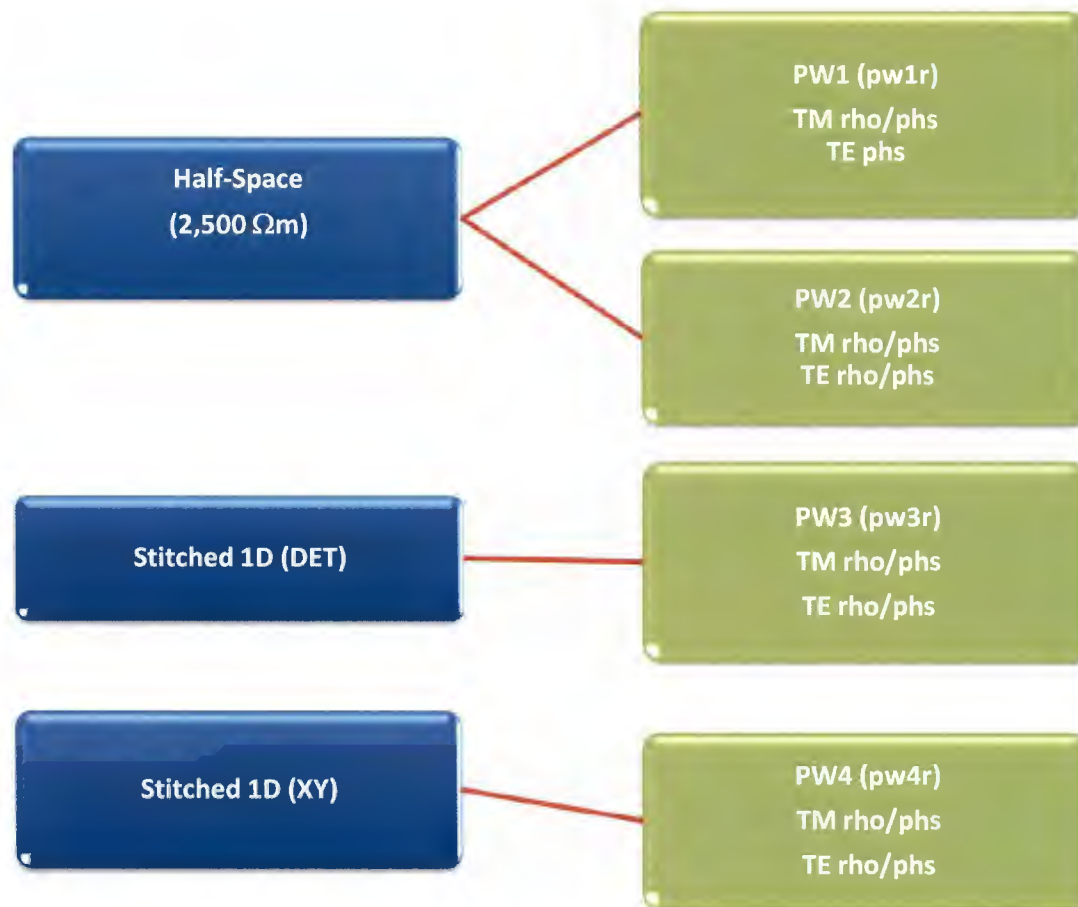   TM –rho/phs– & TE –phs–

Starting model

    Half Space or Stitched 1D
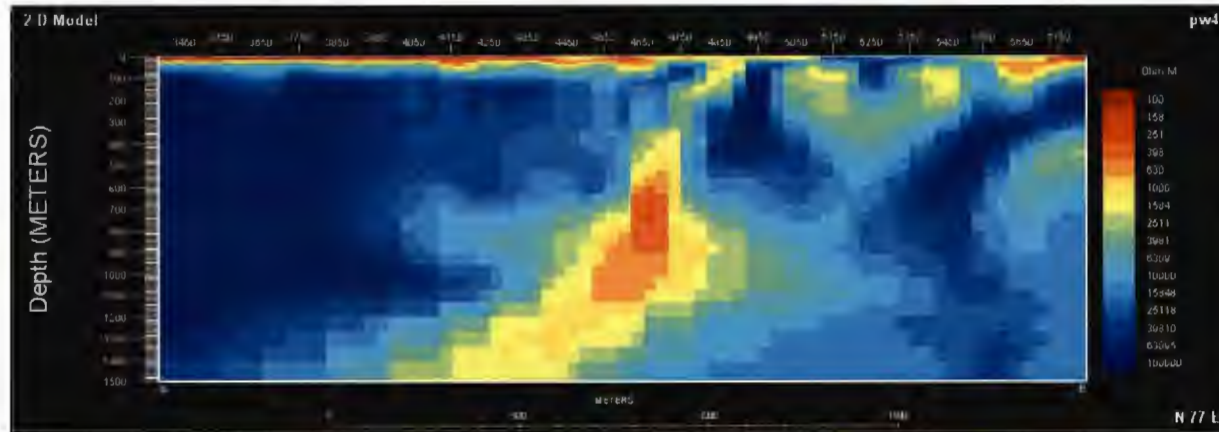
PW code

    pw2diam (sharp)

PW:
de Lugao, P. P., and Wannamaker, P. E. (1996).
Calculating the two-dimensional magnetotelluric
Jacobian in finite elements using reciprocity:
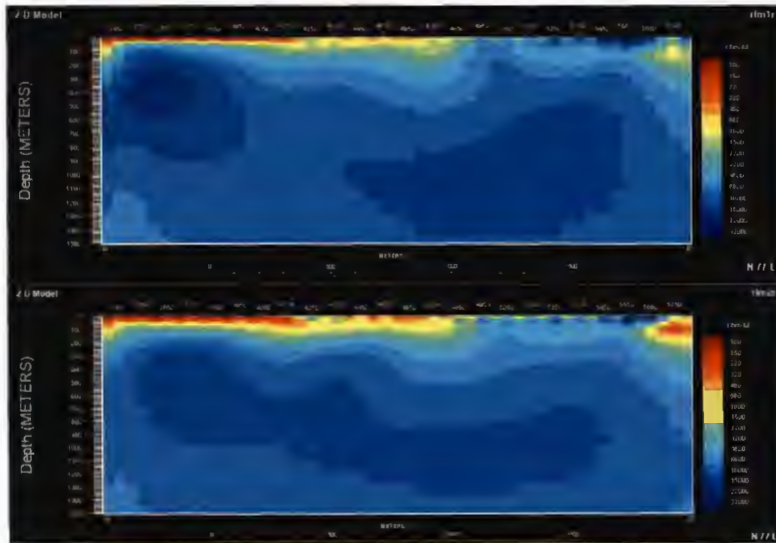*Geophysical Journal International, 127, 806-810.*

Half-Space (2,500 Ωm)

PW1 (pw1r)
TM rho/phs
TE phs

PW2 (pw2r)
TM rho/phs
TE rho/phs

Stitched 1D (DET)

PW3 (pw3r)
TM rho/phs
TE rho/phs

Stitched 1D (XY)

PW4 (pw4r)
TM rho/phs
TE rho/phs

PW4 (un-rotated) – L9900N
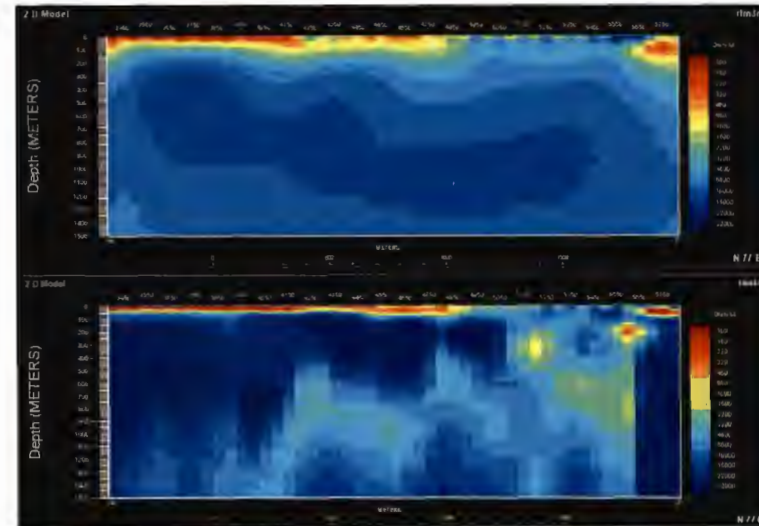## Stitched 1D -> RLM ->PW

RLM Inversions – L9900N

Starting from half-space (2500 Ωm)
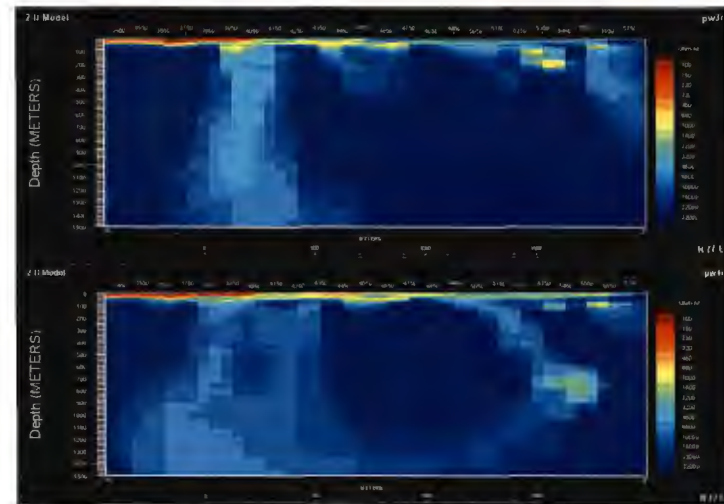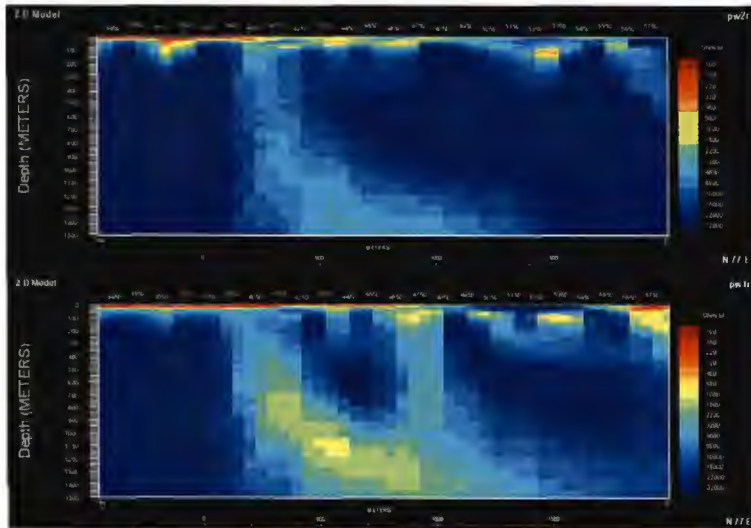Top: TM+TE phase
Bottom: TM+TE

Starting from stitched 1D
Top: DET and TM+TE
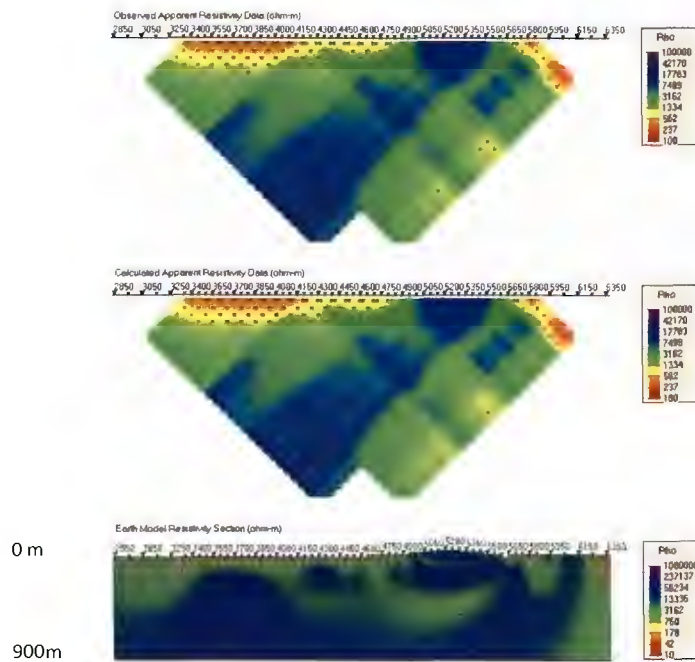Bottom: XY and TM+TE

PW 2D Inversions – L9900N

Starting from Half-space;
top: TM+TE phs;
bottom: TM+TE;

Starting from Stitched 1D;
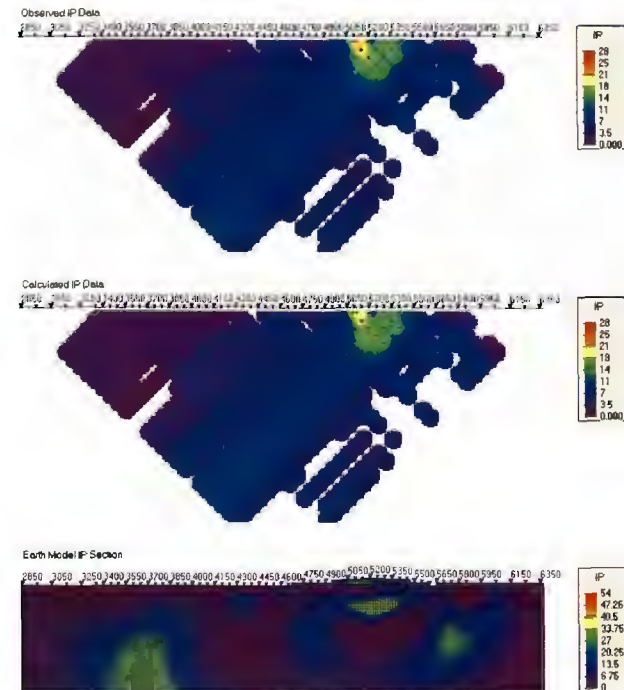top: DET TM+TE;
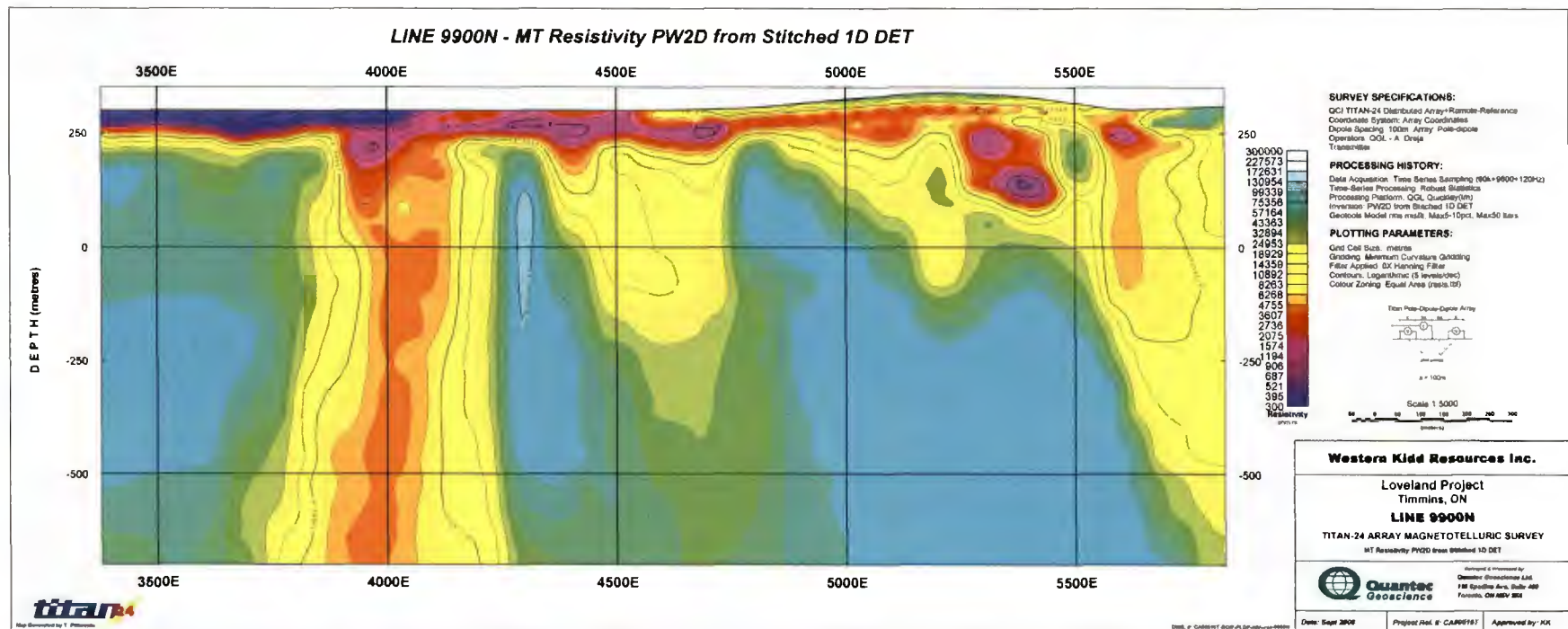bottom: XY TM+TE;

DCIP2D Inversions – L9900N
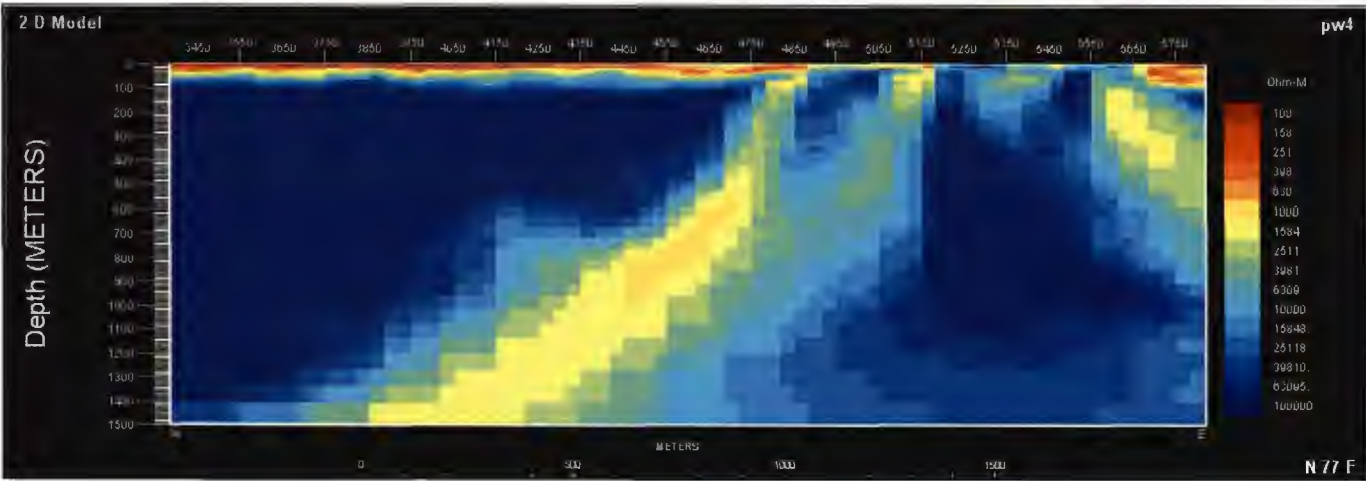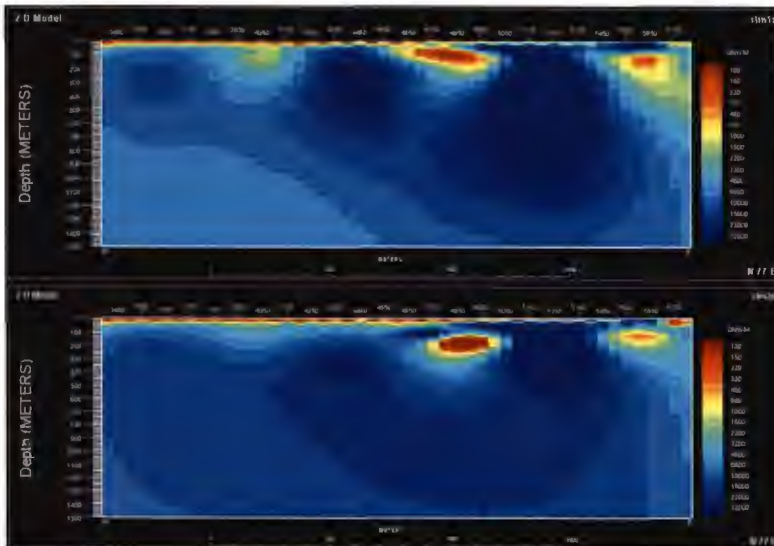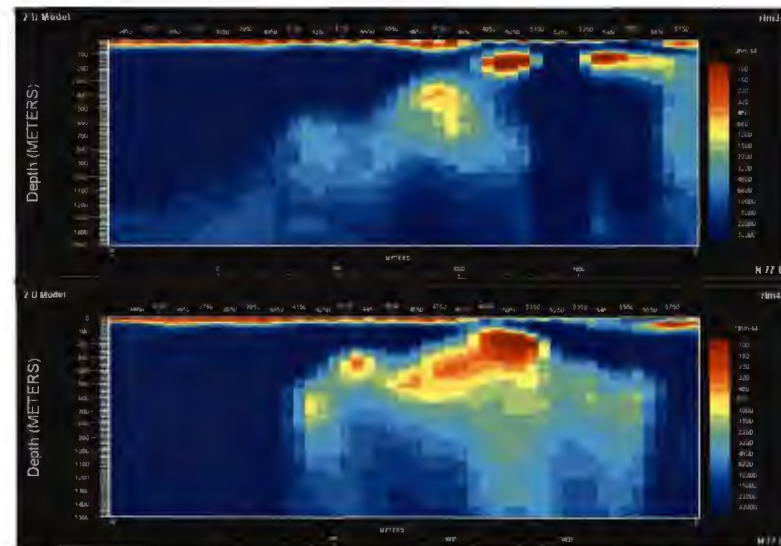
Resistivity

IP (using DC2D conductivity)

Geosoft Section – L9900N (PW2D – stitched 1D DET)

LINE 9900N - MT Resistivity PW2D from Stitched 1D DET

Geosoft Section – L9900N (PW2D – stitched 1D XY)

LINE 9900N - MT Resistivity PW2D from Stitched 1D XY

PW4 (un-rotated) – L10200N
Stitched 1D -> RLM ->PW

RLM Inversions – L10200N

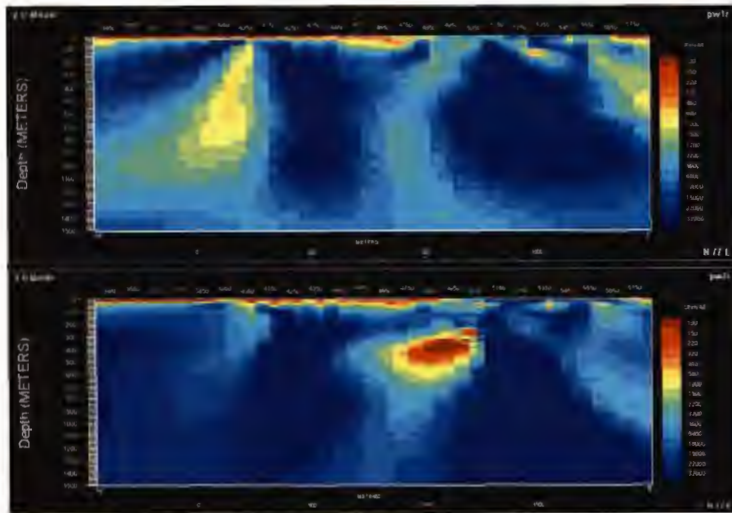Starting from half-space (2500 Ωm)
Top: TM+TE phase
Bottom: TM+TE

Starting from stitched 1D
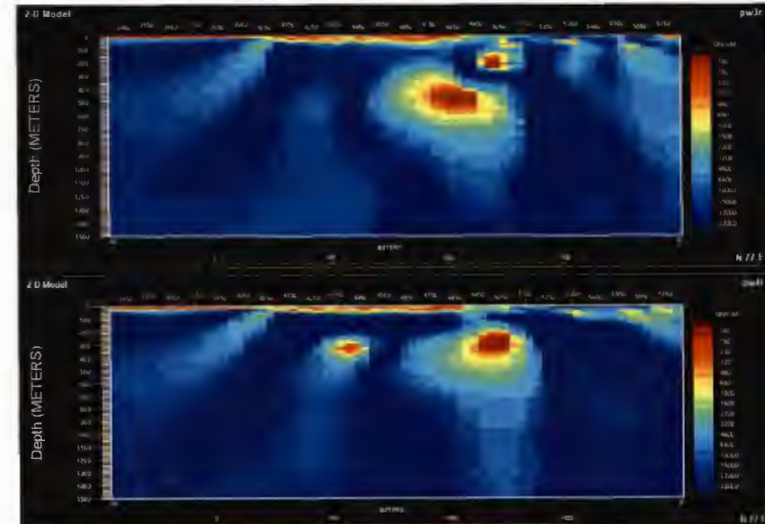Top: DET and TM+TE
Bottom: XY and TM+TE

PW Inversions – L10200N

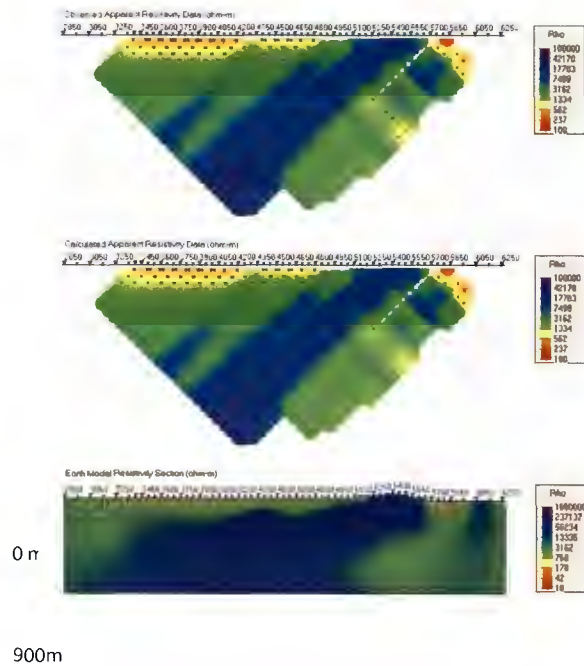Starting from half-space (2500 Ωm)
Top: TM+TE phase
Bottom: TM+TE

Starting from:
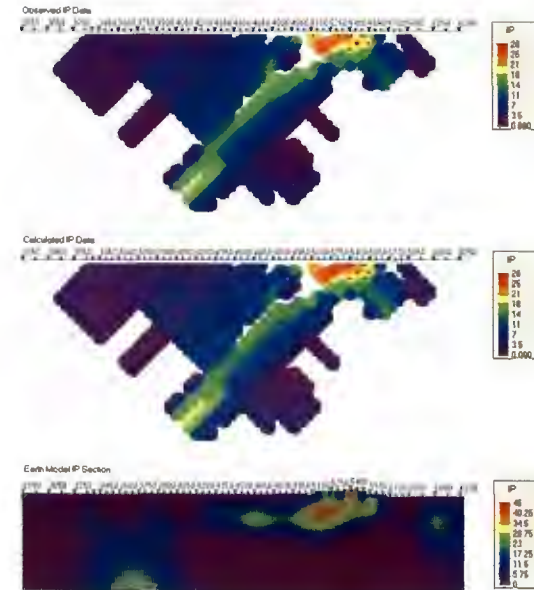Top: Stitched 1D DET and TM+TE
Bottom: Stitched 1D XY and TM+TE
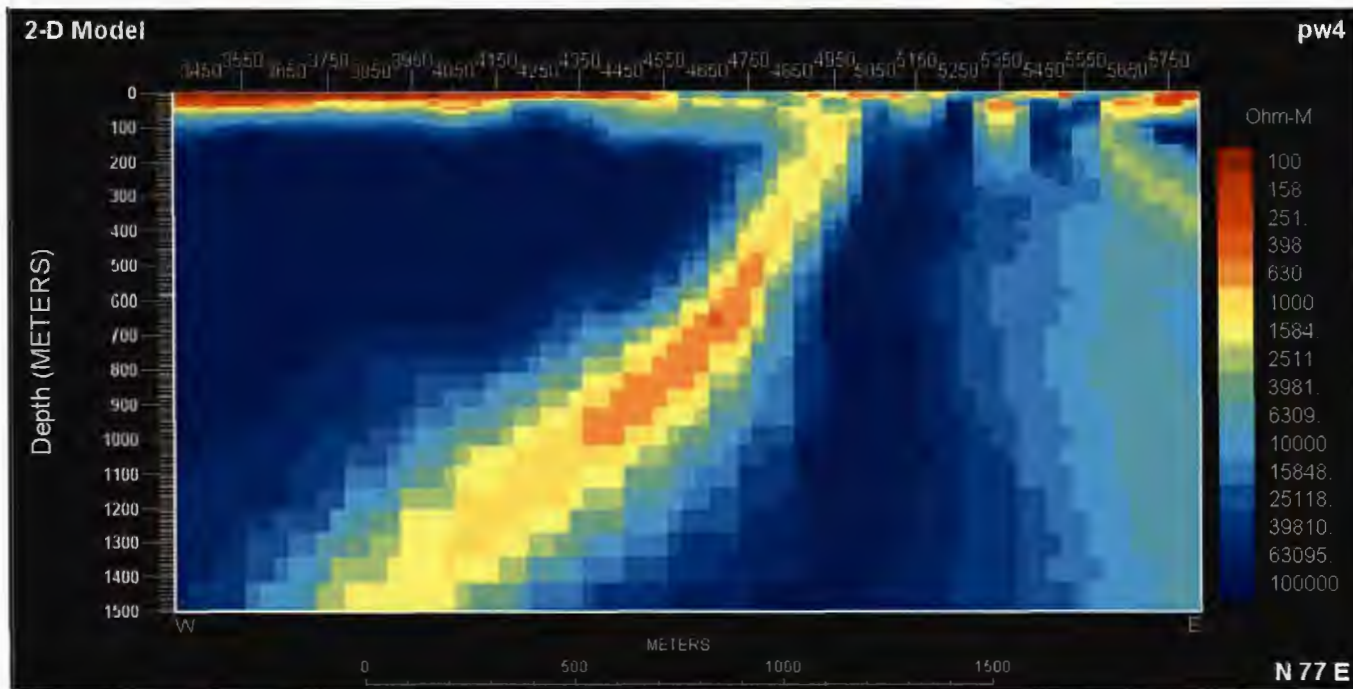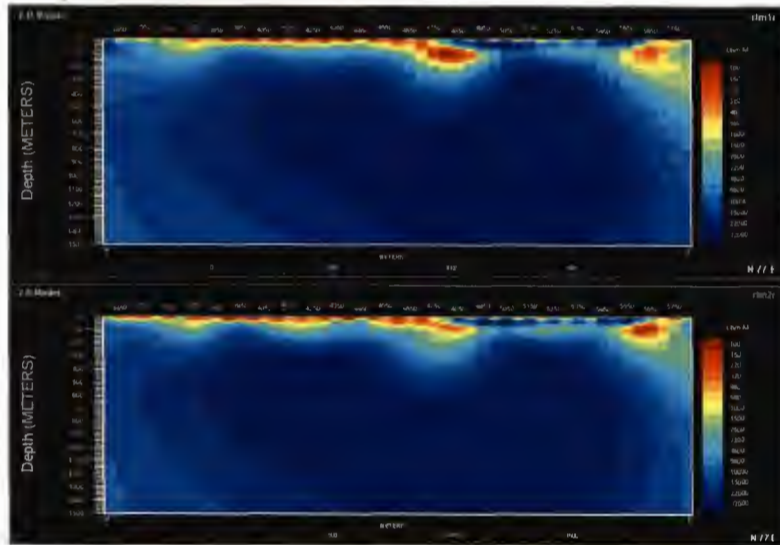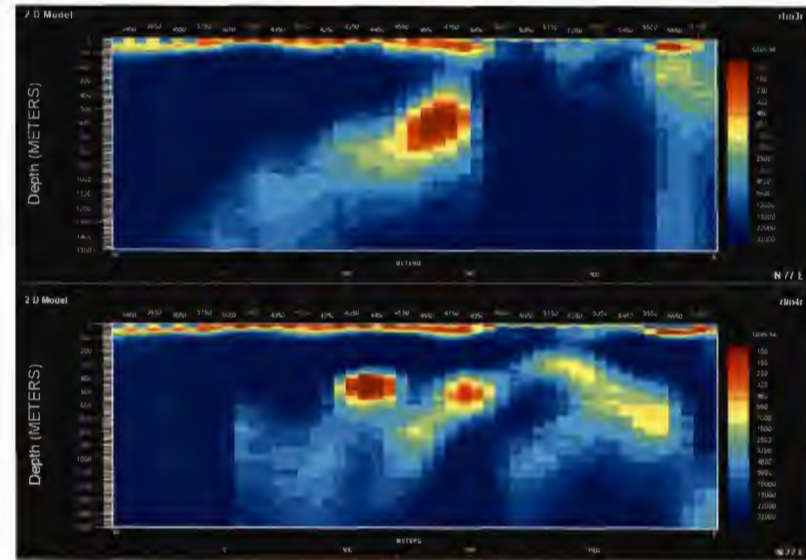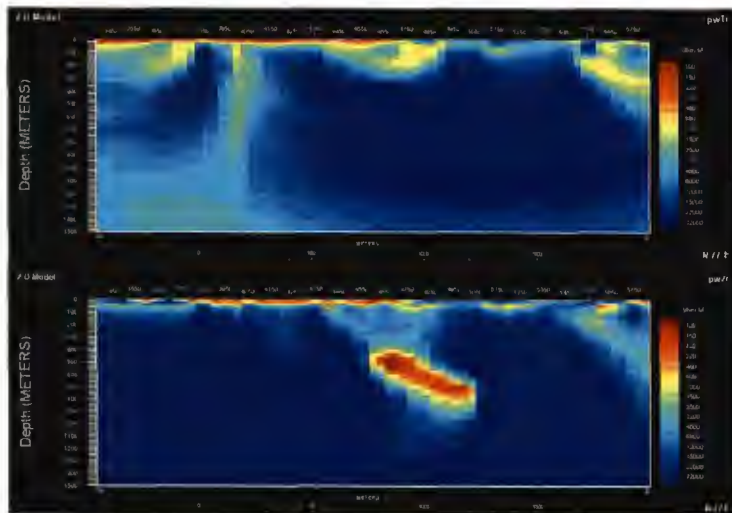
DCIP2D Inversions – L10200N

Resistivity   **IP (using DC2D conductivity)**

Geosoft Section – L10200N (PW2D – stitched 1D DET)

LINE 10200N - MT Resistivity PW2D from Stitched 1D DET

Geosoft Section – L10200N (PW2D – stitched 1D XY)

LINE 10200N - MT Resistivity PW2D from Stitched 1D XY

PW4 (un-rotated) – L10400N
Stitched 1D -> RLM ->PW

RLM Inversions – L10400N

Starting from half-space (2500 Ωm)
Top: TM+TE phase
Bottom: TM+TE

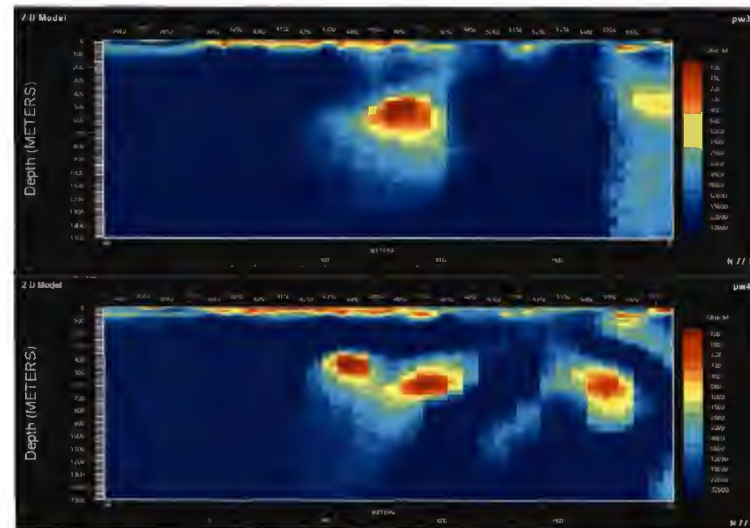Starting from stitched 1D
Top: DET and TM+TE
Bottom: XY and TM+TE

PW Inversions – L10400N

Starting from half-space (2500 Ωm)
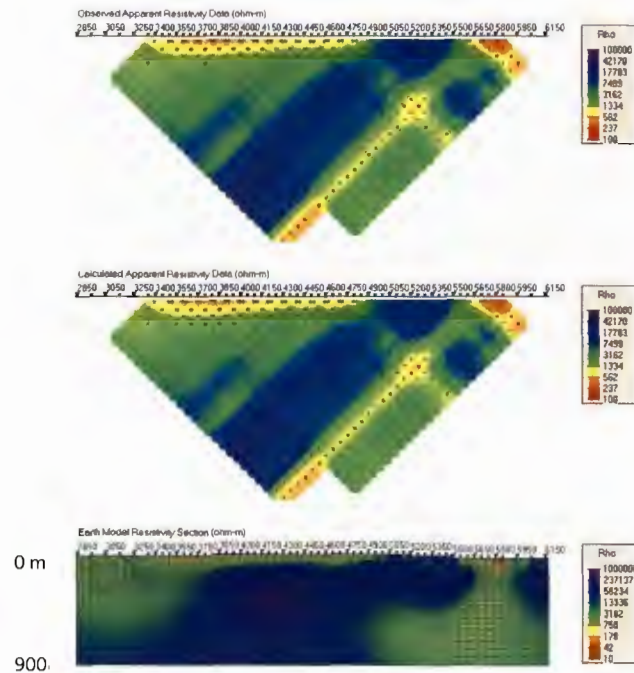Top: TM+TE phase
Bottom: TM+TE

Starting from:
Top: Stitched 1D DET and TM+TE
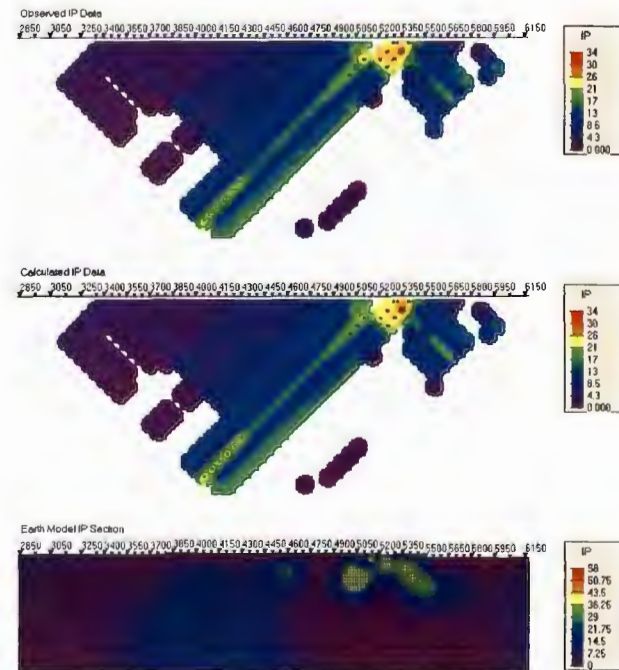Bottom: Stitched 1D XY and TM+TE
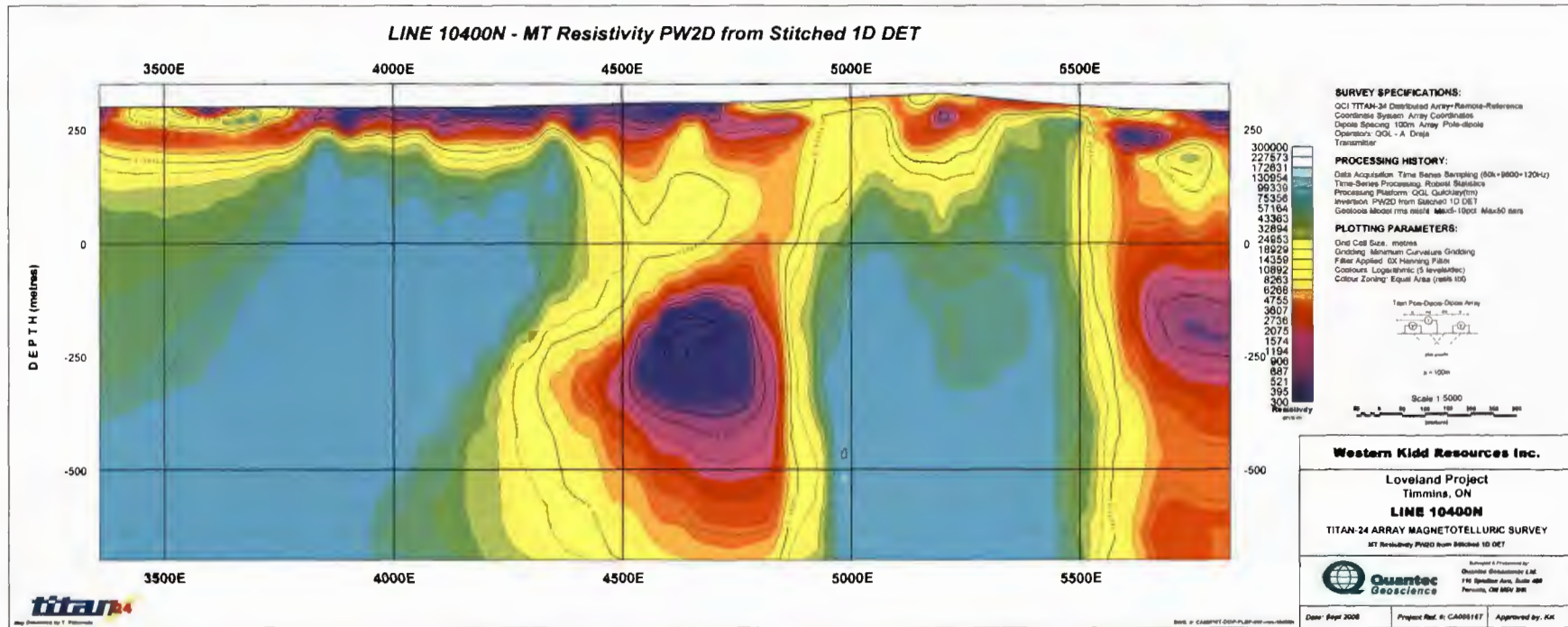
DCIP2D Inversions – L10400N
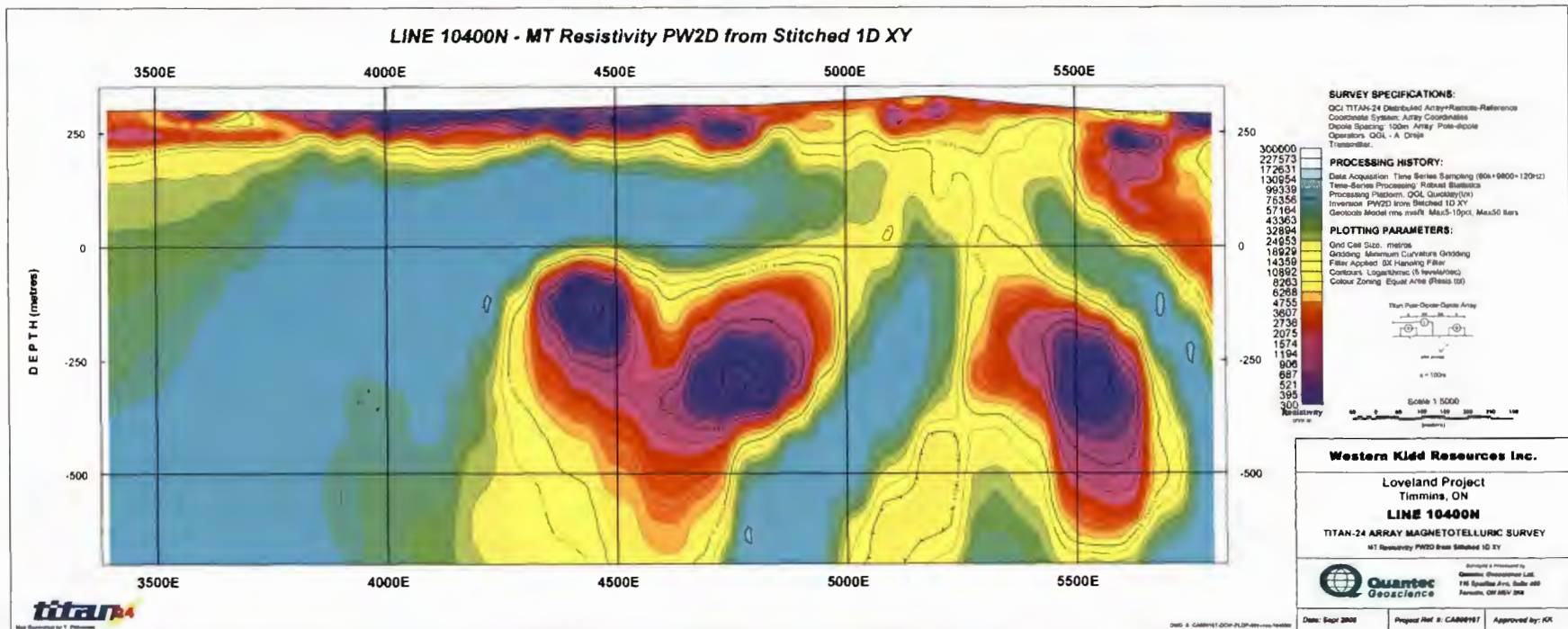
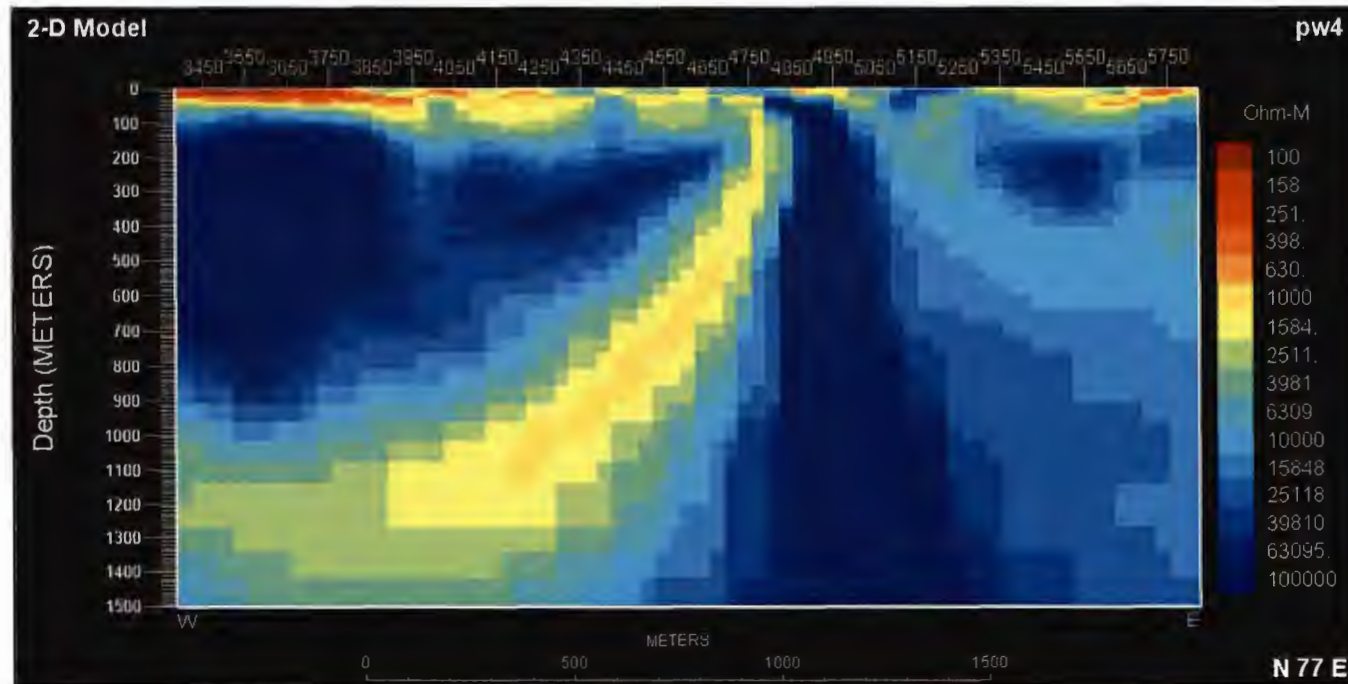**Resistivity**   **IP (using DC2D conductivity)**

Geosoft Section – L10400N (PW2D – stitched 1D DET)

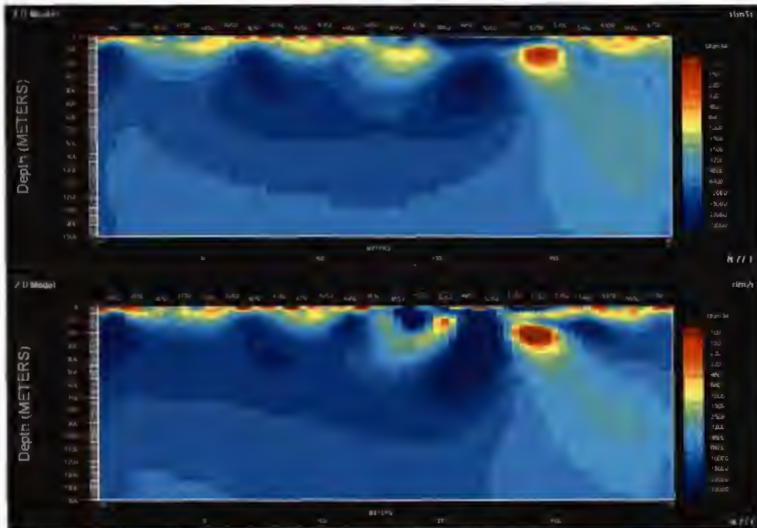# Geosoft Section – L10400N (PW2D – stitched 1D XY)

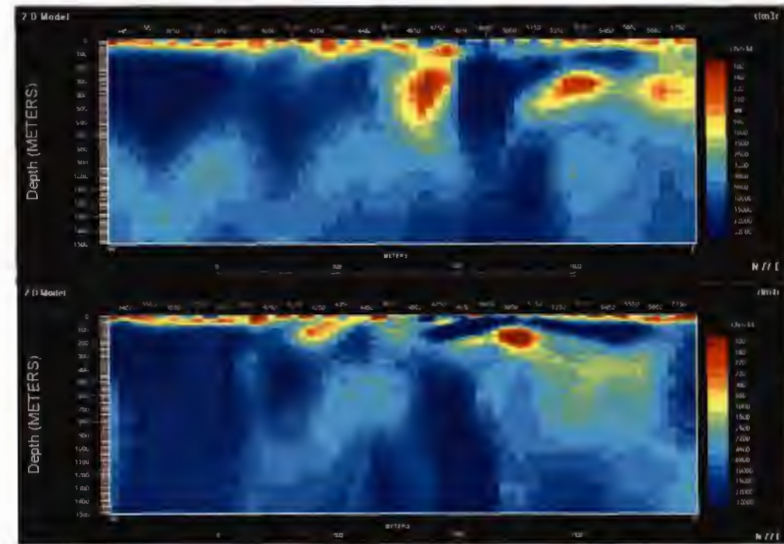# PW4 (un-rotated) – L10600N
Stitched 1D -> RLM ->PW

RLM Inversions – L10600N

Starting from half-space (2500 Ωm)
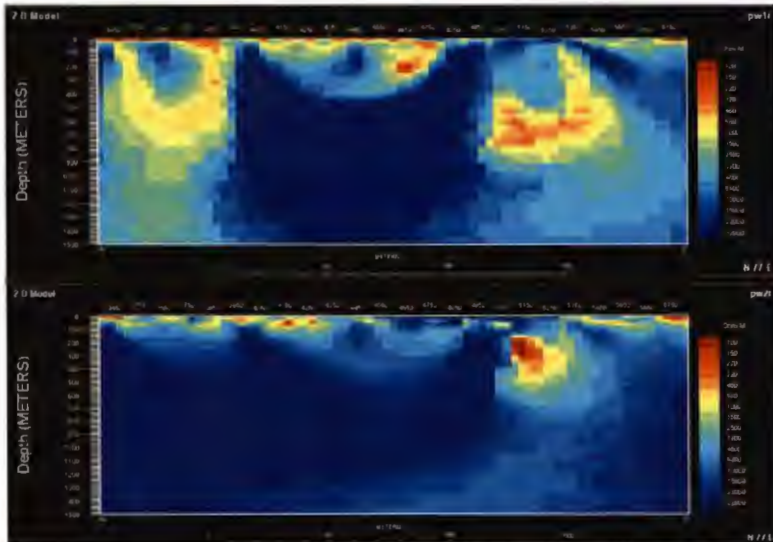Top: TM+TE phase
Bottom: TM+TE

Starting from stitched 1D
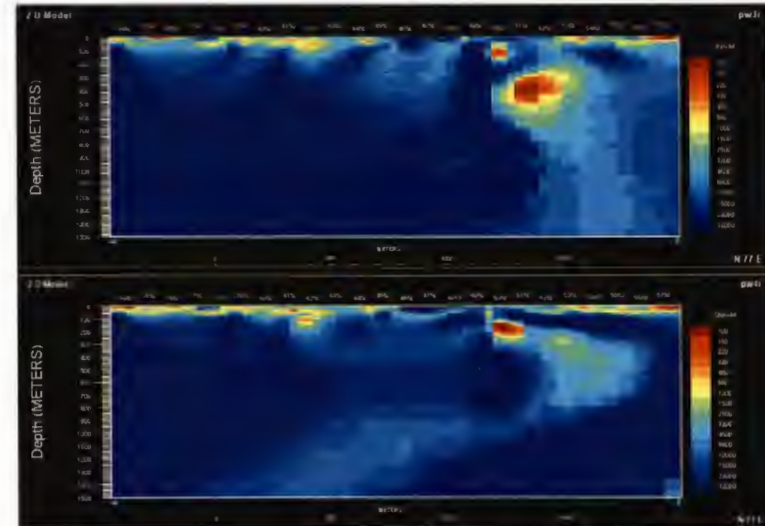Top: DET and TM+TE
Bottom: XY and TM+TE

PW Inversions – L10600N

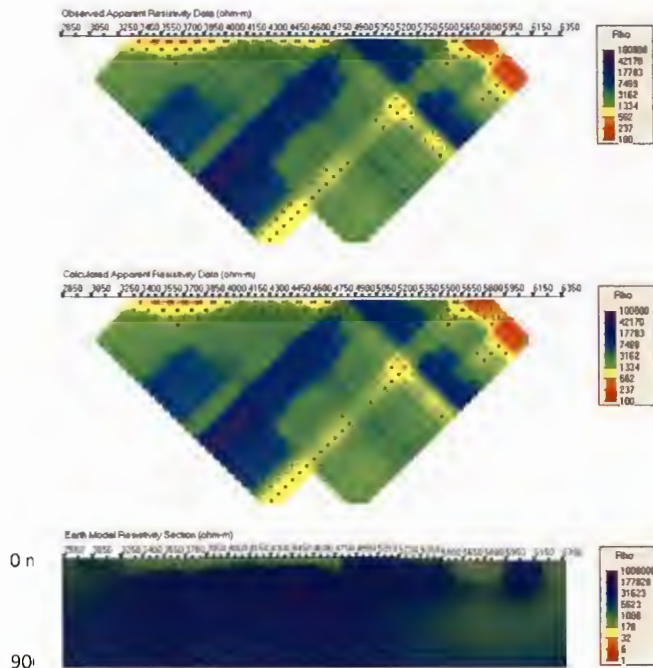Starting from half-space (2500 Ωm)
Top: TM+TE phase
Bottom: TM+TE

Starting from:
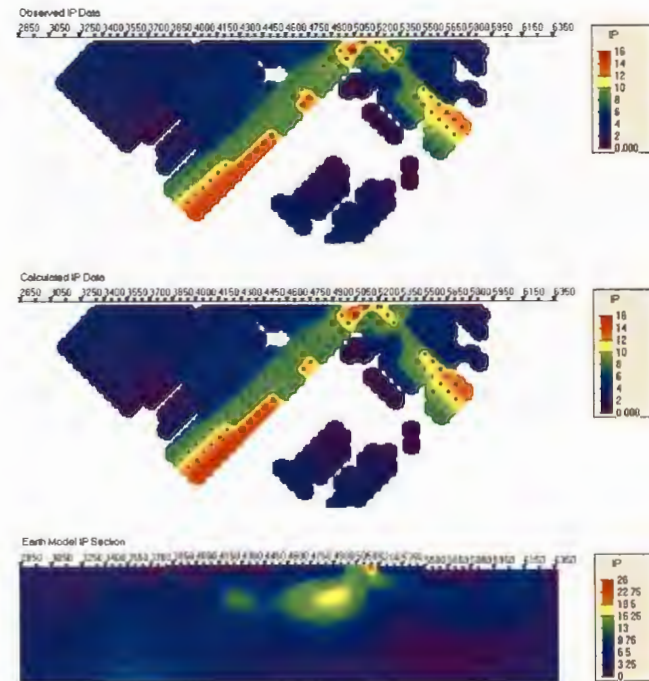Top: Stitched 1D DET and TM+TE
Bottom: Stitched 1D XY and TM+TE
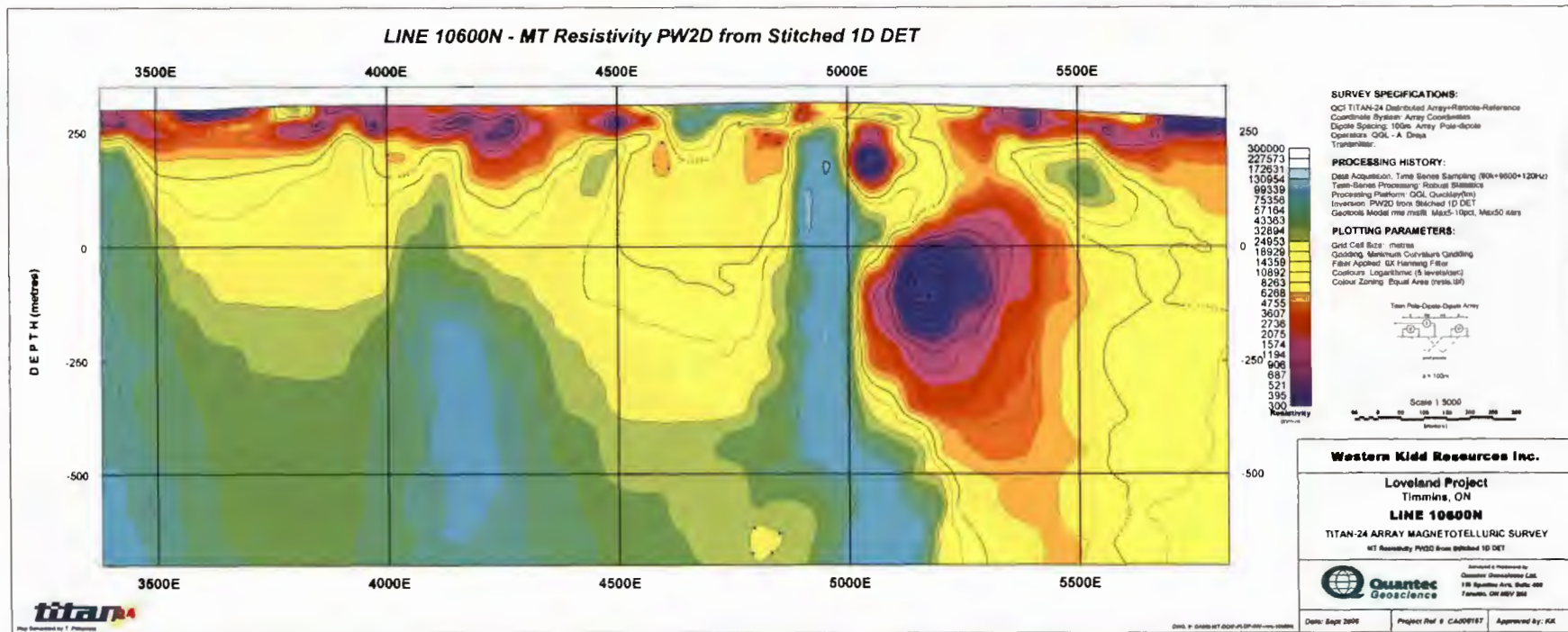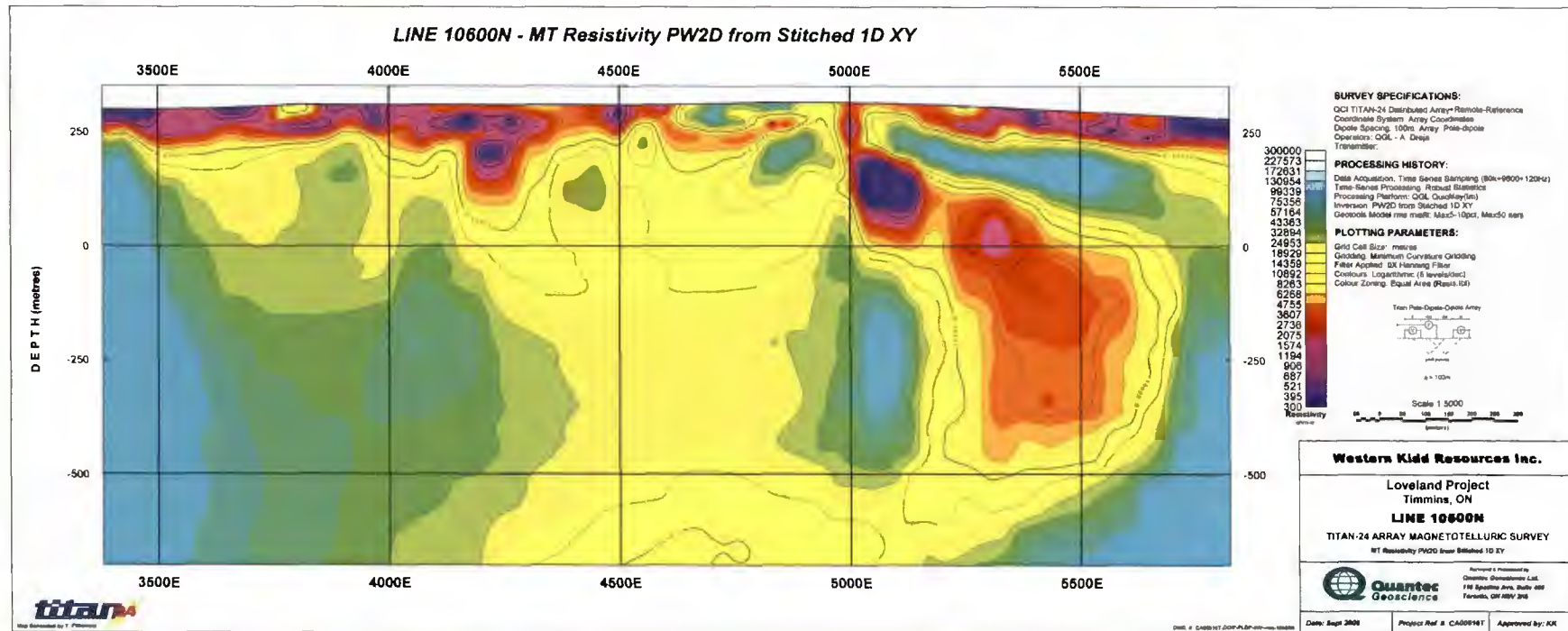
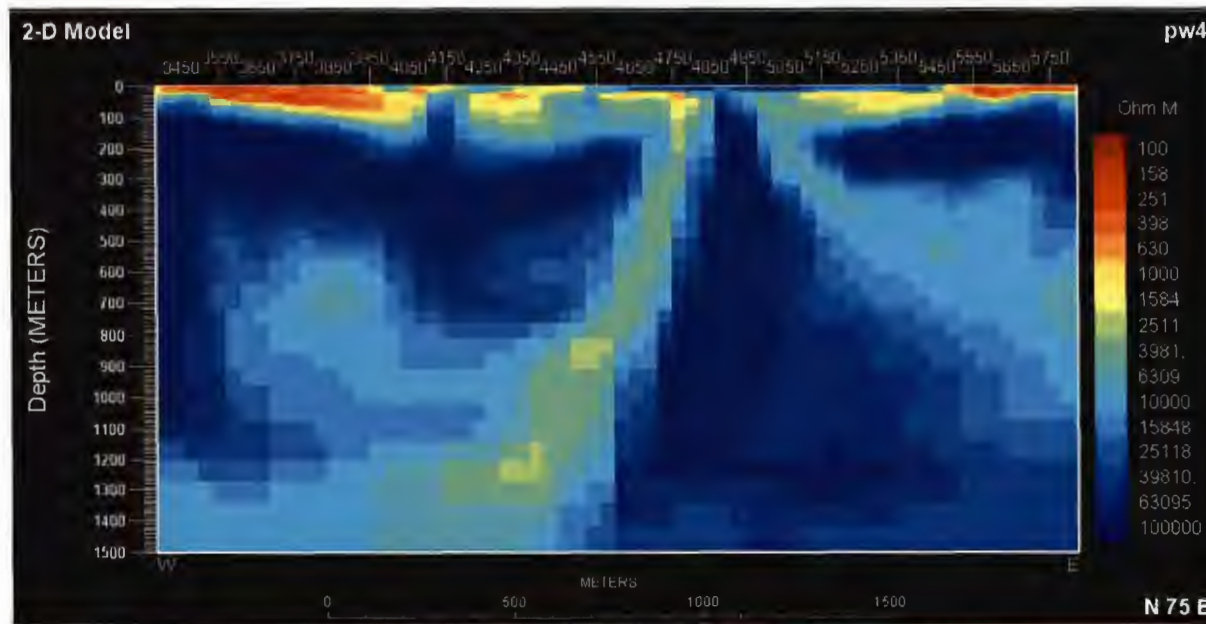# DCIP2D Inversions – L10600N

Resistivity

IP (using DC2D conductivity)

Geosoft Section – L10600N (PW2D – stitched 1D DET)

LINE 10600N - MT Resistivity PW2D from Stitched 1D DET
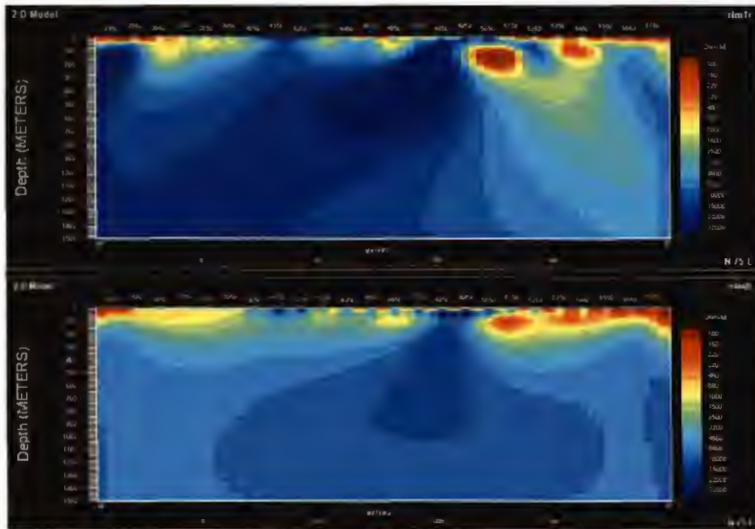
Geosoft Section – L10600N (PW2D – stitched 1D XY)

PW4 (un-rotated) – L10800N
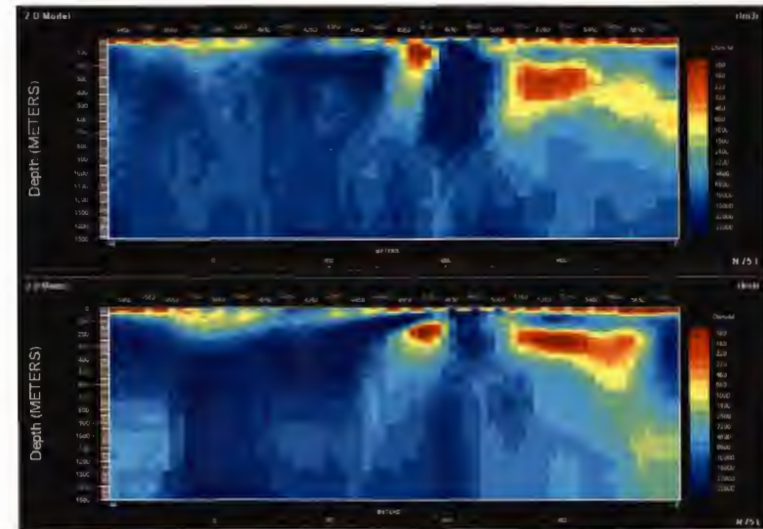## Stitched 1D -> RLM ->PW

RLM Inversions – L10800N

Starting from half-space (2500 Ωm)
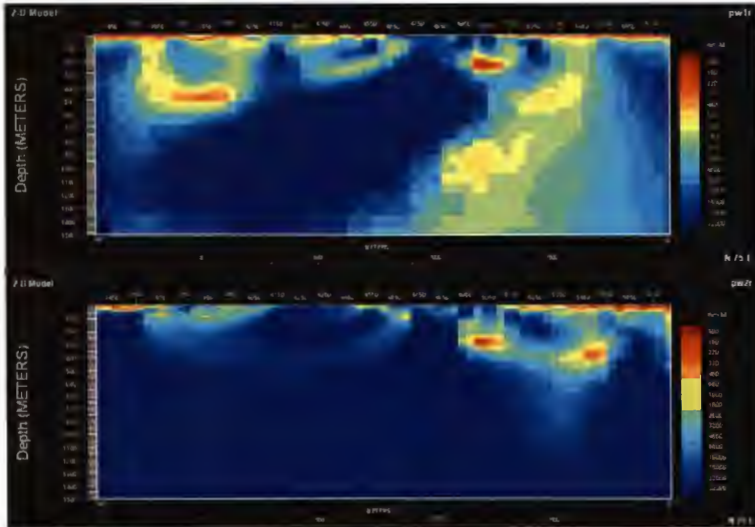Top: TM+TE phase
Bottom: TM+TE

Starting from stitched 1D
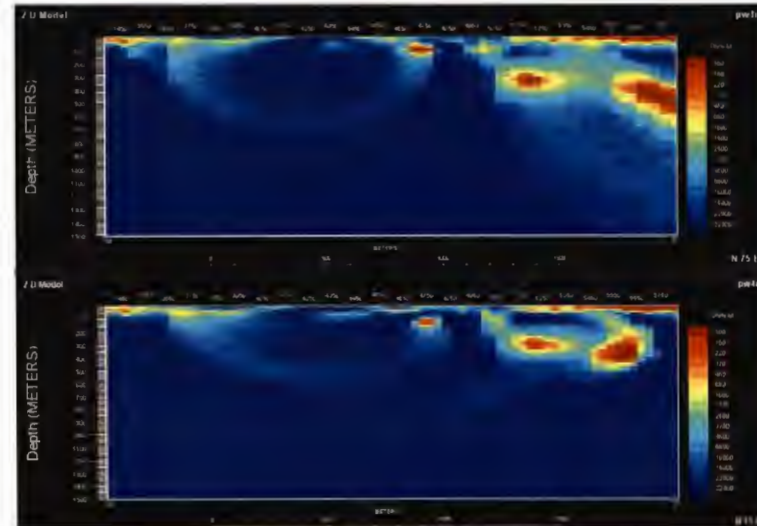Top: DET and TM+TE
Bottom: XY and TM+TE

PW Inversions – L10800N

Starting from half-space (2500 Ωm)
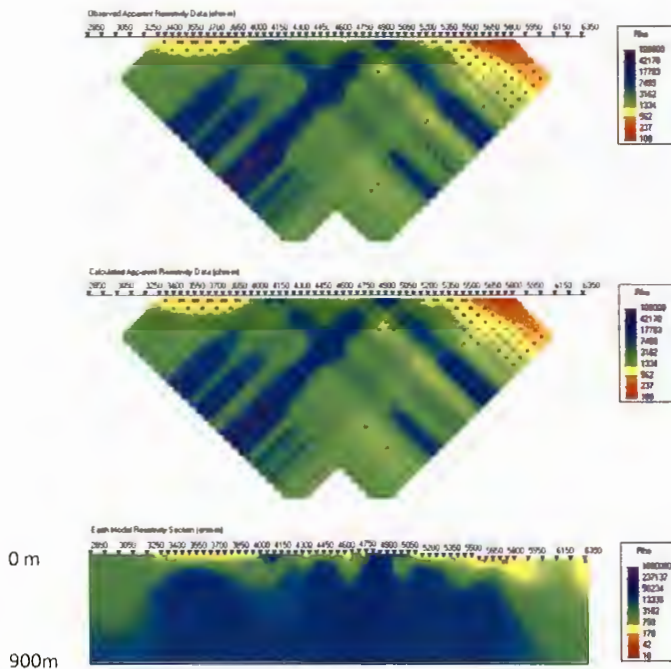Top: TM+TE phase
Bottom: TM+TE

Starting from:
Top: Stitched 1D DET and TM+TE
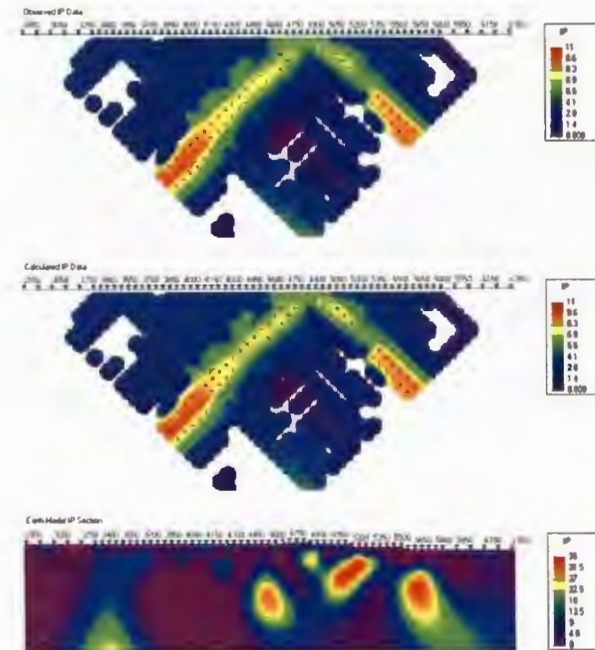Bottom: Stitched 1D XY and TM+TE
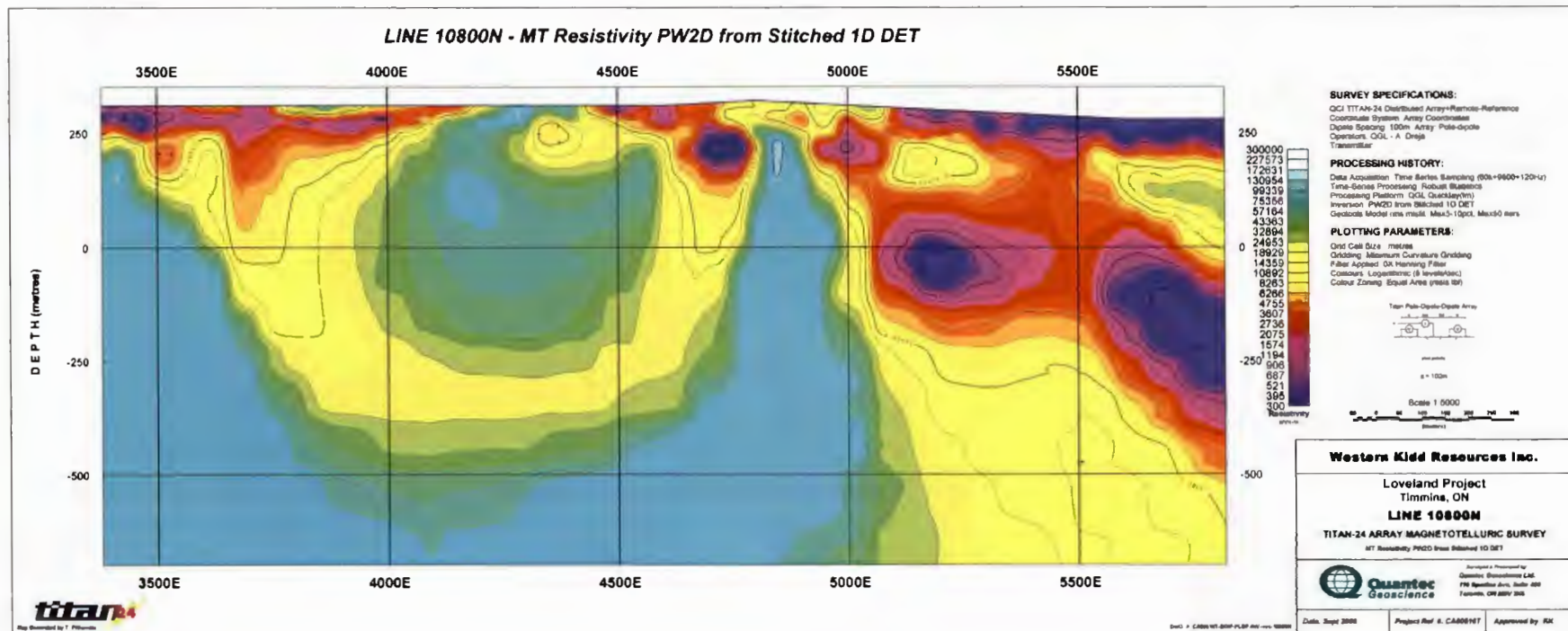
DCIP2D Inversions – L10800N

Resistivity **IP (using DC2D conductivity)**

Geosoft Section – L10800N (PW2D – stitched 1D DET)

Geosoft Section – L10800N (PW2D – stitched 1D XY)

LINE 10800N - MT Resistivity PW2D from Stitched 1D XY