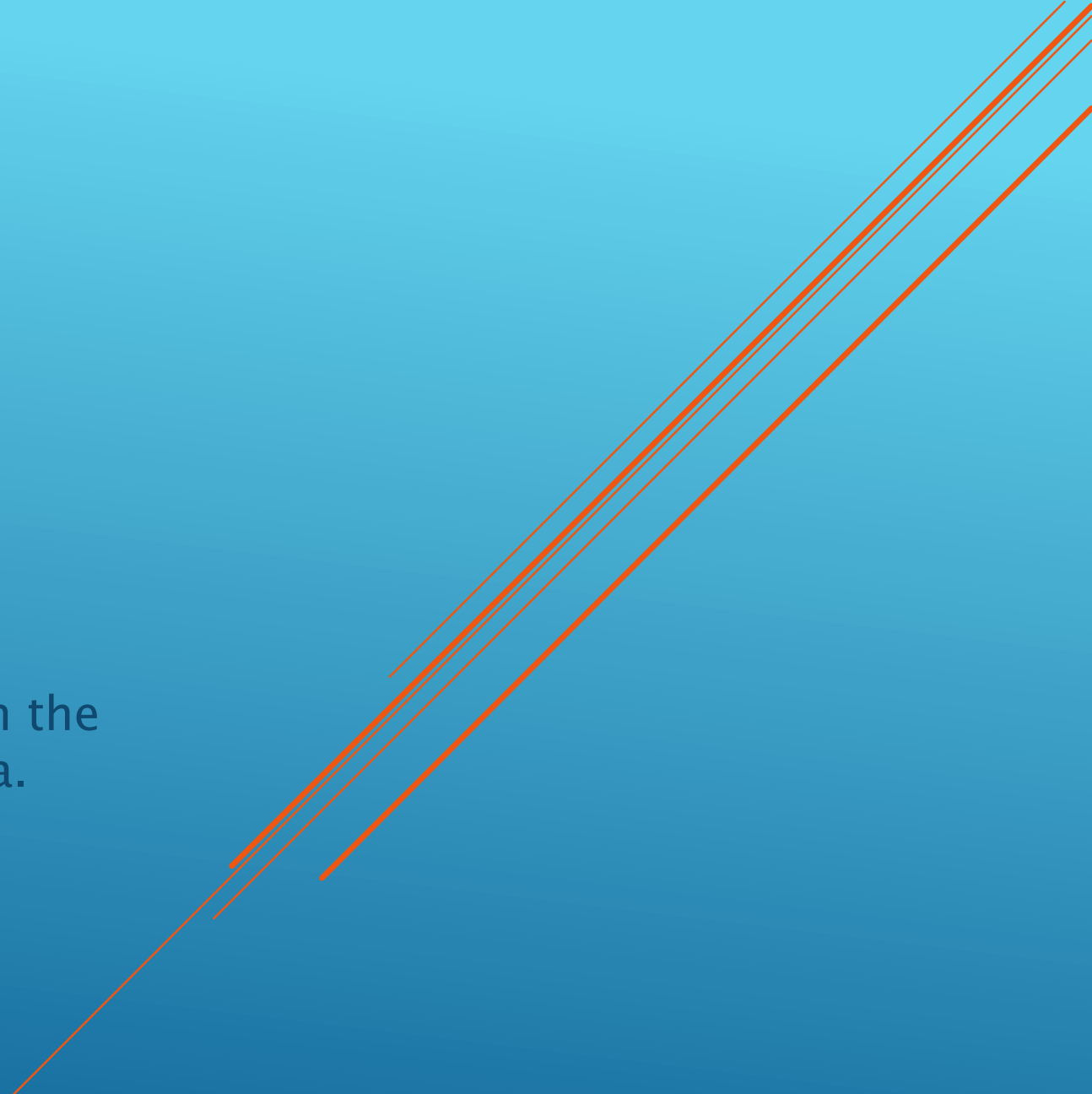


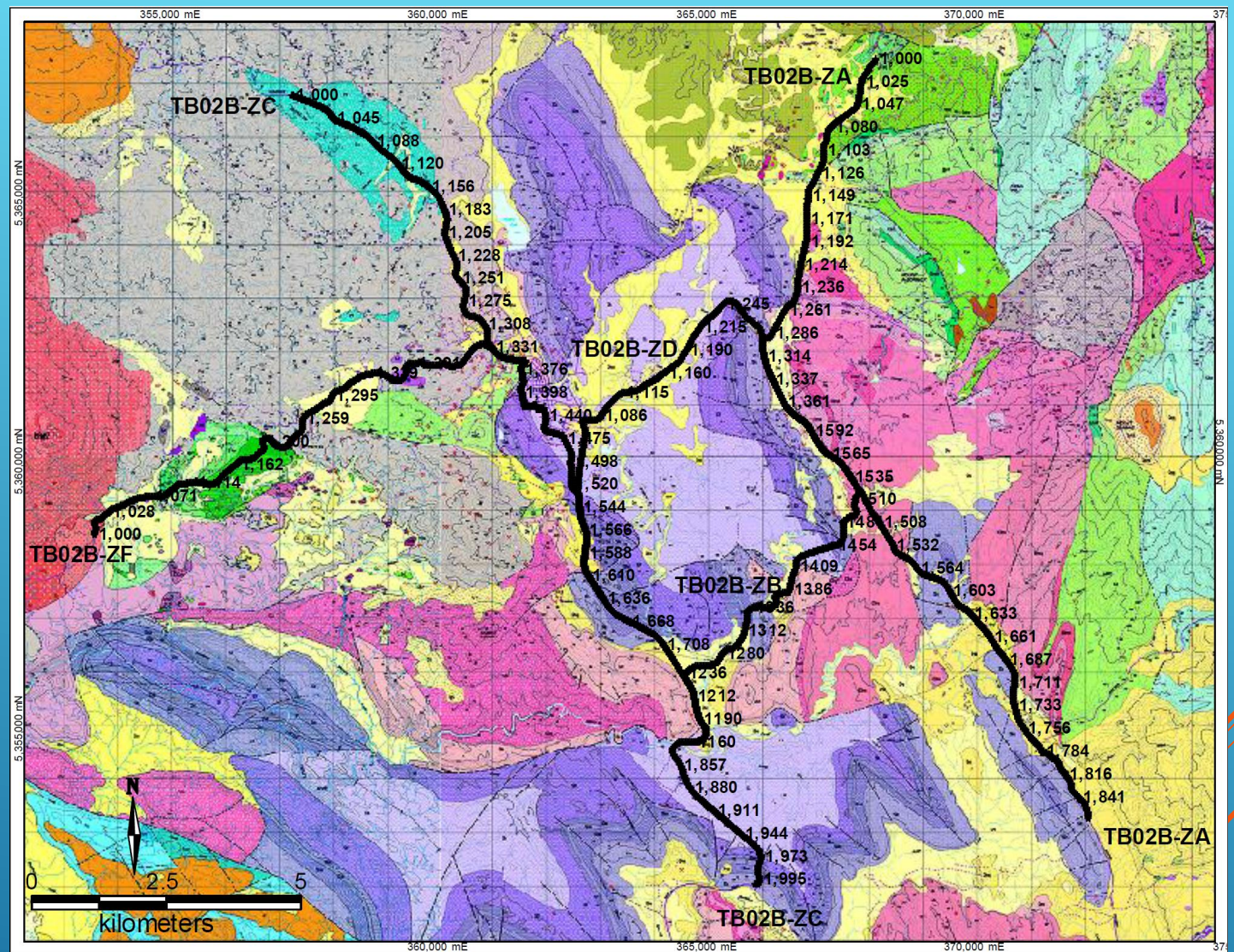
# ZEEHAN SEISMIC

Assessment of the subsurface geology in the Zeehan region using related seismic data.



# SURVEY INFORMATION





# SURVEY ACQUISITION MAP

► **Seismic Survey = Zeehan Zinc 2D**

► **Station Interval = 20.0 metres**

► **Line Name   Start       End       Distance**

► TB02b-ZA   1000       1864       17.28

► *TB02b-ZC*   1000       2002       20.04

► *TB02b-ZD*   900       1400       10.00

► *TB02b-ZF*   1000       1573       11.46

► **TOTAL 58.78**

► TB02b-ZB   1160       1600       8.80

► **TOTAL 8.80**

► **Total kilometres: 67.58**

INTERPRETED LINES (*ITALICS*)



## RECORDING PARAMETERS

- ▶ **Vibroseis Source**
- ▶ **Acquisition Type:** Sercel 388 - 24 Bit Telemetry System
- ▶ **Energy Source:** 3 x Input-Output 42,000lb Peak Force
- ▶ 6x6 Truck mounted Vibrators Online
- ▶ **Vibrator Point Interval:** 20 metres
- ▶ **Vibrator Array:** 15 m Pad-Pad / No Moveups
- ▶ **Vibrator Array Location:** Centred on Station Pegs (Centred at SP 100)
- ▶ **Receivers:** 12 x 10 Hz SM24 Geophones / Group
- ▶ **Receiver Interval:** 20 metres
- ▶ **Receiver Array:** 20 metres (12 phones with 1.67m phone spacing)
- ▶ **Receiver Array Location:** Centred between Stations (Centered at SP 100.5)
- ▶ **Sweep Length:** 12 sec Sweeps or 8 sec Sweeps (see GSLM)
- ▶ **Number of Sweeps:** 2 x 12 second sweeps / VP
- ▶ Or 2 x 8 second sweeps / VP (see GSLM)
- ▶ **Sweep Type:** Monosweep
- ▶ **Sweep Frequencies:** 6-140 HZ
- ▶ **Sweep Taper:** 200 msec Taper
- ▶ **Sweep Energy per Km:** 1200 sec/km or 800 sec/km (see GSLM)
- ▶ **Sweep Control:** Pelton Advance 2 Model 5
- ▶ **Accelerometers:** Pelton M5 High Performance
- ▶ **Similarity System:** Pelton VIBRA-SIG
- ▶ **Peak Force:** 44,000 lbs
- ▶ **Hold Down Weight:** 44,200 lbs
- ▶ **Vibrator Drive Level:** Force Control On - 80% Peak Force
- ▶ **Phase Lock:** Ground Force Phase Lock
- ▶ **No. of Channels:** 300 Channels
- ▶ **Spread Geometry:** Symmetric Split Spread
- ▶ **Maximum Offset:** 2990 - 10 – 0 – 10 – 2990 metres
- ▶ **Fold:** 150 Fold with 10m CDP interval
- ▶ **Record Length:** 6.0 seconds
- ▶ **Correlation Sample Rate:** 2 milliseconds
- ▶ **Written to Tape S.R.:** 2 milliseconds
- ▶ **Output Data Format:** SEG D

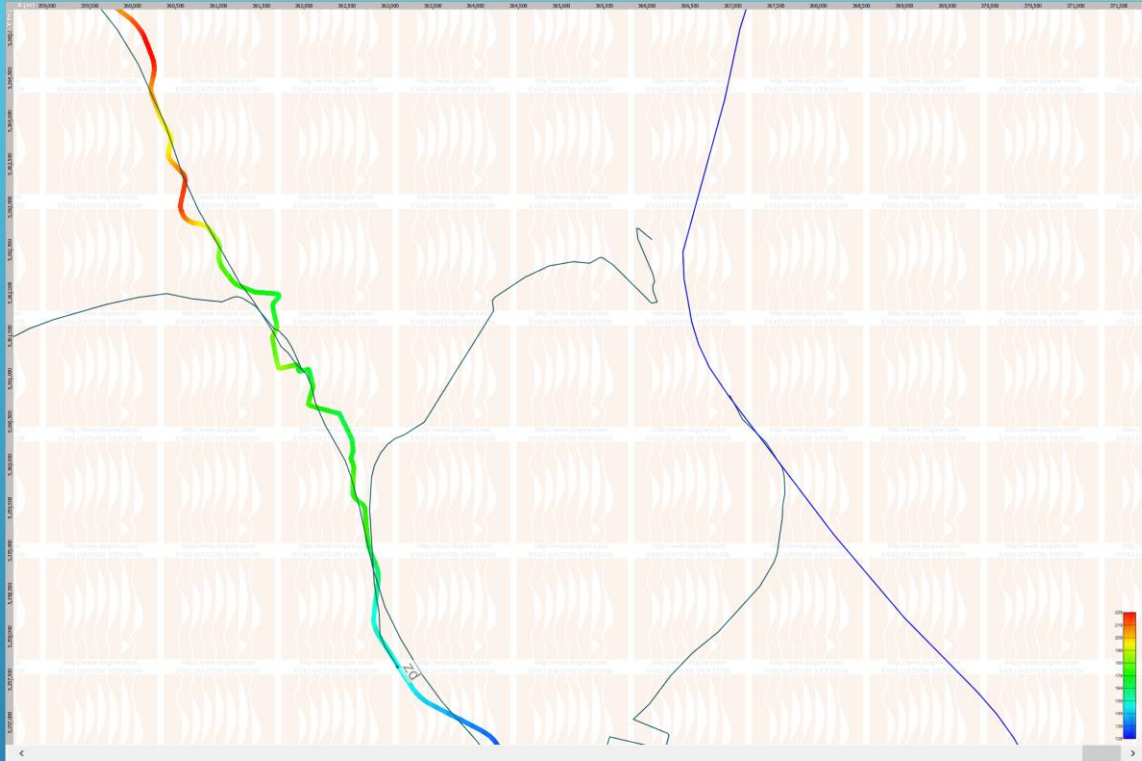
# ACQUISITION PARAMETERS



MAP SHOWING PROCESSED LINES

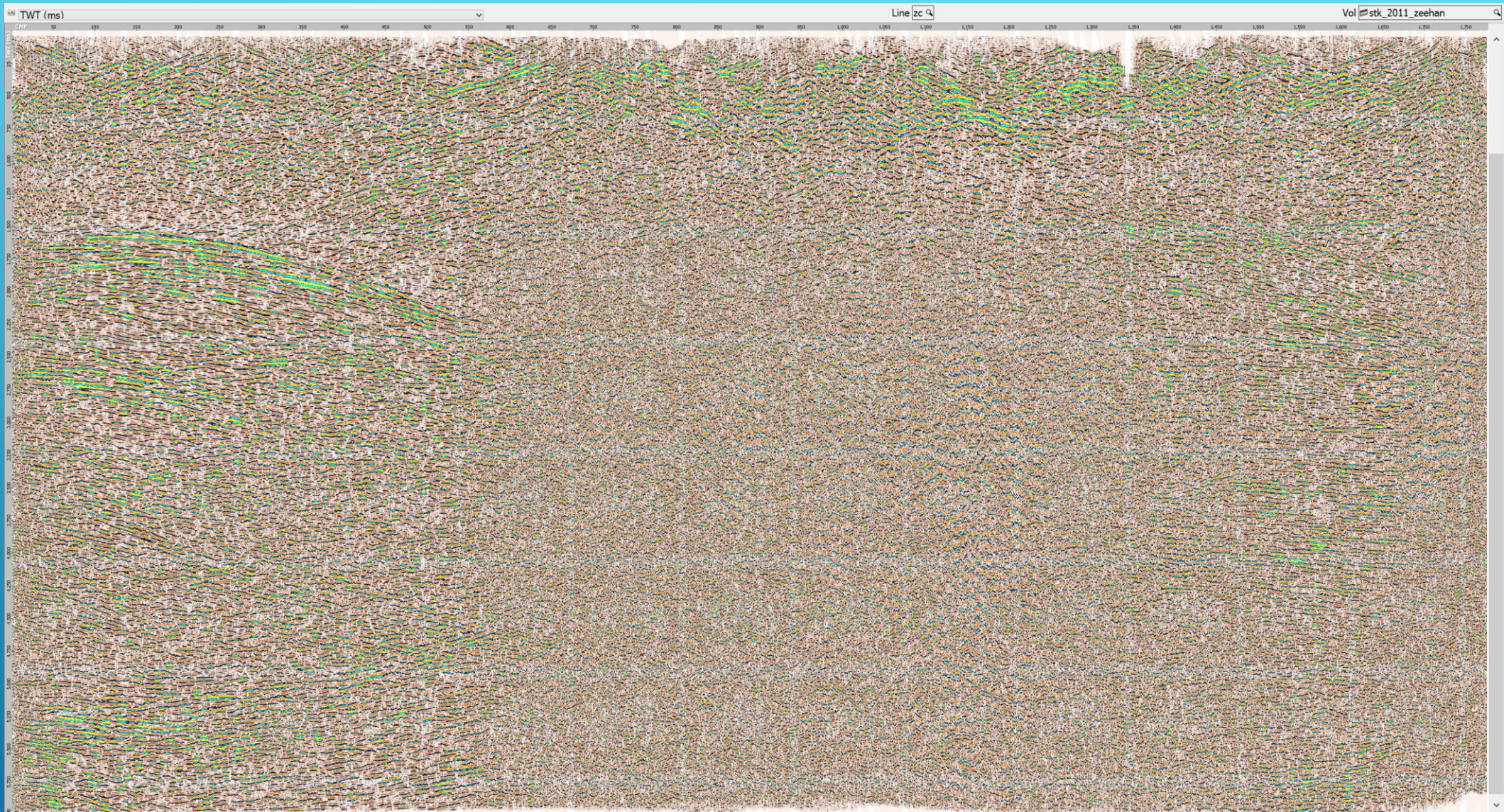
- ▶ Data originally processed by Fugro in 2008
- ▶ Reprocessed in 2011 by SRK An additional version was created 'scatter'
- ▶ 3 versions of the 2011 reprocessed data is available
  - ▶ Stack
  - ▶ Migration
  - ▶ Scatter

# PROCESSING



MAP OF LINE ZC – ACQUISITION (COLOURED ELEVATION)  
COMPARED WITH PROCESSED





LINE ZC – STACK





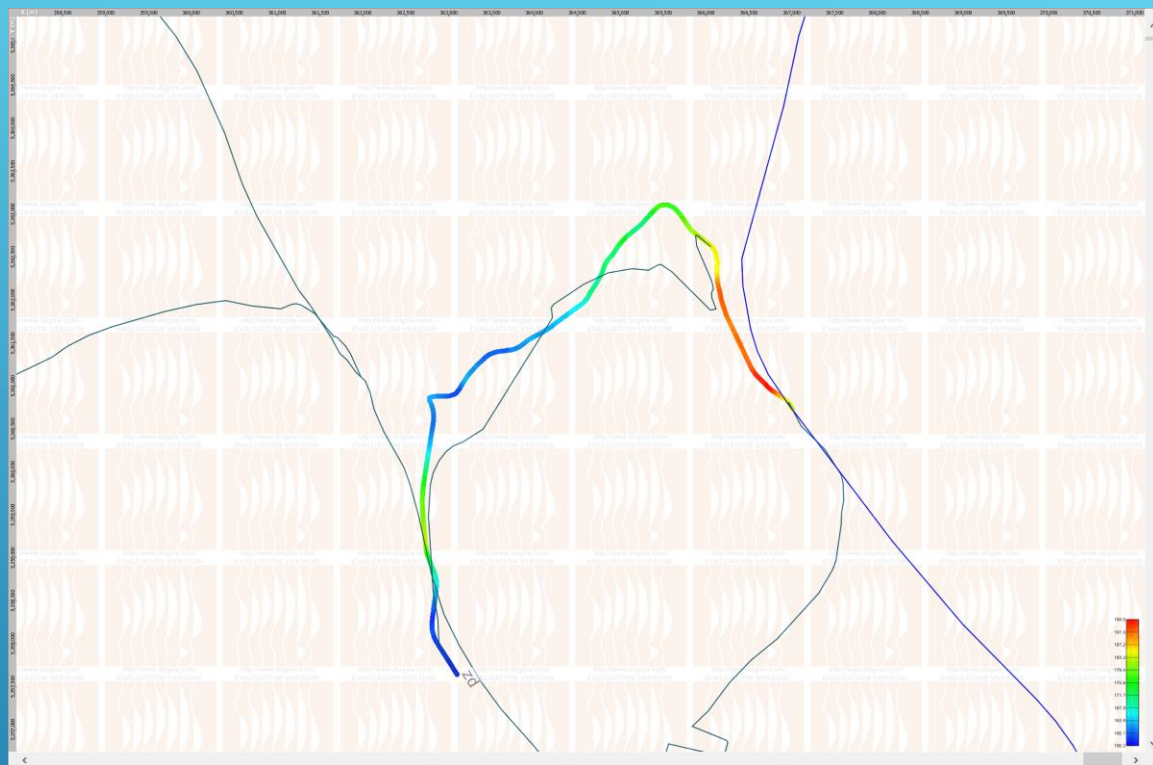
LINE ZC – MIGRATION





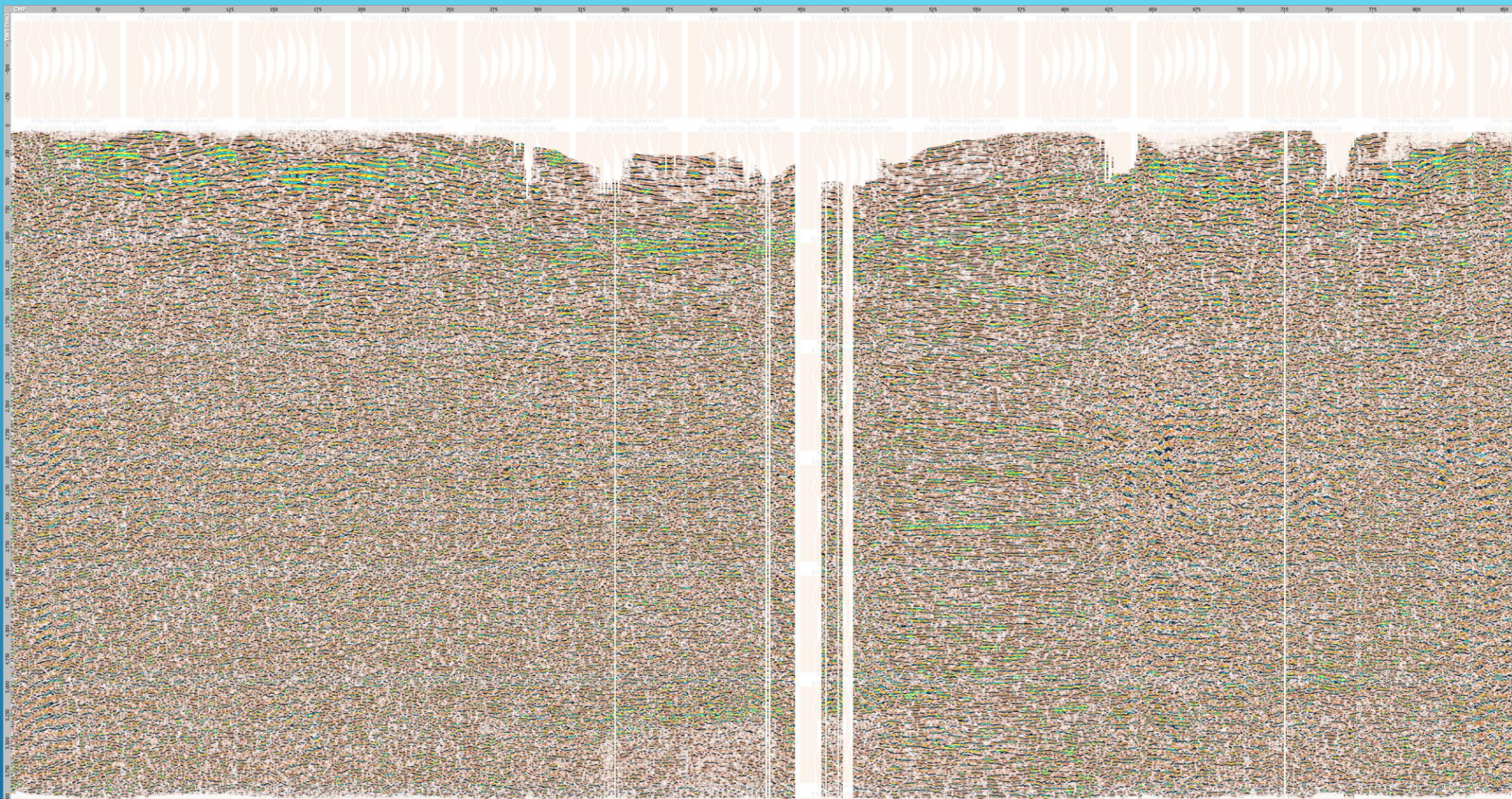
LINE ZC – SCATTER





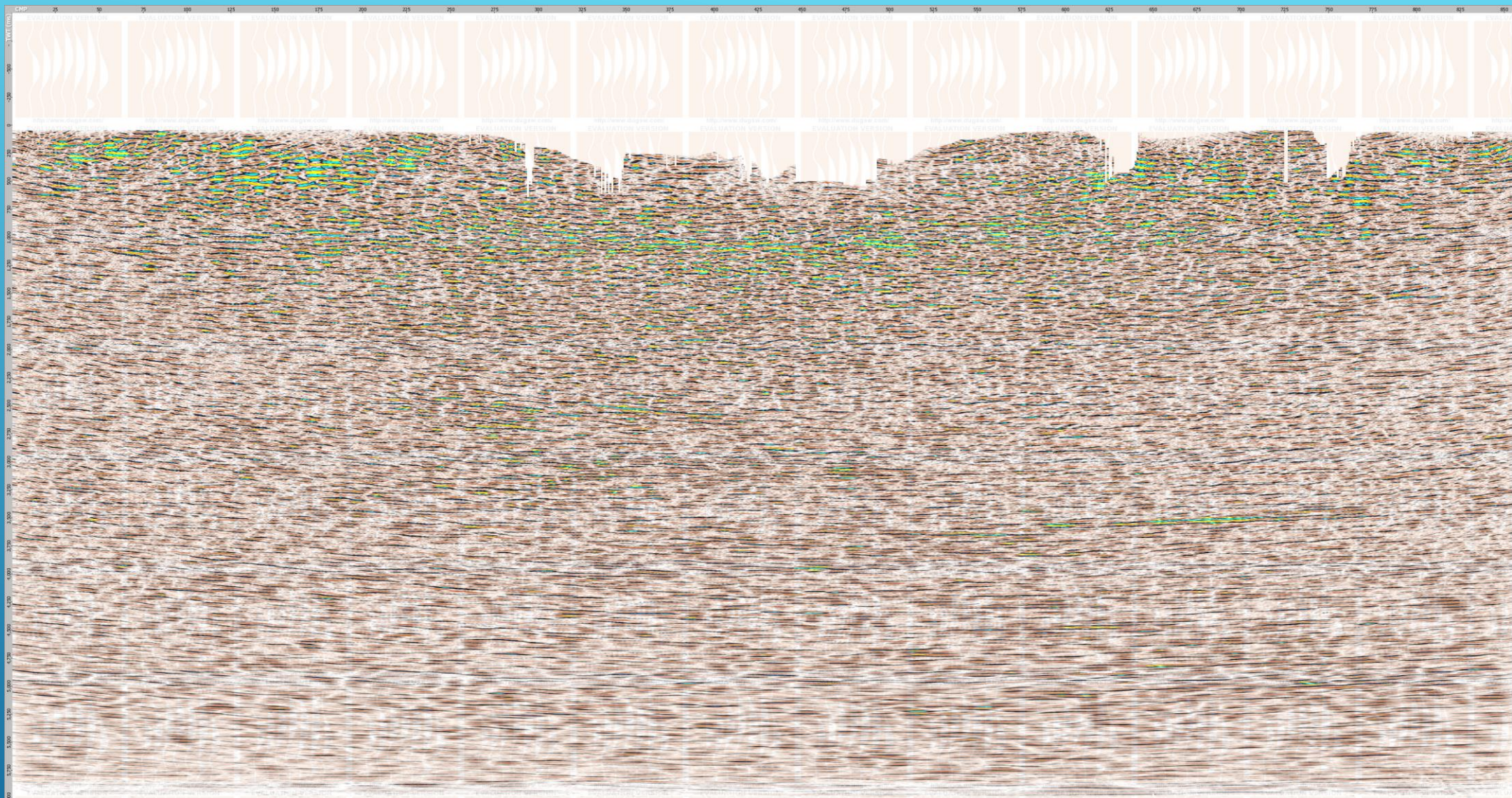
MAP OF LINE ZD – ACQUISITION (COLOURED ELEVATION)  
COMPARED WITH PROCESSED





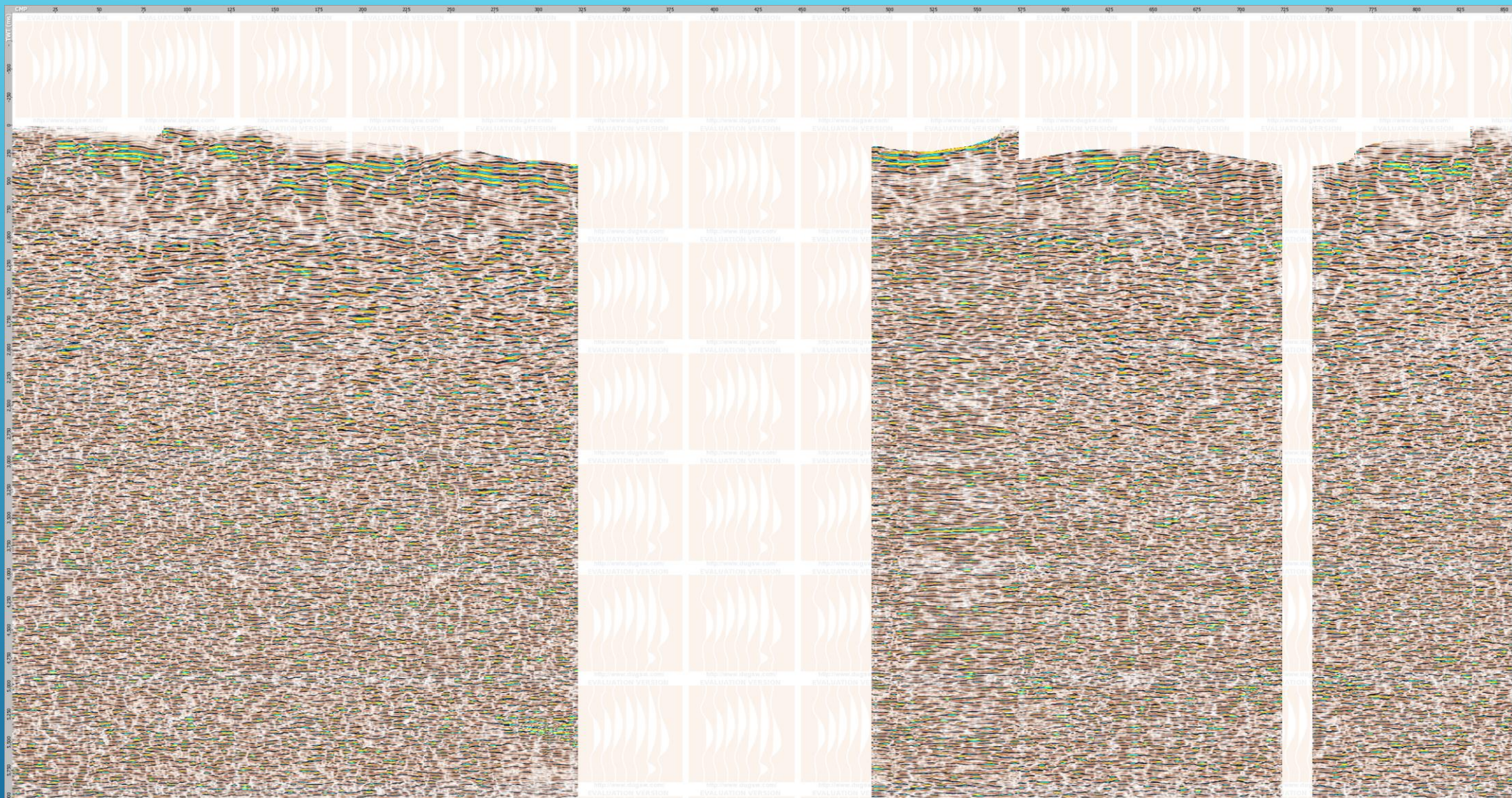
LINE ZD – STACK





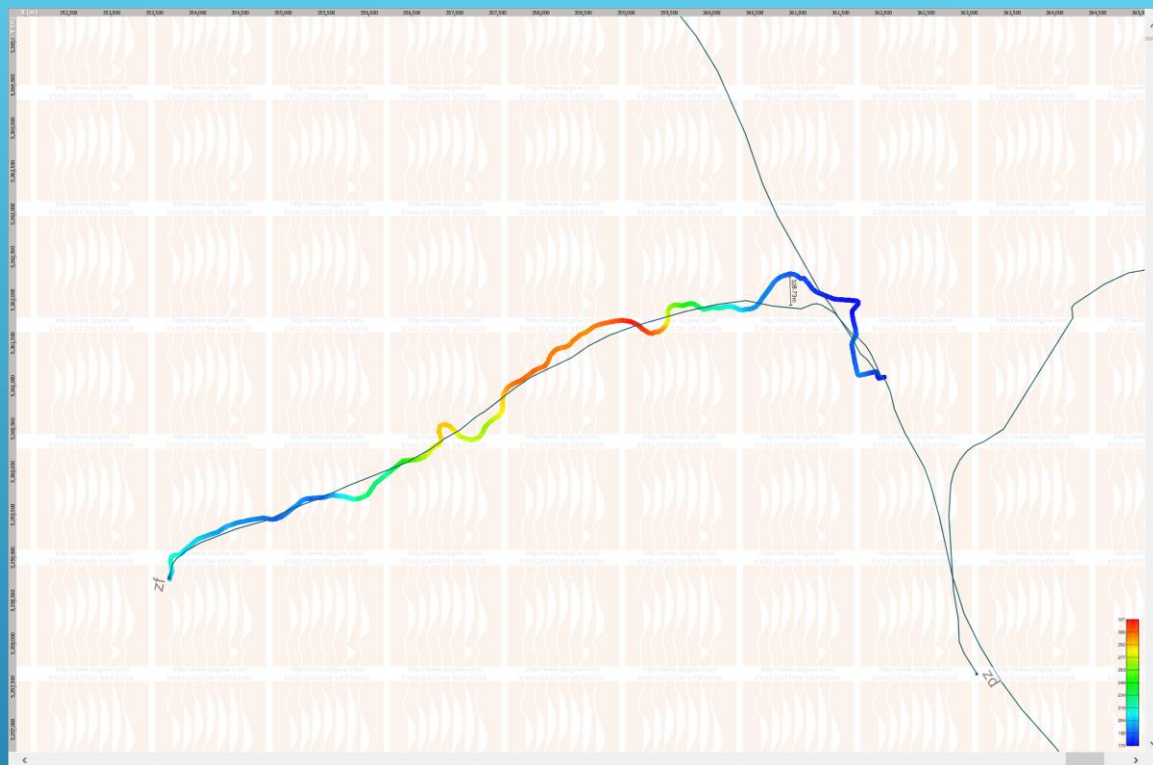
LINE ZD – MIGRATION





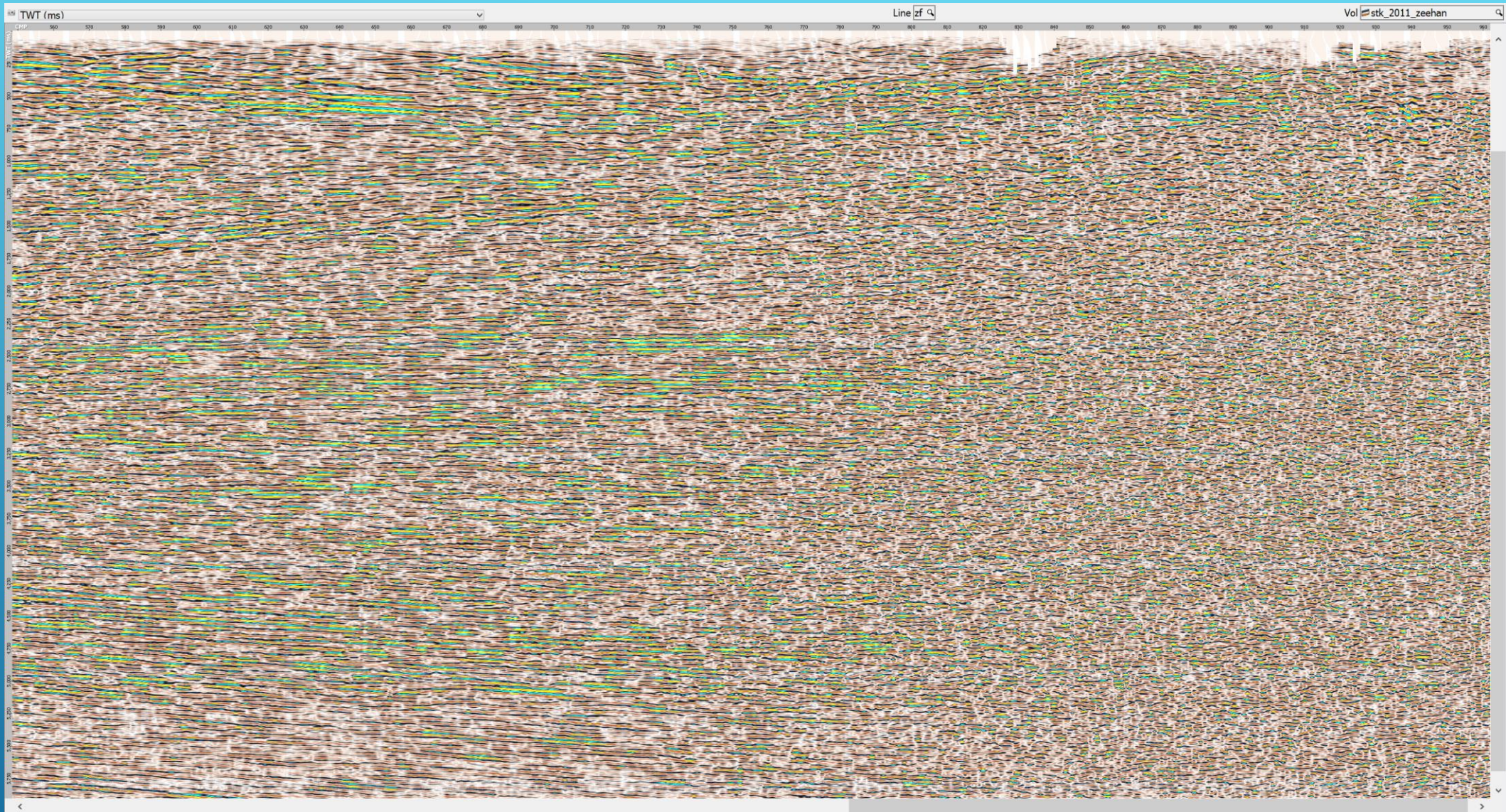
LINE ZD – SCATTER





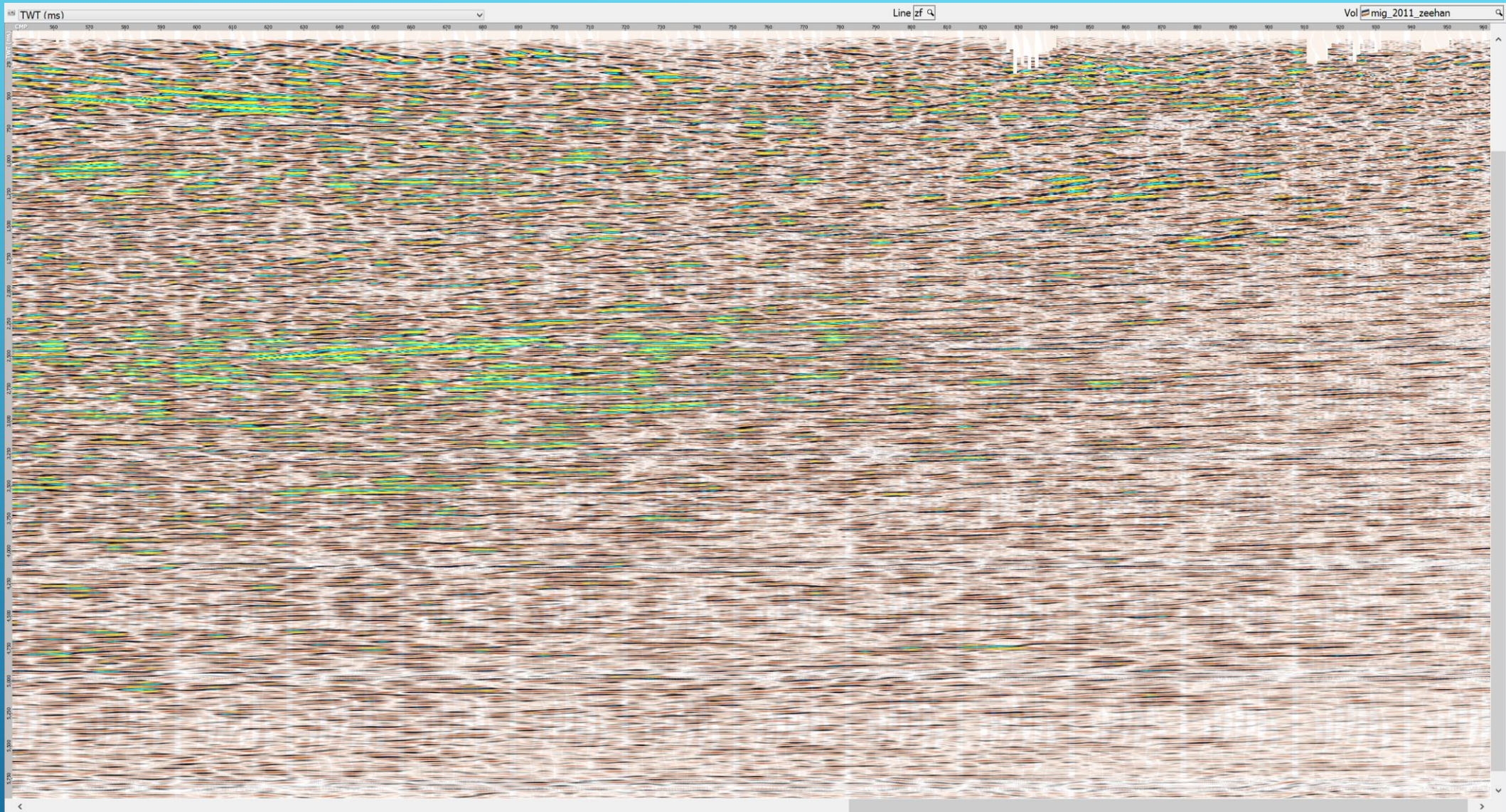
MAP OF LINE ZF – ACQUISITION (COLOURED ELEVATION) COMPARED  
WITH PROCESSED





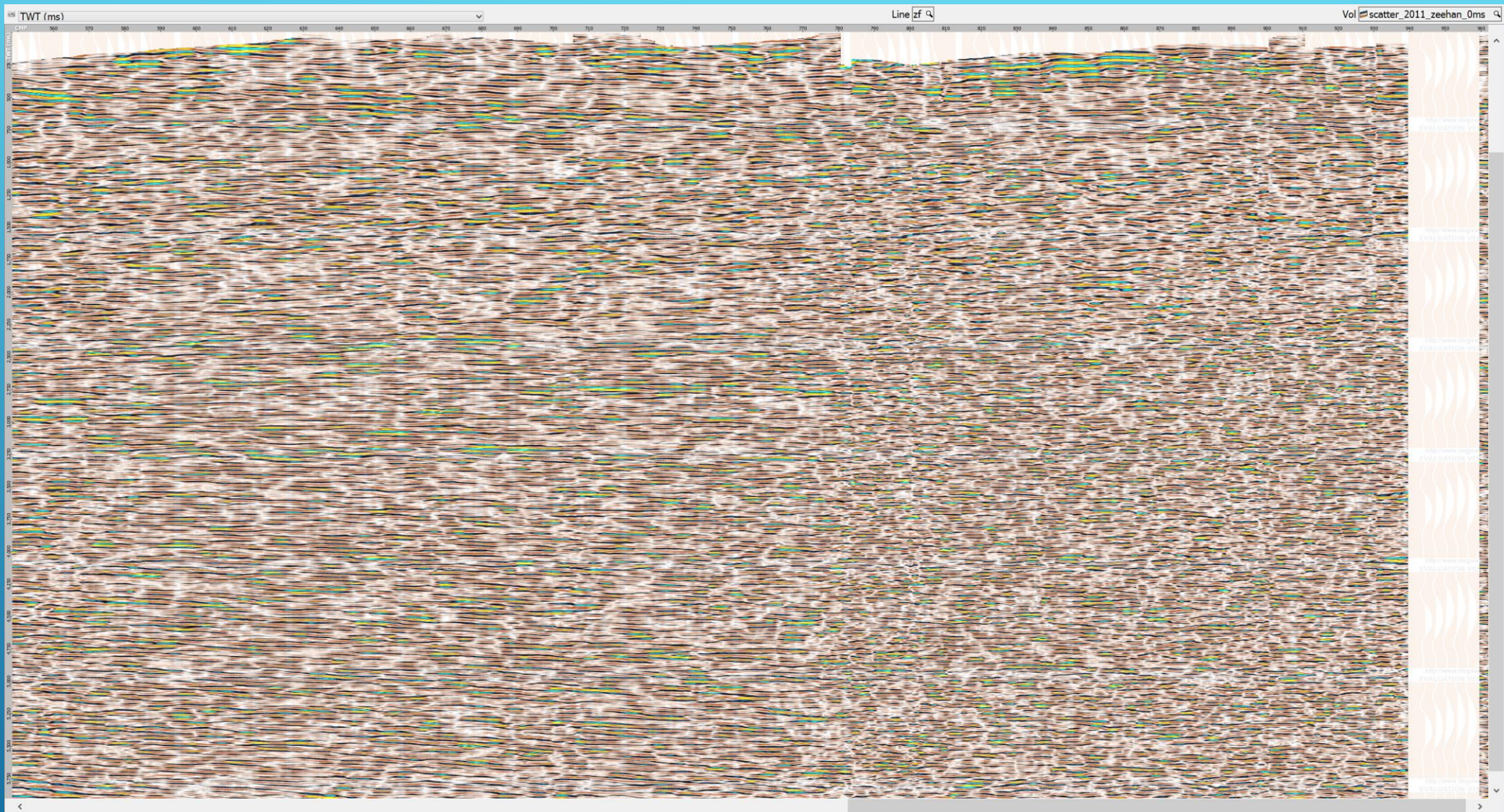
LINE ZF – STACK





LINE ZF – MIGRATION





LINE ZF – SCATTER



# INTERPRETATION

Structure





- ▶ Identification of structure (faults) on seismic lines
- ▶ Mapping the extent of the granite

# APPROACH

- ▶ Events dip at angles not dissimilar to the faults, as such laterally continuous events that reflect lithological boundaries are virtually absent in 'migration' and 'scatter'.
- ▶ Some dip is apparent in the 'stack' volume
- ▶ Discontinuities can be identified on all 3 versions of the seismic data
- ▶ There is a discrepancy between fault positioning on the 'scatter' processed version compared with the 'migration'
- ▶ The 'scatter' version shows faults as more clearly defined, however it also has significant problems due to static effects (compensation for topography) which needed to be accounted for.
- ▶ The 'scatter' version has been used for structural interpretation with the 'migration' being used as verification for the faults presence.
- ▶ 'Stack' volume is used for event picking.

## INTERPRETATION OF FAULTS

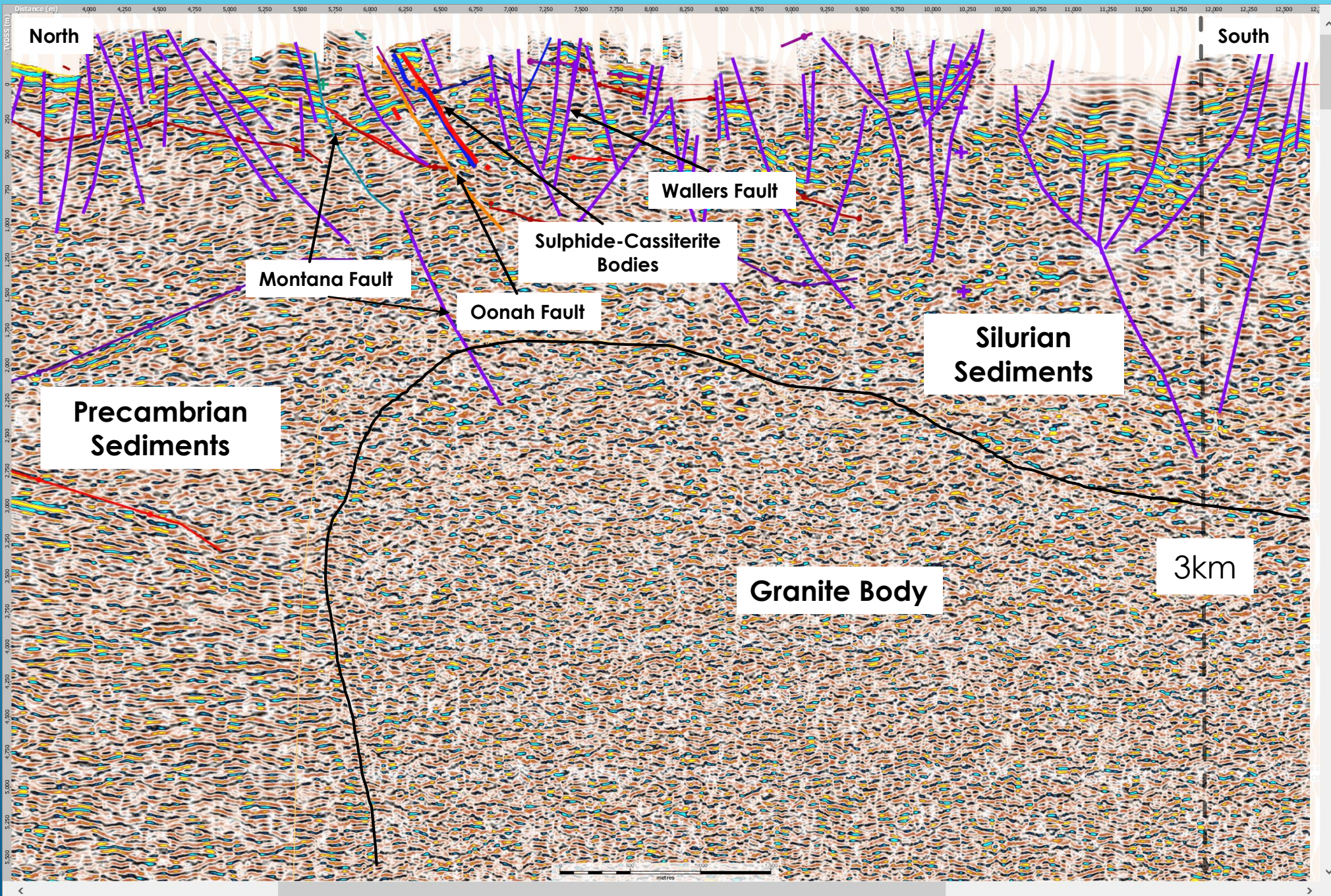
- ▶ Stacking velocities from processing were not available from the government (they are still hunting them down)
- ▶ Sonic logs to depth are also not available because there are no deep wells in the area
- ▶ Geology varies significantly laterally due to steeply dipping, folded and highly faulted structure
- ▶ An average velocity slightly higher than that determined by lithology alone (i.e. allowing for higher densities due to consolidated sediments and deformation)
- ▶ As velocities are likely to be underestimated **depths are likely to be overestimated** (conservative case)

## DEPTH CONVERSION

- ▶ The following velocities are indicative of the lithologies
  - ▶ Db - Devonian Mudstone – 2500m/s
  - ▶ Df - Lower Devonian (more consolidated) Siltstone– 2500m/s
  - ▶ Og - Ordovician Gordon Limestone – 3500m/s
  - ▶ Om - Ordovician Quartzite Sandstone – 3000m/s
  - ▶ Edmu - Cambrian Sediments – 3800m/s
  - ▶ Pou – Pre-Cambrian mafics – 5000m/s
- ▶ Structure indicates laterally varying velocity rather than vertical
- ▶ An **average** velocity of **3500m/s** has been used for converting from TWT to depth

## VELOCITIES OF LOCAL GEOLOGY

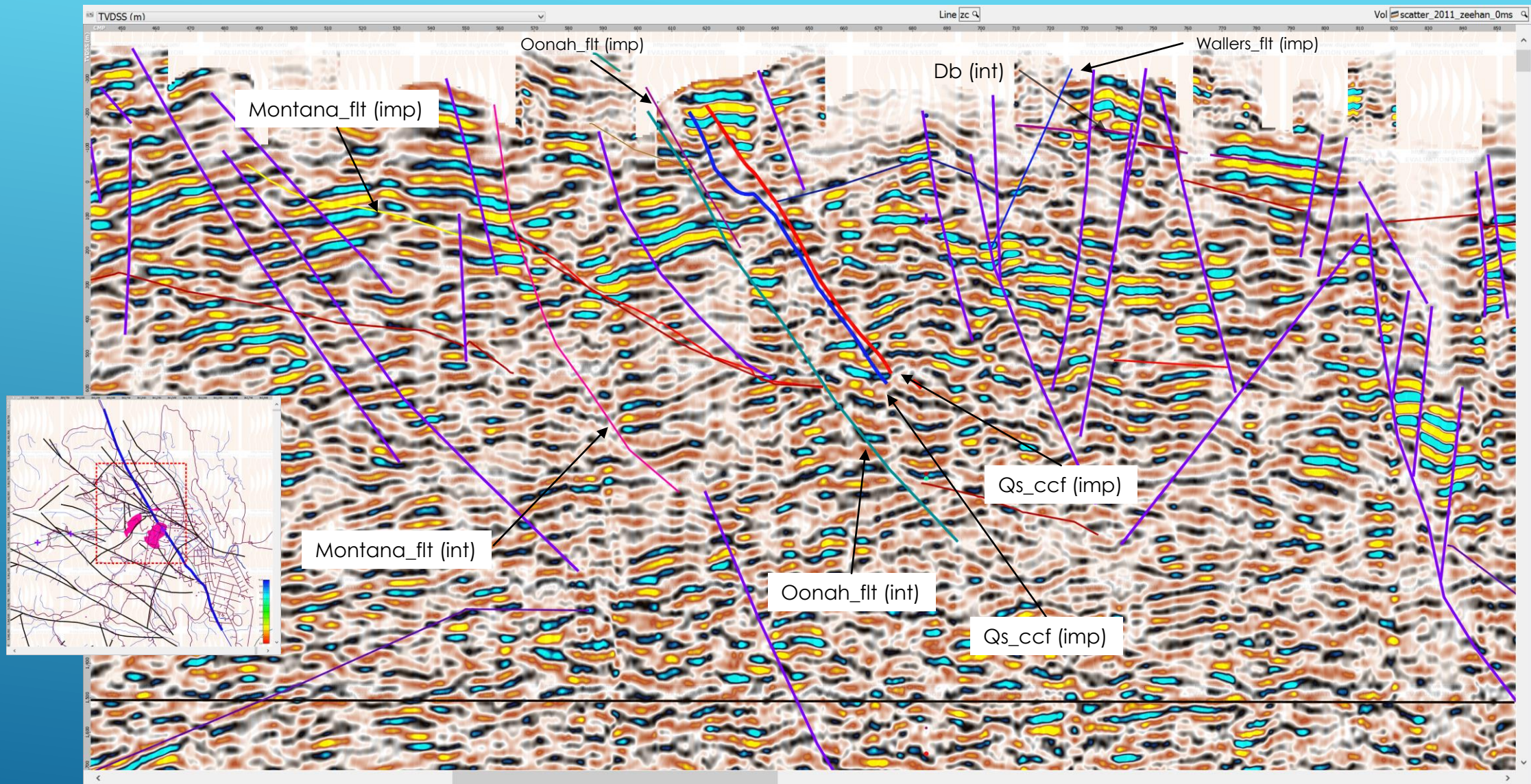




ZC\_SCATTER  
SCALED

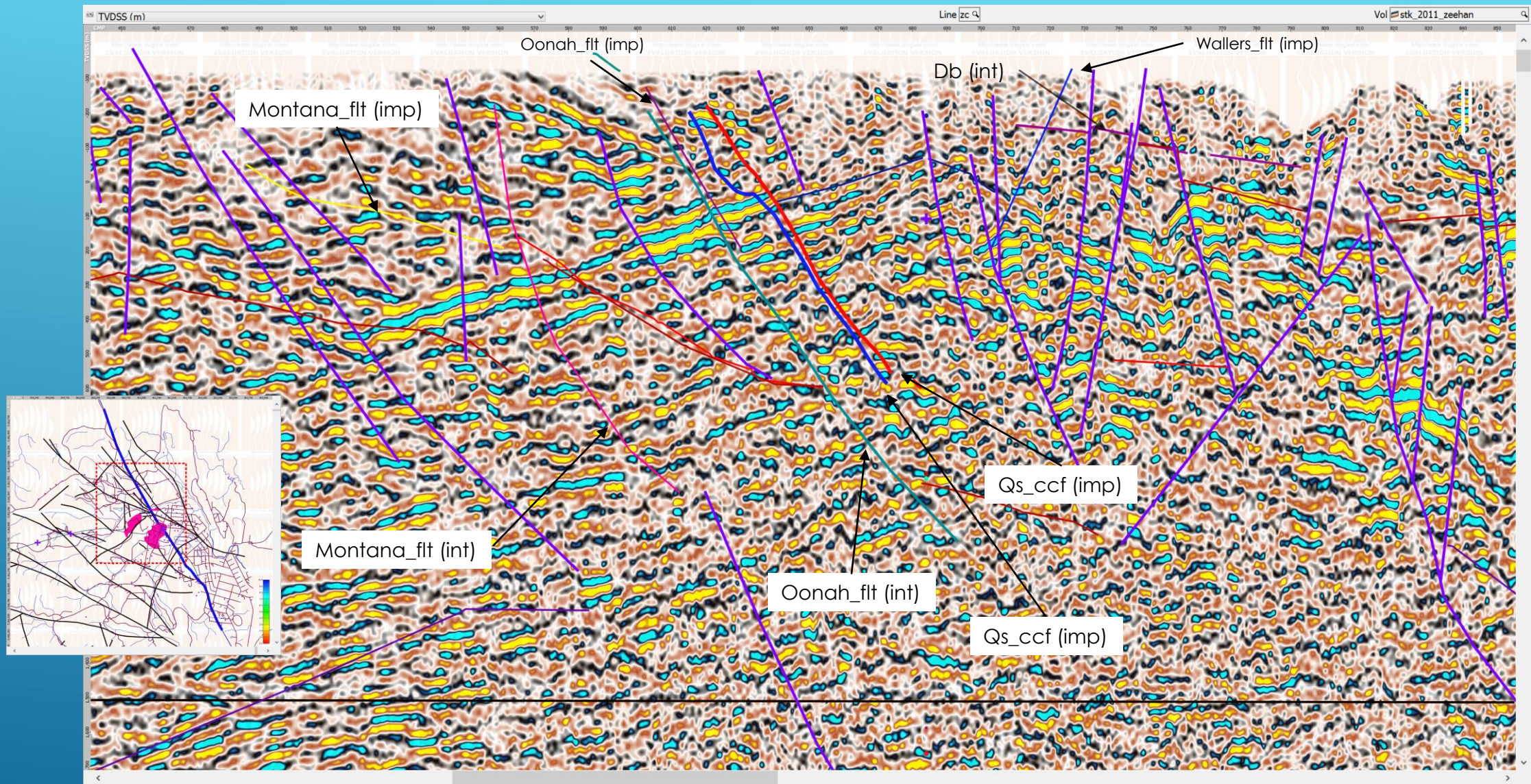
imp – imported  
int – interpreted  
flt – fault





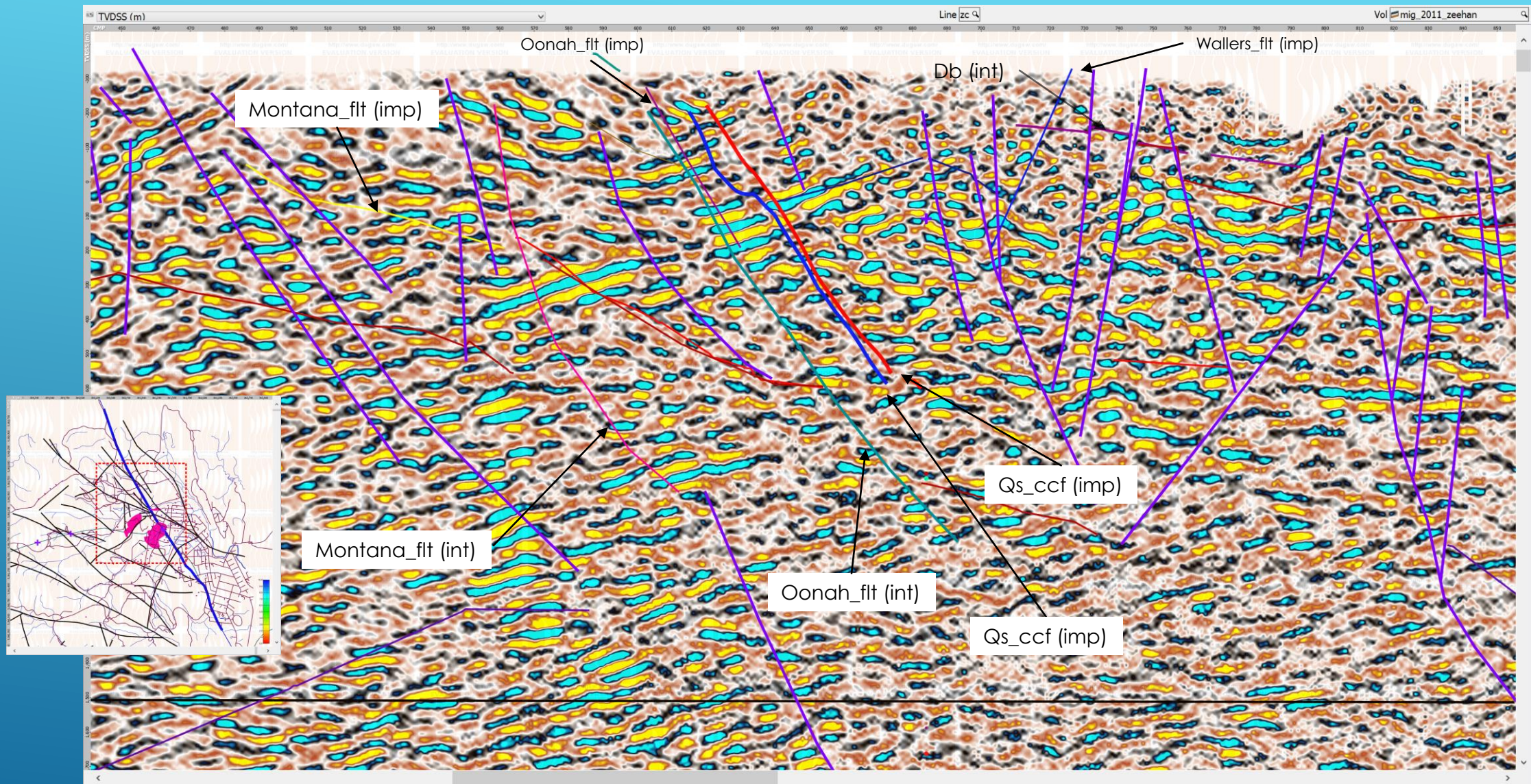
## LINE ZC – SCATTER WITH INTERPRETATION





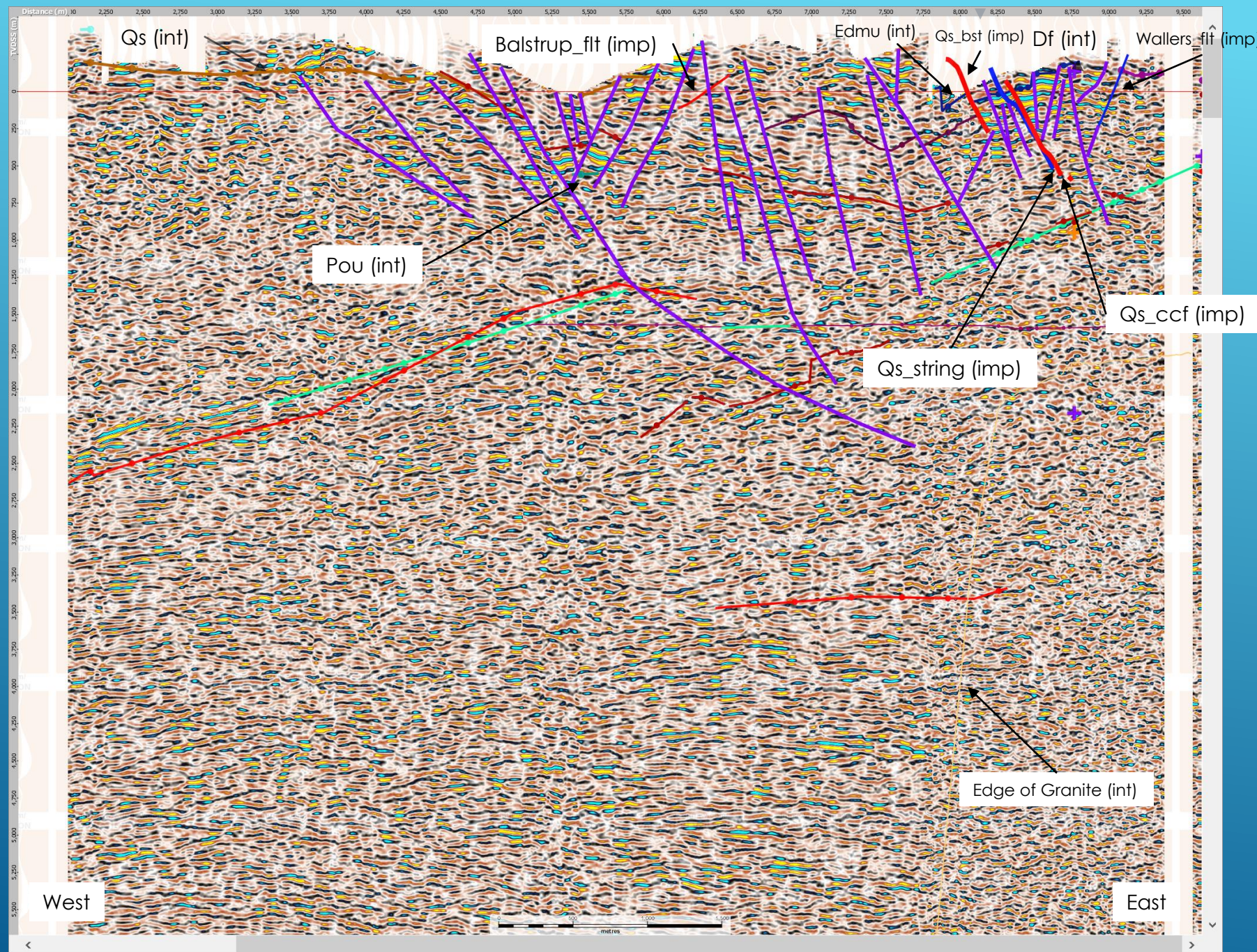
LINE ZC – STACK WITH INTERPRETATION





## LINE ZC – MIGRATION WITH INTERPRETATION

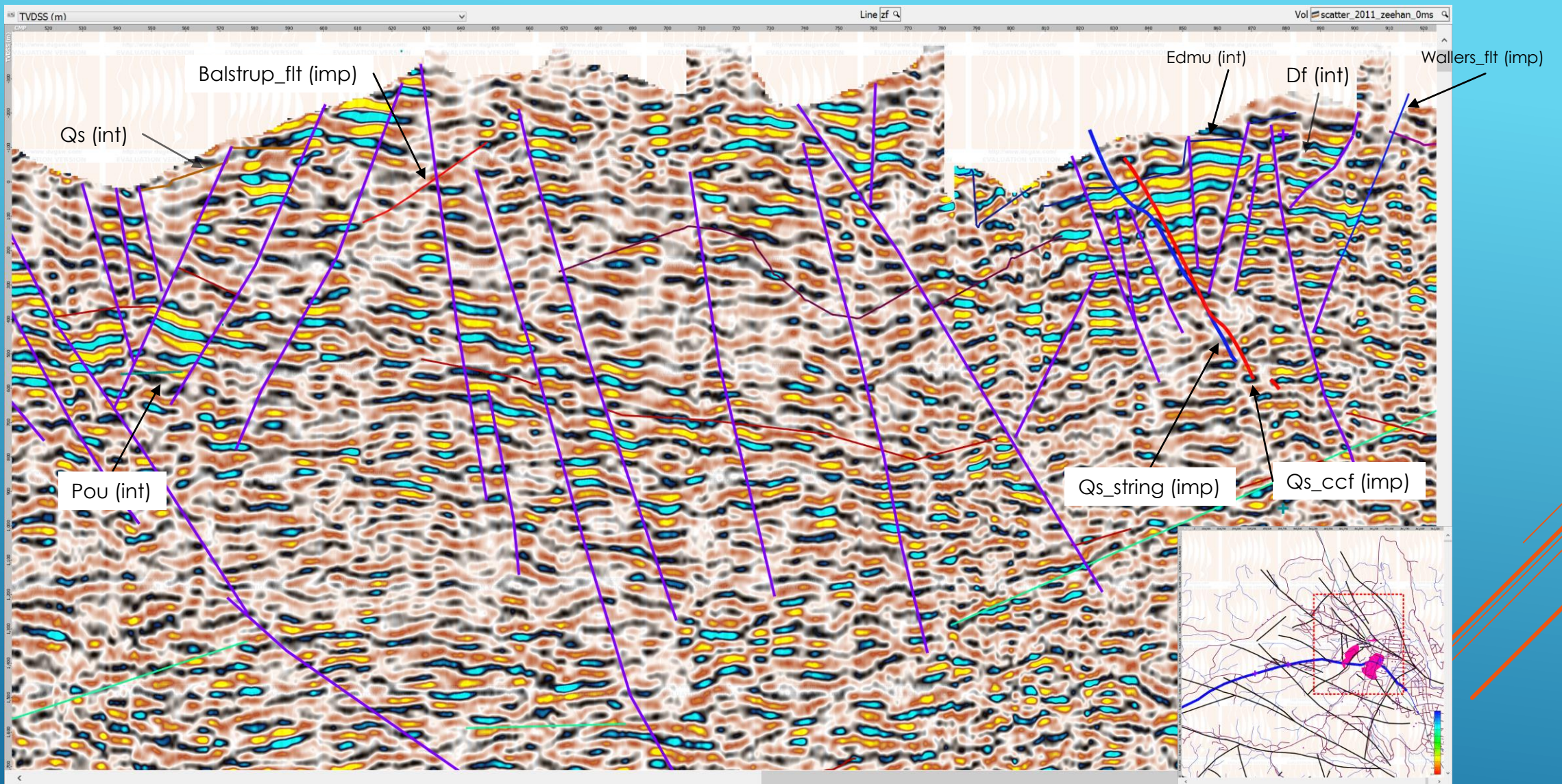




ZF\_SCATTER  
SCALED

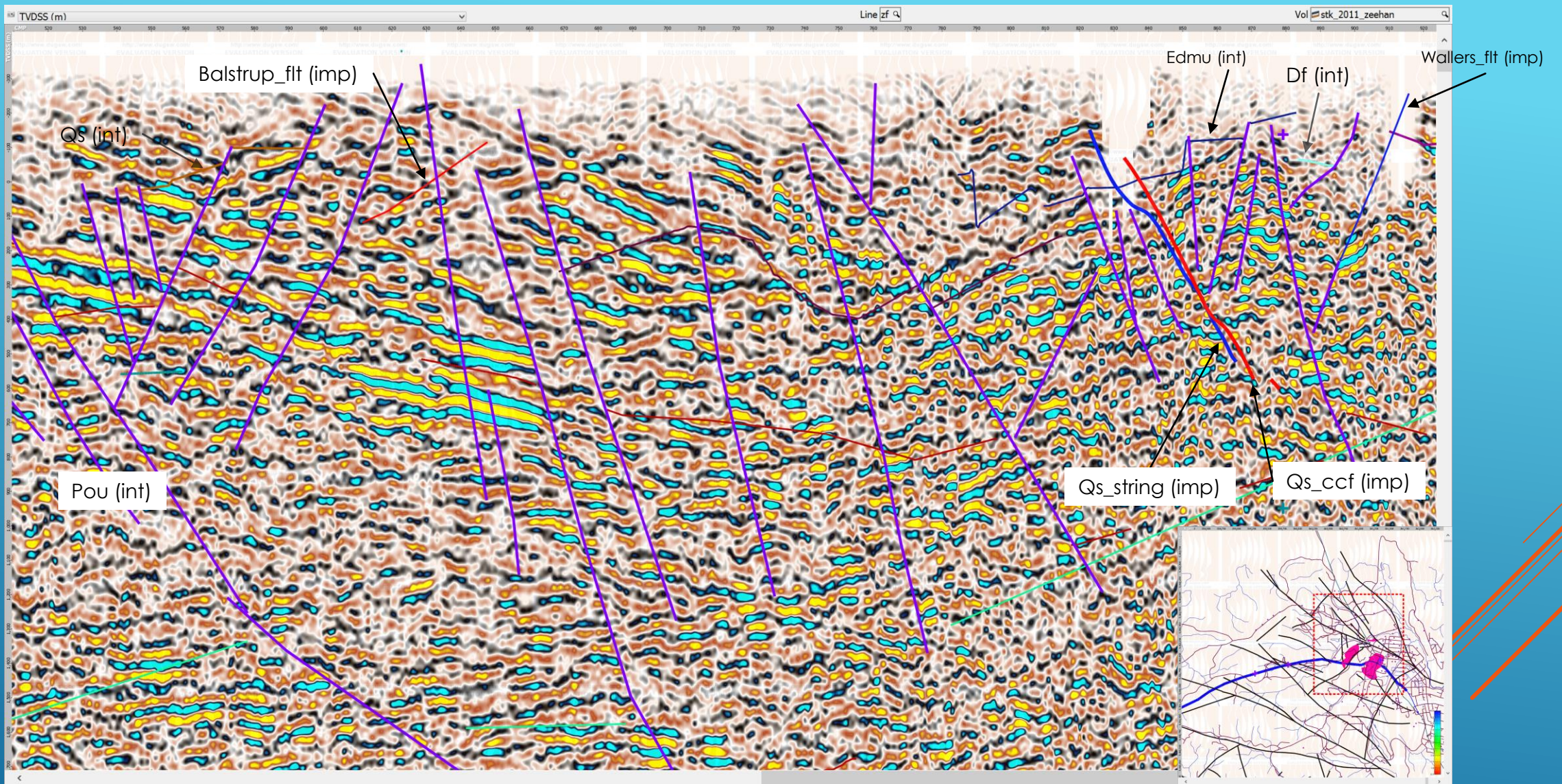
imp – imported  
int – interpreted  
flt – fault





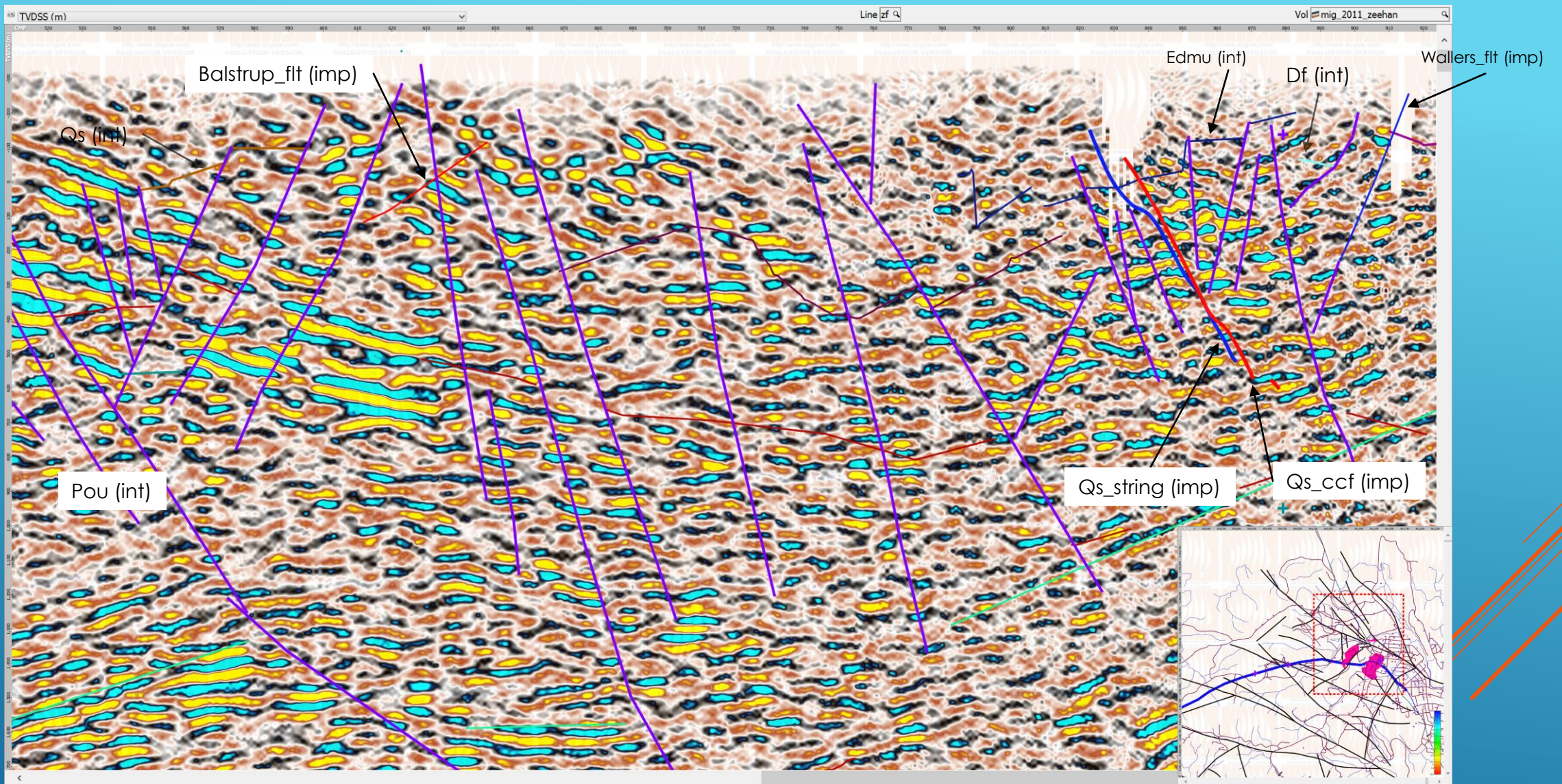
LINE ZF – SCATTER WITH INTERPRETATION





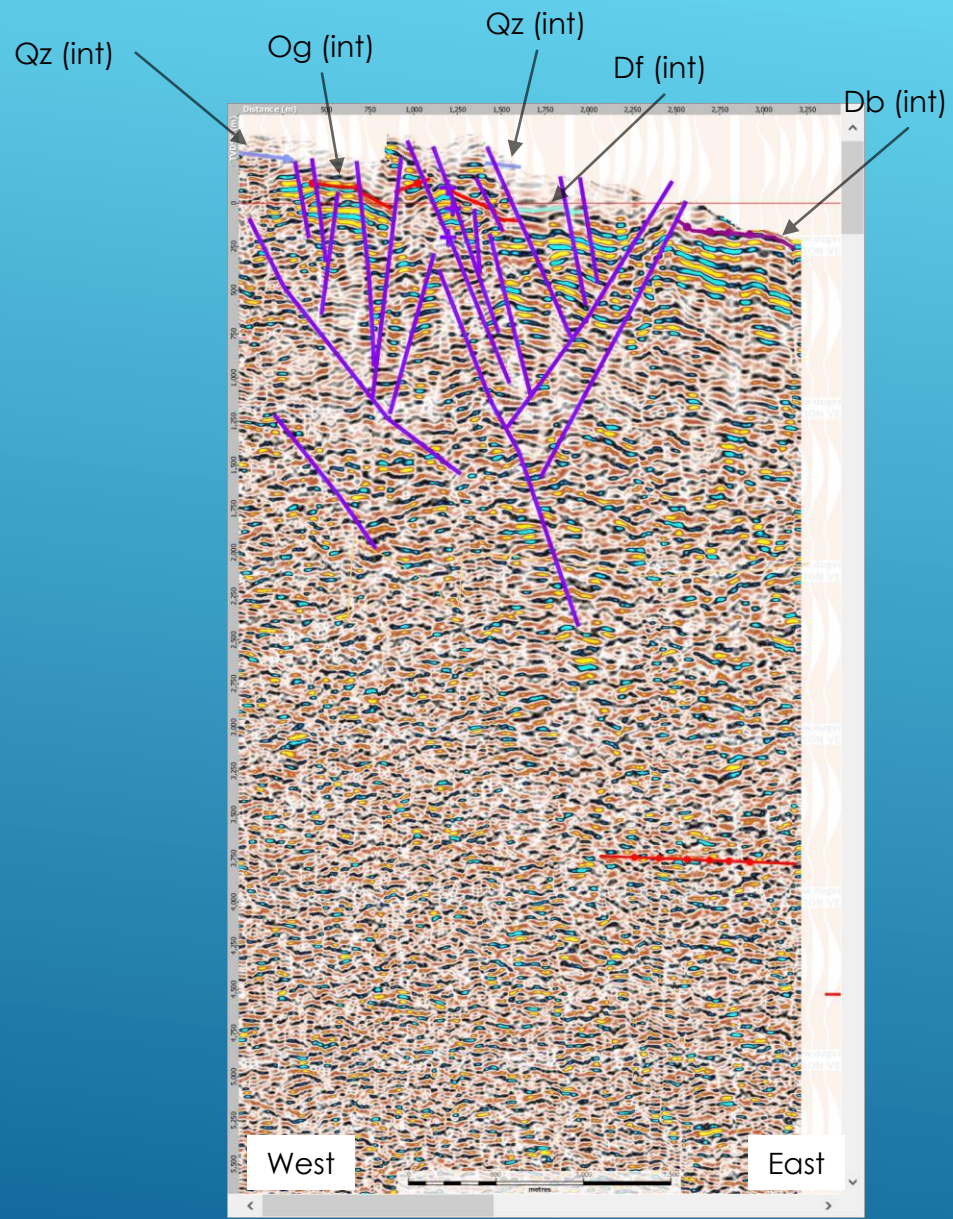
## LINE ZF – SCATTER WITH INTERPRETATION





LINE ZF – MIGRATION WITH INTERPRETATION

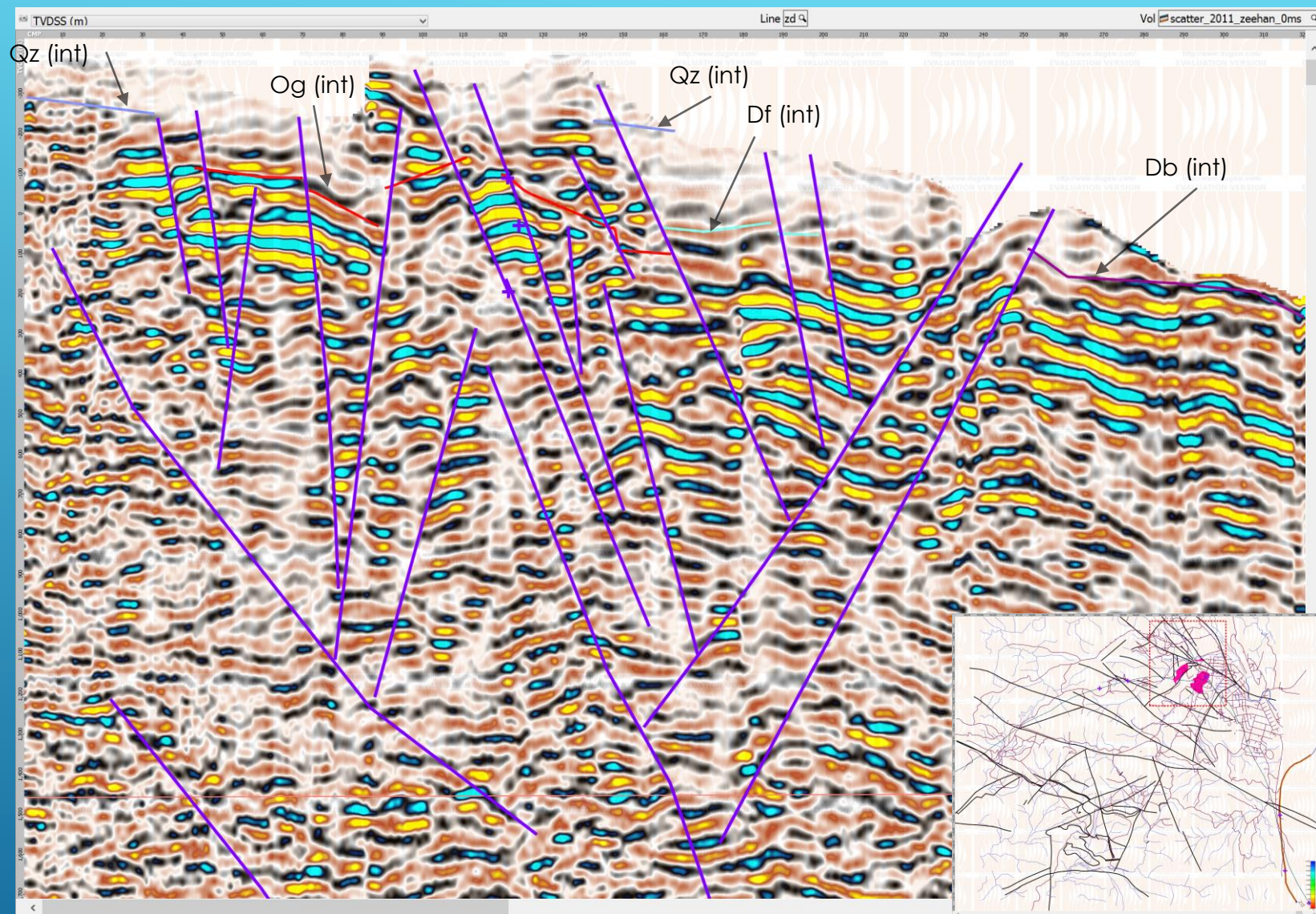




ZD\_SCATTER  
SCALED

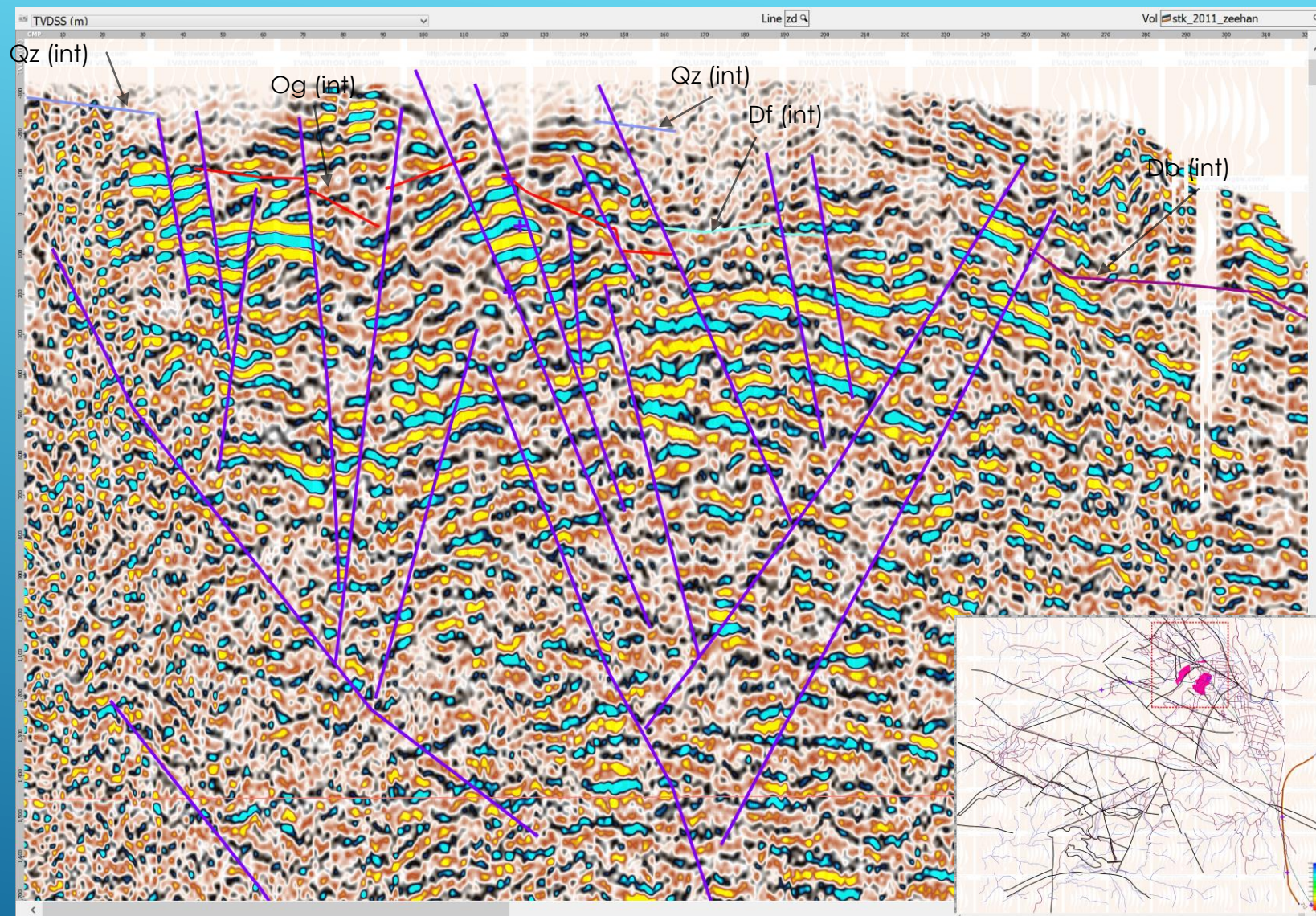
imp – imported  
int – interpreted  
flt - fault





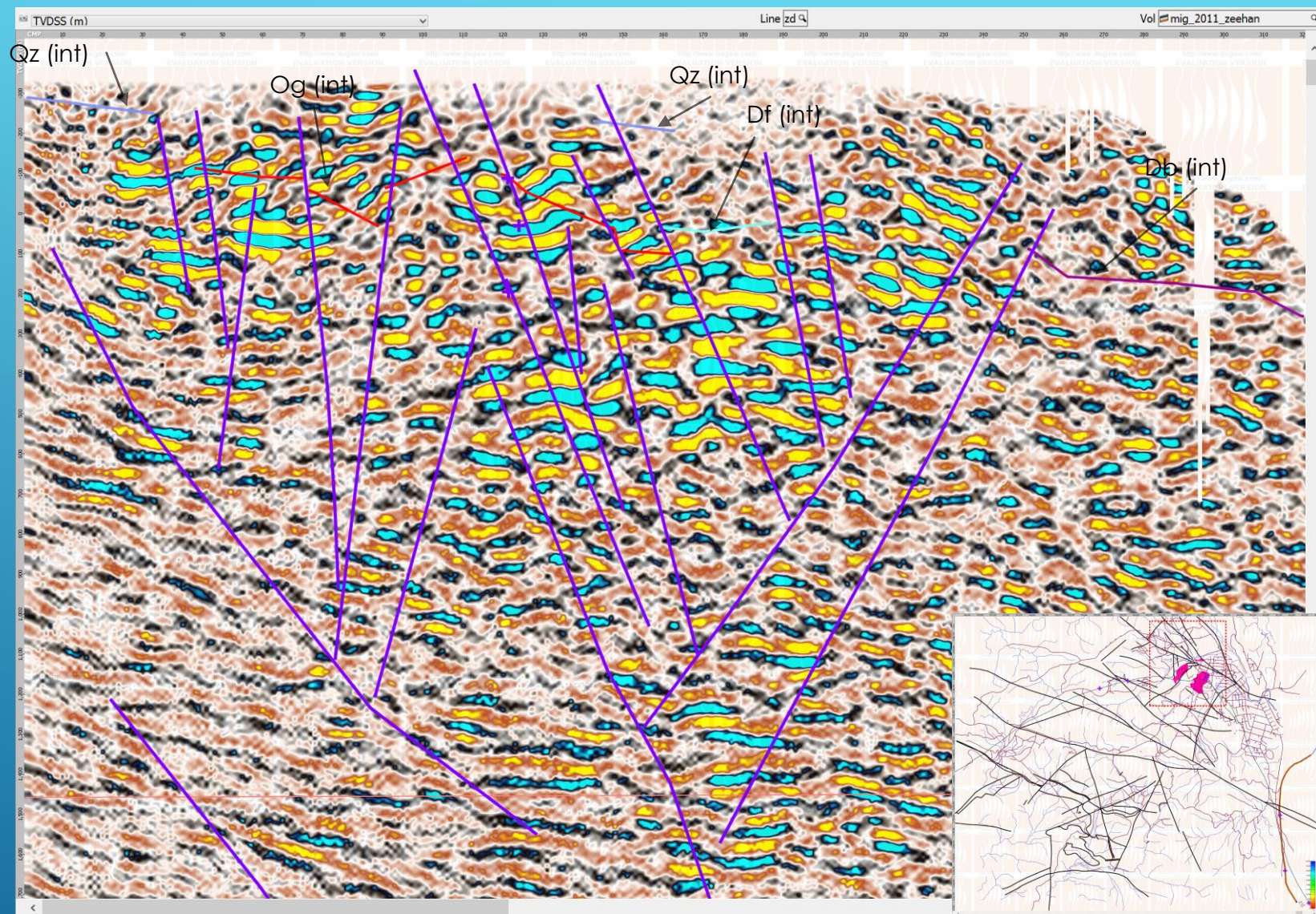
LINE ZD – SCATTER WITH INTERPRETATION





LINE ZD – STACK WITH INTERPRETATION



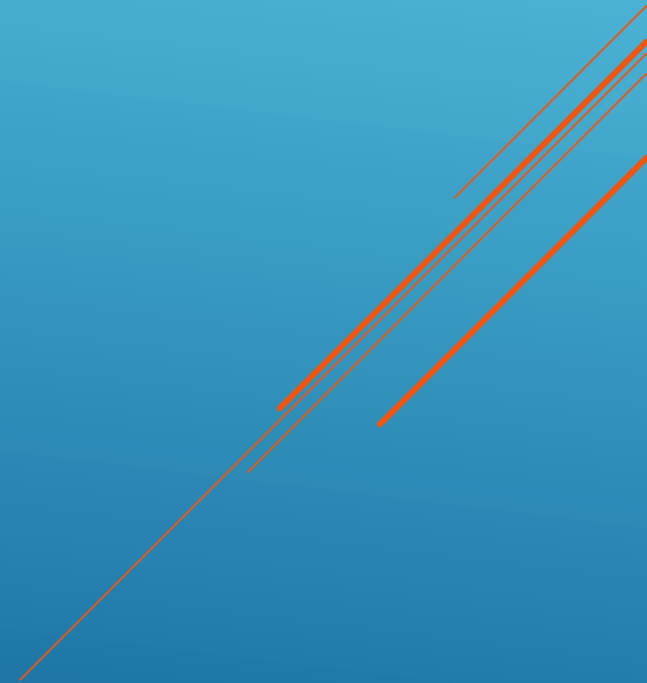


LINE ZD – MIGRATION WITH INTERPRETATION



# GRANITE

Various attributes of the seismic volume in conjunction with existing aeromagnetics have been used to determine the depth and lateral extent of the granite.

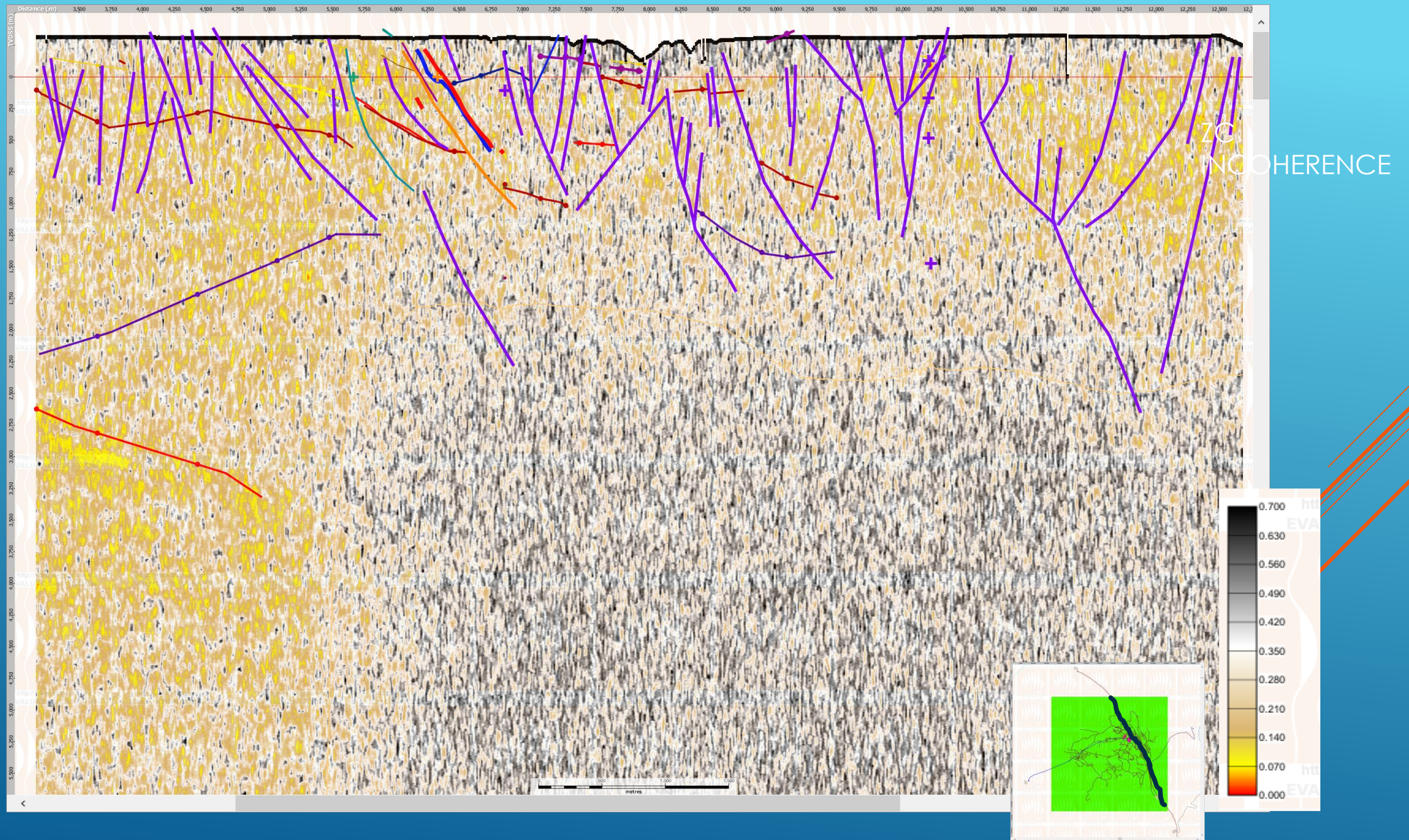




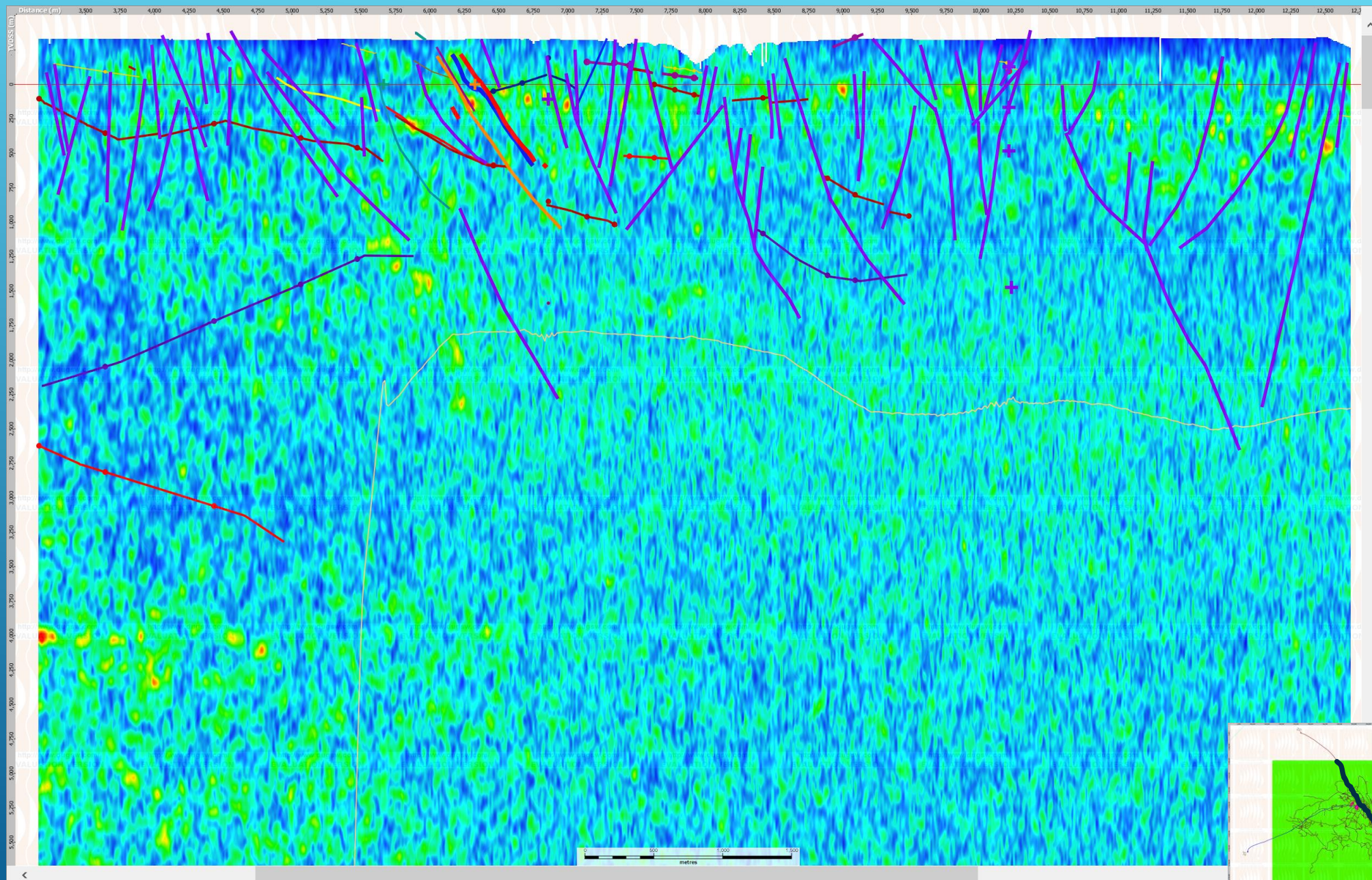
- ▶ Granite should (in general) be high velocity and disperse waves
- ▶ This will appear as high frequency incoherent noise on seismic
- ▶ Attributes used to highlight this include;
  - ▶ Incoherence
  - ▶ Spectral decomposition (more high frequencies)
- ▶ With the incoherence we expect the granite to show lower values (grey-black)
- ▶ With spectral decomposition we expect higher counts at high frequencies and low counts of low frequencies
- ▶ *Note: only the line part within the green area is displayed in depth*

## SEISMIC CHARACTER FOR GRANITES

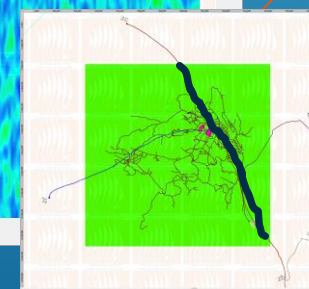
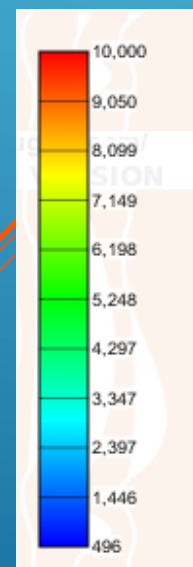




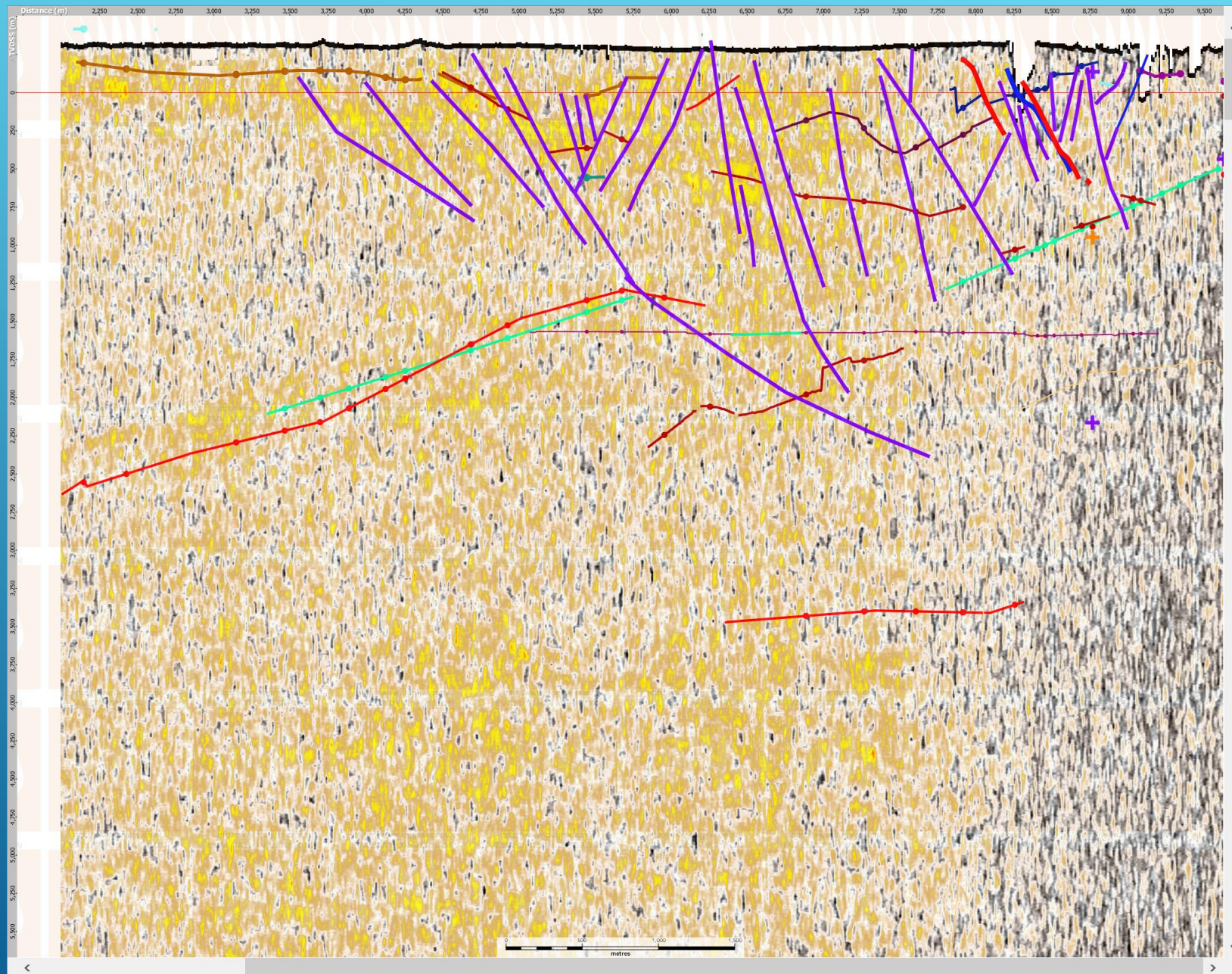




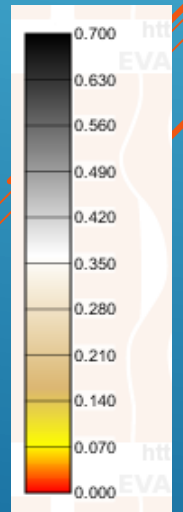
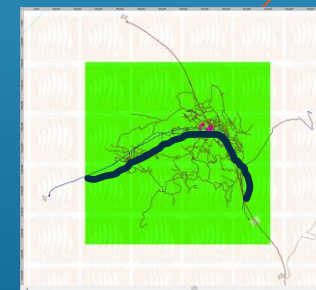
ZC  
SPECTRAL  
DECOMP  
92HZ



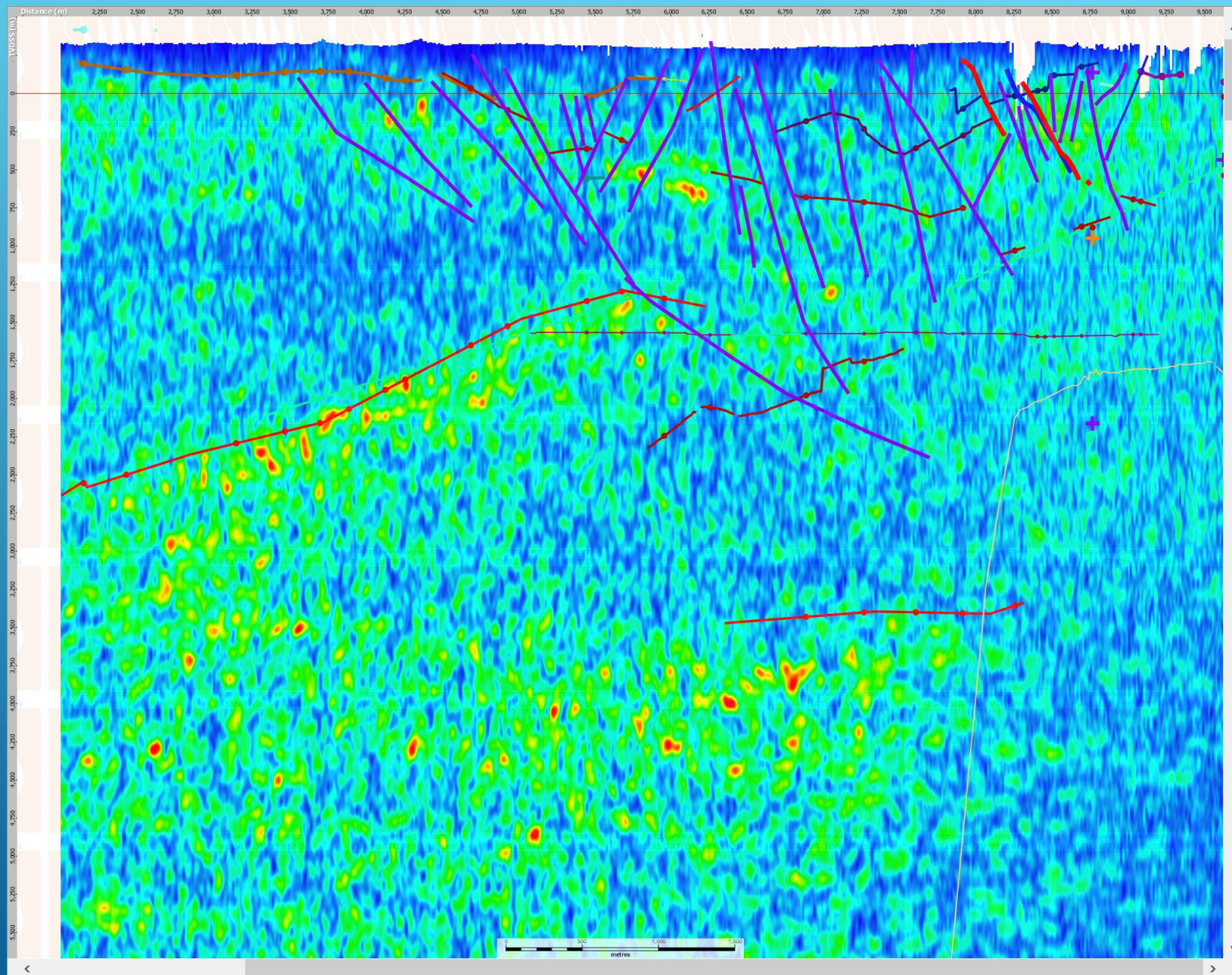




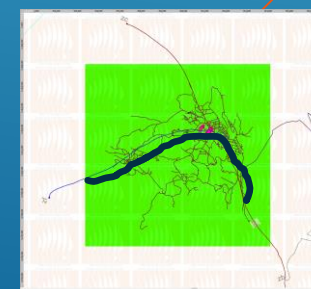
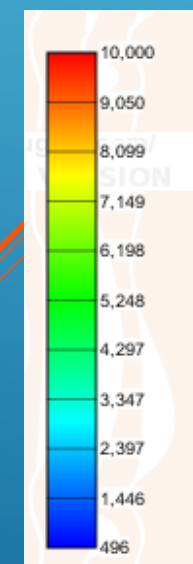
ZF  
INCOHERENCE



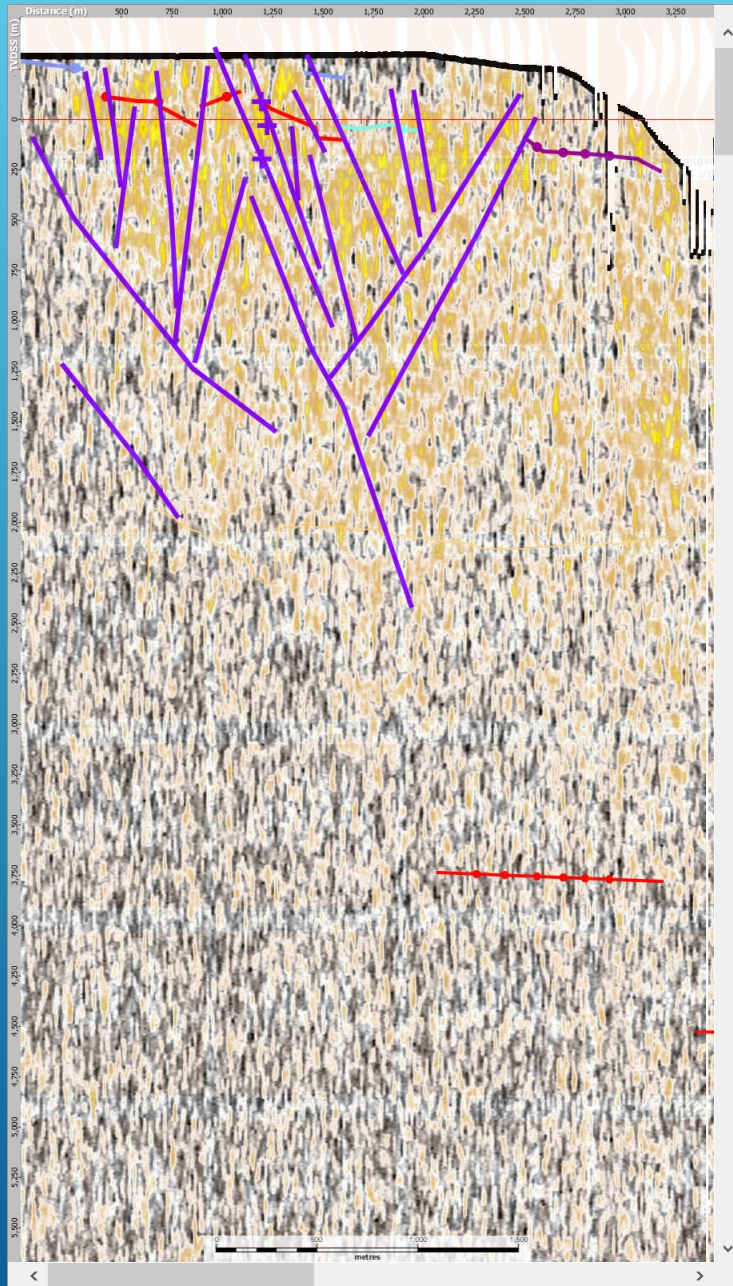




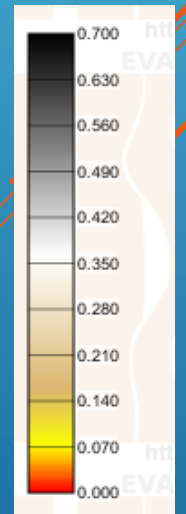
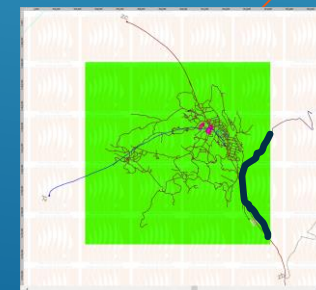
ZF  
SPECTRAL  
DECOMP  
92HZ



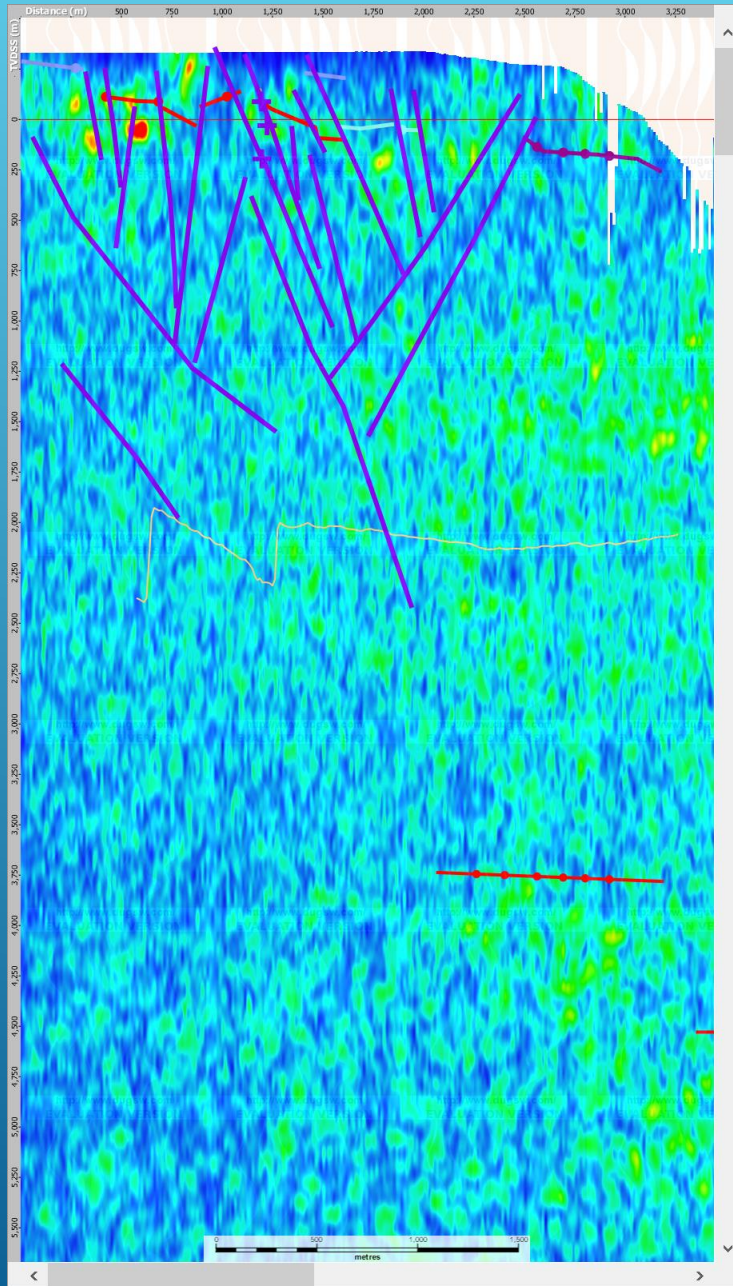




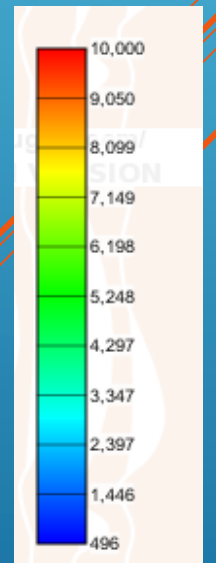
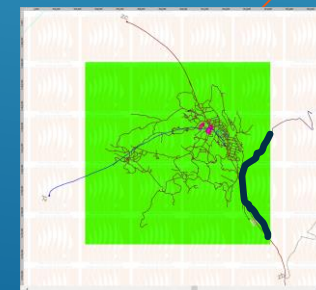
ZD  
INCOHERENCE



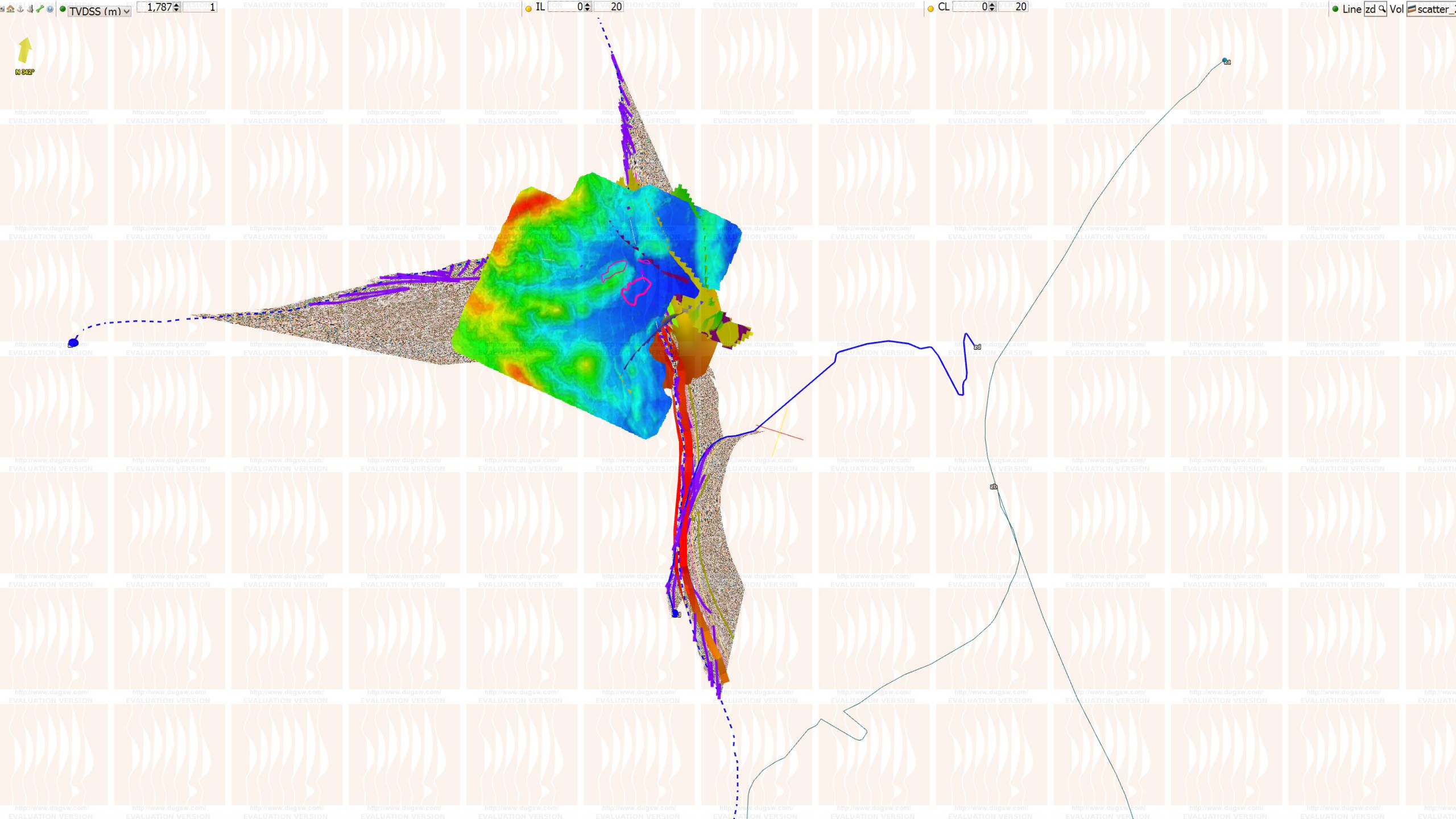




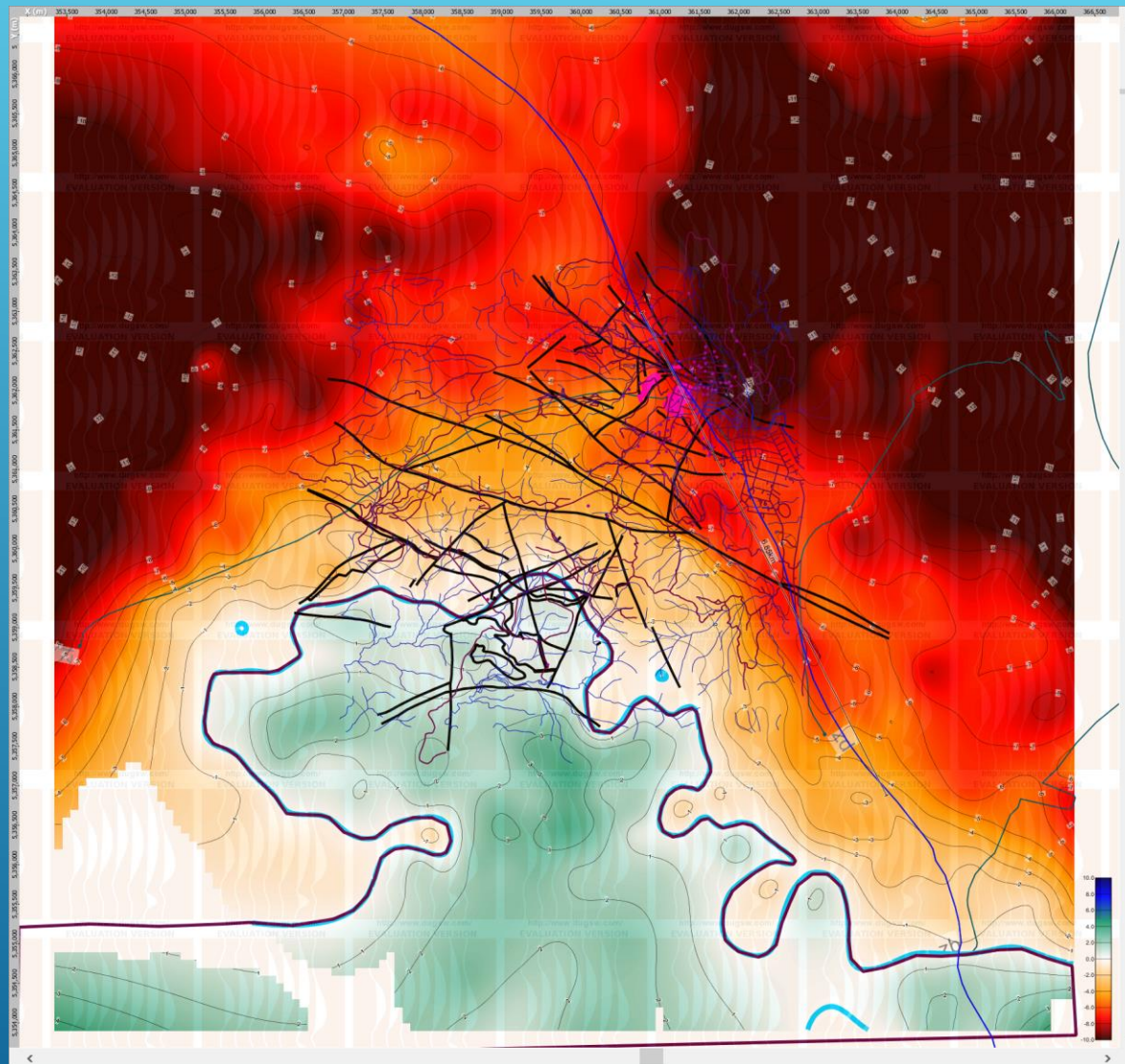
ZD  
SPECTRAL  
DECOMP  
92HZ











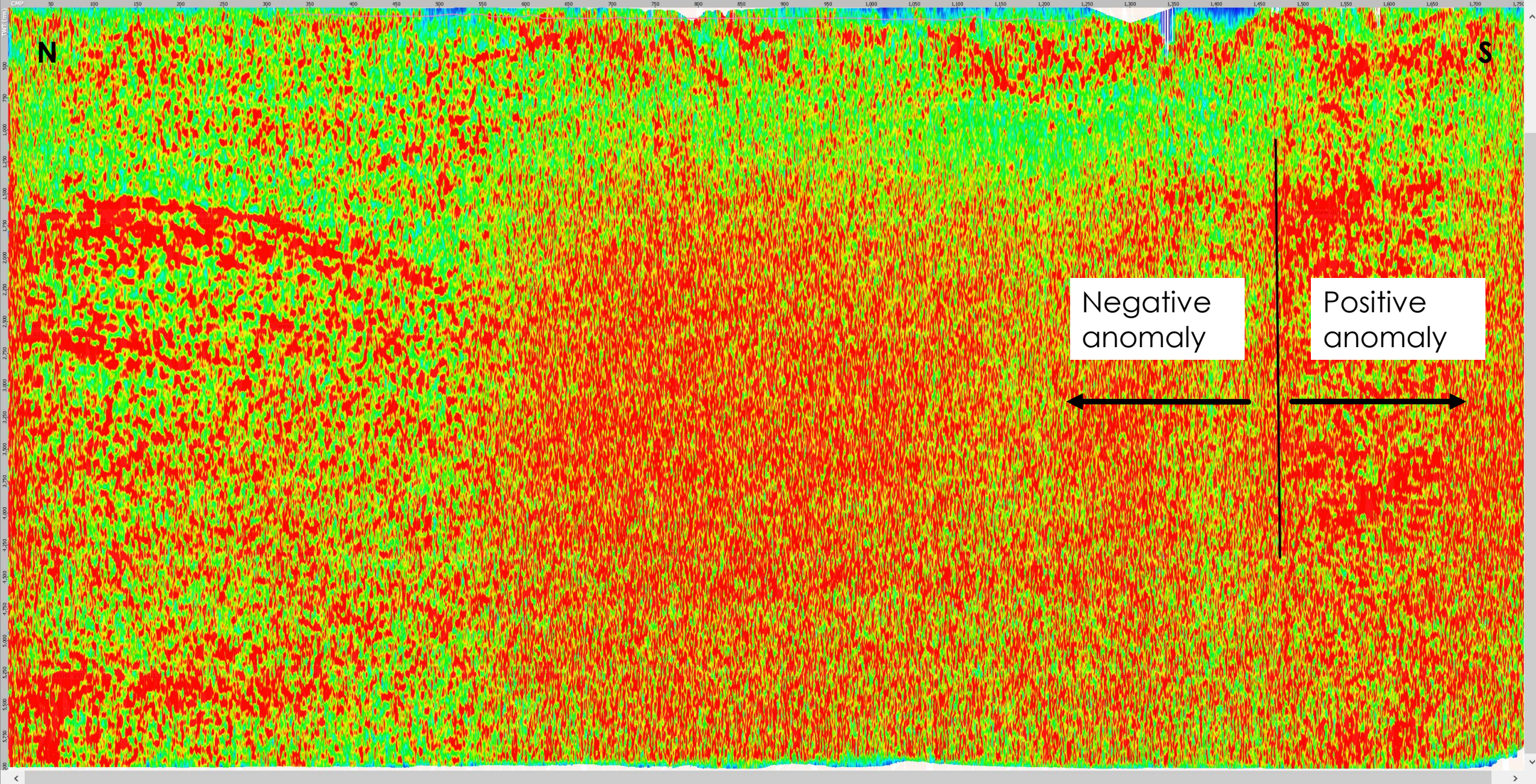
## BOUGUER ANOMALY

Blue line is the zero contour of corrected gravity anomaly

Datafile:  
GBOUG\_Zeehan100\_NOV13

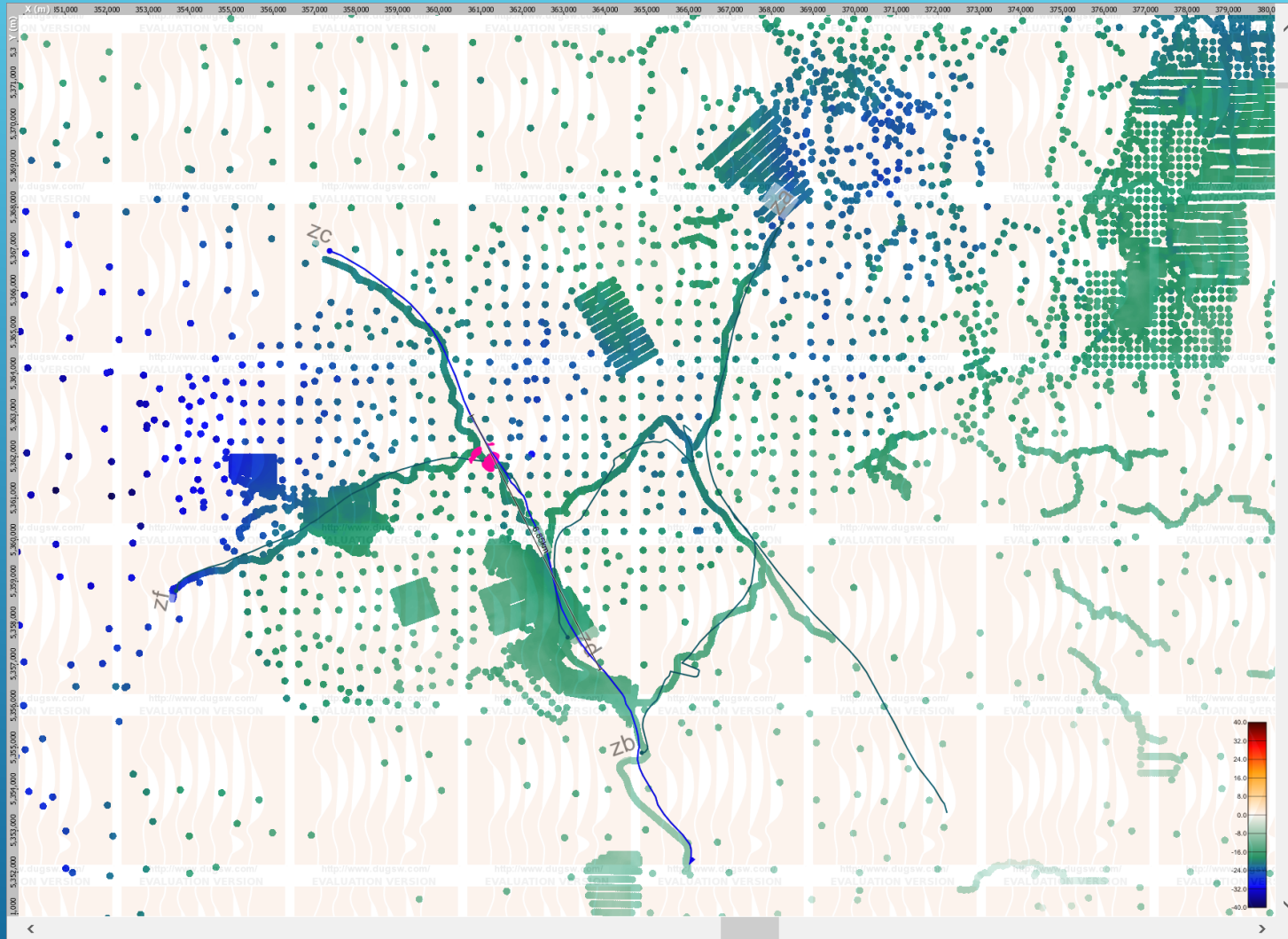
Note the point at which the contour crosses line ZC – this is marked on the next section





Line zc – SD92Hz showing gravity anomaly



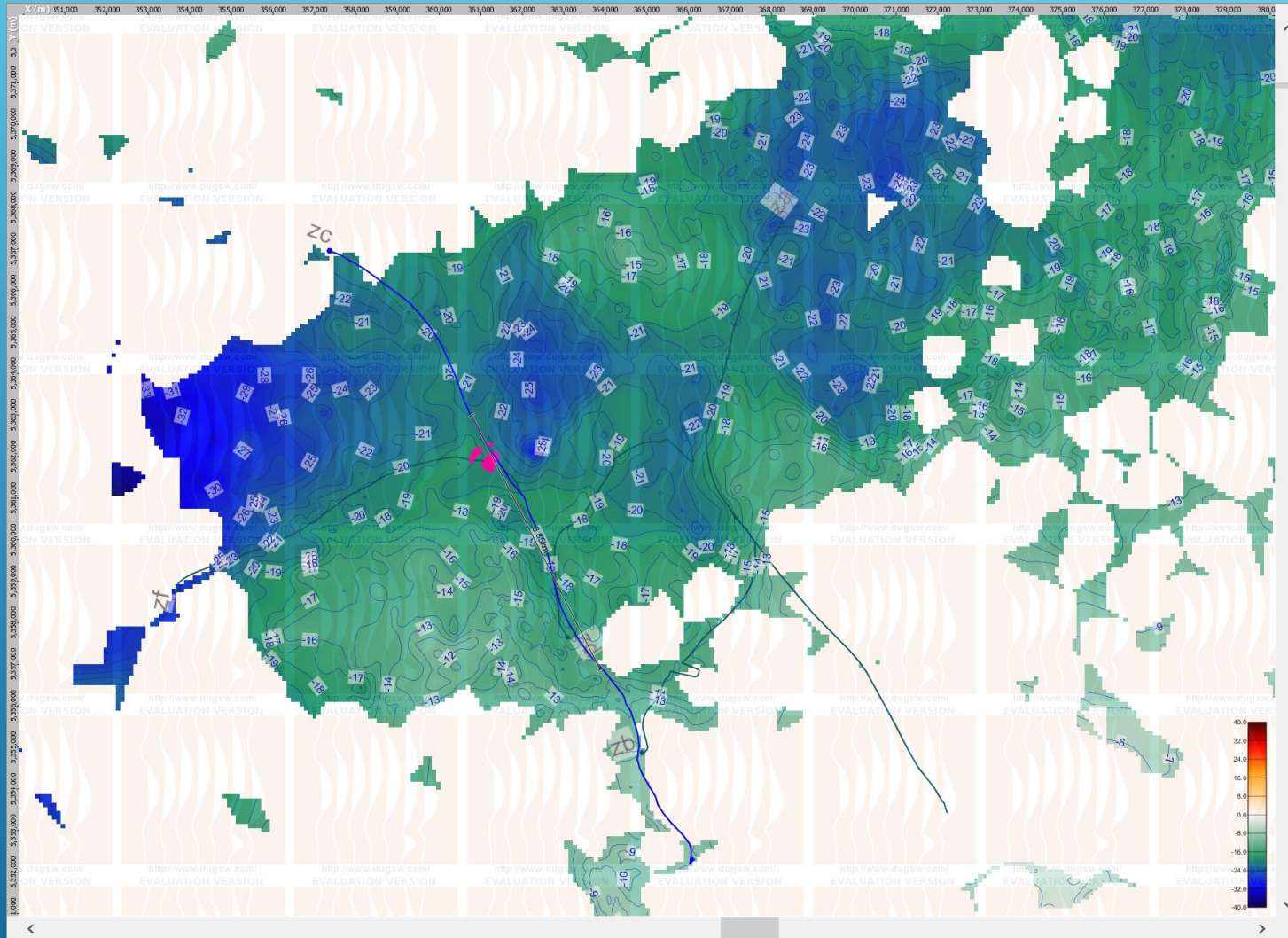


# NORTH WEST TASMANIA GRAVITY SURVEY 2012/2013

Residual gravity data

Scale +/- 40





# NORTH WEST TASMANIA GRAVITY SURVEY 2012/2013

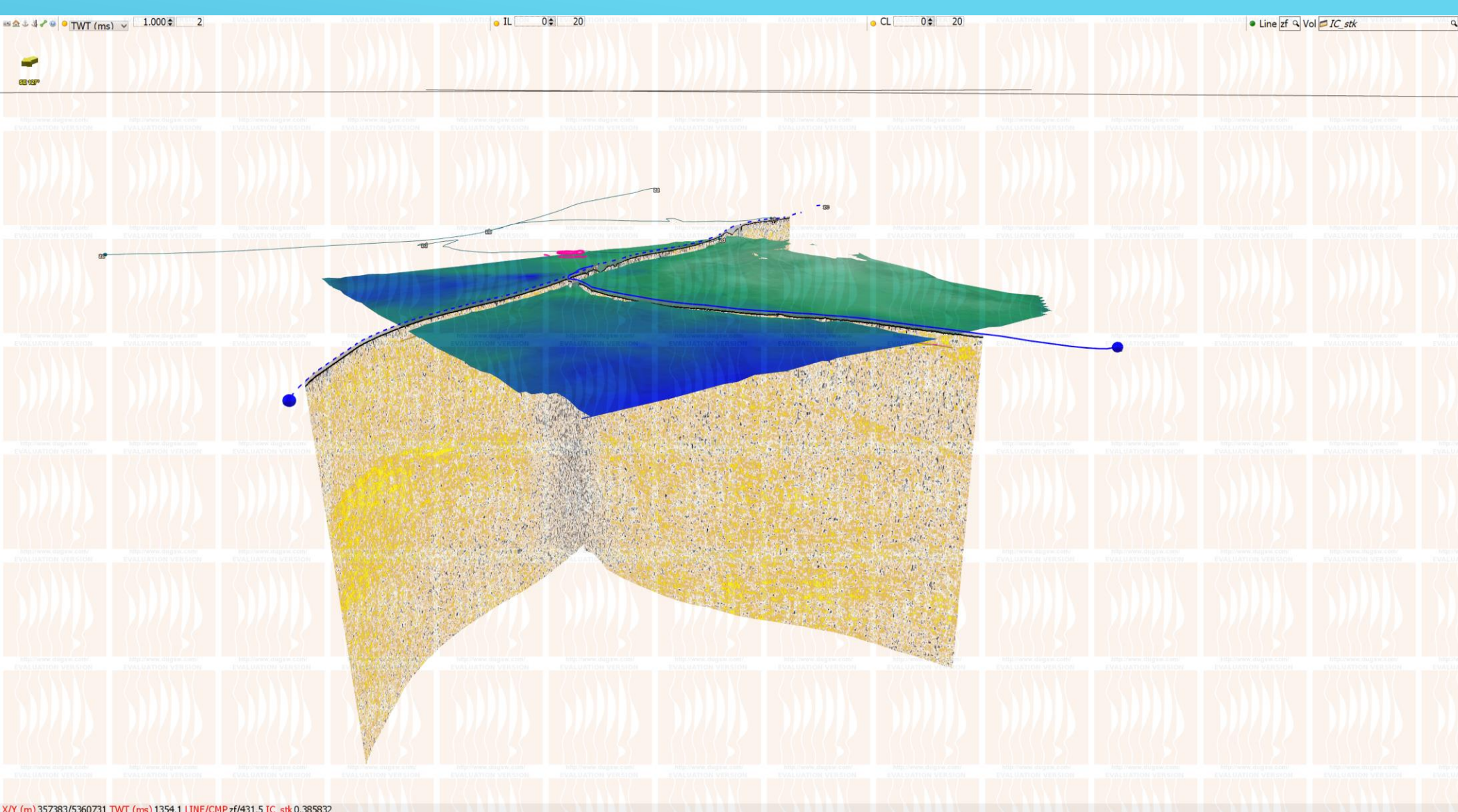
Residual gravity gridded

Scale +/- 40





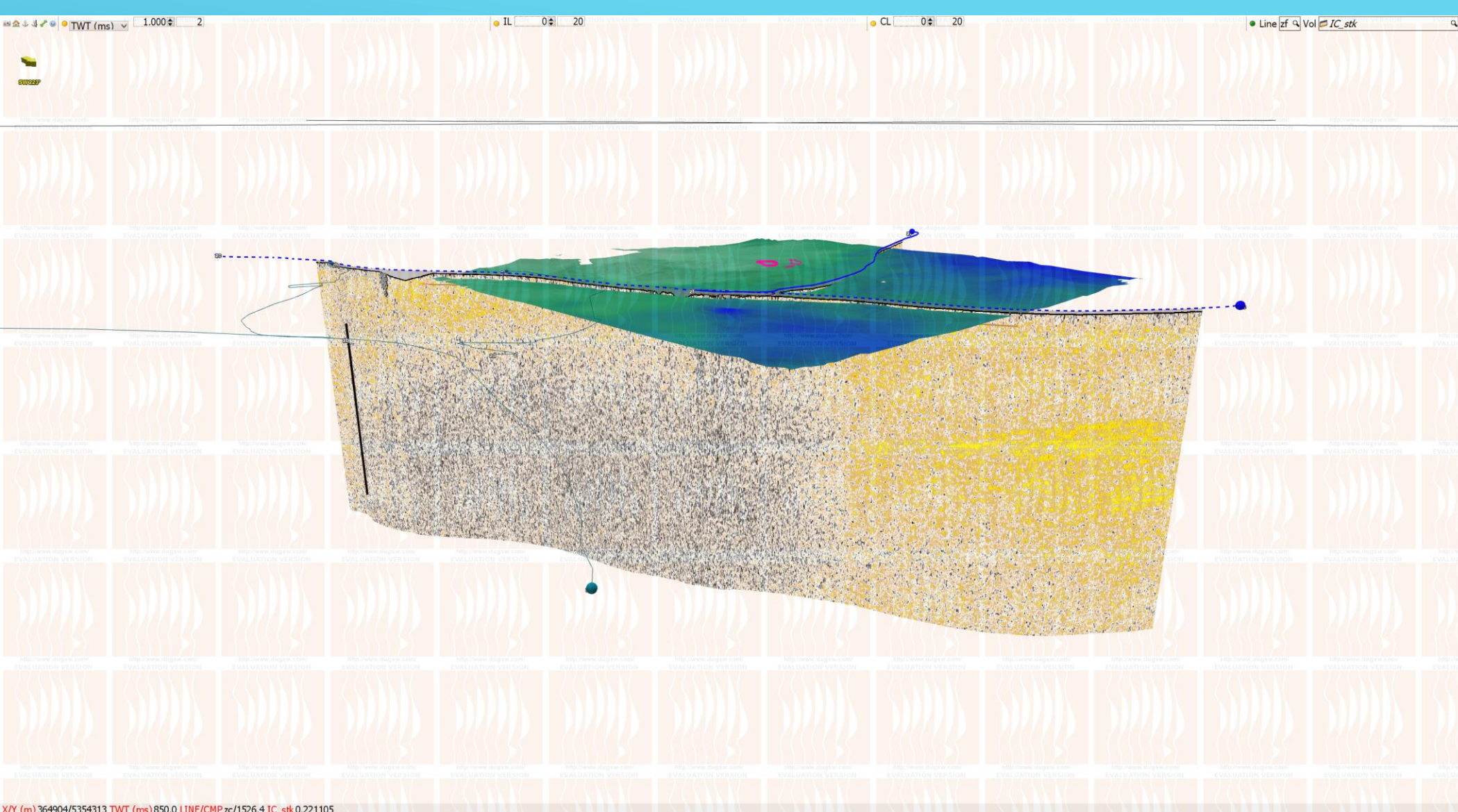




## BOUGUER ANOMALY

- ▶ North West Tasmania Gravity Survey 2012/2013 – grid
- ▶ Incoherence seismic attribute from Stack volume

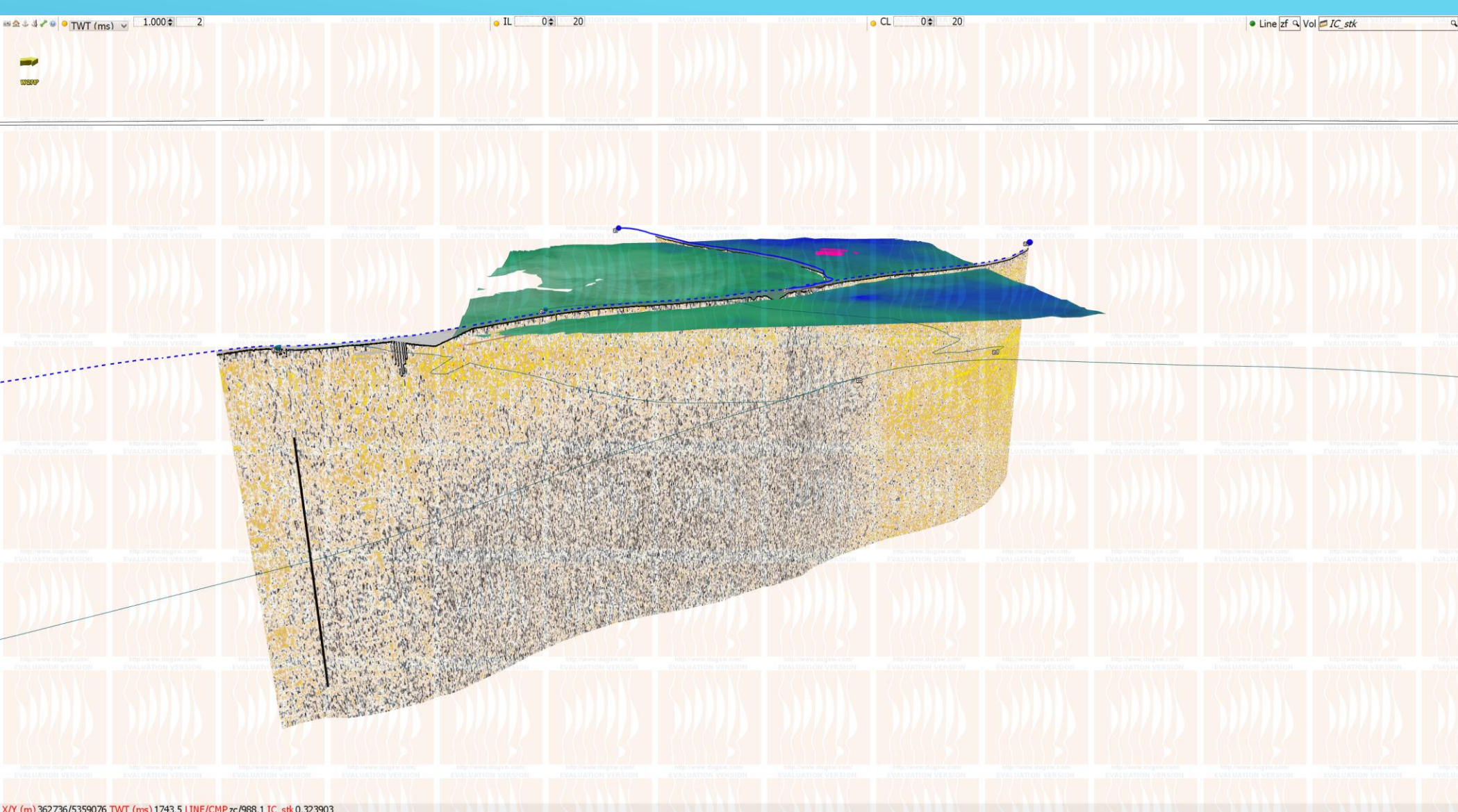




## BOUGUER ANOMALY

- ▶ North West Tasmania Gravity Survey 2012/2013 – grid
- ▶ Incoherence seismic attribute from Stack volume

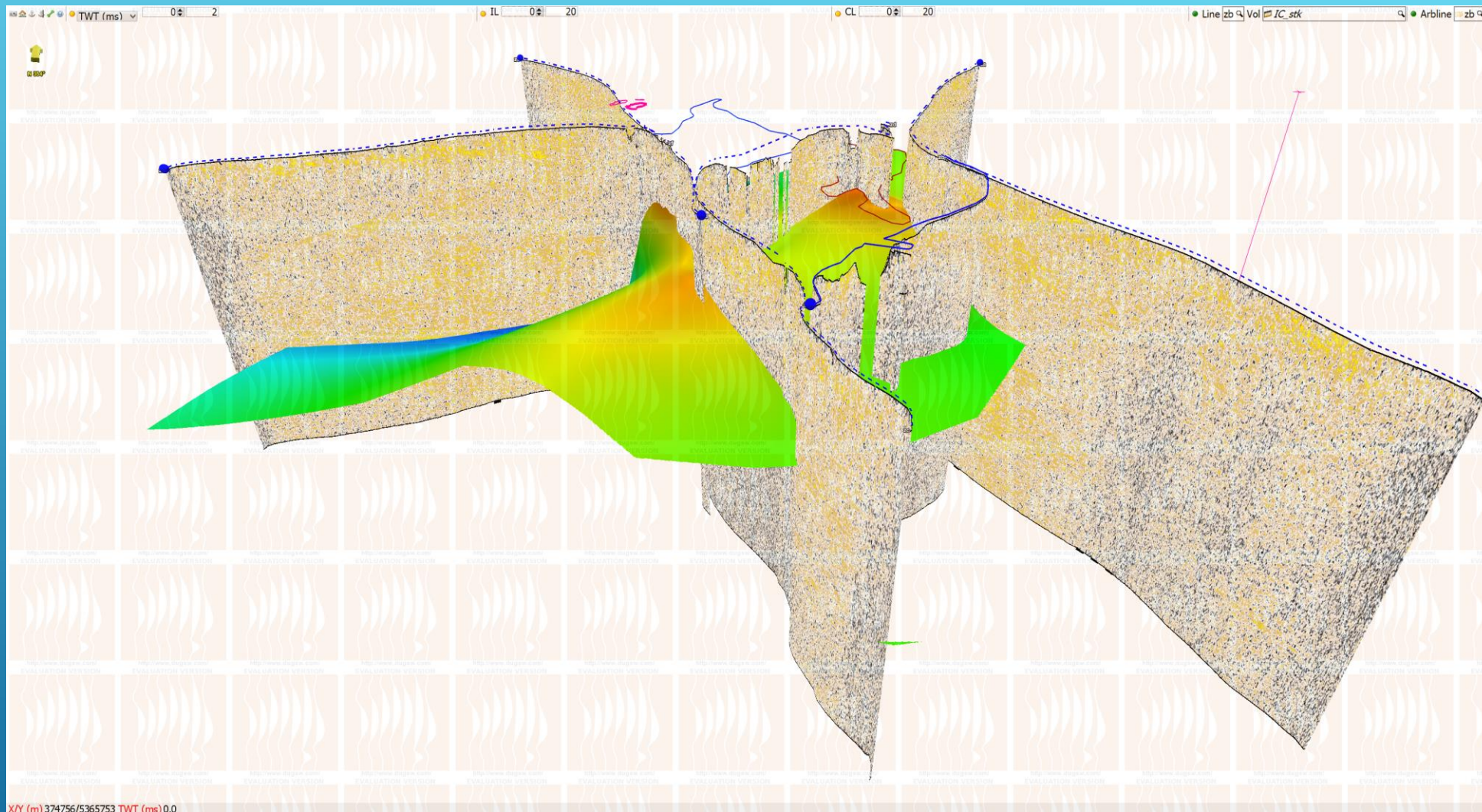




## BOUGUER ANOMALY

- ▶ North West Tasmania Gravity Survey 2012/2013 – grid
- ▶ Incoherence seismic attribute from Stack volume

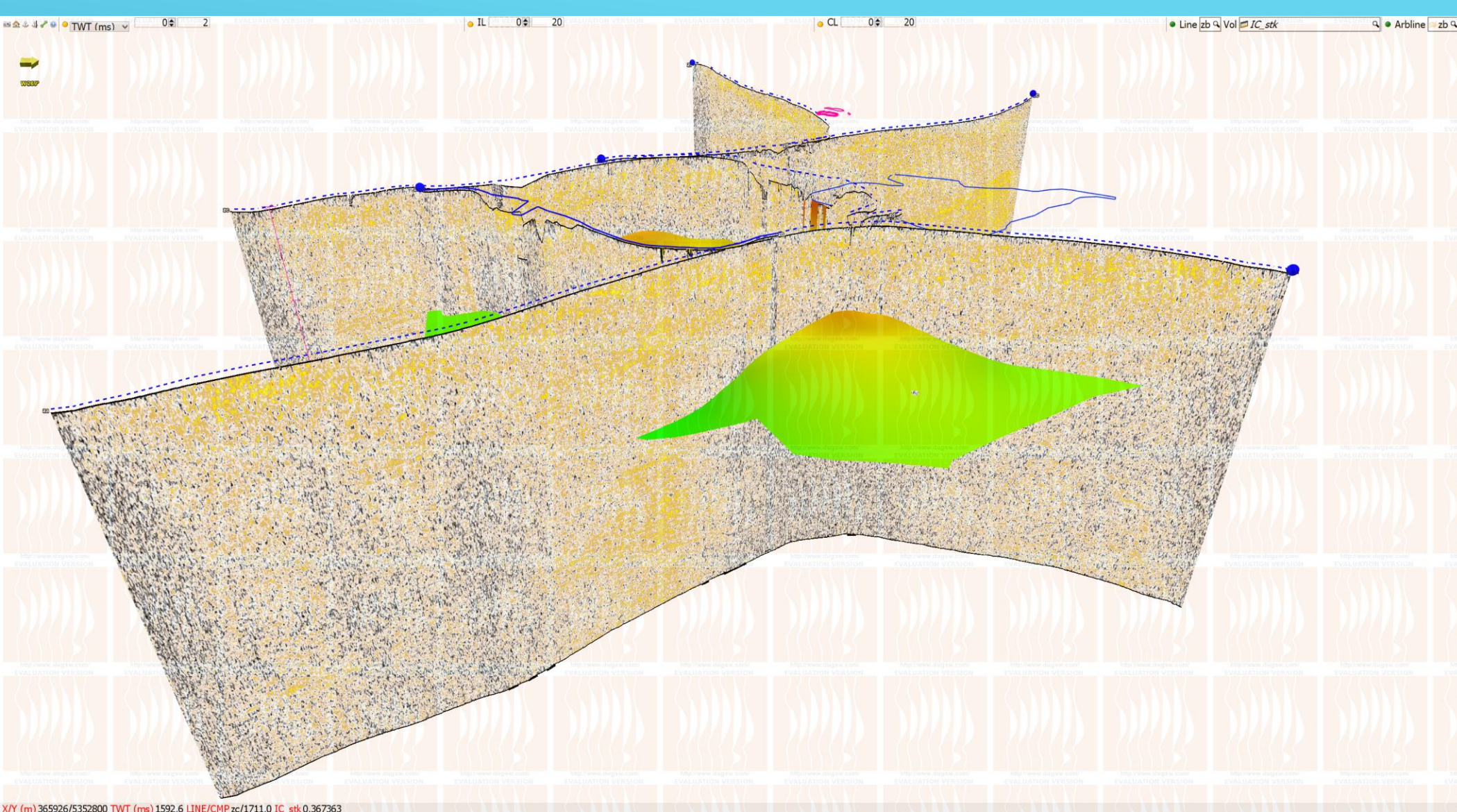




## GRANITE

- ▶ Granite interpretation from seismic
- ▶ Incoherence seismic attribute from Stack volume

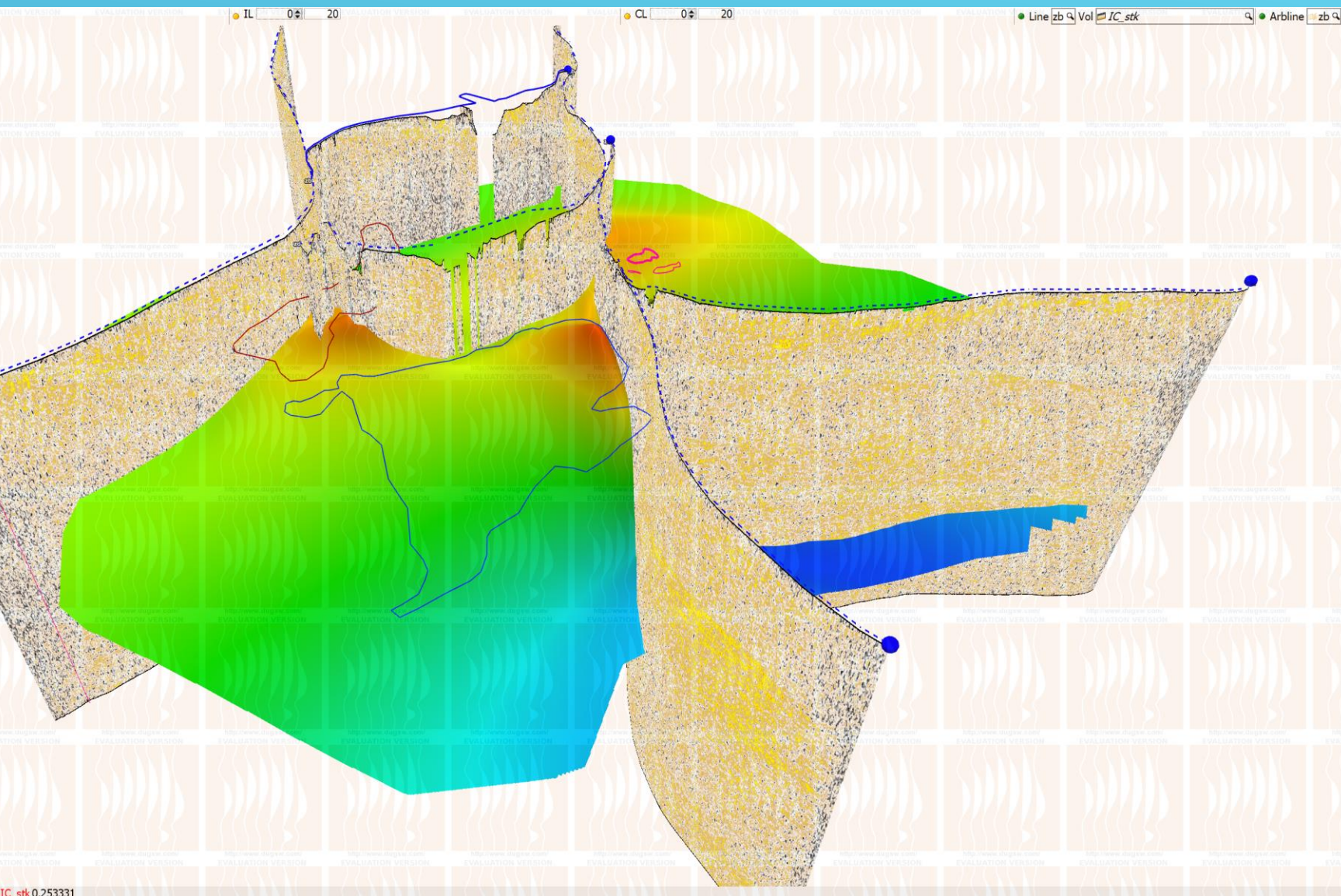




## GRANITE

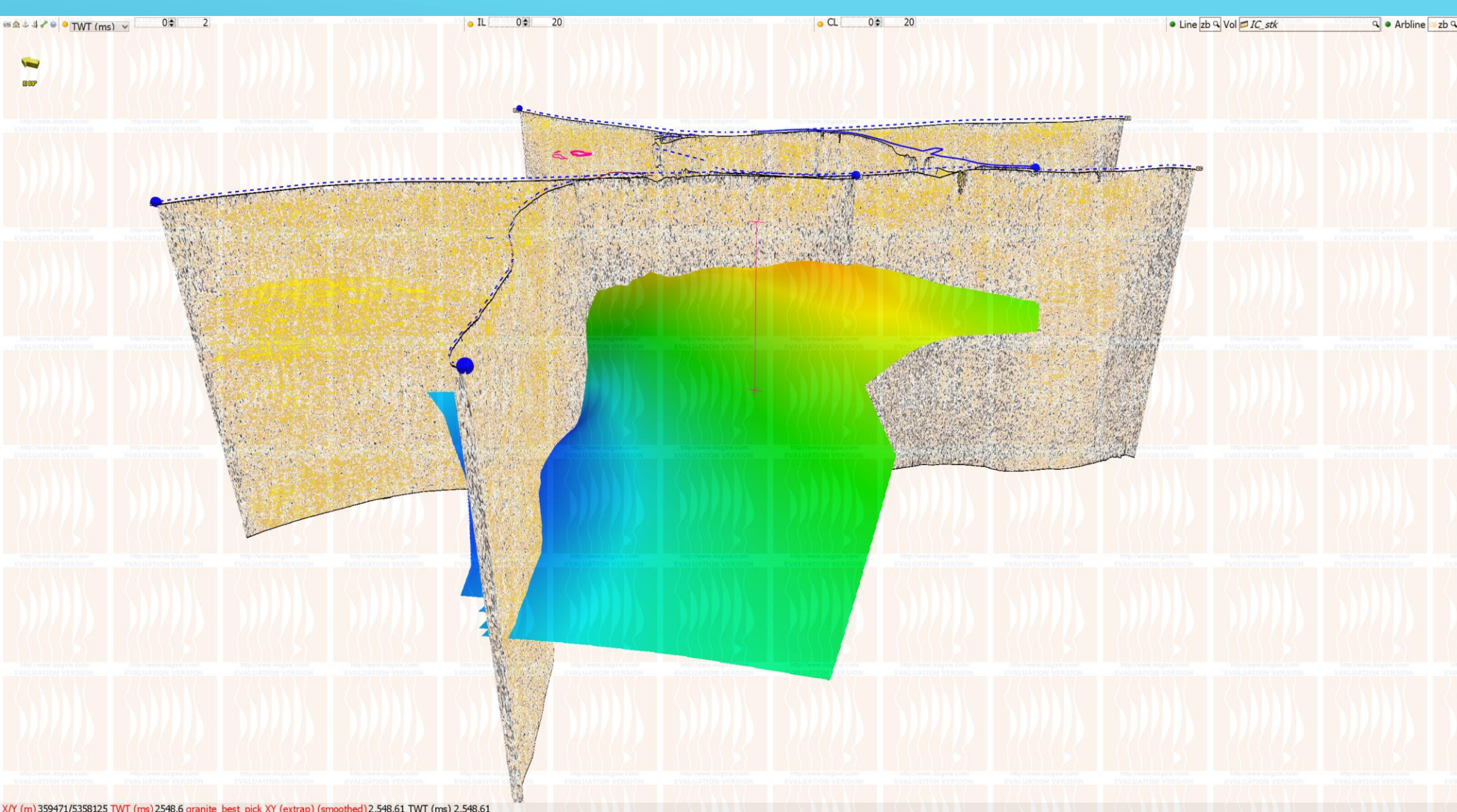
- ▶ Granite interpretation from seismic
- ▶ Incoherence seismic attribute from Stack volume





► Incoherence seismic attribute from Stack volume

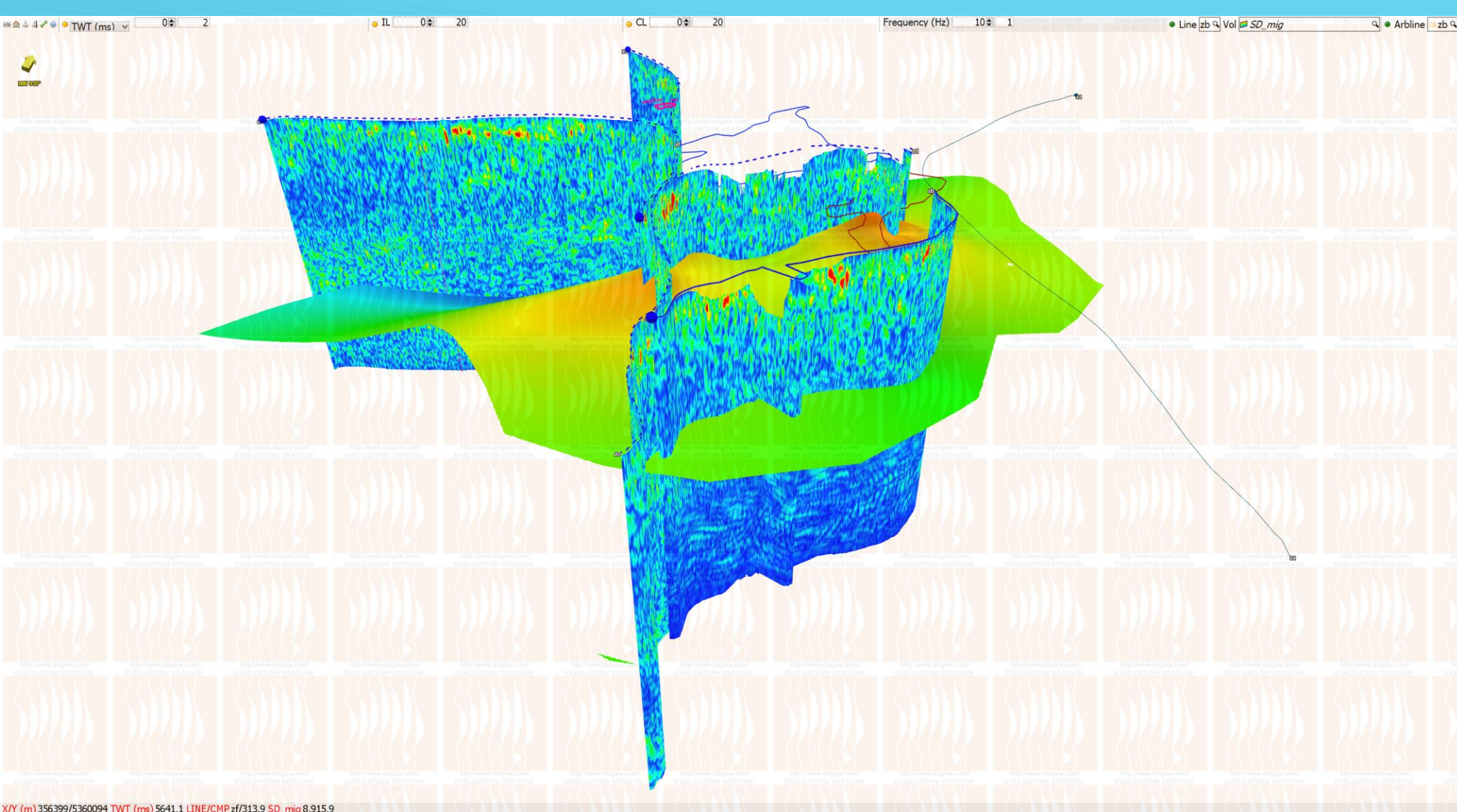




## GRANITE

- ▶ Granite interpretation from seismic
- ▶ Incoherence seismic attribute from Stack volume

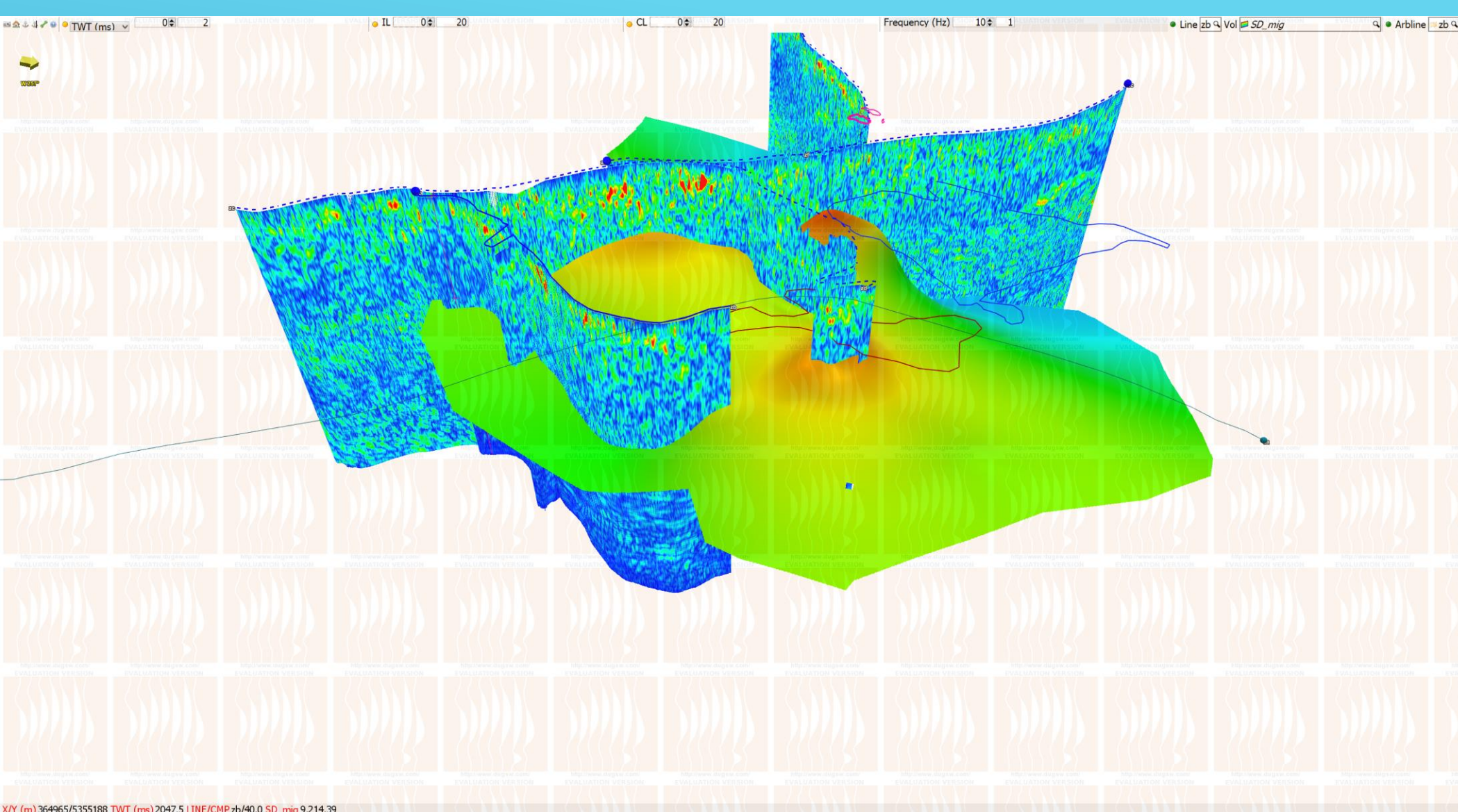




## GRANITE

- ▶ Granite interpretation from seismic
- ▶ Incoherence seismic attribute from Stack volume

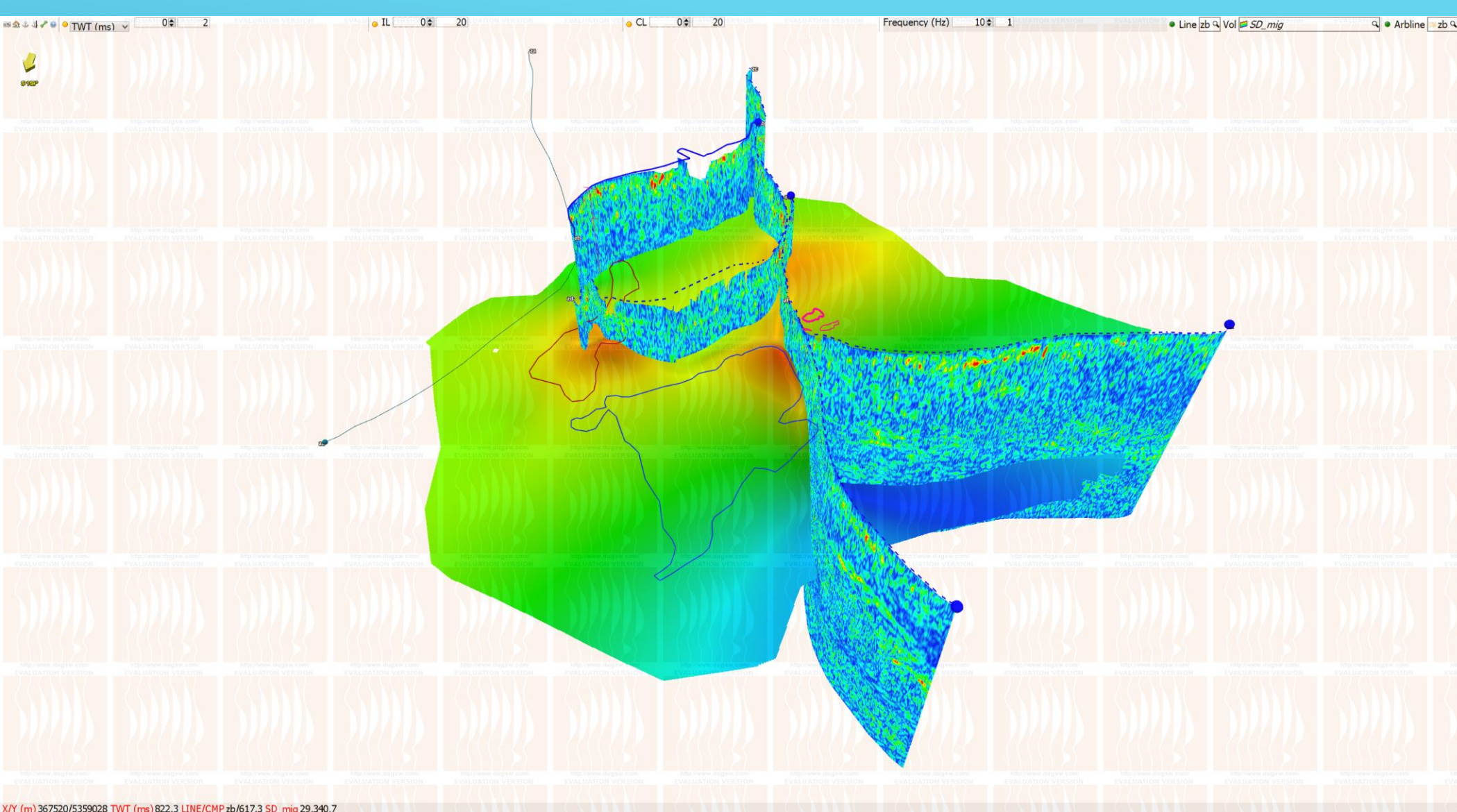




## GRANITE

- ▶ Granite interpretation from seismic
- ▶ Incoherence seismic attribute from Stack volume

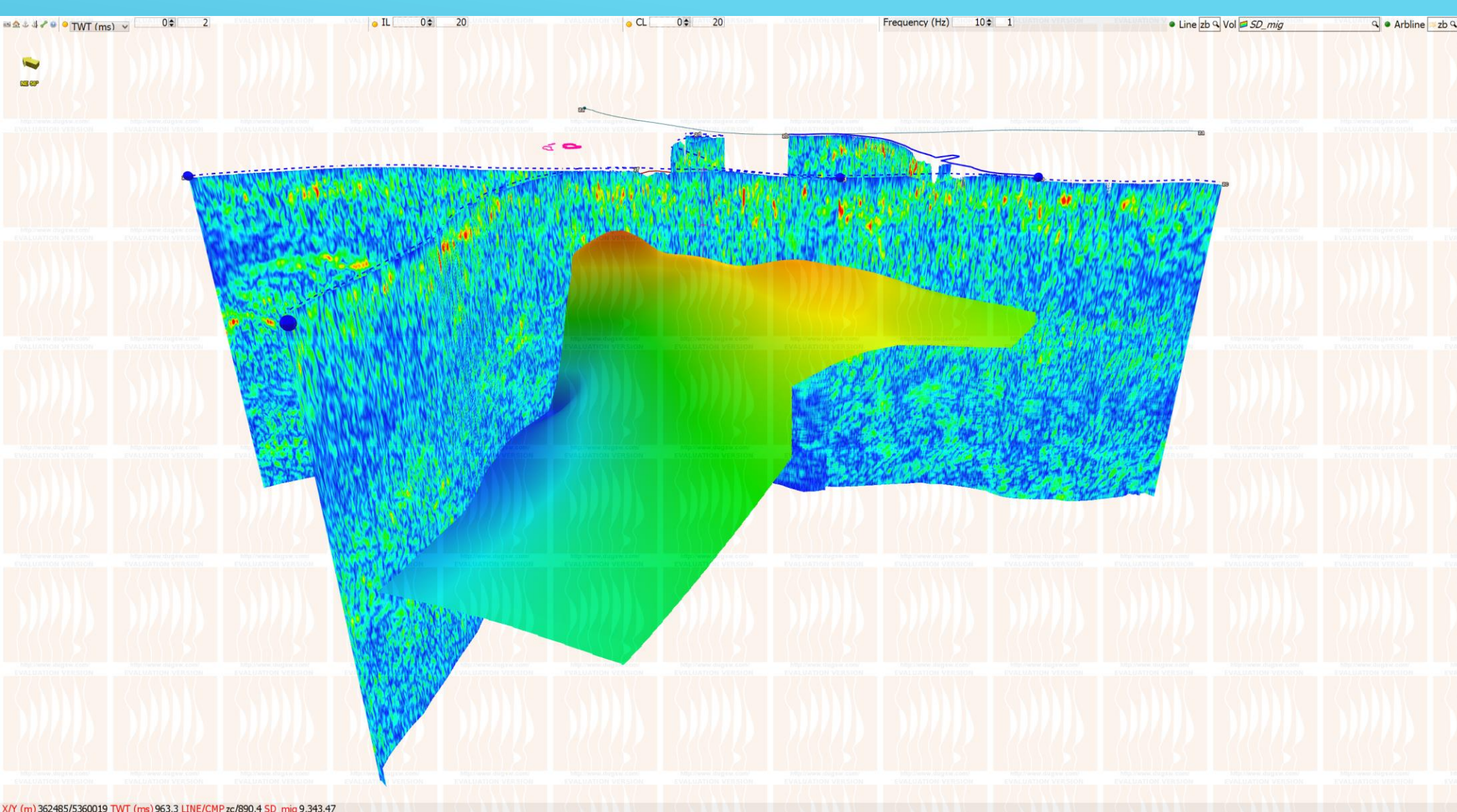




GRANITE

- ▶ Granite interpretation from seismic
- ▶ Incoherence seismic attribute from Stack volume

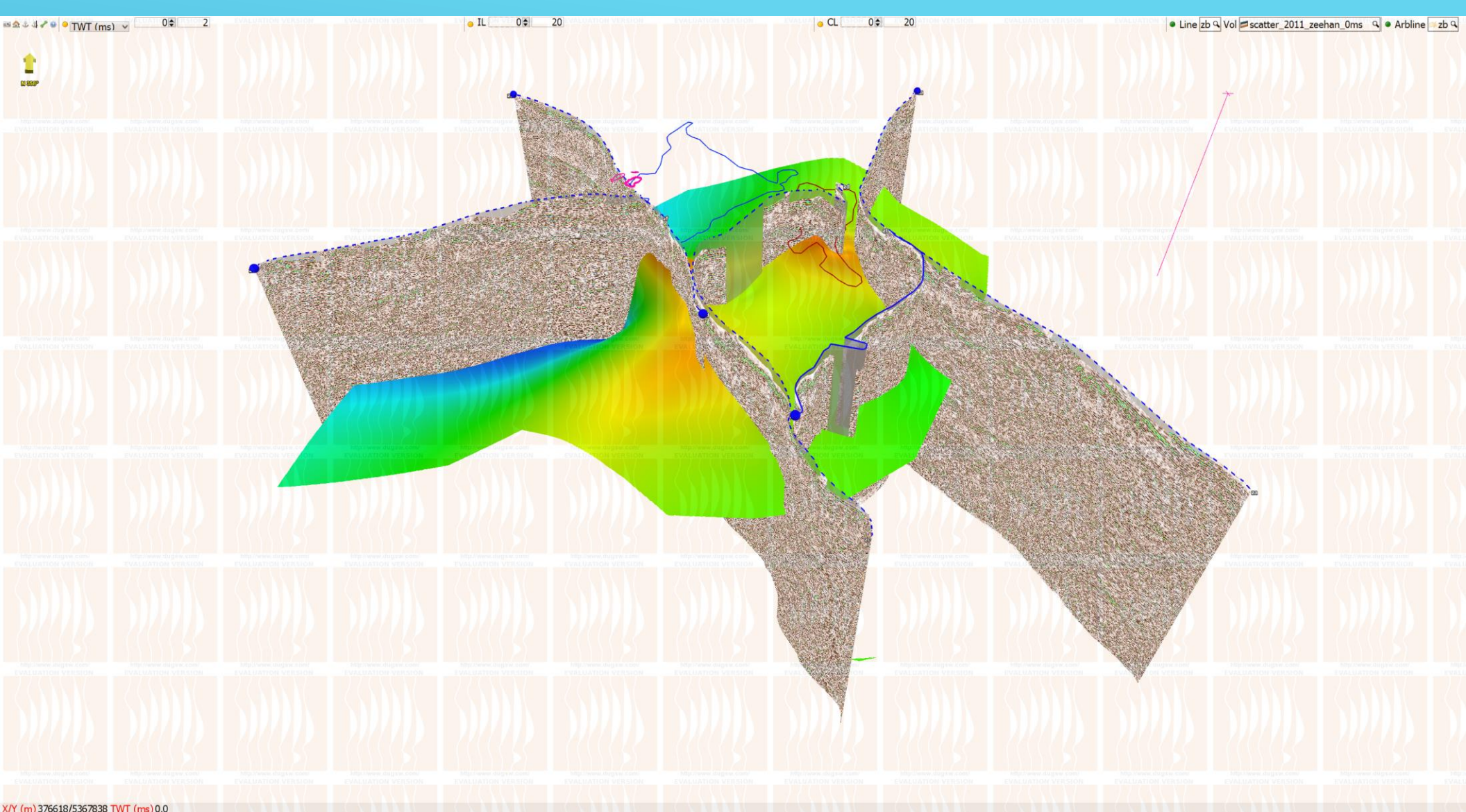




## GRANITE

- ▶ Granite interpretation from seismic
- ▶ Incoherence seismic attribute from Stack volume

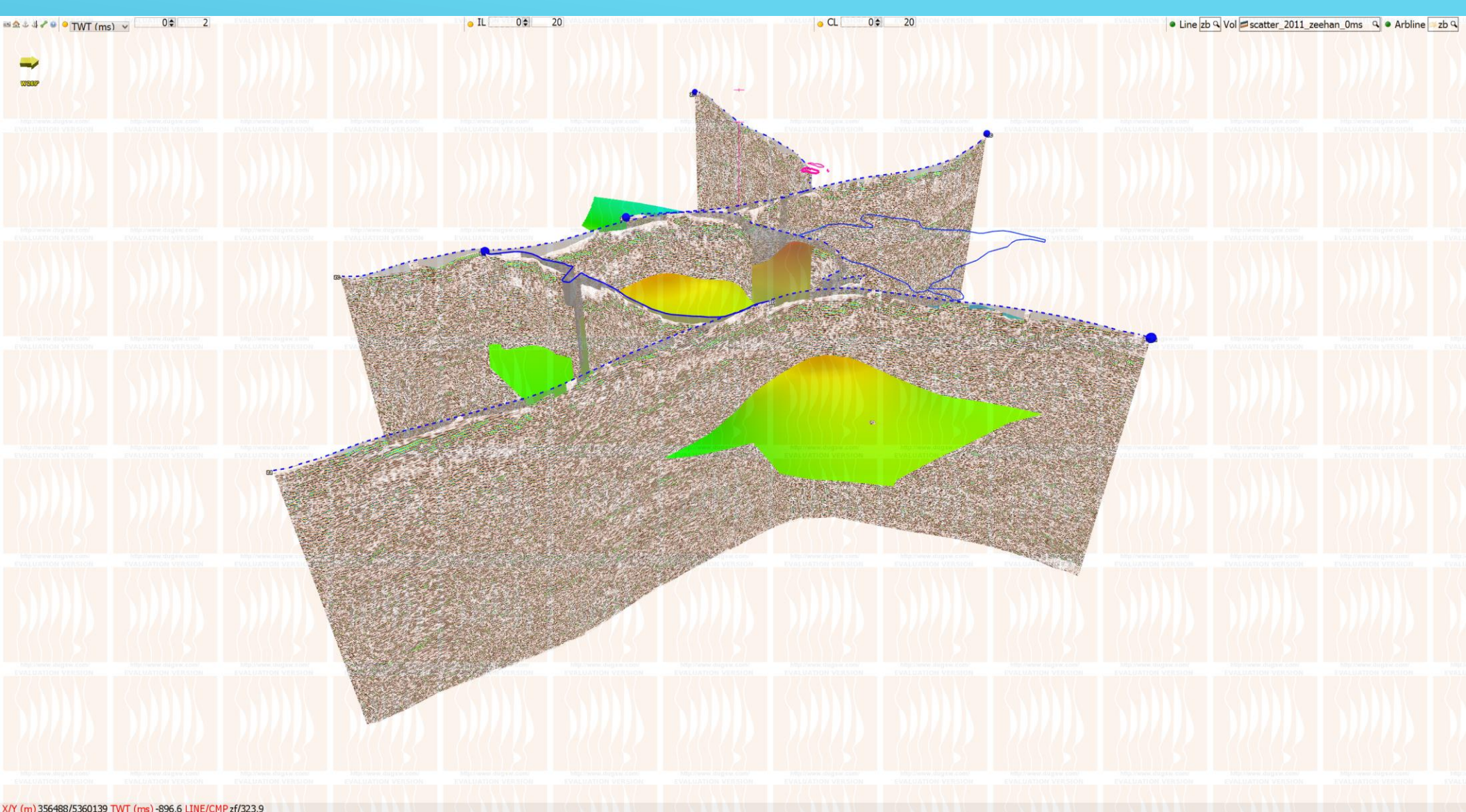




## GRANITE

- ▶ Granite interpretation from seismic
- ▶ Scatter volume

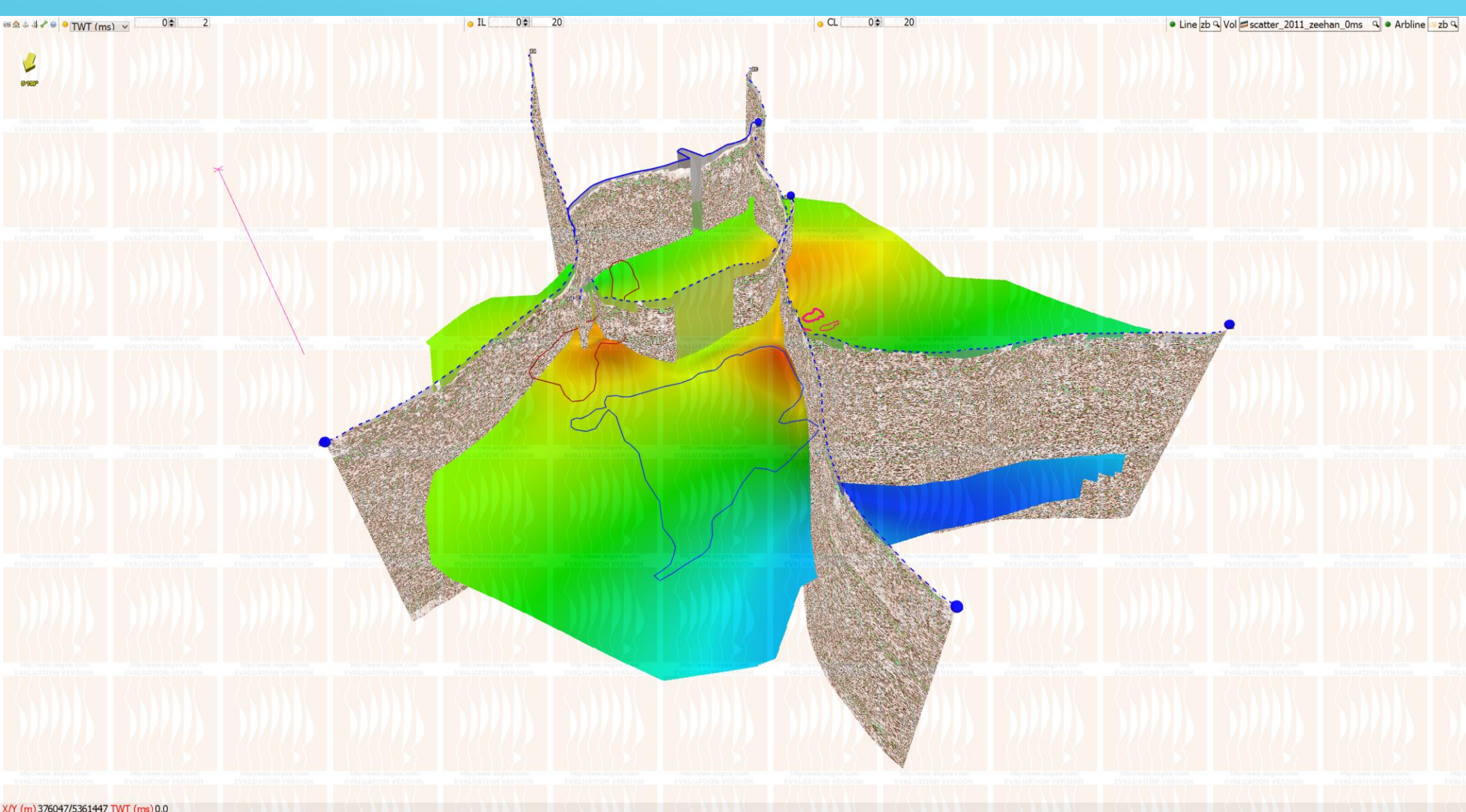




## GRANITE

- ▶ Granite interpretation from seismic
- ▶ Scatter volume

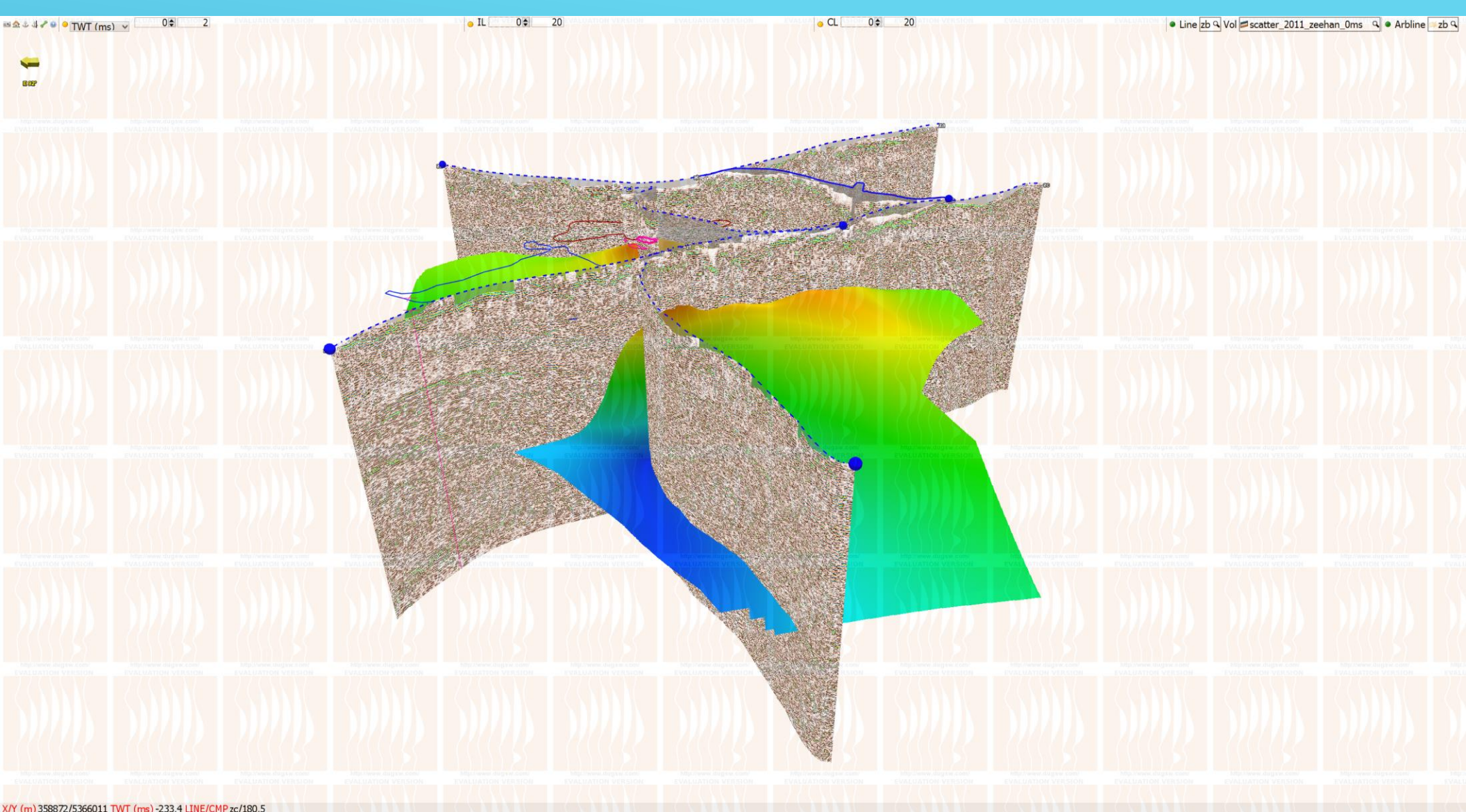




## GRANITE

- ▶ Granite interpretation from seismic
- ▶ Scatter volume

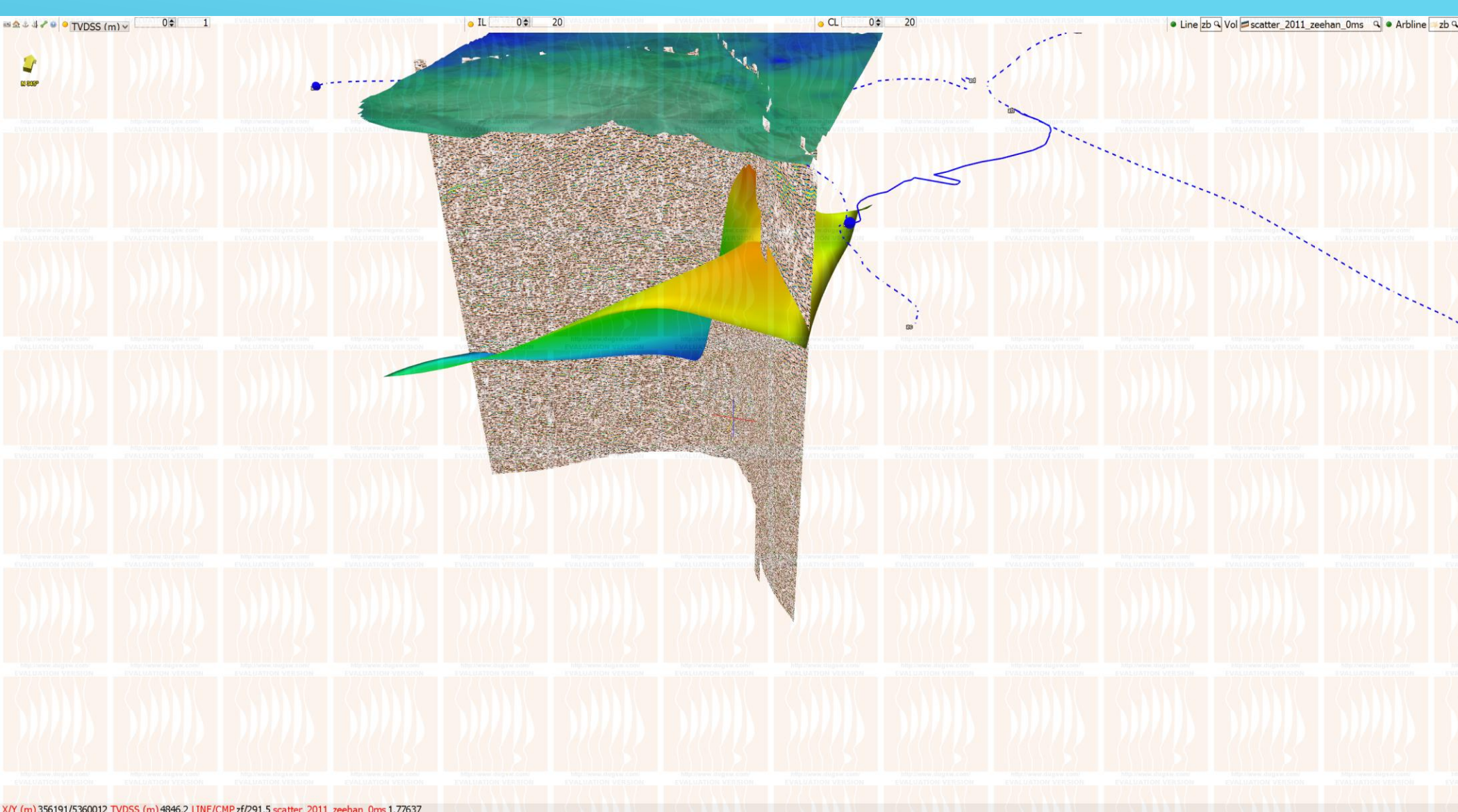




## GRANITE

- ▶ Granite interpretation from seismic
- ▶ Scatter volume

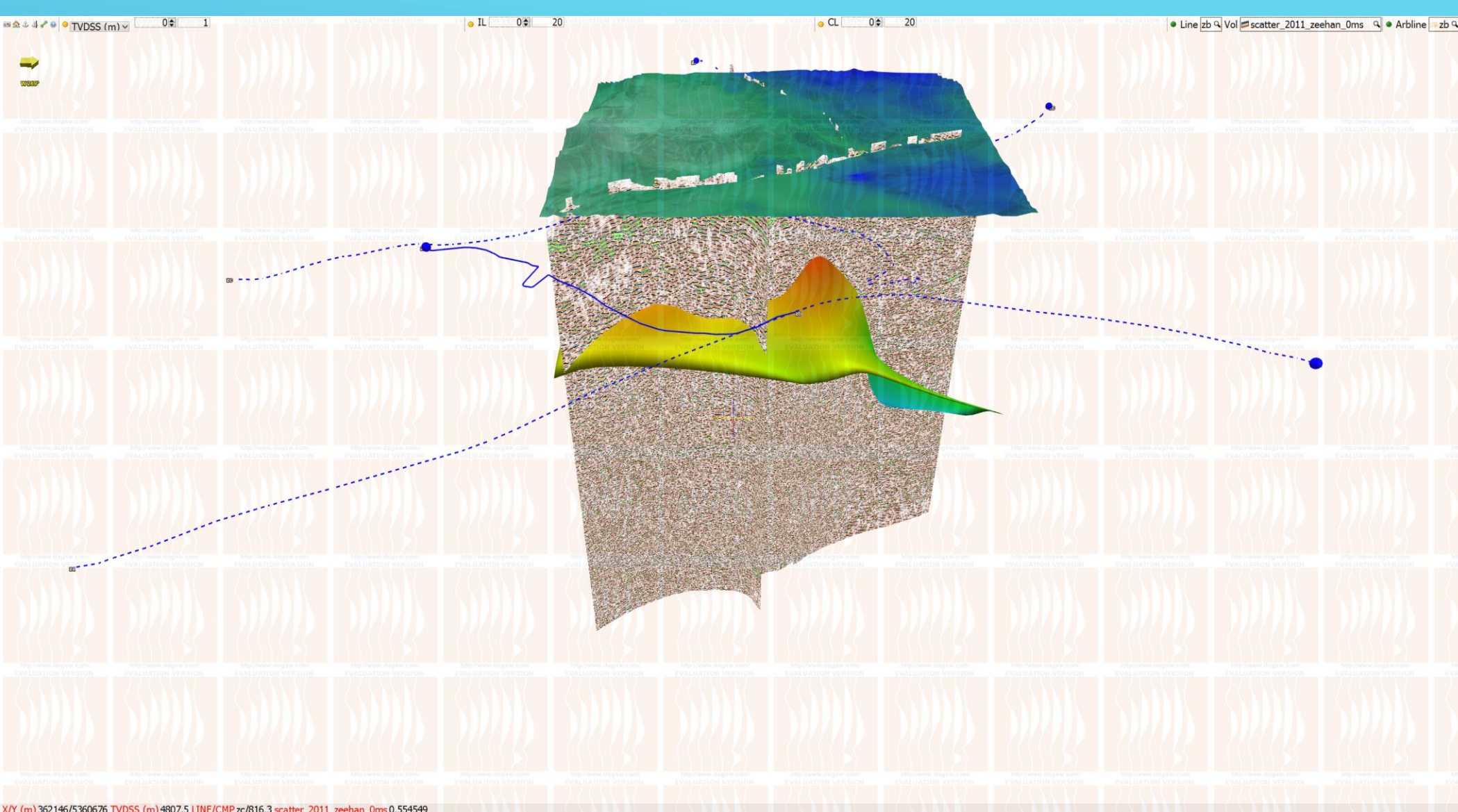




## BOUGUER ANOMALY WITH GRANITE

- ▶ North West Tasmania Gravity Survey 2012/2013 – grid
- ▶ Scatter Volume

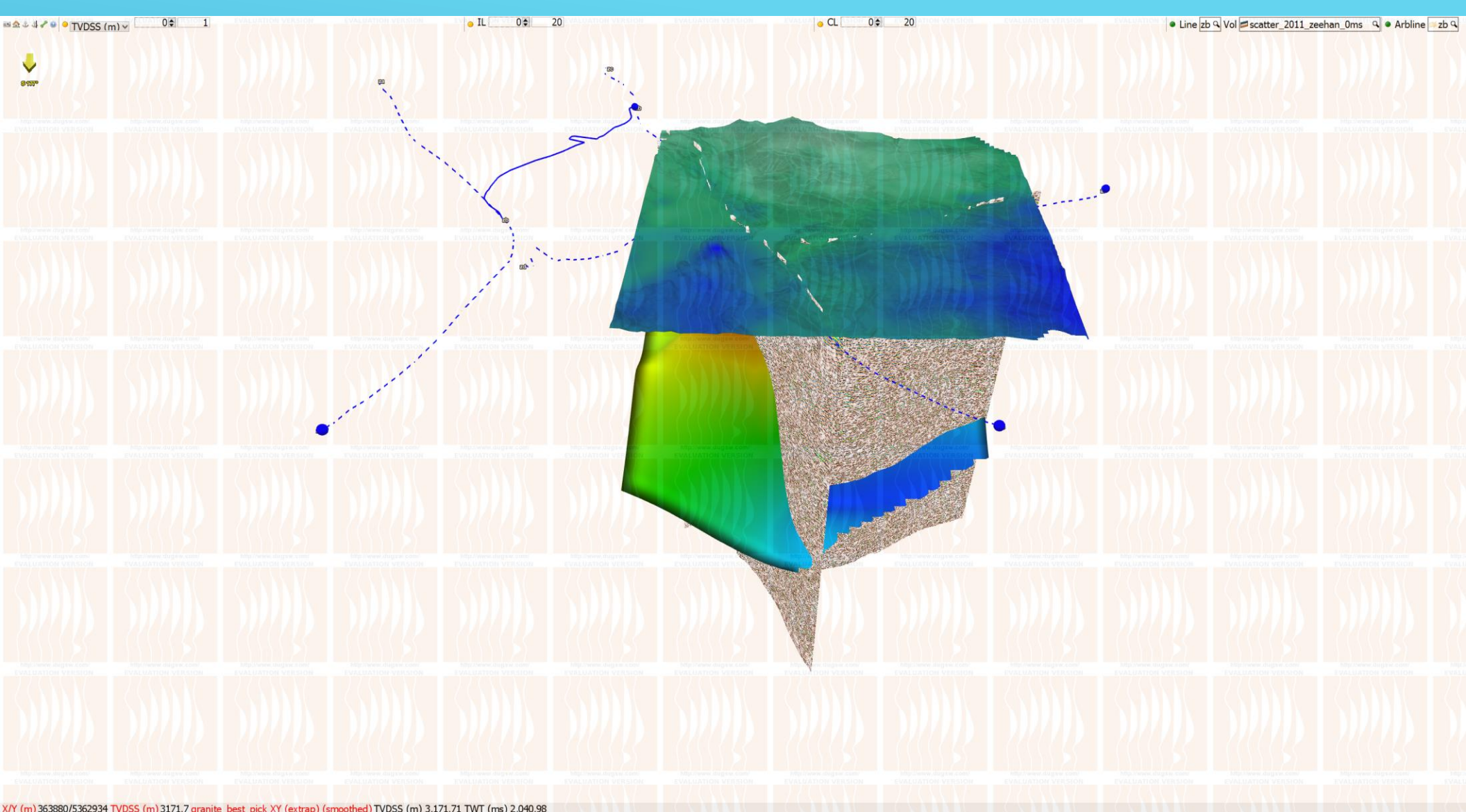




## BOUGUER ANOMALY WITH GRANITE

- ▶ North West Tasmania Gravity Survey 2012/2013 – grid
- ▶ Scatter Volume

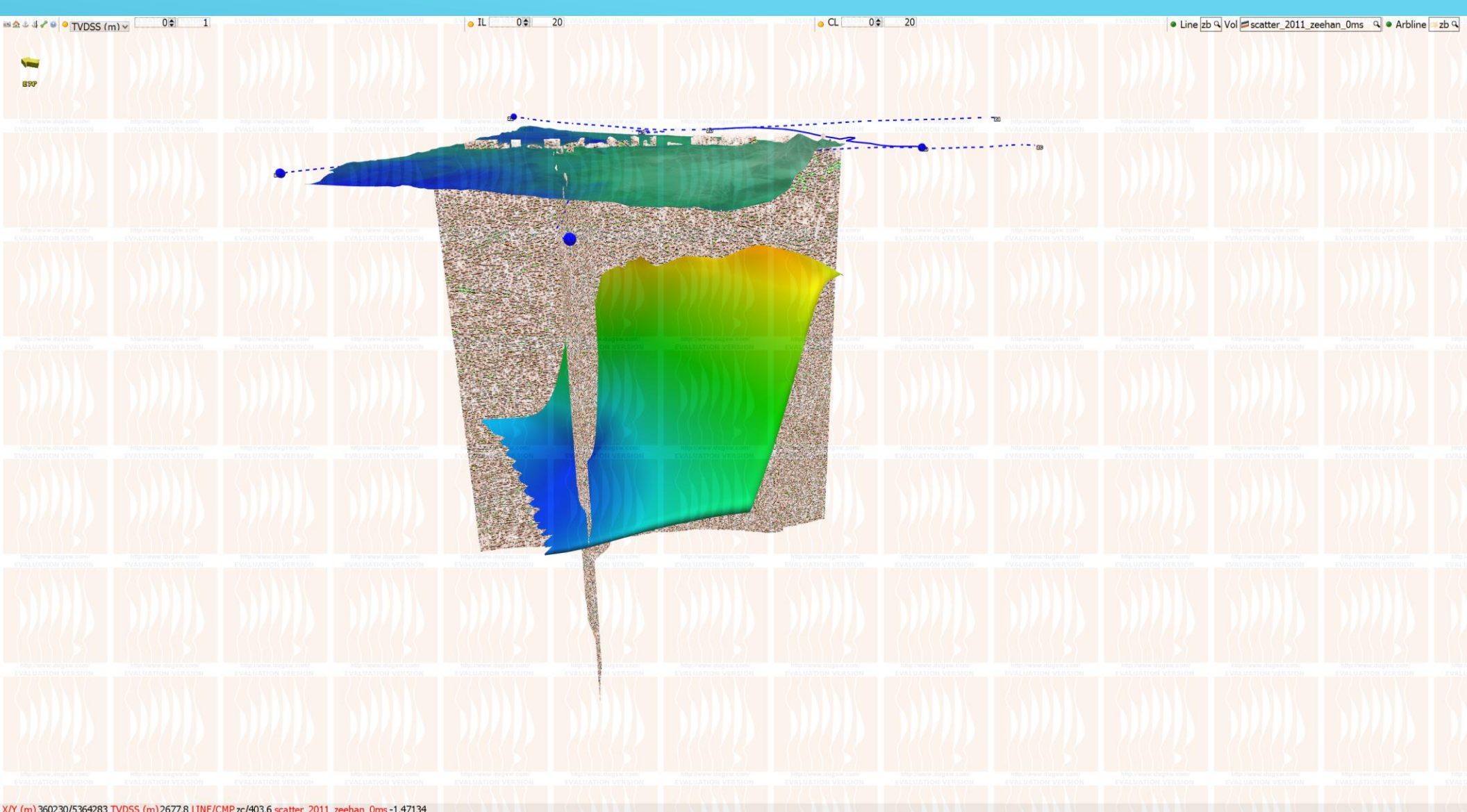




## BOUGUER ANOMALY WITH GRANITE

- ▶ North West Tasmania Gravity Survey 2012/2013 – grid
- ▶ Scatter Volume





## BOUGUER ANOMALY WITH GRANITE

- ▶ North West Tasmania Gravity Survey 2012/2013 – grid
- ▶ Scatter Volume



- ▶ Aperture – 1500m
- ▶ CDP spacing – 10m
- ▶ Average velocity – 3500 m/s
- ▶ Seismic Reference Datum = 400m ASL

# IMPORTANT NUMBERS