



## **EXPLORING BRITISH COLUMBIA'S NEWEST GOLD BELT**

**Franz Zone – DC Resistivity Survey**  
October 2020

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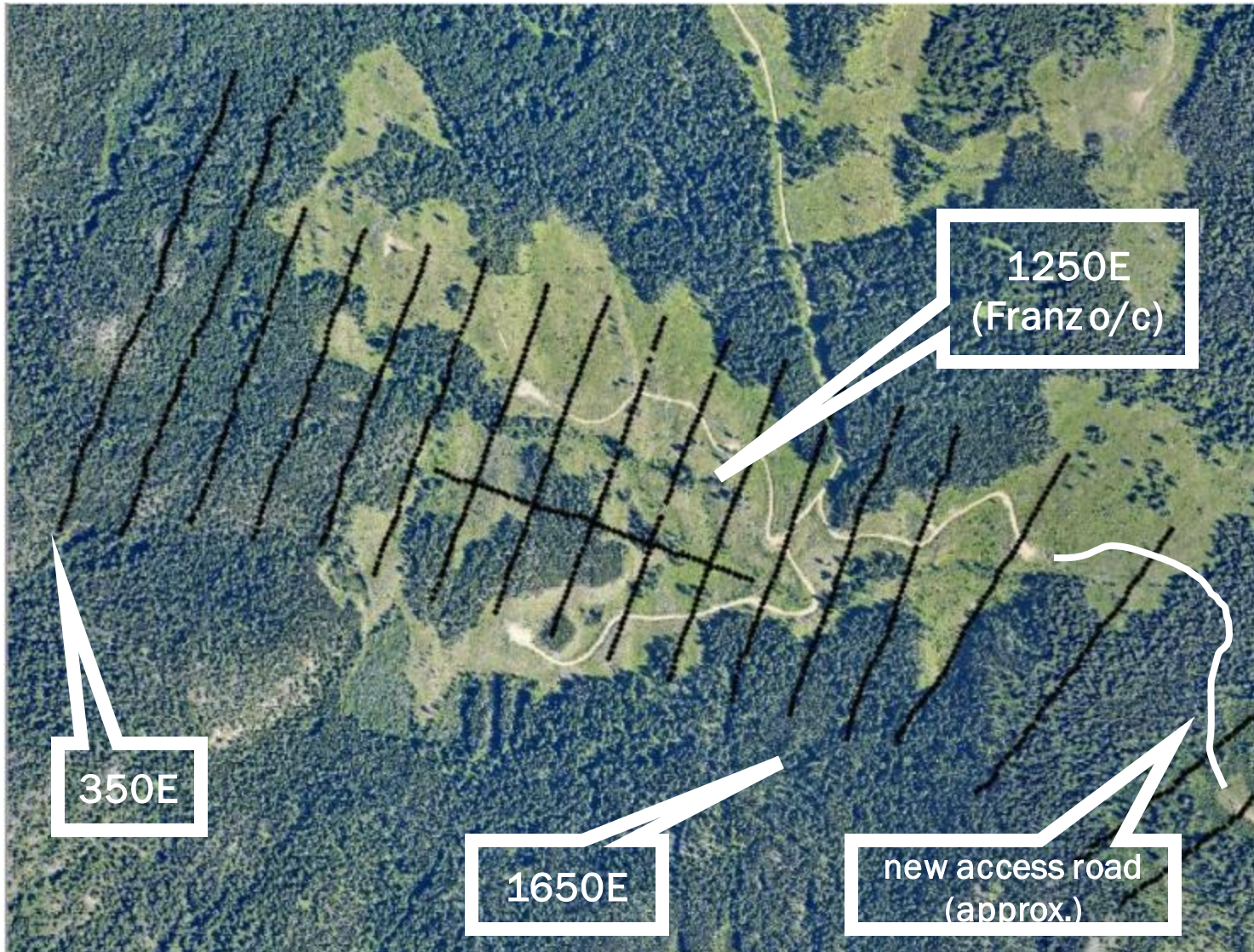
# FRANZ ZONE – DC RESISTIVITY

- ✓ Franz AOI is situated on west side of Shovelnose Property, measures ~1.6 x 2.0 km and covers <2% of land package
  - ✓ DC Resistivity survey operated by Peter E. Walcott & Associates, represents grid coverage in and around the Franz outcrop, and covers less than <0.4% of the property
  - ✓ data intensive survey with associated processing delays
  - ✓ 540m long cable string; 10m electrode spacing; dipole-dipole array
  - ✓ field production is ~1 line/day (with 3 person crew), overlapping as:
    - Day 1 - tight chain and hammer in 55 – 40cm steel electrodes
    - add bentonite slurry into each electrode hole
    - soak surrounding ground with clay rich saline water
    - Day 2 - connect cable to electrodes and resoak ground
    - check contacts, modify electrodes, read data (including 3D GPS)
    - pull electrodes and repeat
- ➡ **getting a reliable 'error free' product takes time** – requires data editing and corrections; compensation for topography; multiple iterations with different input parameters to produce a 2D depth slice; verification for reasonableness and line to line continuity; etc - then face issues with attempting multiple 2.5 or 3D inversion models where the process algorithm, input constraints and line to line results all impact the result





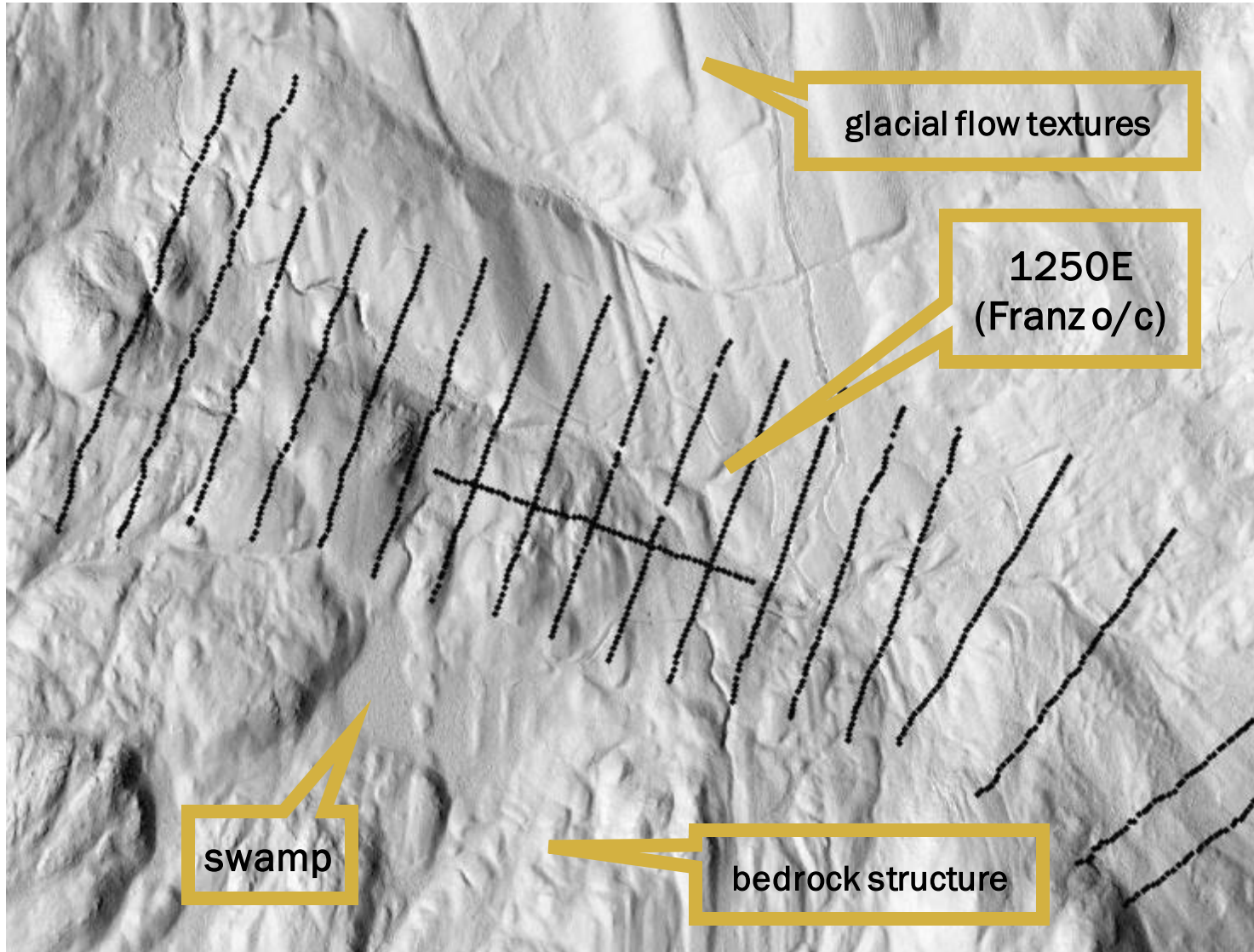
# 2020 ORTHOPHOTO WITH DC RESISTIVITY COVERAGE



- ✓ 17 DC Resistivity survey lines completed at Franz to date
- ✓ lines 350E to 1650E (left to right) at 100m line spacings as shown
- ✓ lines 350E and 450E are ~800m long (done as 'rolling' array to extend coverage)
- ✓ all other lines are 540m long and each dot represents a dipole station
- ✓ orthogonal line (120N) run to try to better define potential NNE faults which may be complicating 2.5/3D modelling
- ✓ mineralized outcrop occurs on line 1250; 2 - 50m flanking infill lines not shown
- ✓ extra 4 eastern lines (A-D) follow possible trend down to FMN Zone

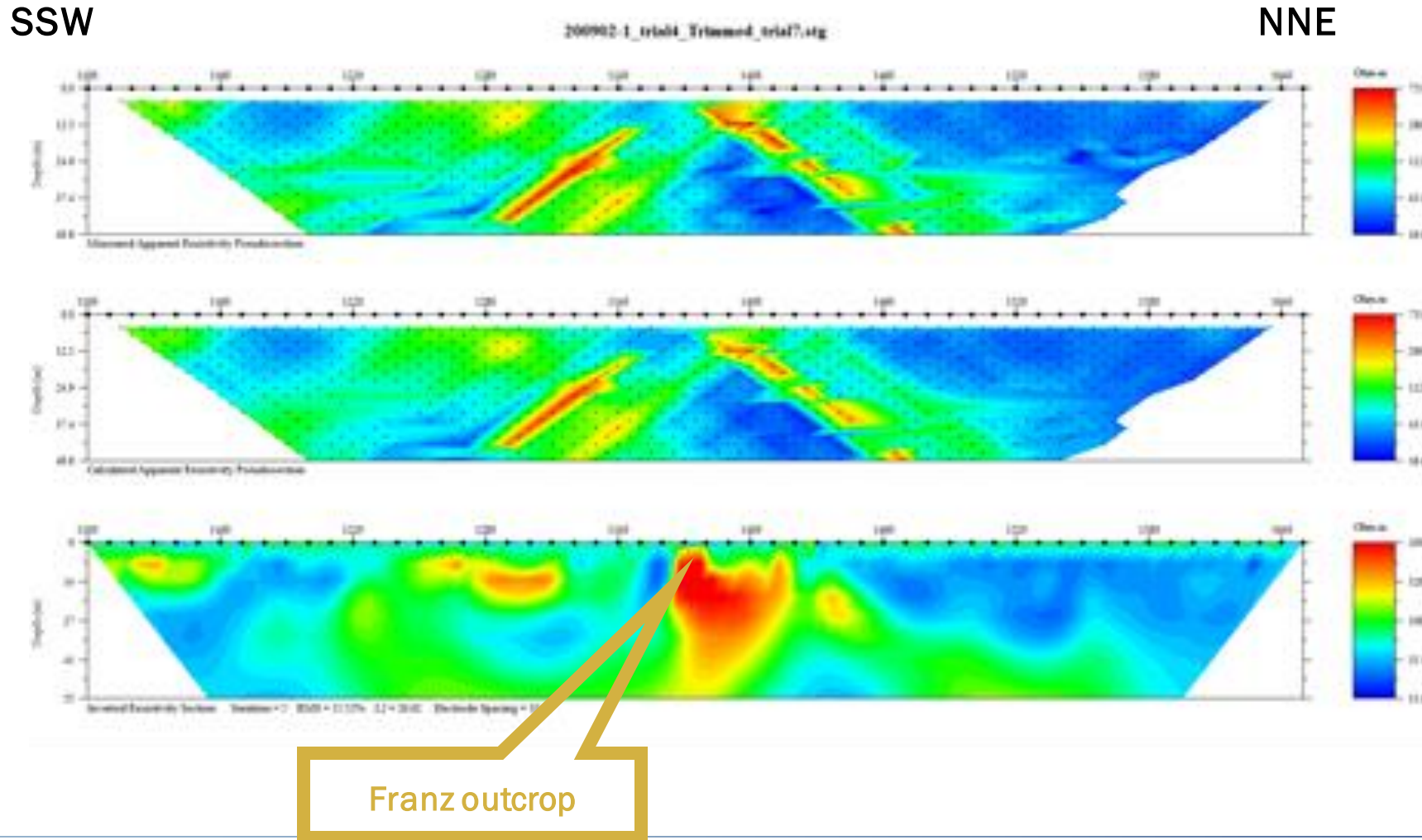


# 2020 LIDAR HILLSIDE SHADED IMAGE WITH DC RESISTIVITY COVERAGE



- ✓ same field of view as previous image  
~1.6km north-south by 2.0km east-west
- ✓ background is hillside shaded image from 2020 WHN property wide LiDAR survey (collection/processing strips away vegetative cover to show surface textures)
- ✓ note prominent glacial flow textures at both large and small scales (orientation changes across the property both left to right and top to bottom); thicker till to north
- ✓ lineaments cross cutting the glacial flow are interpreted as underlying bedrock structures (faults?)
- ✓ see also linear vegetative anomalies (moisture along faults) on previous image

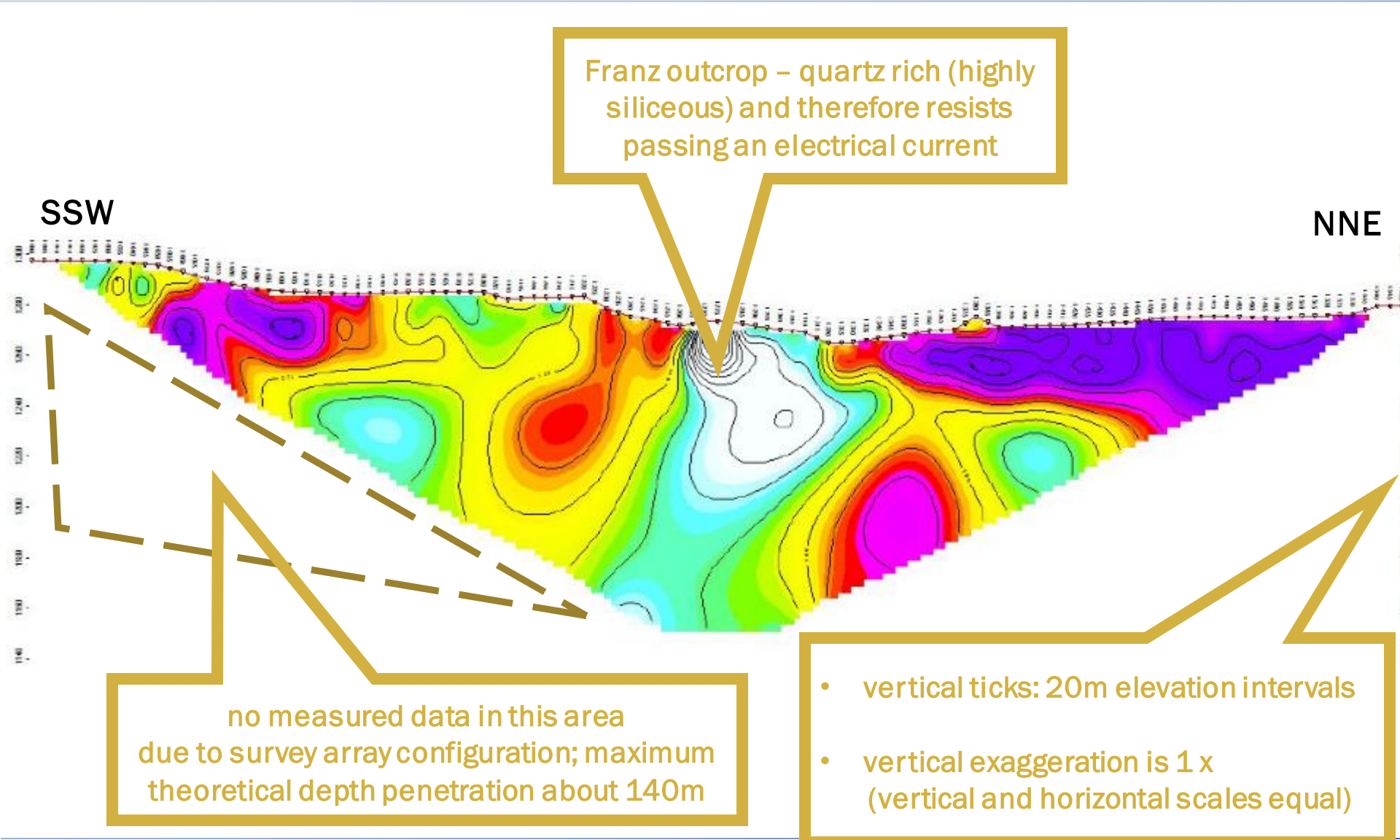
# LINE 1250E 'RAW' DC RESISTIVITY PROFILE DATA



- ✓ initial DC resistivity data (vertical section) along line 1250E (orientation survey)
- ✓ upper and middle images are more or less 'raw' field measurements – collection process run from alternate ends of line to look for asymmetry or other issues
- ✓ readings are a series of depth soundings with location shown as black dots
- ✓ bottom image – first pass inversion modelling of data
- ✓ no correction for topography

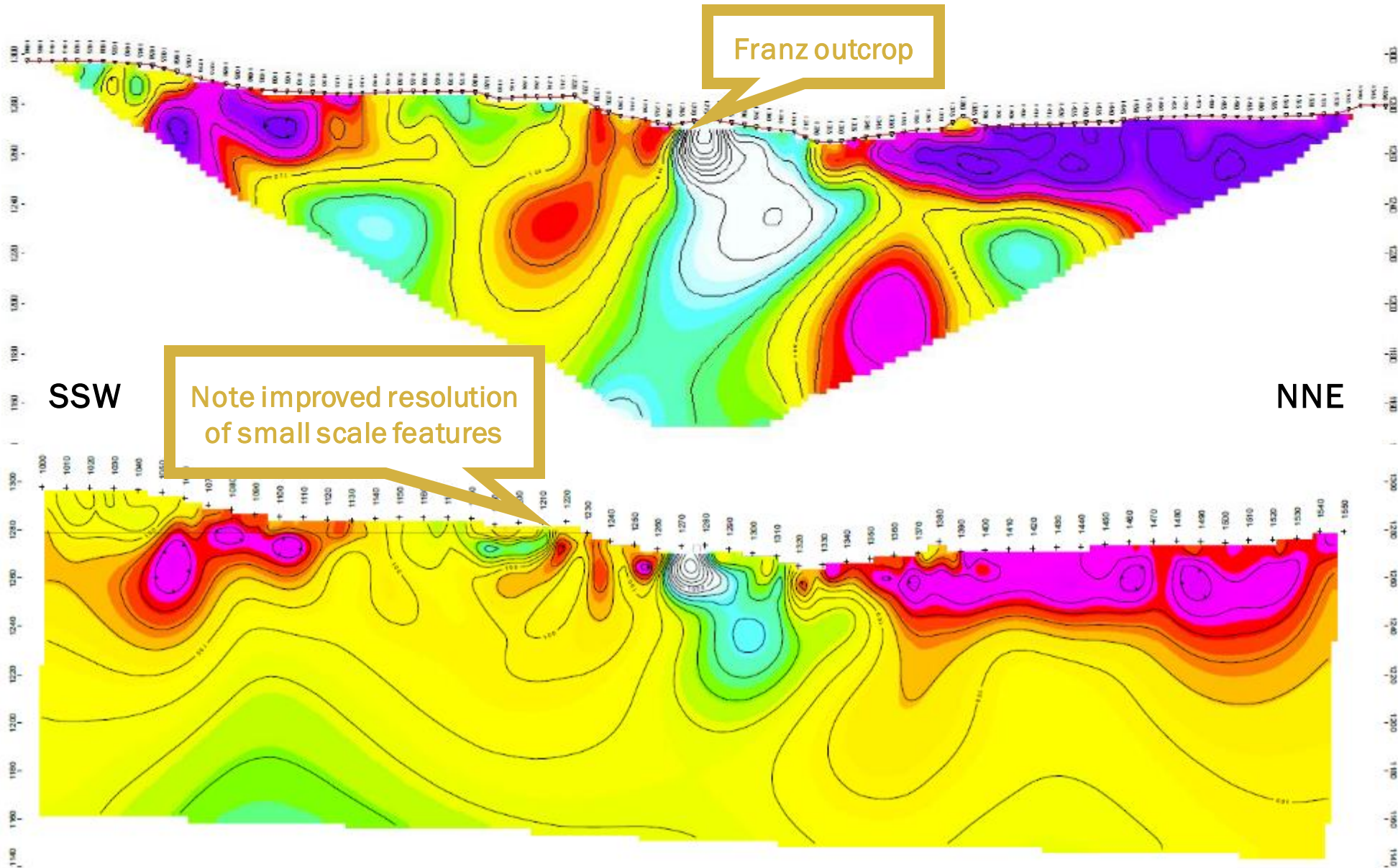


# LINE 1250E DC RESISTIVITY PROFILE DATA - 2D INVERSION



- ✓ two-dimensional (2D) inversion model
- ✓ in-field 3D GPS survey used for initial terrain correction
- ✓ typical resistivity colour bar: hot colours are conductive, cold colours are resistive
- ✓ thick conductive layer overlying right (north) end of line
- ✓ strongly resistive feature corresponds to Franz outcrop and extends to depth

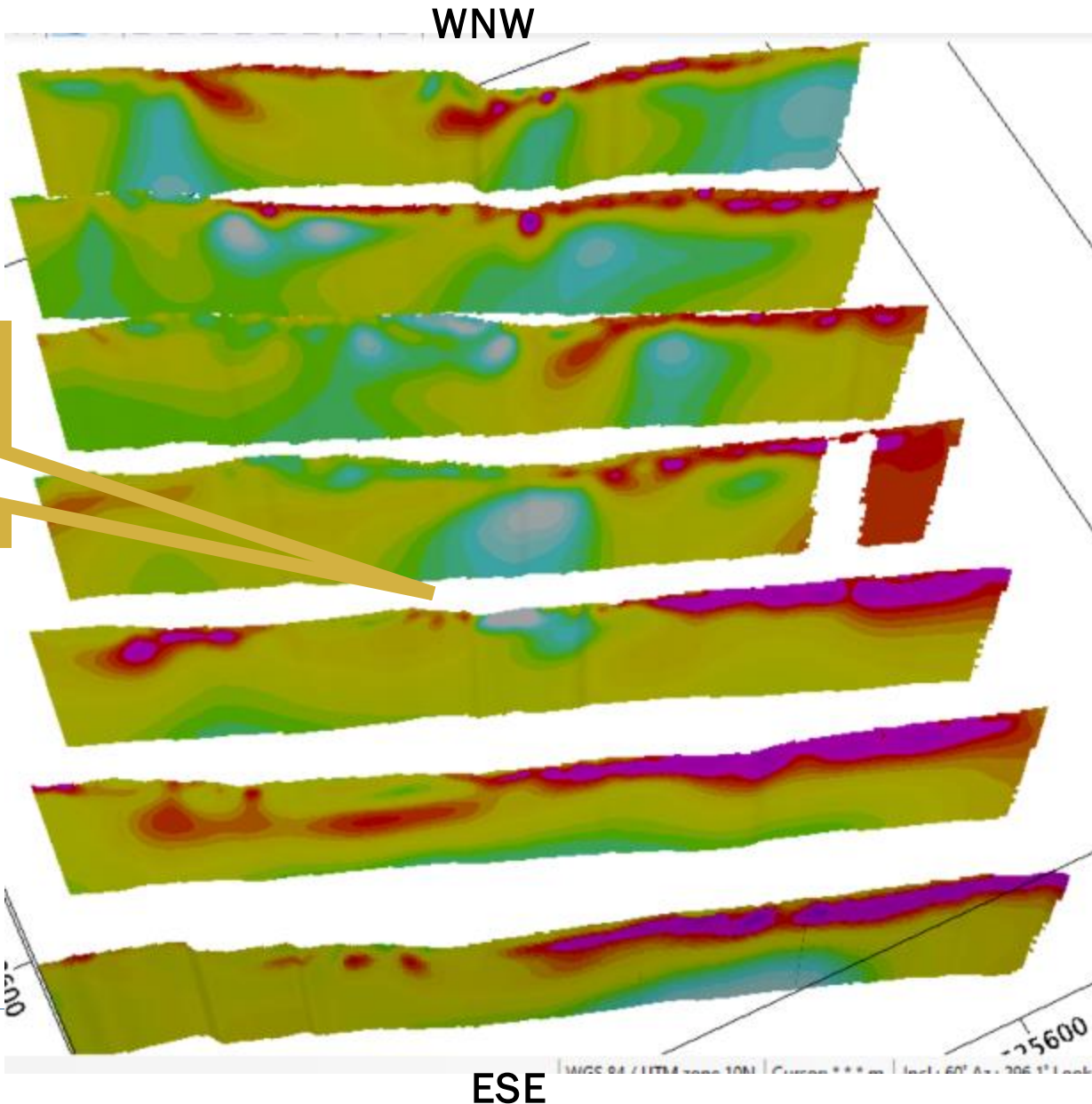
# LINE 1250E DC RESISTIVITY PROFILE DATA – REVISED 2D INVERSION



- ✓ comparative before (above) and after (below) slices
- ✓ issues with in-field 3D GPS lead to use of elevation data derived from 2020 LiDAR survey
- ✓ data edited for poor quality depth points
- ✓ 2D inversion model allowed to run a bit deeper on line ends

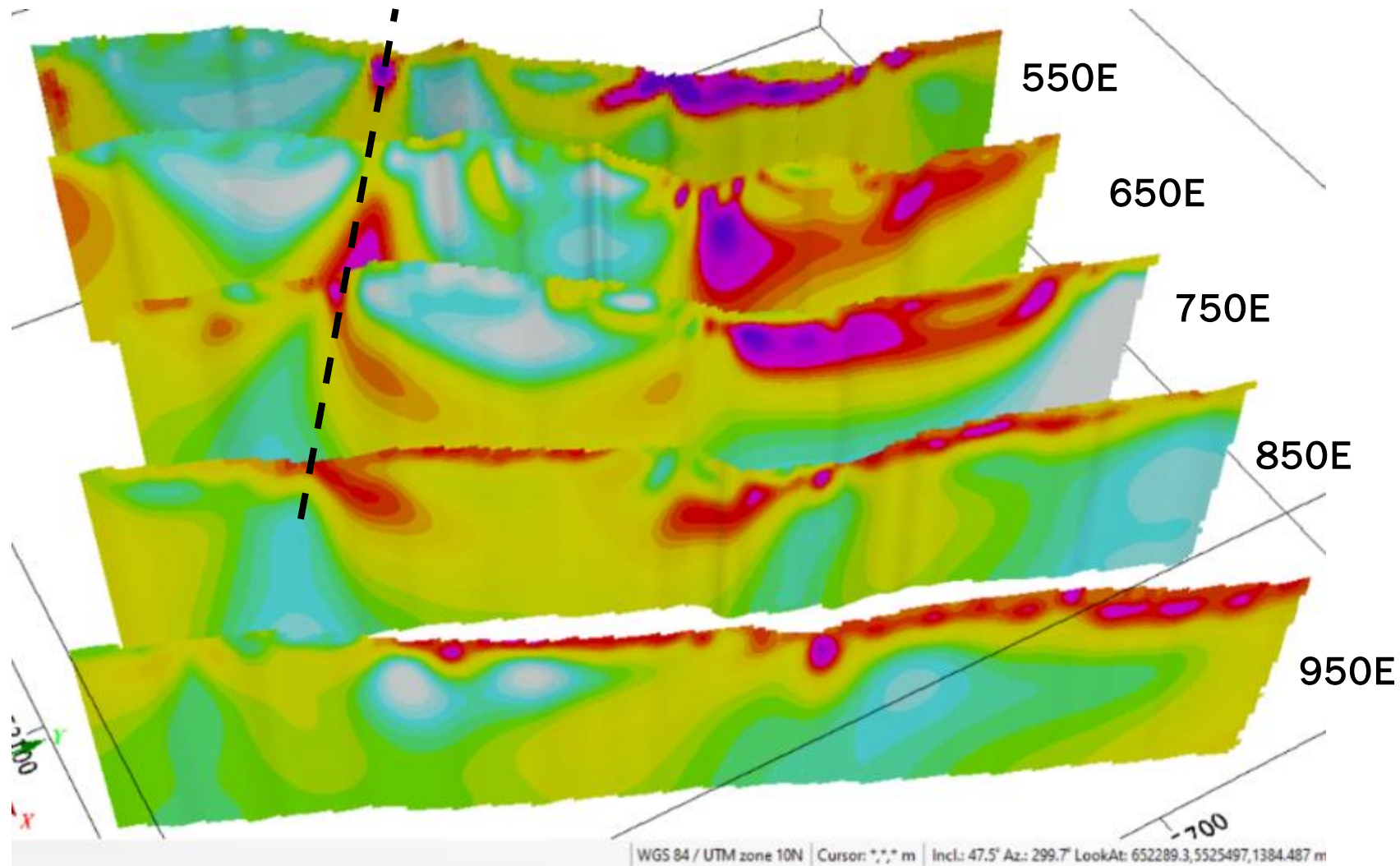


# STACKED VERTICAL DC RESISTIVITY PROFILES



- ✓ data collection and processing is repeated for each line within the survey area
- ✓ lines can be stacked in space as a series of vertical slices to give a pseudo-3D effect
- ✓ this view is looking WNW down the long axis of the survey area
- ✓ Note: for clarity only lines 850E (rear) to 1450E (front) are shown
- ✓ 'bends' or wrinkles along some lines are real and caused by the side to side offset of electrodes due to ground conditions
- ✓ gaps represent poor quality data that has been omitted at this point

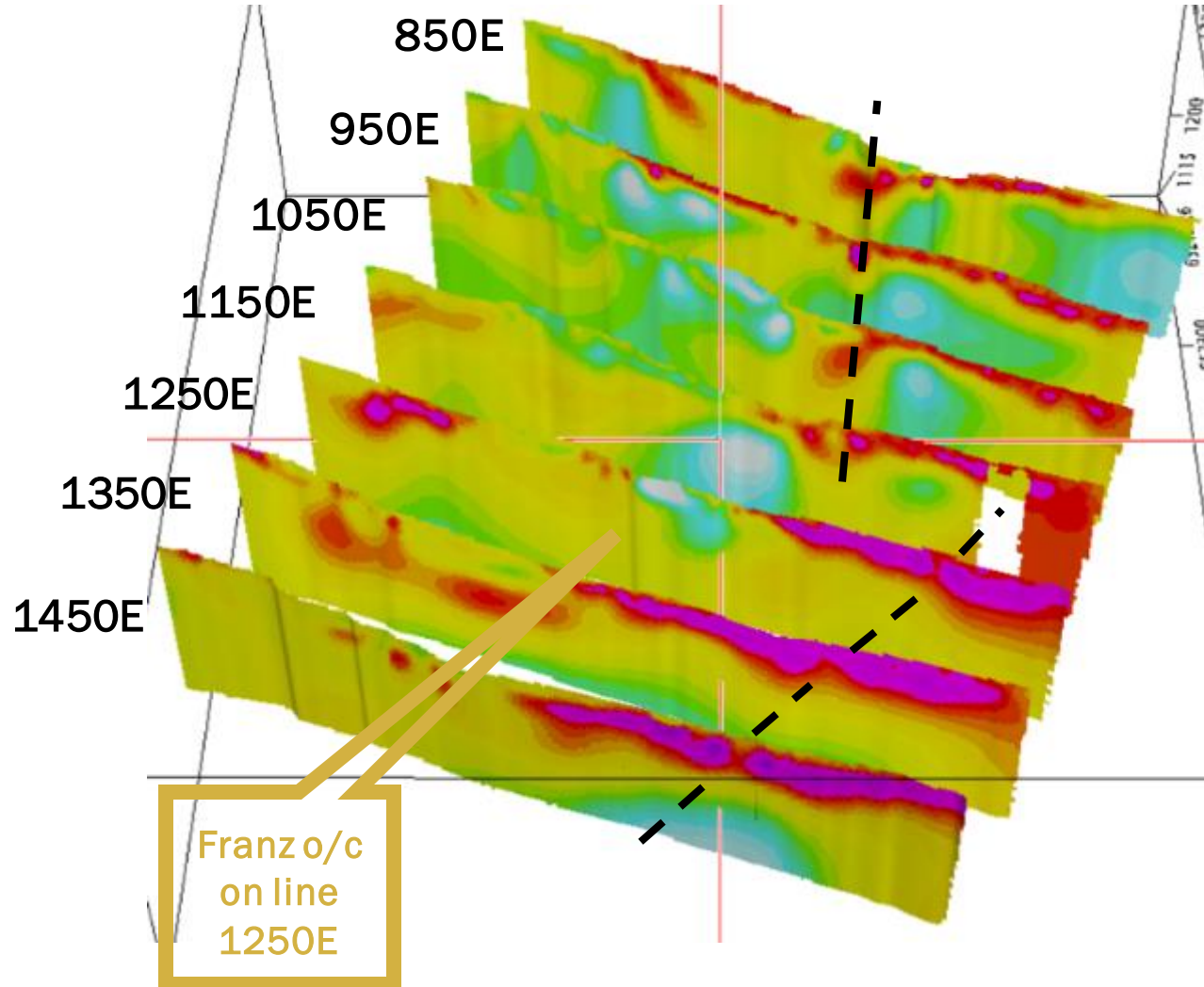
# LINE TO LINE CONTINUITY – LINES 950E TO 550E



- ✓ check sections for examples of line to line continuity: can be reasonably expected to occur in the geological environment and support validity of data
- ✓ this view is looking WNW down the long axis of the survey area (lines 950E to 550E)
- ✓ note similar shape of broad near surface conductive areas at north (right) end of lines 550E to 750E
- ✓ narrow conductive zones on 550E to 850E that may indicate a roughly WNW fault (wet)

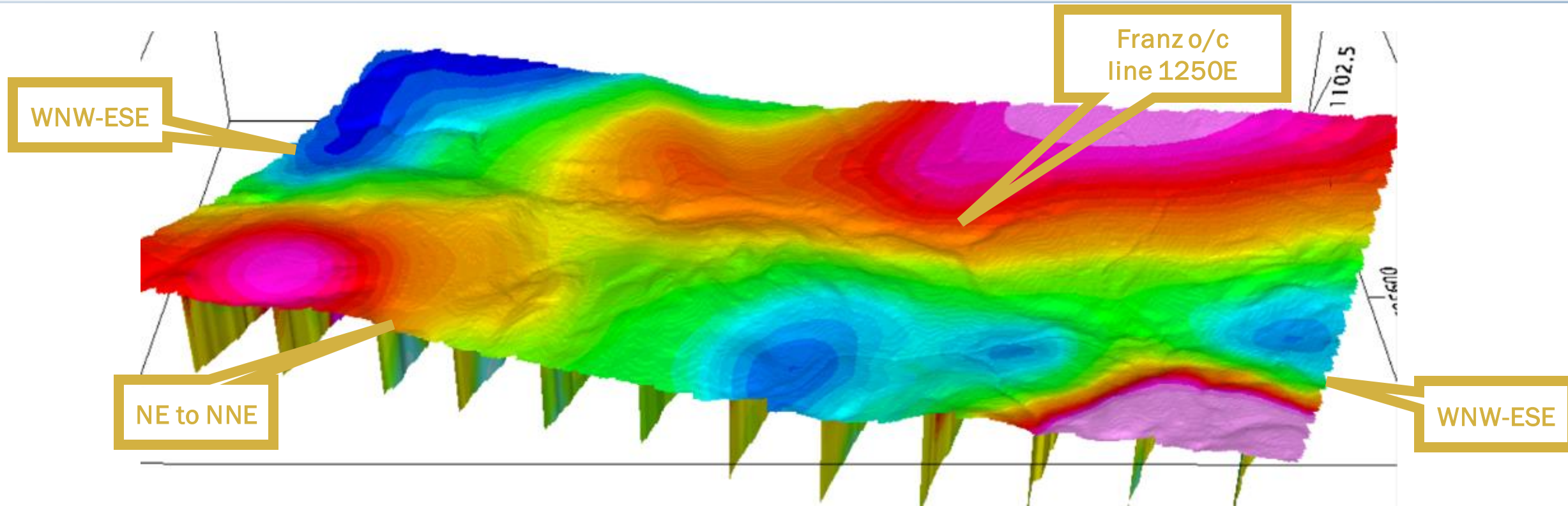


# LINE TO LINE CONTINUITY – LINES 1450E TO 850E



- ✓ this view is looking due west down through lines 1450E (front) to 850E (rear)
- ✓ note similar shape of broad near surface conductive areas at north (right) end of lines 1450E to 1250E
- ✓ each of those three lines demonstrates a centrally located (and shallow) break or offset
- ✓ a series of narrow conductive zones on 550E to 850E may indicate a roughly E-W fault (wet)
- ✓ the resistive feature associated with the Franz outcrop on 1250E appears to broaden to the west on line 1150E – this could be a function of geological reality, the bulk volume effect where geophysics ‘sees’ a feature located to one side of the survey line, or a depth/topo effect

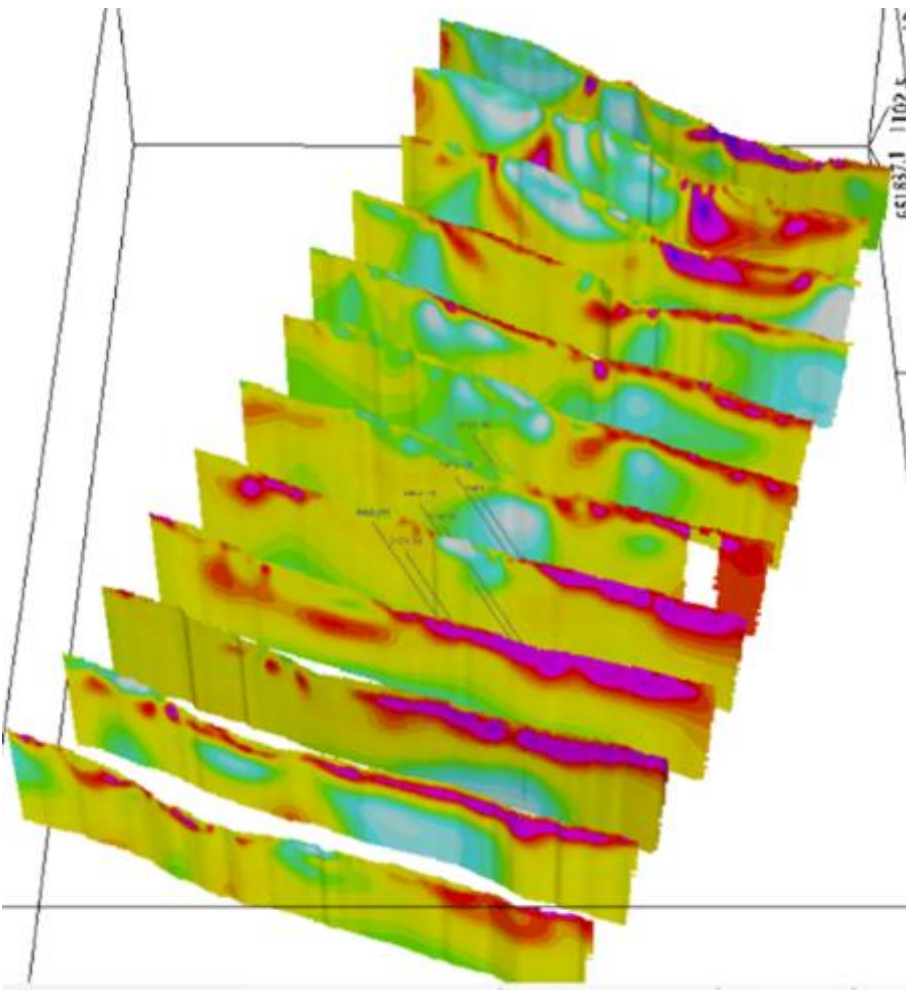
# SURFACE TOPOGRAPHY – ELEVATION AND SURFACE TEXTURES



- ✓ a digital elevation model is draped onto the hillside shaded LiDAR image above, emphasizing possibly offset WNW-ESE topographic breaks running subparallel to the survey's long axis, as well as NE to NNE bedrock features
- ✓ elevation varies across the AOI, being higher in the south and west corners, as well as along the northeast side, then drops off to the northwest – elevation changes are important in both 2D and 3D inversion modelling

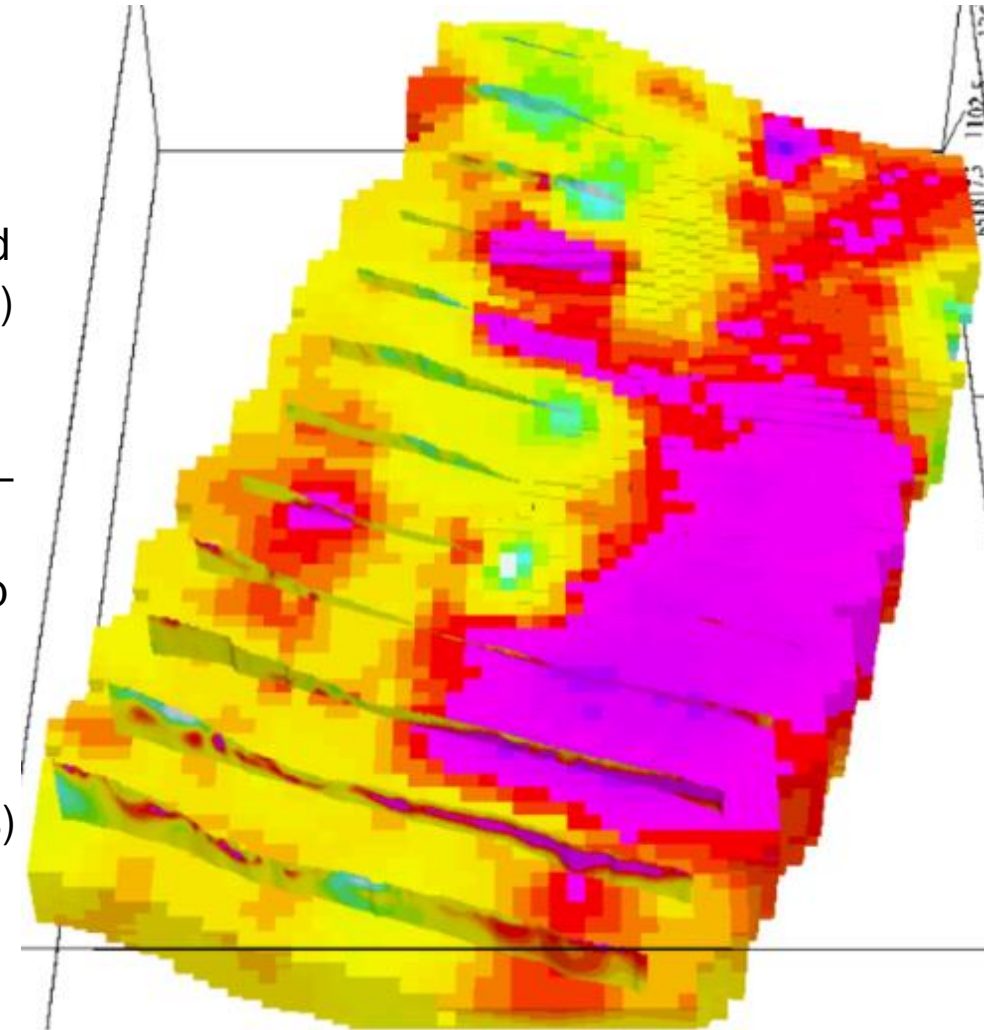


## 2.5 AND 3D MODELLING ISSUES



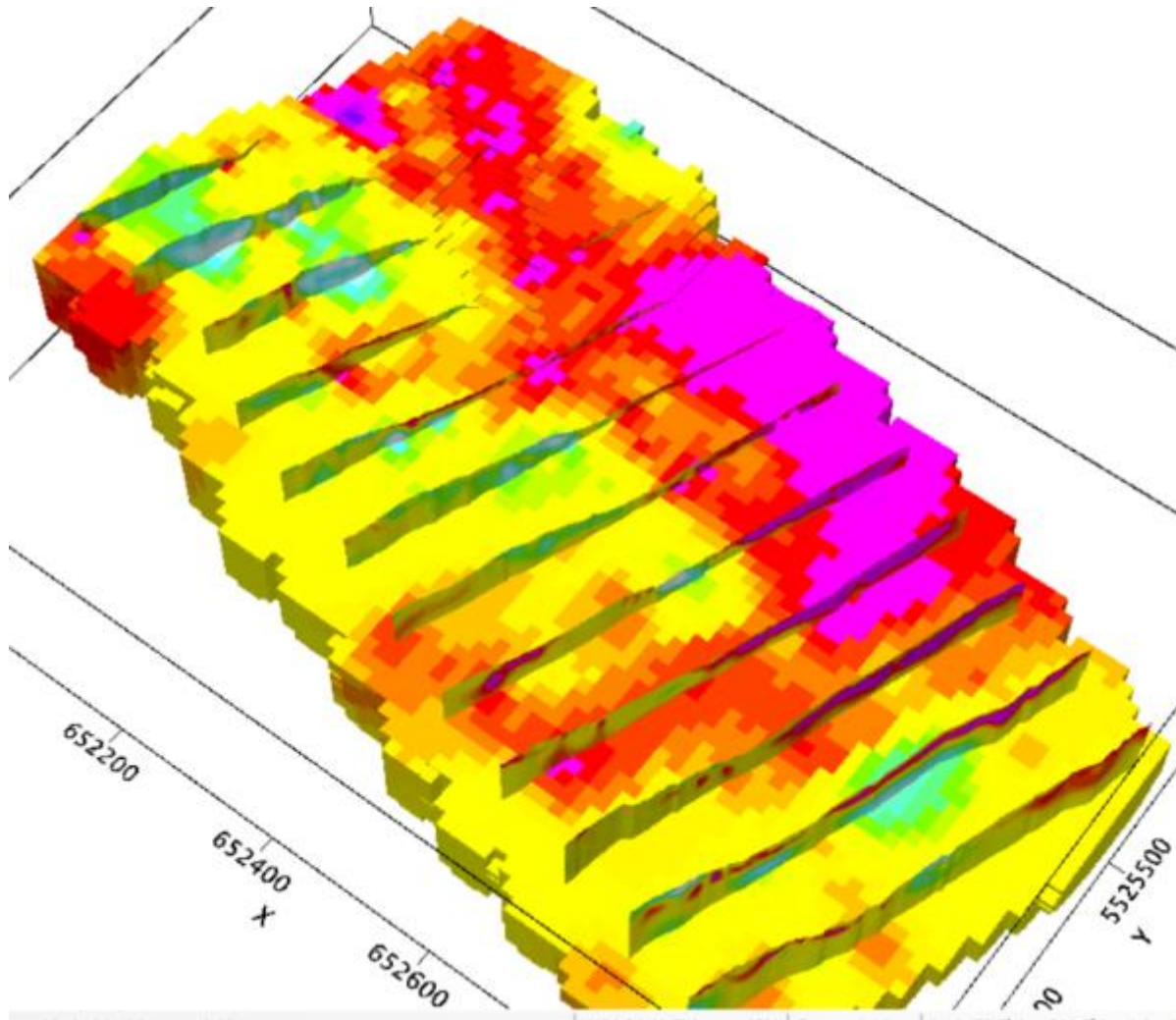
2D INVERSION SECTIONS

- ✓ next step should be a 2.5D inversion model of 'true' resistivity - built to best fit all raw data (data on each line is influenced by data on adjacent lines)
- ✓ at Franz these inversions are not working properly - potentially due to NE to NNE faults (subparallel to the survey lines)
- ✓ short term solution is to use voxels (regular cubes) to build a 3D volumetric model from the sections (w/o the mathematical precision of inversion)



CORRESPONDING 3D VOXEL MODEL (290m asl)

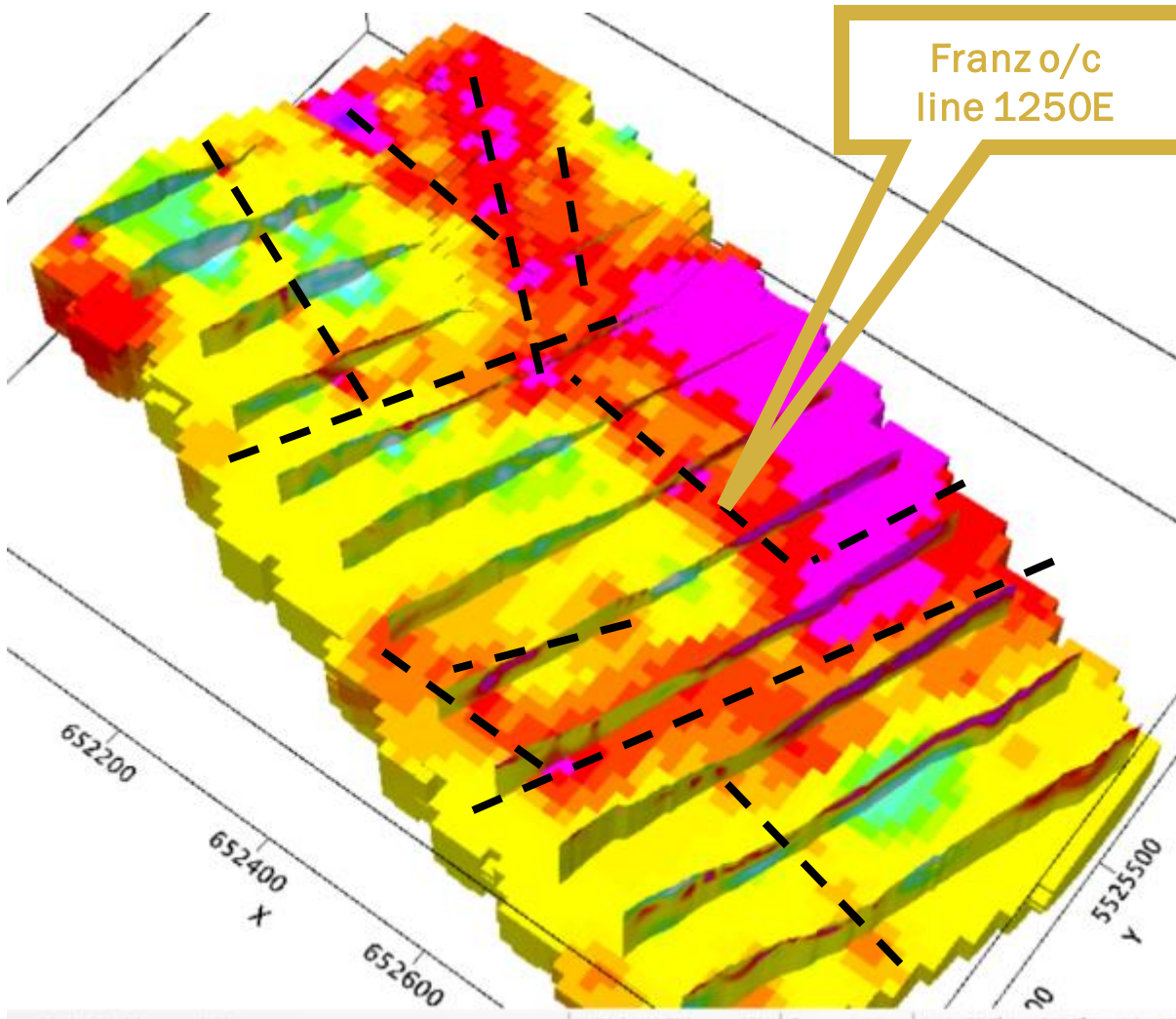
# 3D VOXEL MODEL SLICED AT 1250M ASL ELEVATION



- ✓ individual voxels (data point cubes) are created within a defined sphere of influence that may extend beyond the actual measured data – see image to left where voxels radiate out beyond the end of survey lines
- ✓ voxel models can be treated like any other 3D volumetric model in that they can be rotated, integrated with other data, sliced (vertically and horizontally), etc
- ✓ in this case the model has been sliced horizontally at 1250m asl and displayed with the topographically controlled DC resistivity sections at their proper elevations to demonstrate height differences
- ✓ the 3D model presentation is theoretically easier to view and for recognizing features

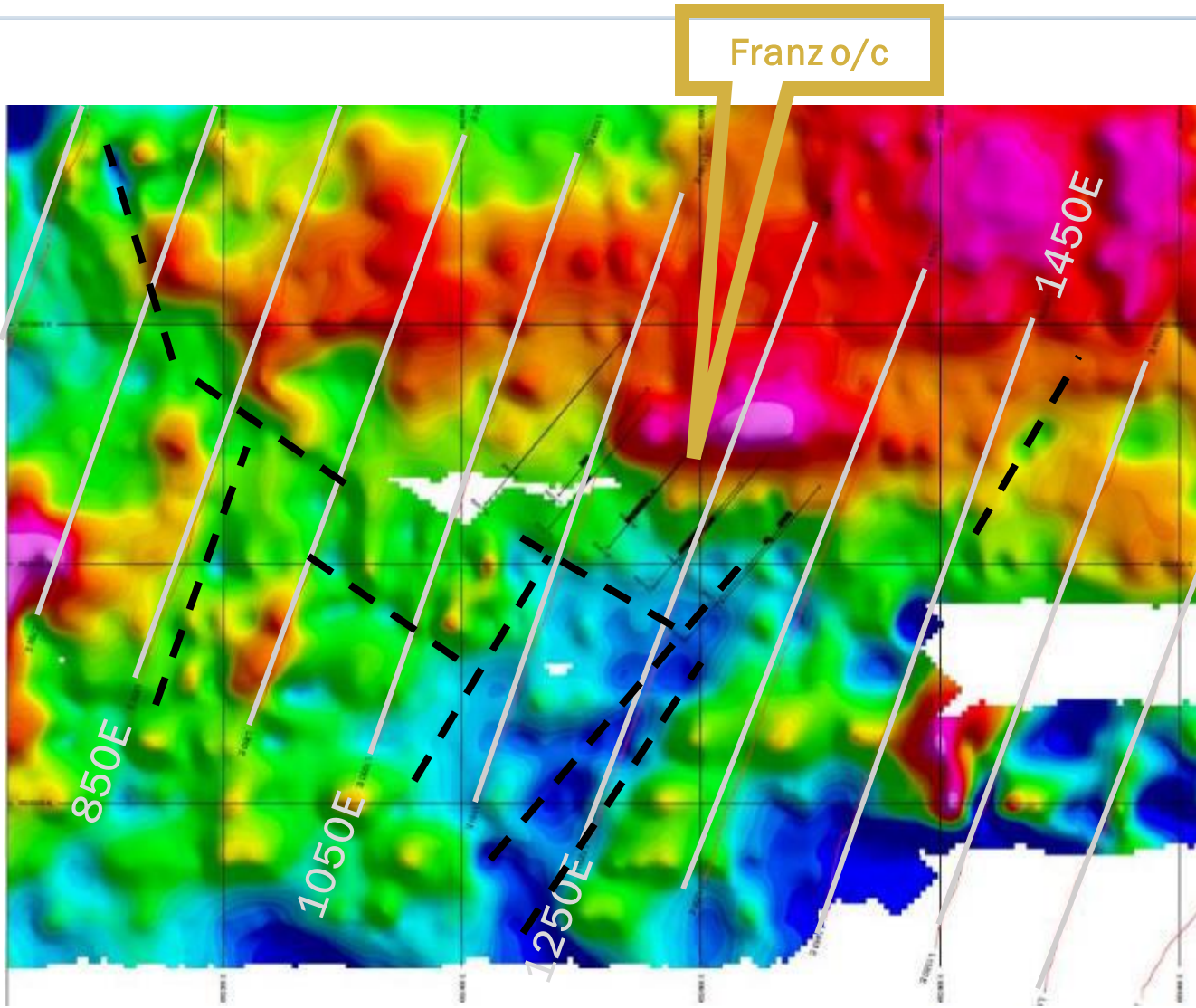


# 3D VOXEL MODEL – INTERPRETATION?



- ✓ image to the left is the voxel model sliced/capped at the same 1250m asl elevation
- ✓ the most obvious feature is the near surface conductive feature along the northeast edge – this could potentially be attributed to thicker till seen in the grey hillside shaded LiDAR image, but the correlation is not exact (although we do not know depth to bedrock which could affect interpretation)
- ✓ resistive features tend to be smaller and potentially less continuous (either strike limited or fault offset??)
- ✓ weaker, generally narrower conductive features (some of which have been mentioned previously) may outline structural breaks serving as water conduits – shown as the overly simplistic dashed lines

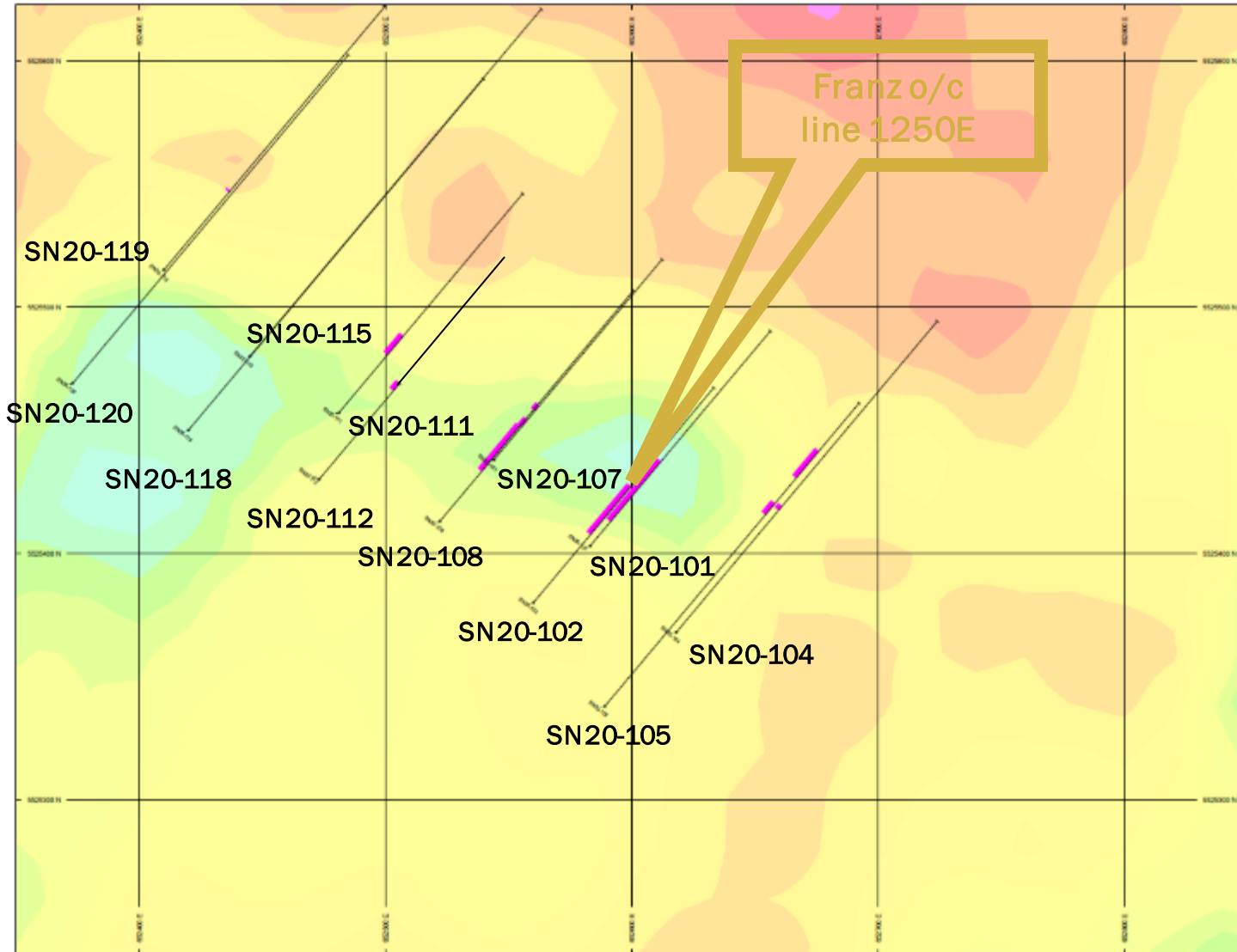
# 3D VOXEL MODEL – VERIFICATION



- ✓ before going too wild with the voxel image, we should make an effort to check its validity - in this case we have not only the Franz outcrop itself, but also recent drilling for control
- ✓ drill sections are oriented at about 040 degrees (black), while the DC resistivity lines are offset slightly at about 020 degrees (grey)
- ✓ ground magnetic data was collected in 2020 along east-west oriented lines at 50m line spacing (ties into existing mag coverage)
- ✓ preliminary magnetic data is shown to left with the local resistivity survey lines and surface projections of paired drill holes SN20-101/102, -104/105, -107/108, -111/112 and -115/118 (some possible lineaments as noted)

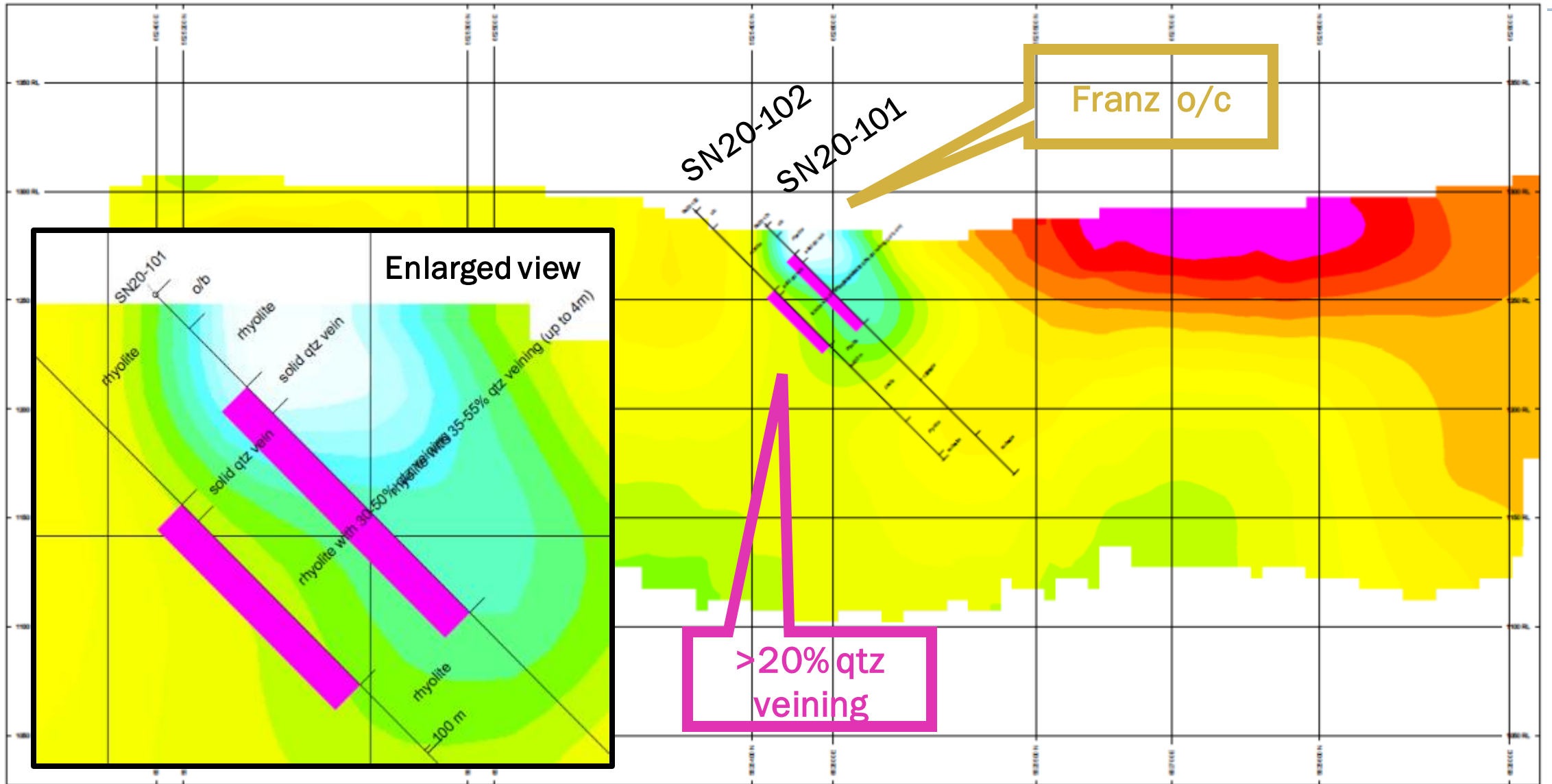


# VOXEL MODEL TEST – PLAN VIEW AND DRILL HOLE PROJECTIONS



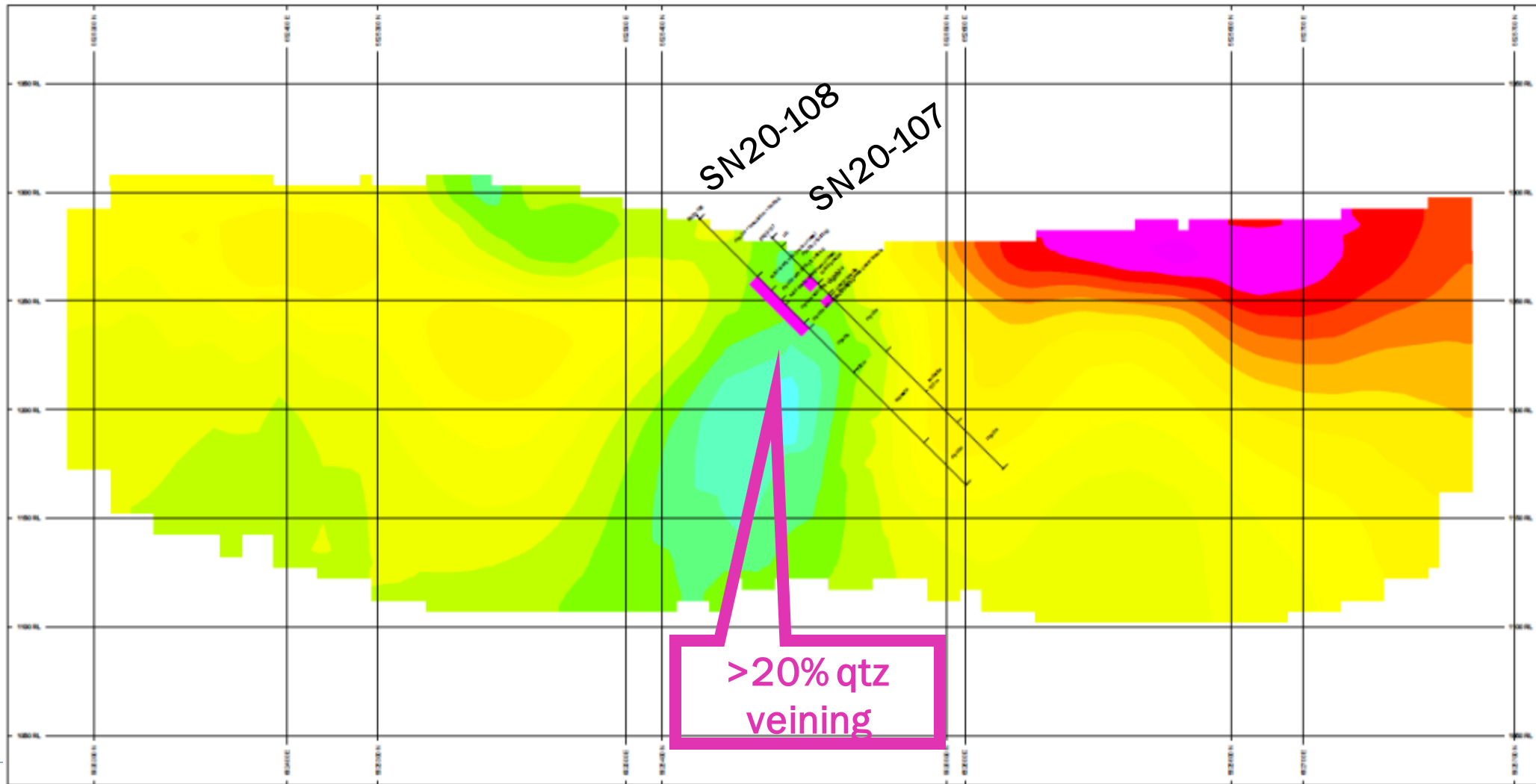
- ✓ plan view of voxel model (blue represents resistive responses)
- ✓ UTM grid squares at 100m intervals
- ✓ trace of drill holes projected to surface (azimuth 040 dip -45); collars labelled
- ✓ drill logs simplified to show >20% quartz veining in a given interval as a solid magenta highlight (from Quick Logs)
- ✓ *Note: this is an arbitrary beakpoint, but one with enough silicification that it can be reasonably expected to impede passage of an electrical current and create a resistivity anomaly*
- ✓ **now slice model along the drill sections**

# VOXEL MODEL TEST – SLICED THROUGH SN20-101 AND 102

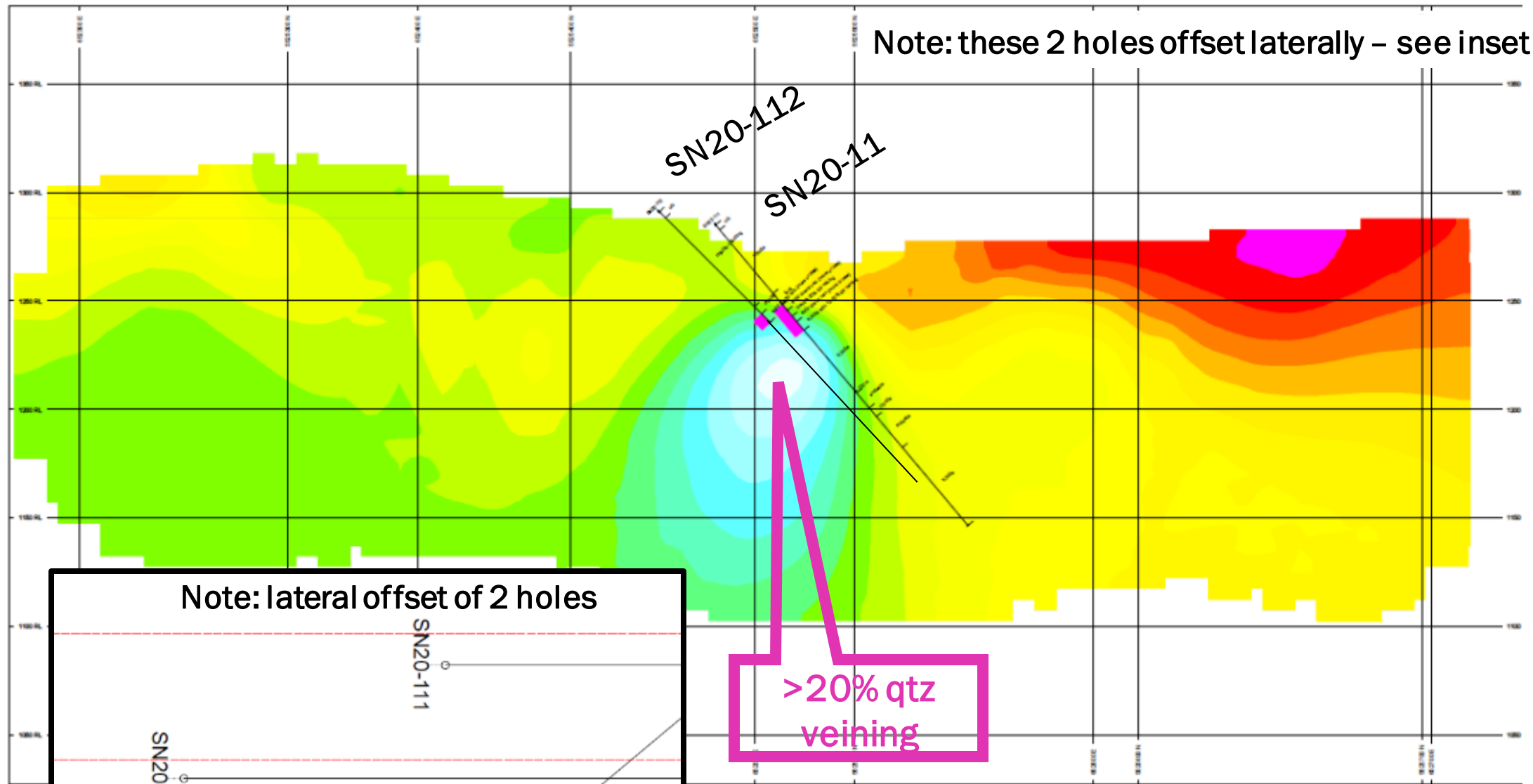




# VOXEL MODEL TEST – SLICED THROUGH SN20-107 AND 108



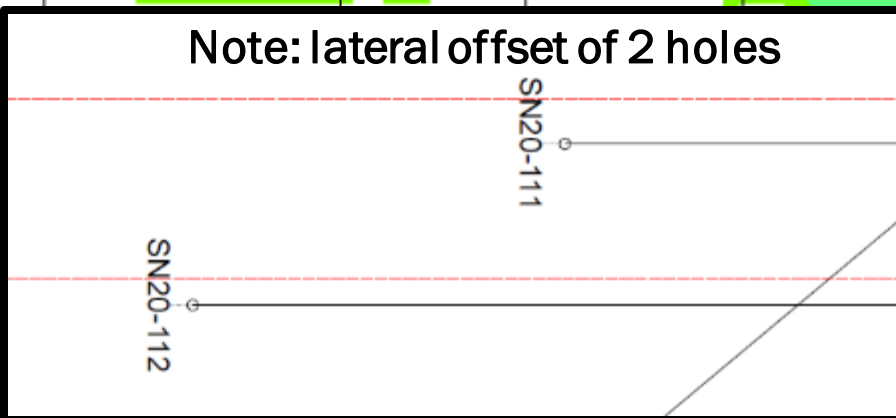
# VOXEL MODEL TEST – SLICED THROUGH SN20-111 AND 112



Note: these 2 holes offset laterally – see inset below

SN20-112  
SN20-111

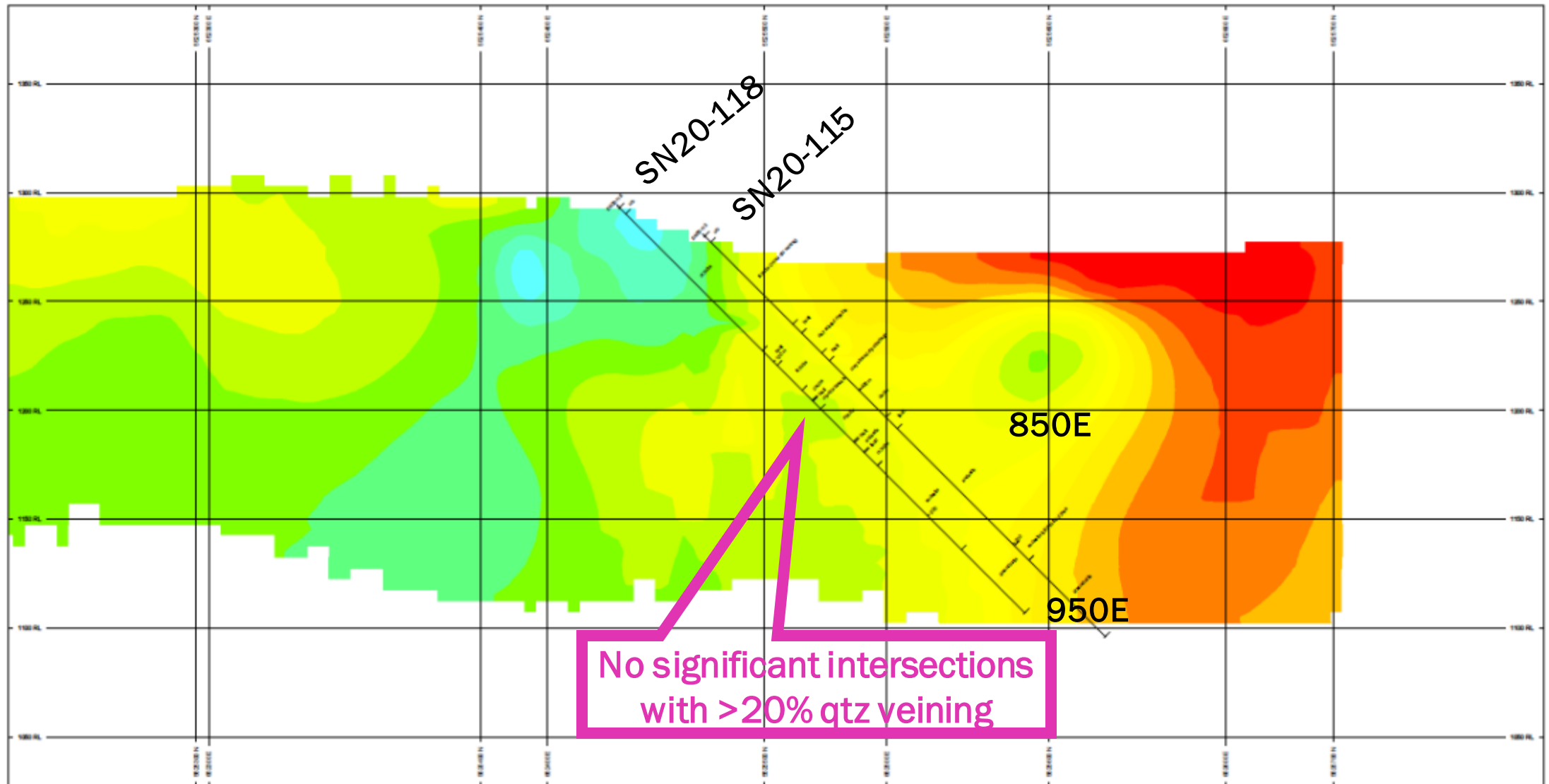
Note: lateral offset of 2 holes



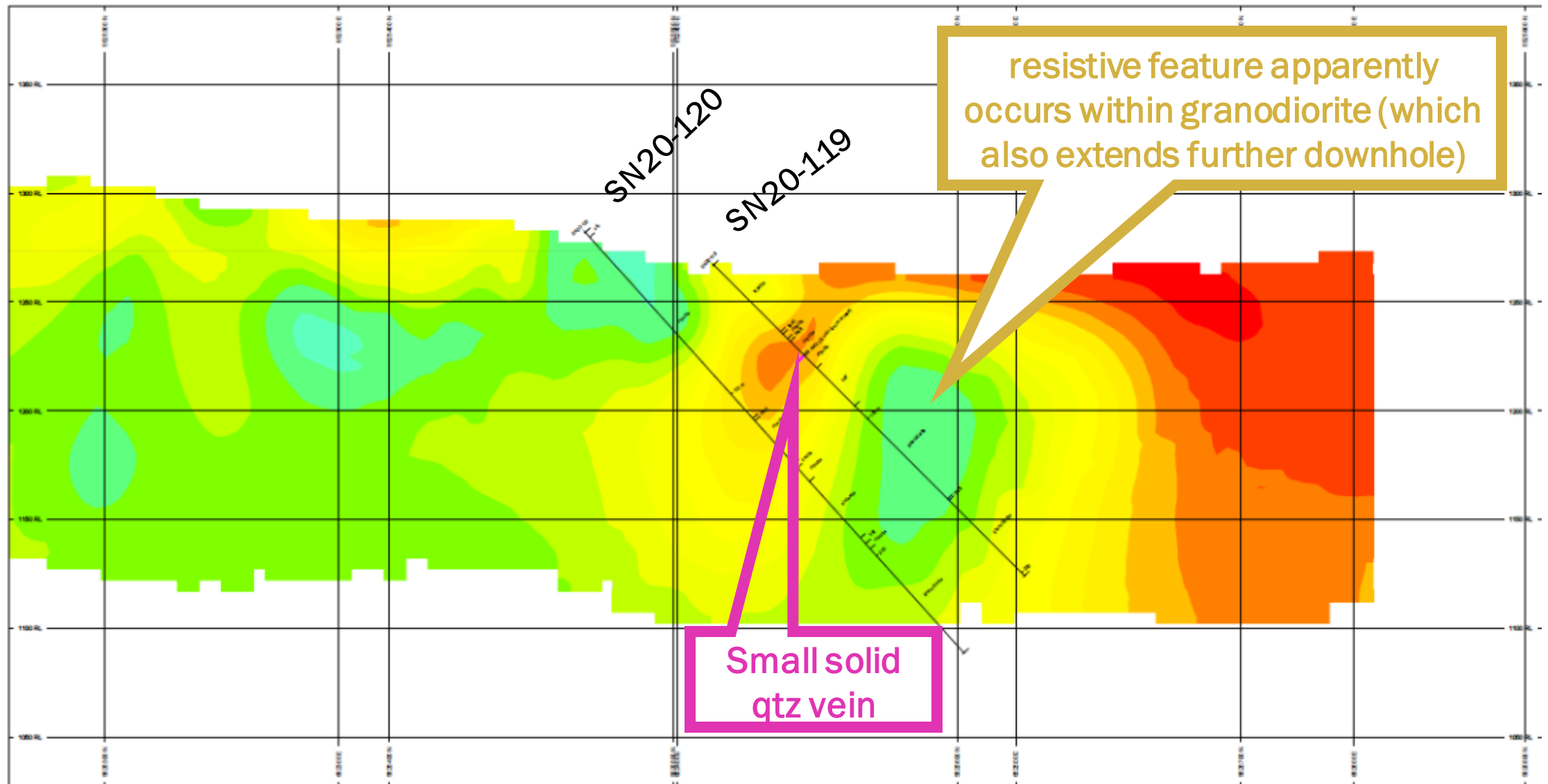
>20% qtz  
veining



# VOXEL MODEL TEST – SLICED THROUGH SN20-115 AND 118



# VOXEL MODEL TEST – SLICED THROUGH SN20-119 AND 120



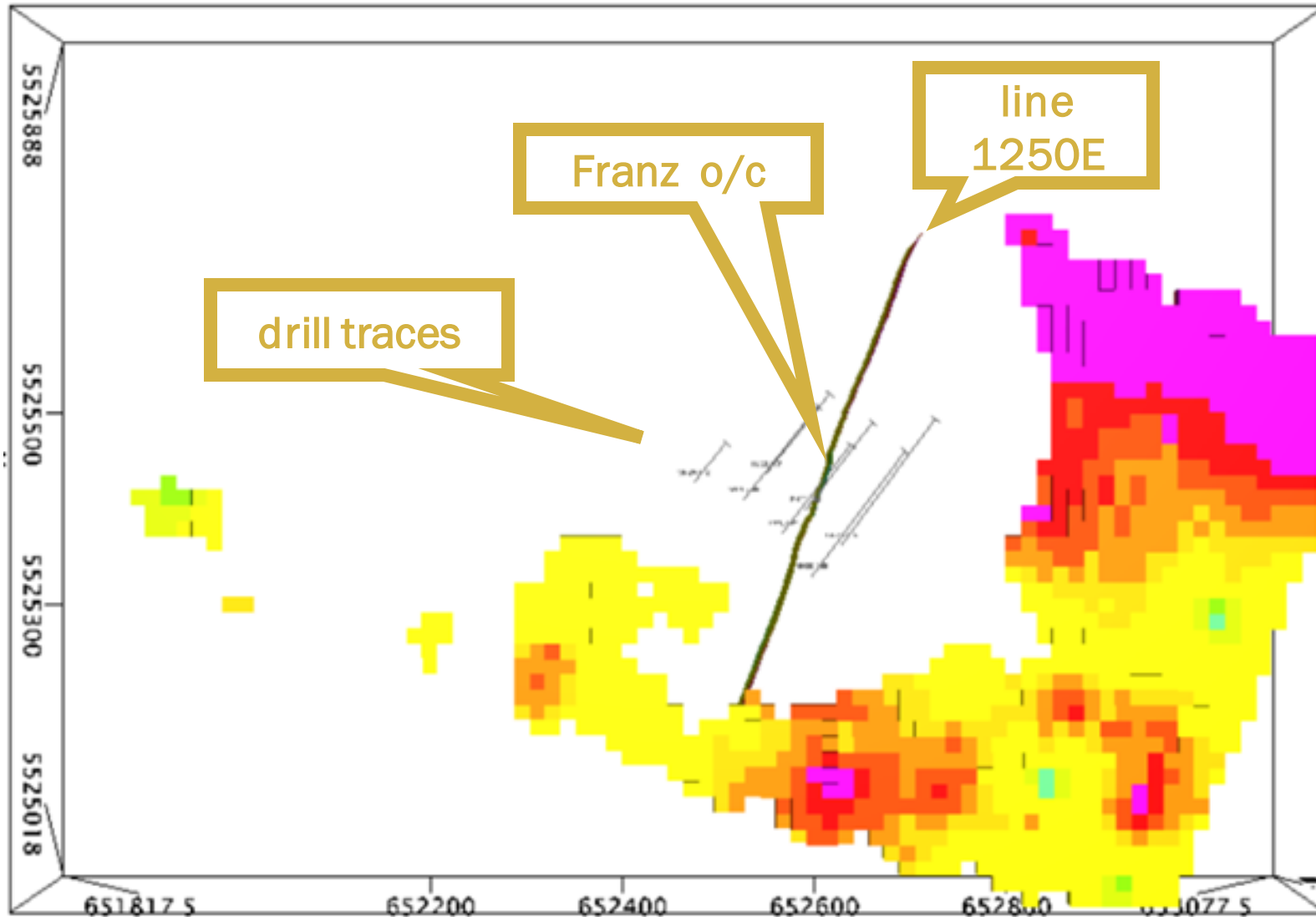


# VOXEL MODEL TEST – OBSERVATIONS AND CONCLUSIONS

- ✓ Based on reviewing of the voxel model slices above....
  - ✓ silicification associated with the Franz outcrop presents on section and in model as a prominent resistive feature (line 1250E)
  - ✓ drilling beneath the outcrop and into the resistive feature intersected a ‘solid’ quartz vein (see simplified logs to right)
  - ✓ intersections with elevated amounts of quartz veining (>20%) also appear to coincide with the resistive feature on other sections
  - ✓ other silica rich units (e.g. rhyolites) in the drilling do not appear to correlate with, or create, any significant resistive responses, but a weaker resistive response apparently lies within a granodiorite
  - ✓ drilling outside of the prominent resistive responses (e.g. SN20-115 + 118) has not intersected significant amounts of quartz veining
  - ✓ slices across the voxel model suggest that the interpolated cells (cubes) within the model may provide a reasonable representation of geology between the actual measured DC resistivity survey lines

hole	utm mE	utm mN	m asl	azimuth	dip
SN20-101	652583	5525403	1282	40	-45
<b>from (m)</b>	<b>to (m)</b>	<b>lithology</b>			
0	6.8	o/b			
6.8	18.36	rhyolite			
18.36	23.6	solid qtz vein			
23.6	63.24	rhyolite with 35-55% qtz veining (up to 4m)			
63.24	135.83	dacite			
135.83	161	andesite			
		EOH			
<b>hole</b>	<b>utm mE</b>	<b>utm mN</b>	<b>m asl</b>	<b>azimuth</b>	<b>dip</b>
SN20-102	652560	5525380	1289	40	-45
<b>from (m)</b>	<b>to (m)</b>	<b>lithology</b>			
0	11	o/b			
11	51.1	rhyolite			
51.1	54.4	solid qtz vein			
54.4	87	rhyolite with 30-50% qtz veining			
87	100.6	rhyolite			
100.6	136.3	dacite			
136.3	157.85	rhyolite			
157.85	161	andesite			
		EOH			

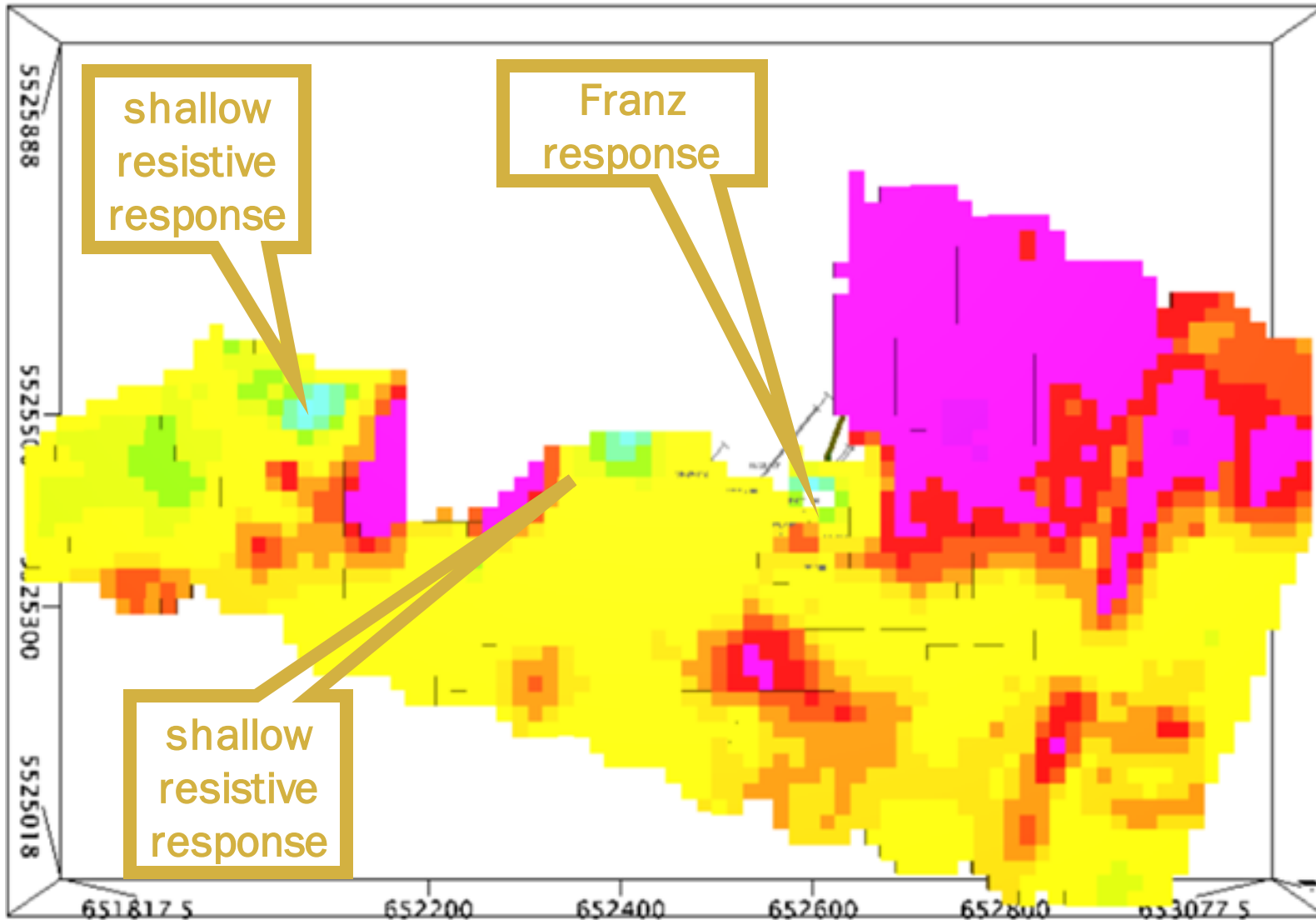
# VOXEL MODEL DEPTH SLICES: 1305 - 1330 M ASL



- ✓ slice current voxel model horizontally into 25m thick depth slices as a means of showing subsurface conditions (north to top)
- ✓ drill hole traces and section 1250 (across the Franz o/c) shown for reference
- ✓ given the topographic variation shown earlier, the series of depth slice images will gradually fill from east to west as we move downslope
- ✓ shallow conductive material lies along the northern extent of the survey area and dominates this depth slice

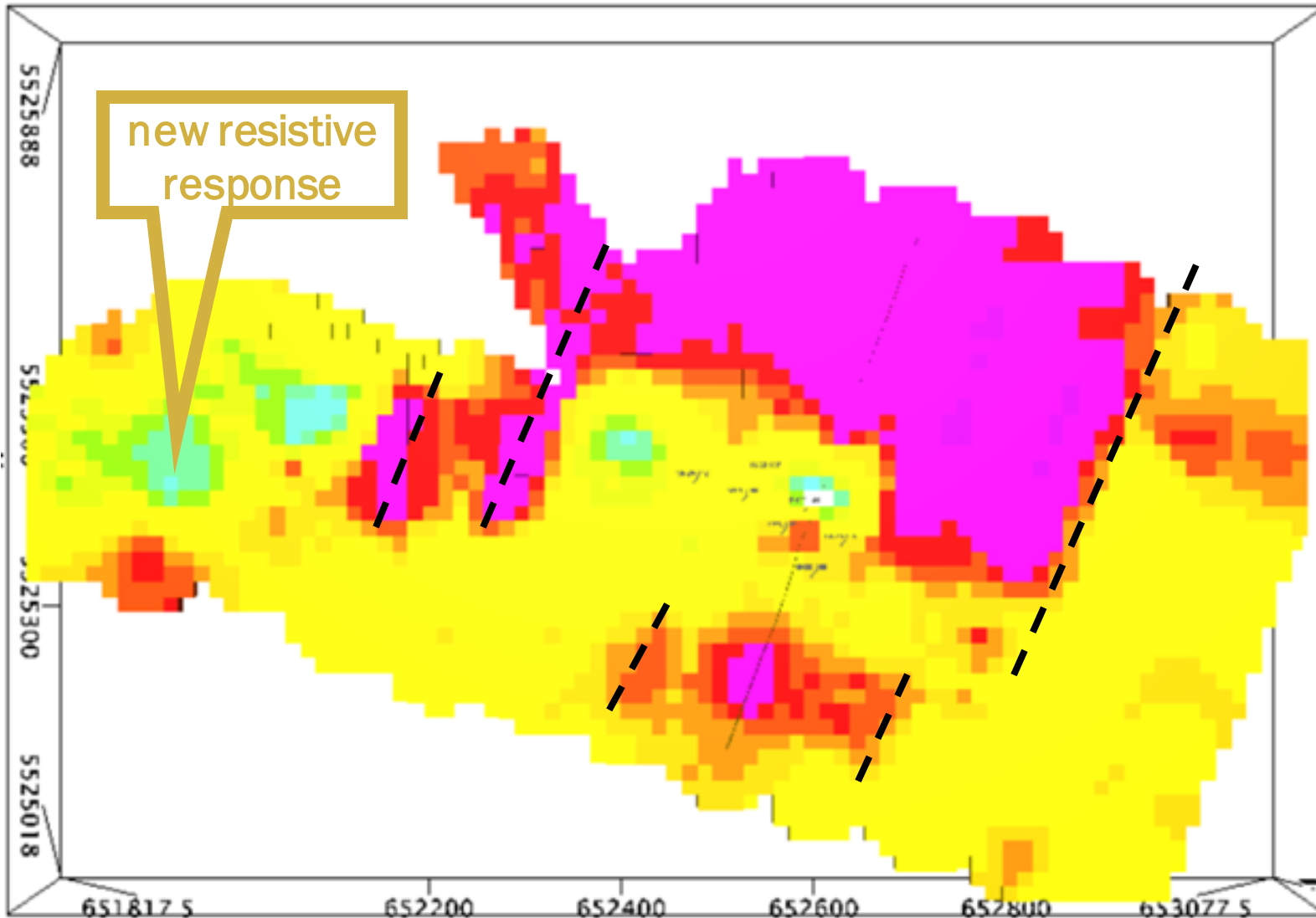


# VOXEL MODEL DEPTH SLICES: 1280 - 1305 M ASL



- ✓ 25m lower the shallow conductive responses migrate south and west
- ✓ a narrow linear conductive response parallel to the survey lines is apparent at the east end of the voxel model
- ✓ strongly resistive response associated with Franz outcrop first appears at ~1282m asl (surface)
- ✓ two other resistive features of limited extent are also evident (and would be theoretically be within 25m of the topographic surface)

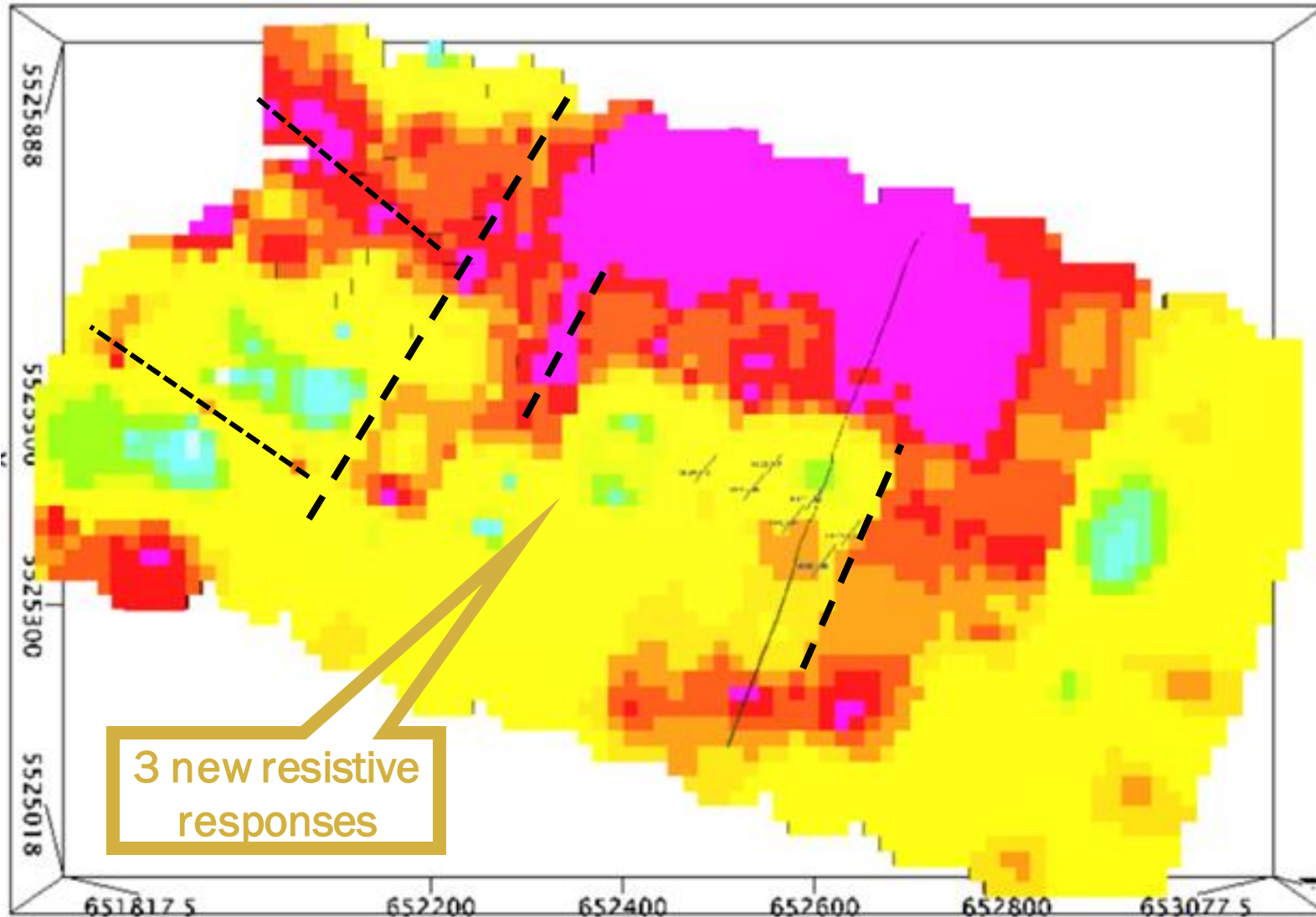
# VOXEL MODEL DEPTH SLICES: 1255 - 1280 M ASL



- ✓ both shallow resistive responses from the previous depth slice continue on this level, as does that associated with the Franz outcrop
- ✓ a fourth resistive response has appeared at the western edge
- ✓ potential faulting subparallel to the survey lines is supported by:
  - ✓ a sharp break in the northern conductive zone
  - ✓ conductive responses in the west part of the block
  - ✓ strike limitations on a WNW trending conductor in the southern third of the block

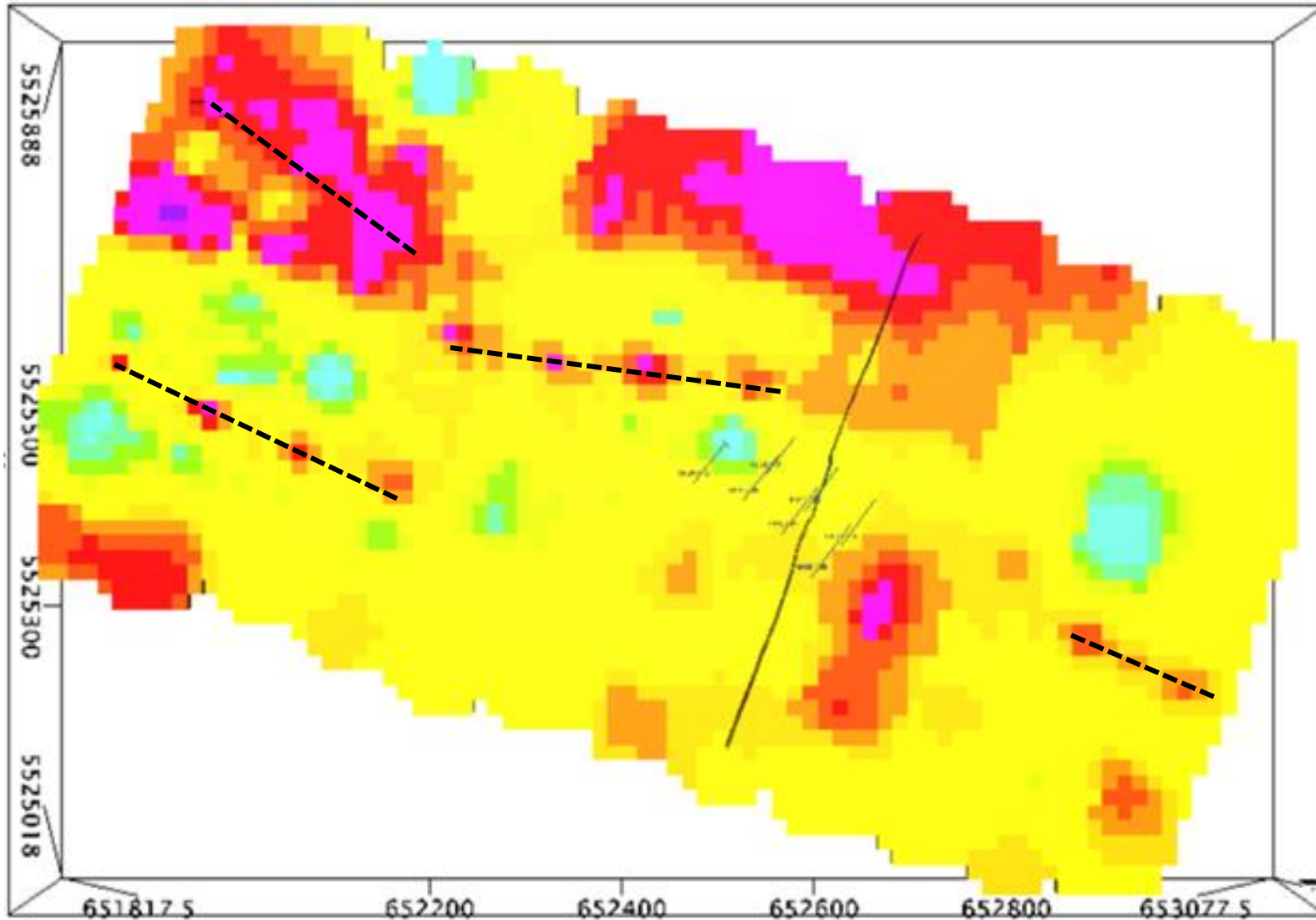


# VOXEL MODEL DEPTH SLICES: 1230 – 1255 M ASL



- ✓ the Franz resistive response is still present (50-75m below surface)
- ✓ the separate (?) resistive zone some 200m west of Franz also continues at this depth
- ✓ three new size limited resistive features have appeared west and WSW of the drilling
- ✓ changes occurring between parts of adjacent survey lines continue to be present (and not always in the same place from depth slice to slice)
- ✓ narrow zones of elevated conductivity may track wet faults/structures (e.g. WNW trends)

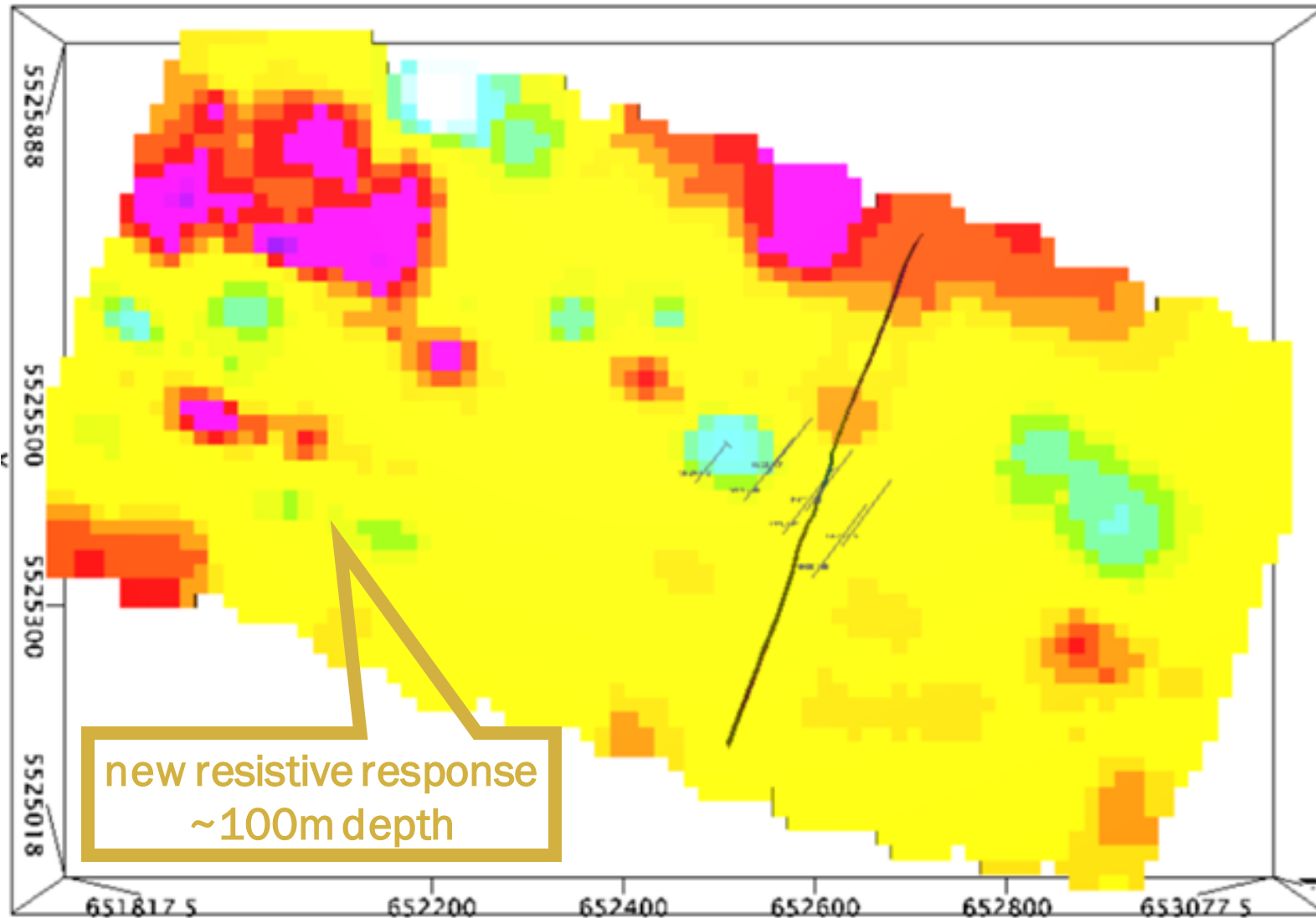
## VOXEL MODEL DEPTH SLICES: 1205-1230 M ASL



- ✓ resistive responses beneath the Franz o/c (1250E) have faded out at depth but a response is still present 100m to the west (note that drilling at SN20-115 and 118 may have overshot this feature)
- ✓ several small resistive features are evident within a few hundred meters of the Franz o/c (to the NW, W and WSW) as well as on the west end of the model
- ✓ broad strong northern conductive zone has significantly decreased in lateral extent at this level
- ✓ narrow linear conductors are more prevalent, but remain strike limited

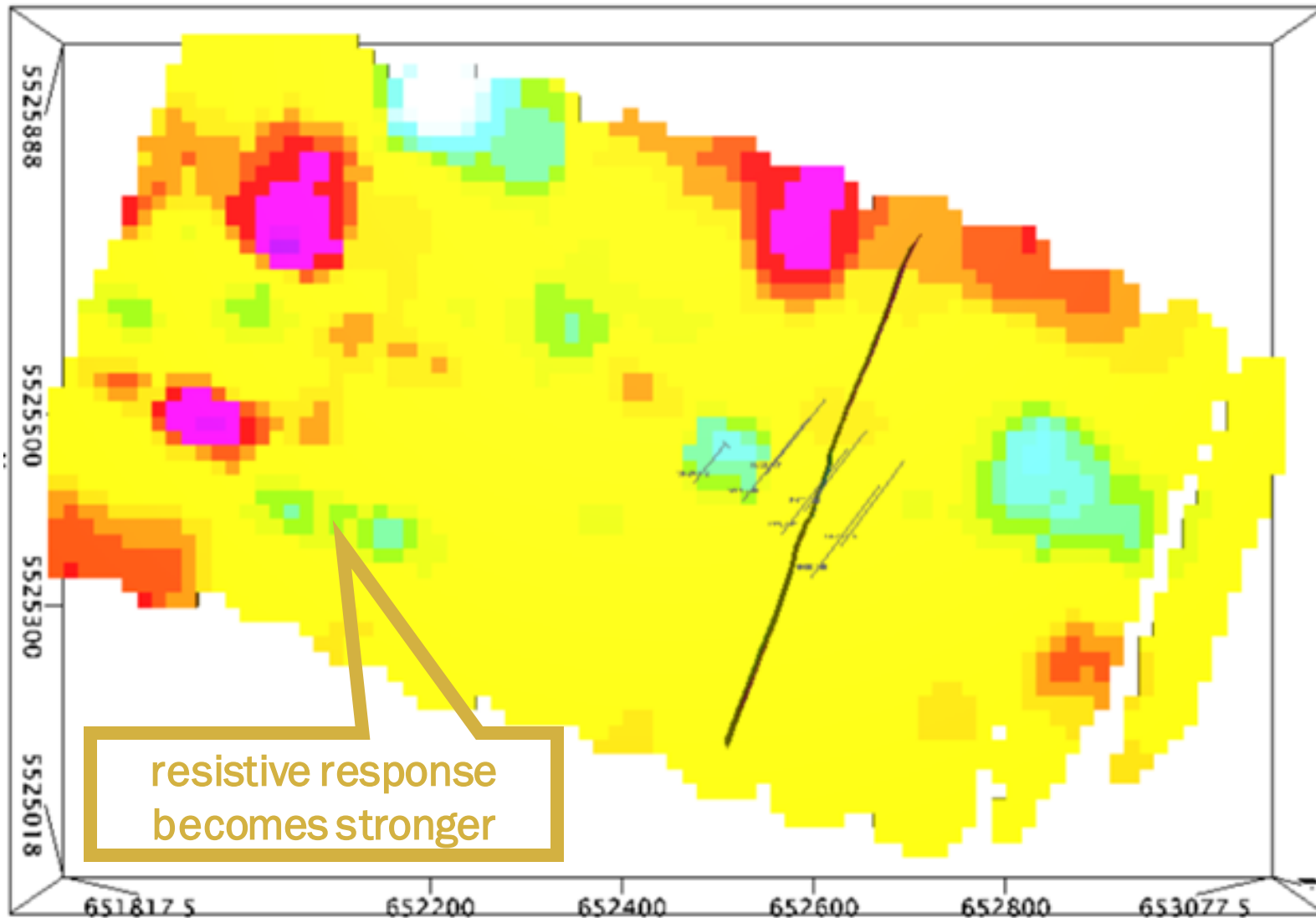


# VOXEL MODEL DEPTH SLICES: 1180 - 1205 M ASL



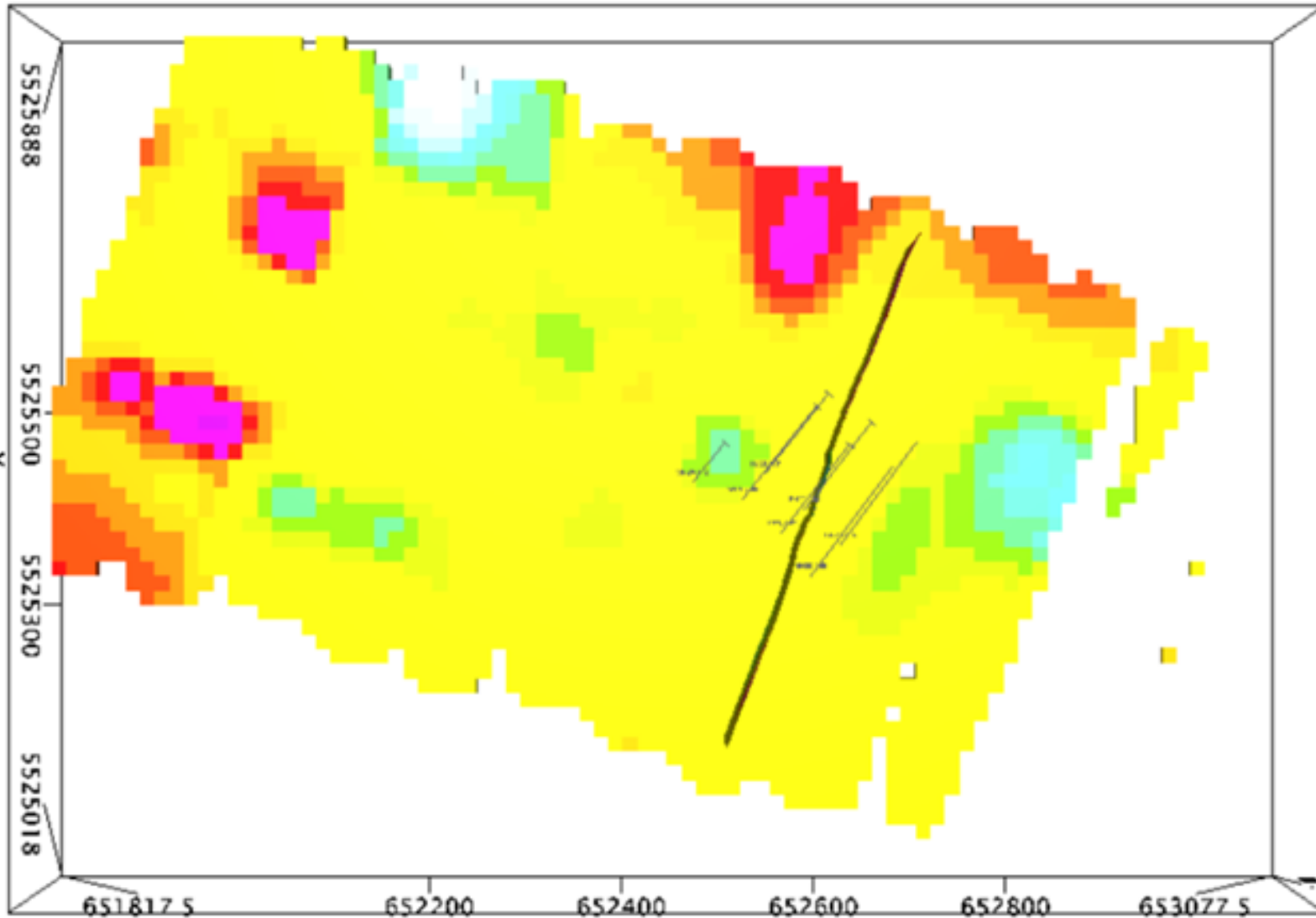
- ✓ resistive zone at east end of survey is starting to broaden and appear on more than one line - the significance/source of this feature is unclear as intrusive bodies can also be comparatively resistive
- ✓ a similar largish resistive feature is developing along the west end of the northern survey boundary (but at this depth and this close to the line ends/survey edge should be treated with some caution)
- ✓ a relatively deep narrow resistive feature (~100m below surface) with a linear character is beginning to develop in the southwest corner

# VOXEL MODEL DEPTH SLICES: 1155-1180 M ASL



- ✓ effective depth penetration of the survey lines at the east end of the model has been reached and the model is starting to break up
- ✓ resistive feature 100m west of Franz o/c is still present
- ✓ there is also a feature ~150m to the NW that was starting to show on the depth slice immediately above
- ✓ resistors at the west end of the survey block continue to depth

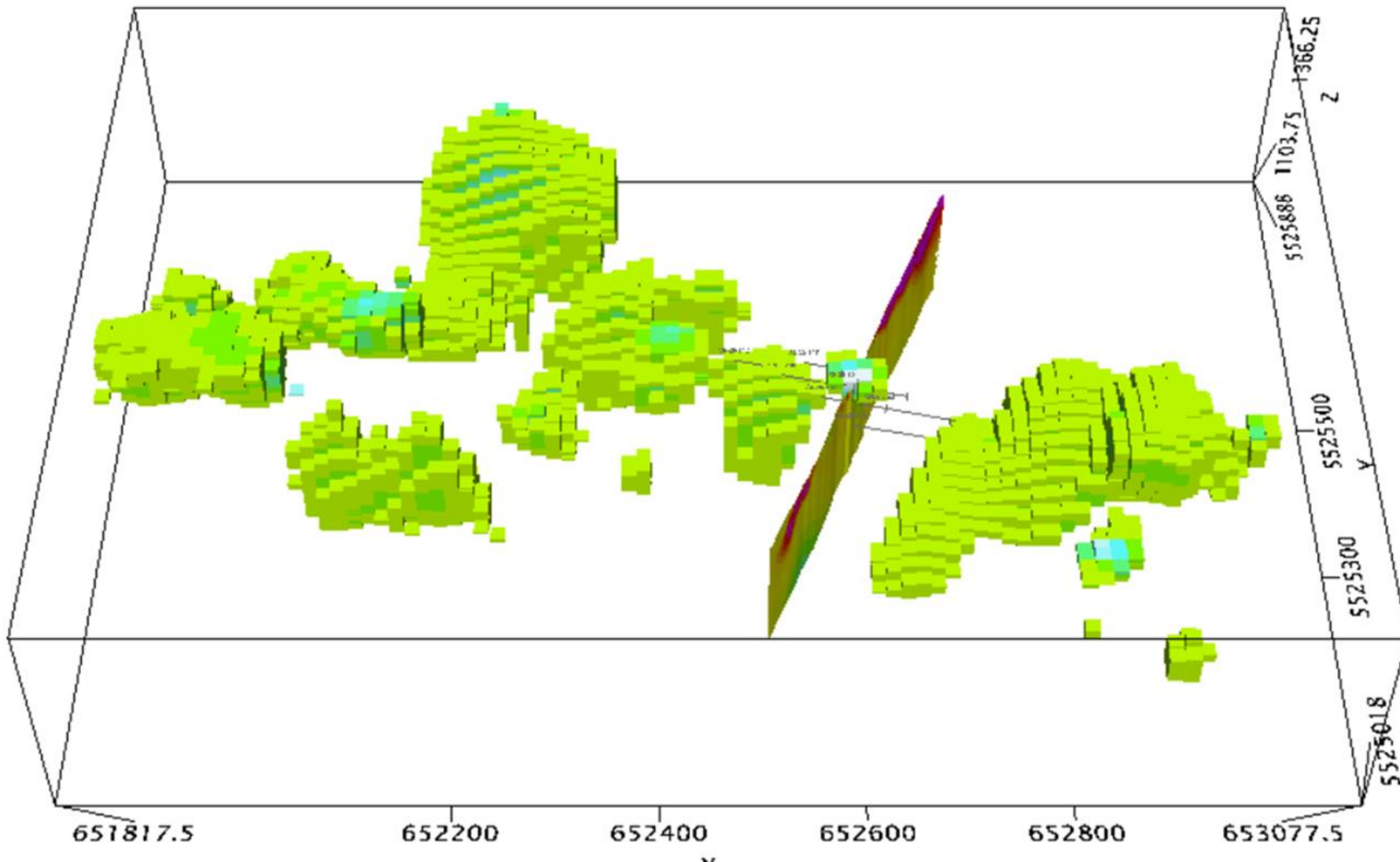
# VOXEL MODEL DEPTH SLICES - 1130-1155 M ASL



- ✓ effective depth has been reached across the entire survey block
- ✓ lines have been inversion modelled to this depth (see 1250E as shown) but realism is suspect
- ✓ **So now what?**
- ✓ if we accept that the voxel model is reasonably representing data as measured on each actual survey line, then we should be able to graphically look at features of potential interest

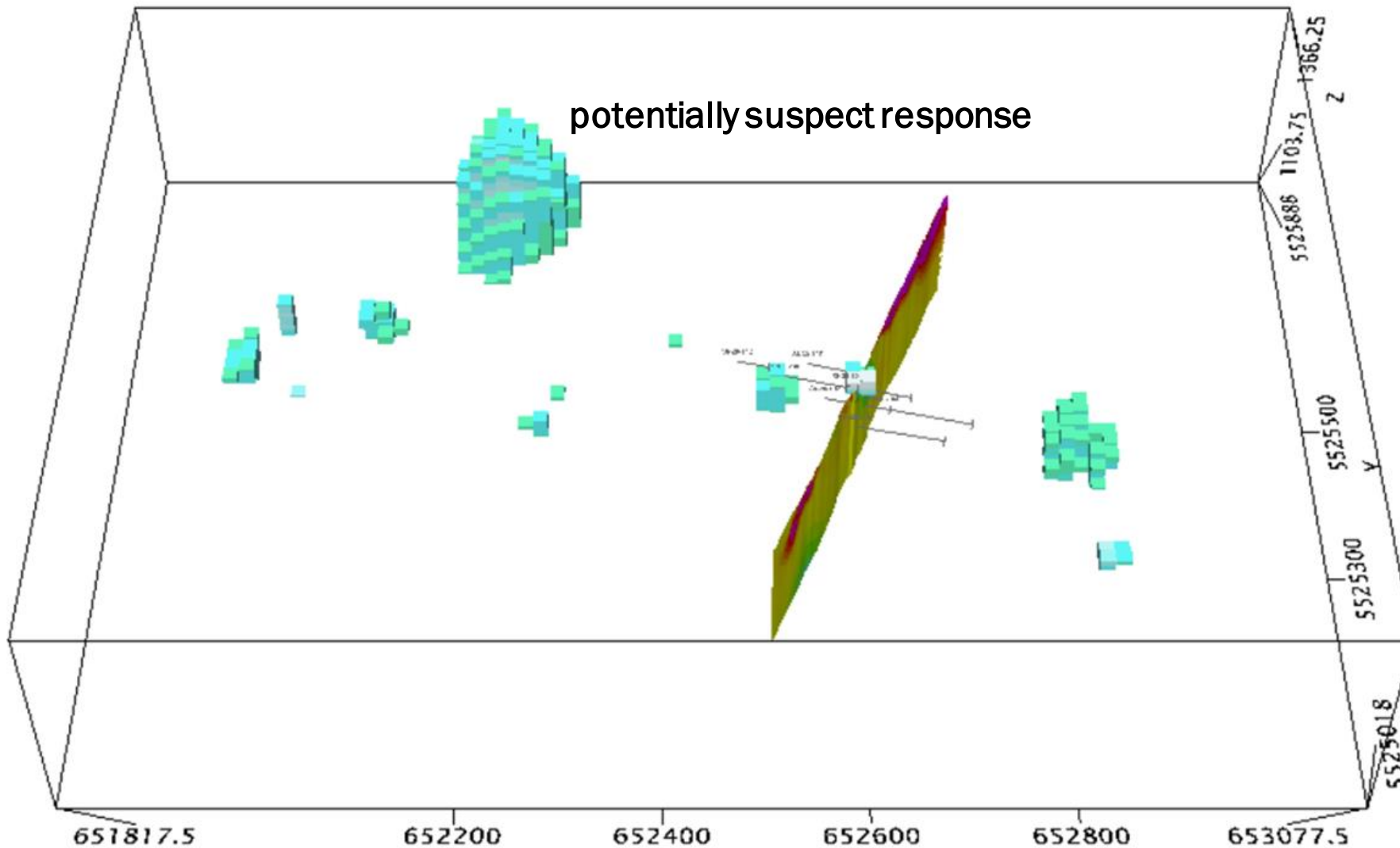


# RESISTIVE ZONES WITHIN THE VOXEL MODEL



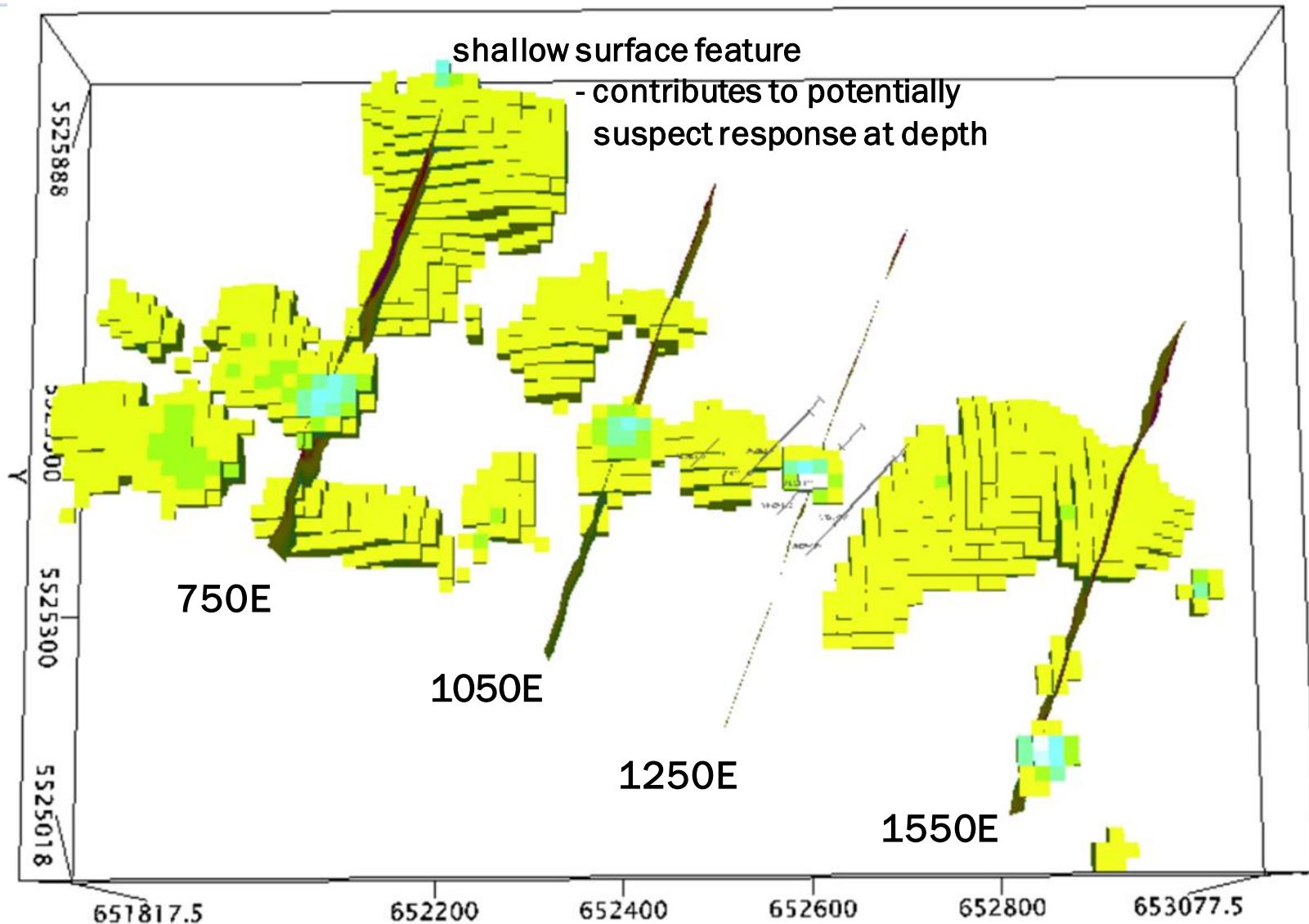
- ✓ individual voxel cubes have been filtered to show relative size and location of areas inferred to have greater resistivity responses
- ✓ view is to the north and from an elevation of about 45 degrees above the horizon
- ✓ line 1250 (Franz o/c) and early drilling shown for reference

# RESISTIVE ZONES WITHIN THE VOXEL MODEL (TIGHTER CONSTRAINTS)



- ✓ same data/view as above but with very tightly constrained voxel cube selection
- ✓ essentially only very most resistive responses shown
- ✓ difficult to envisage depths from this presentation
- ✓ Note: large resistive response to north occurs at the end of survey lines 750 and 850, and is being projected/expanded to depth – these lines have been extended to resolve this feature

# POTENTIAL RESISTIVE TARGETS

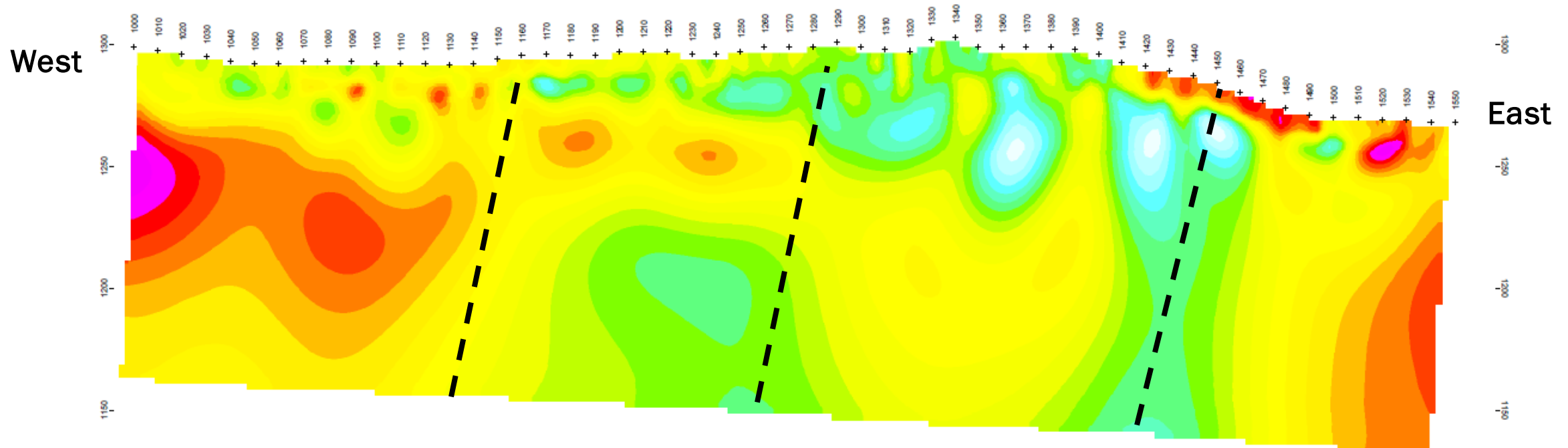


- ✓ same model data and still looking north but at steeper view angle
- ✓ additional resistive cubes are shown to better demonstrate possible shapes, location, and relative orientations for a number of potential targets
- ✓ select survey lines shown for depth reference
- ✓ cubes above/covering survey lines are right at surface
- ✓ potential for NE and NNE fault offset should not be overlooked



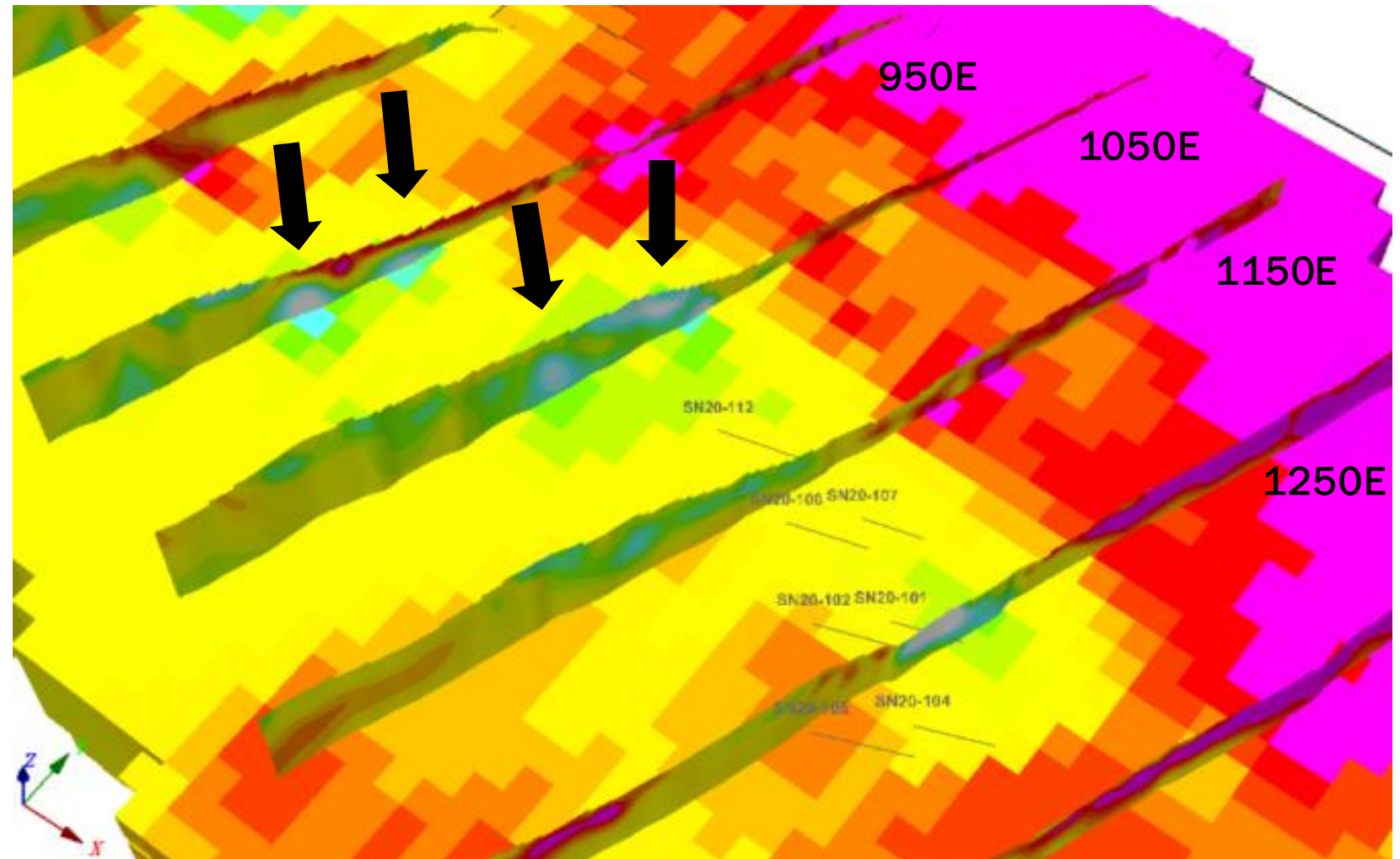
# PRELIMINARY ORTHOGONAL SECTION (L120N) – FAULTING?

- ✓ to test potential for NE or NNE faults a single line was run at right angles to the main survey grid (~110 degrees)
- ✓ preliminary results for this section are shown below (Note: not built into the model images shown previously)
- ✓ a good argument can be made for 3 or more faults, based on offsets to measured responses

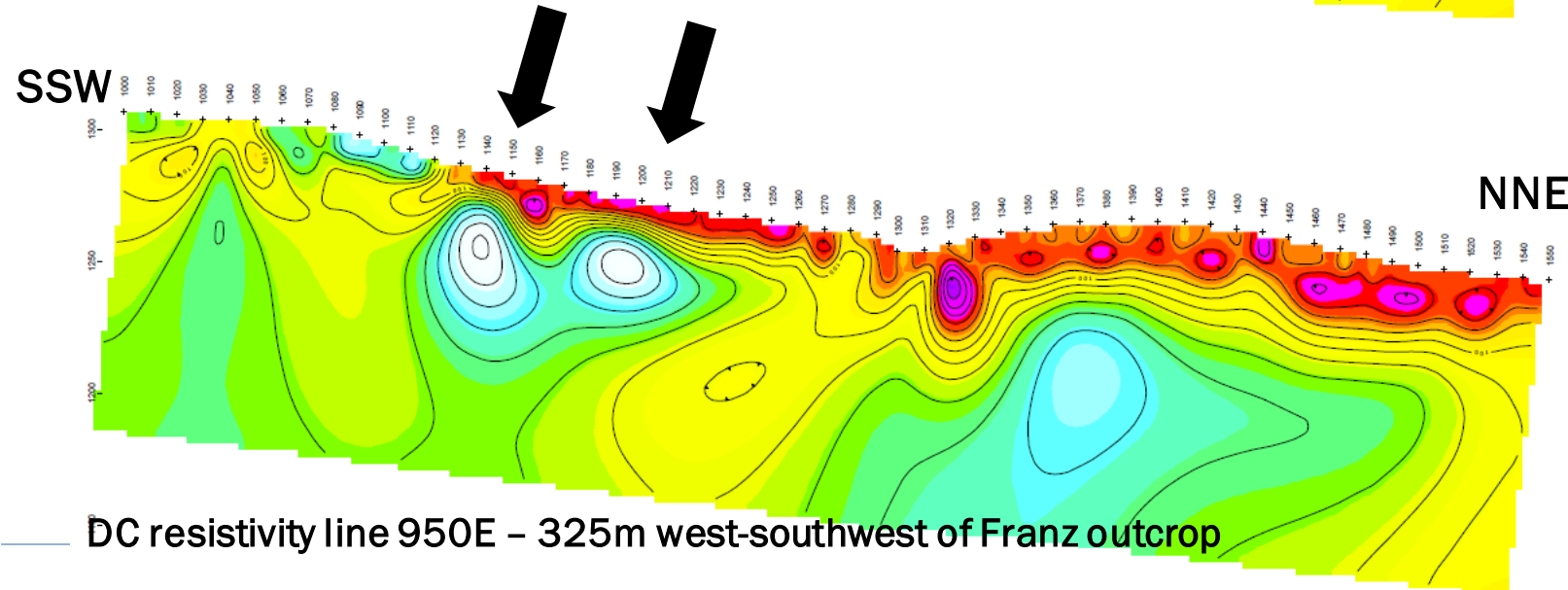
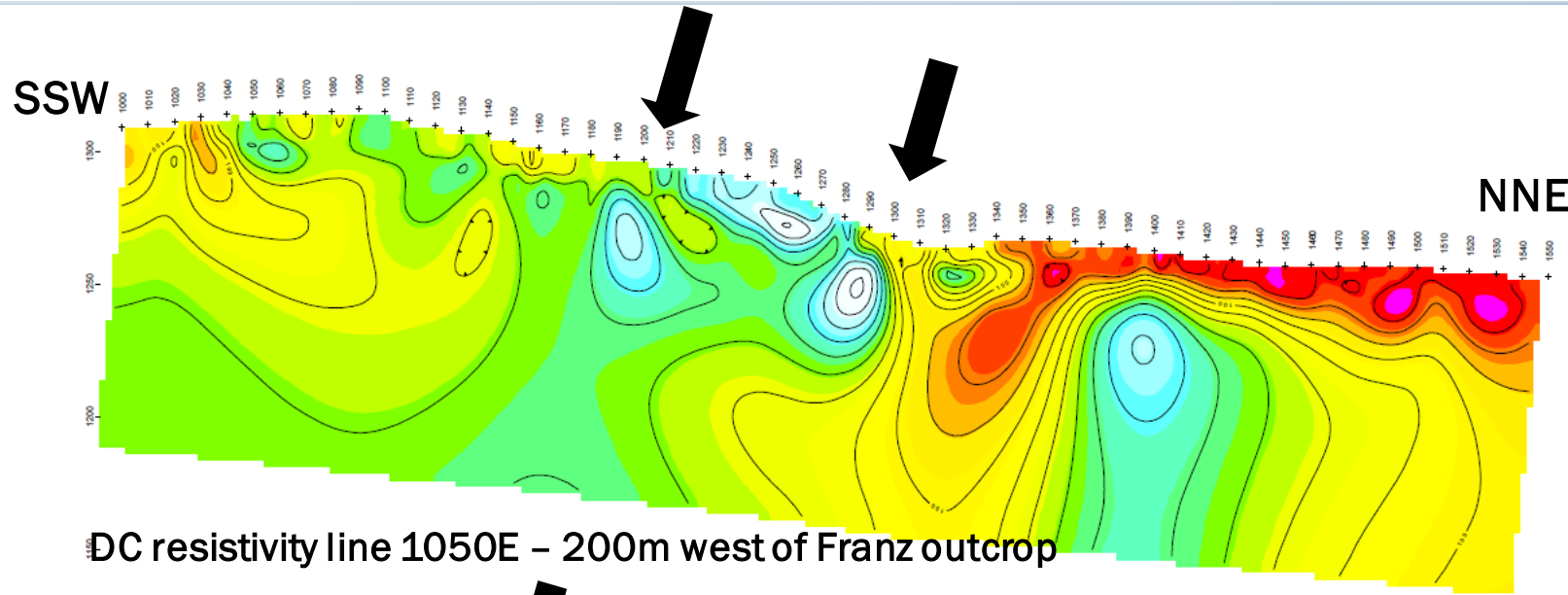


# POTENTIAL TARGETS ON 950 AND 1050

- ✓ voxel model capped at 1250m asl (~30m below Franz o/c) to show relative depth below surface for four potential resistive features of interest
- ✓ located west and southwest of Franz outcrop (lines 950E and 1050E)
- ✓ use the actual inverted sections to select initial target centroids, rather than the voxel model (or 3D inversion model when it arrives)– sections represent real measured data



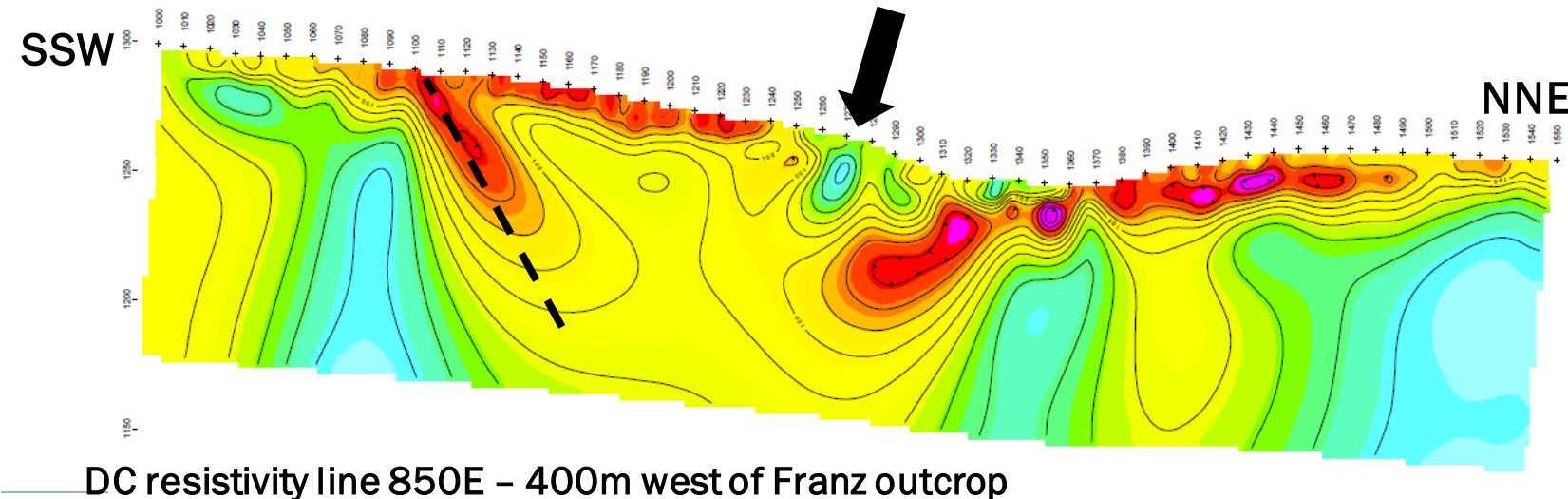
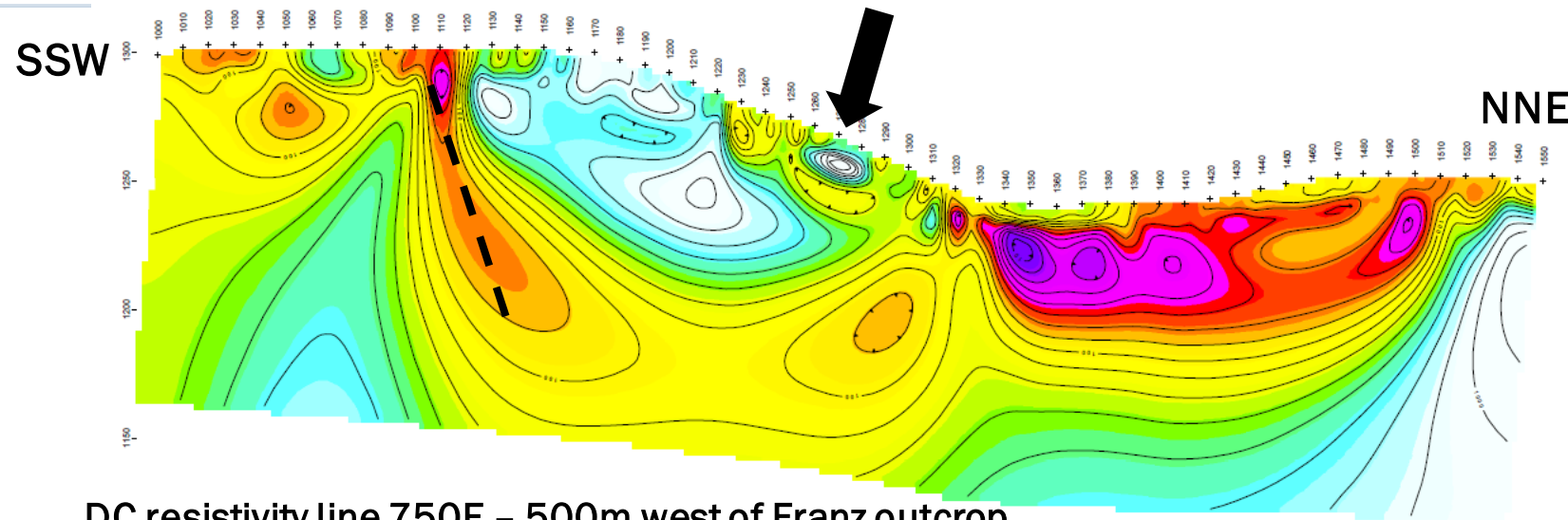
# POTENTIAL TARGETS ON LINES 950E AND 1050E



- ✓ inverted resistivity sections from lines 1050E and 950E shown to left in their relative positions
- ✓ note the gross similarities in anomaly shapes (both discrete resistive features and the dipping lobate central conductive zone)
- ✓ note also the potential left lateral offset of perhaps 70-80m between sections
- ✓ if resistive responses analogous to the Franz feature represent silicified vein material then alternate option could be a series of stacked or anastomosing veins

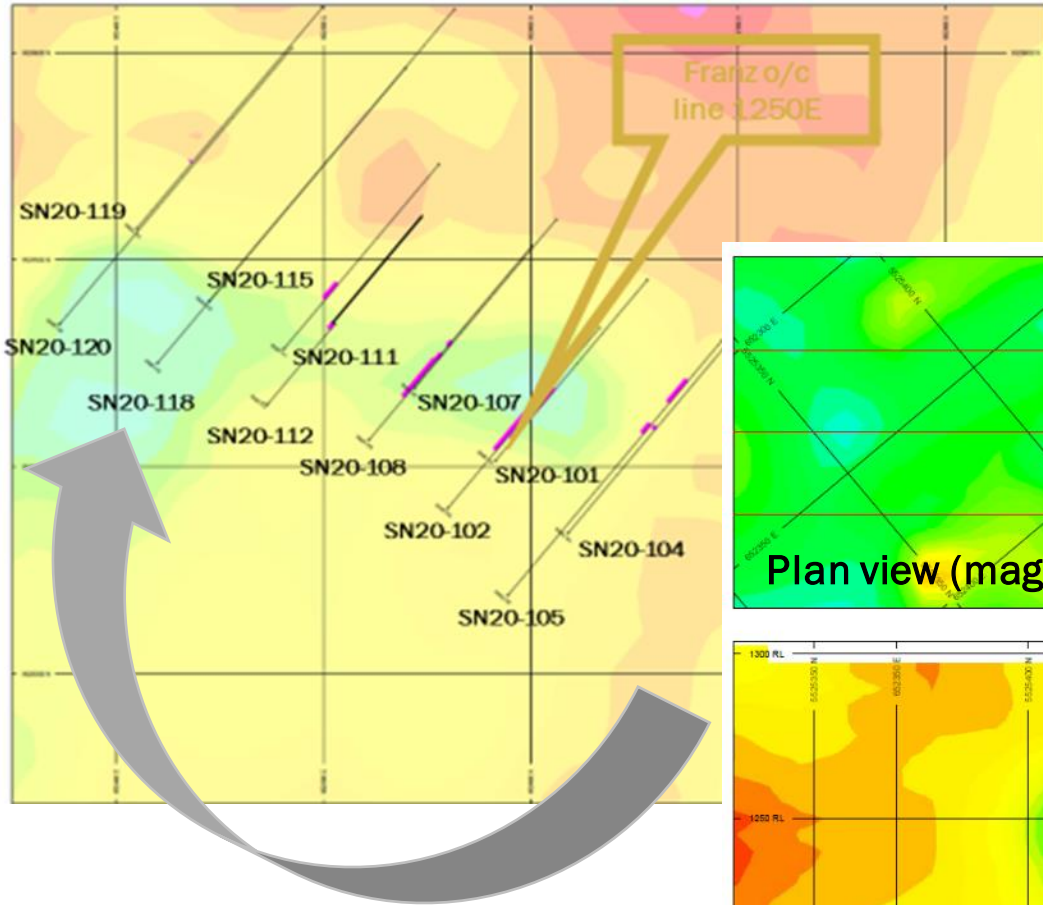


# NEAR SURFACE RESISTIVITY RESPONSES ON 750E AND 850E

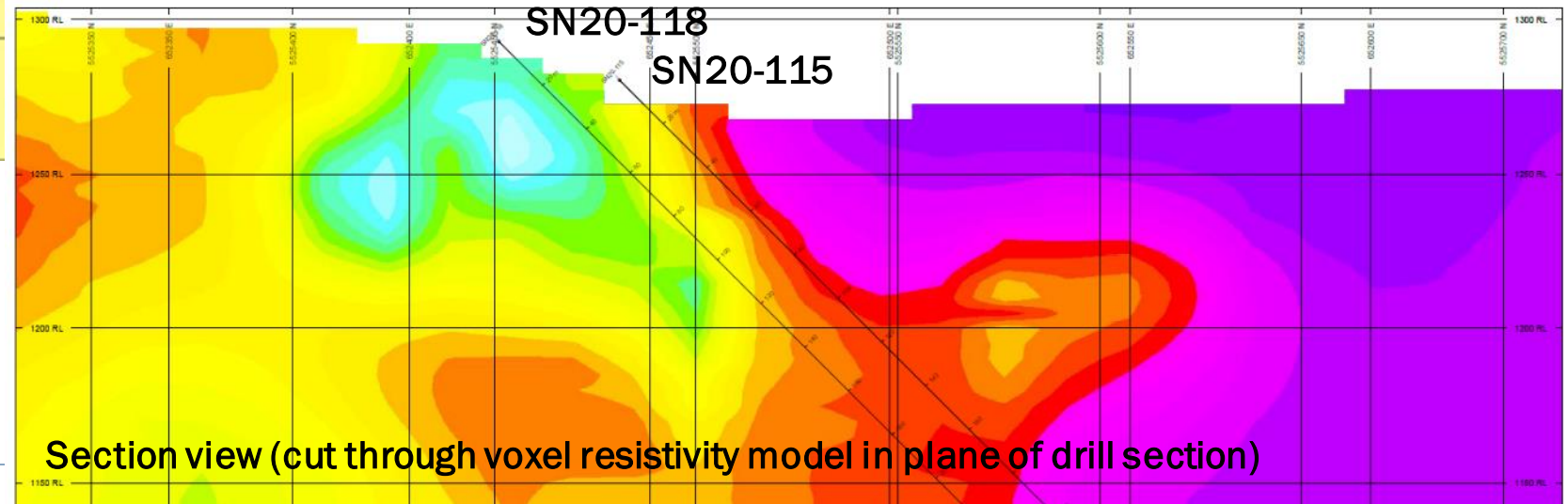
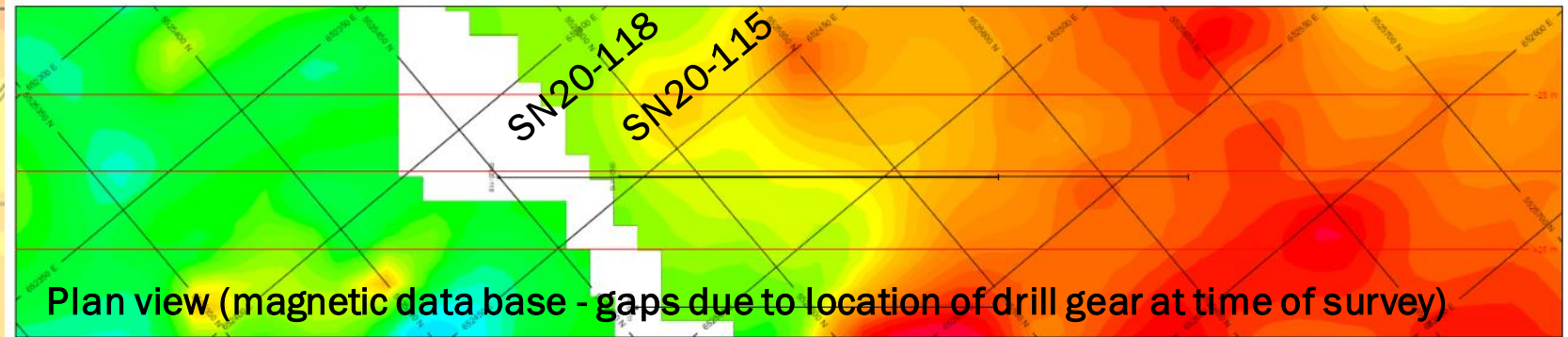


- ✓ inverted resistivity sections from lines 750E and 850E shown to left in their relative positions
- ✓ again there are gross similarities in anomaly shapes, but significant line to line variations – e.g. broad resistive horizon south half line 750
- ✓ both lines have small shallow resistive features that may warrant field investigation – the feature on 750 is particularly strong (comparable to Franz o/c)
- ✓ it may continue 200m to the west (lines 650E and 550E)
- ✓ ground checking is suggested, but a similar feature on 1650E could not be clearly explained in the field

# DRILL HOLES SN20-115/118 (AND SN20-119/120)



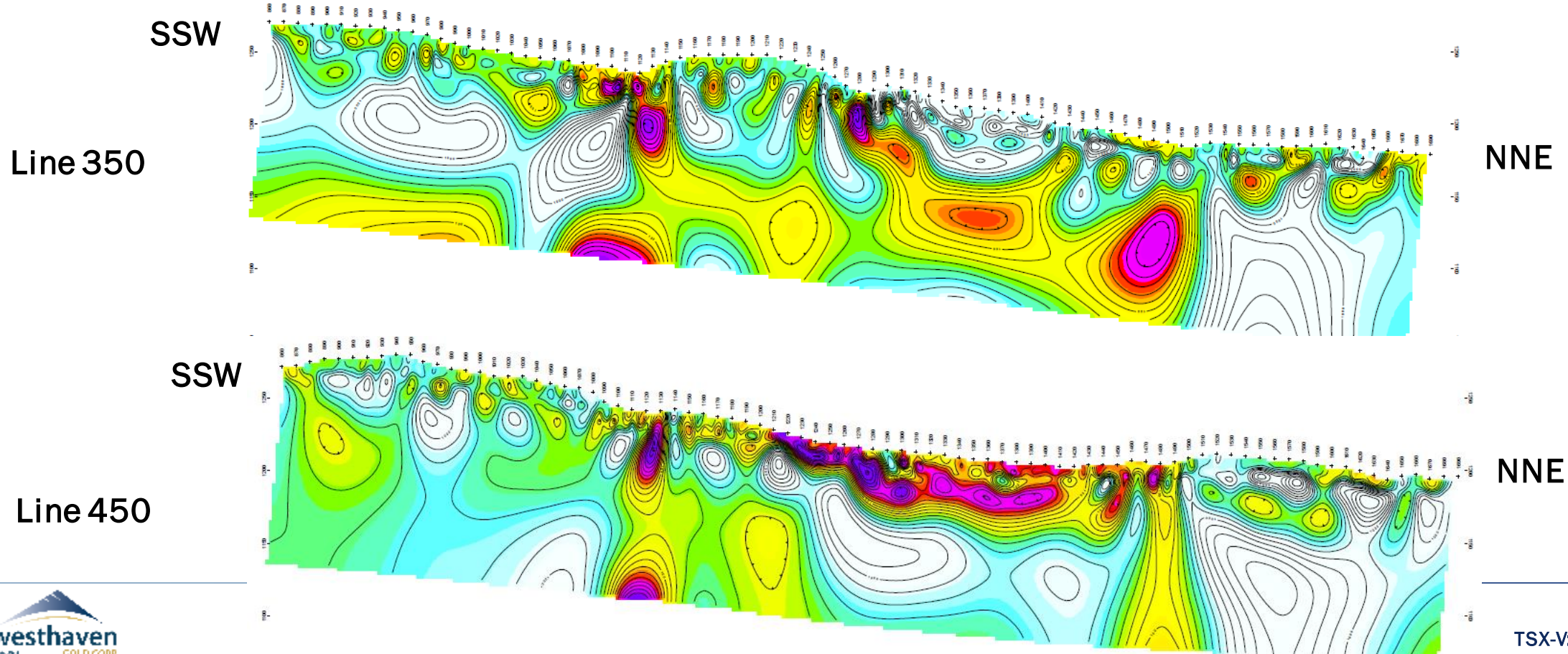
- ✓ consider if drill holes SN20-118 (and SN20-120) may have overshot the relatively shallow resistive feature situated ~150m west of the Franz outcrop





# MOVING FORWARD

- ✓ complete processing of data from orthogonal line (120N)
- ✓ complete processing from 50m infill lines (1200E and 1300E) flanking the Franz outcrop
- ✓ integrate these three lines, plus data from 2 easternmost 'rolling' lines (350E and 450E below), into a voxel model
- ✓ reconsider full 3D inversion in light of local line to line changes that may occur due to NE and NNE fault offsets
- ✓ look at incorporating data from four lines arcing towards the FMN zone (A-D) into the voxel model

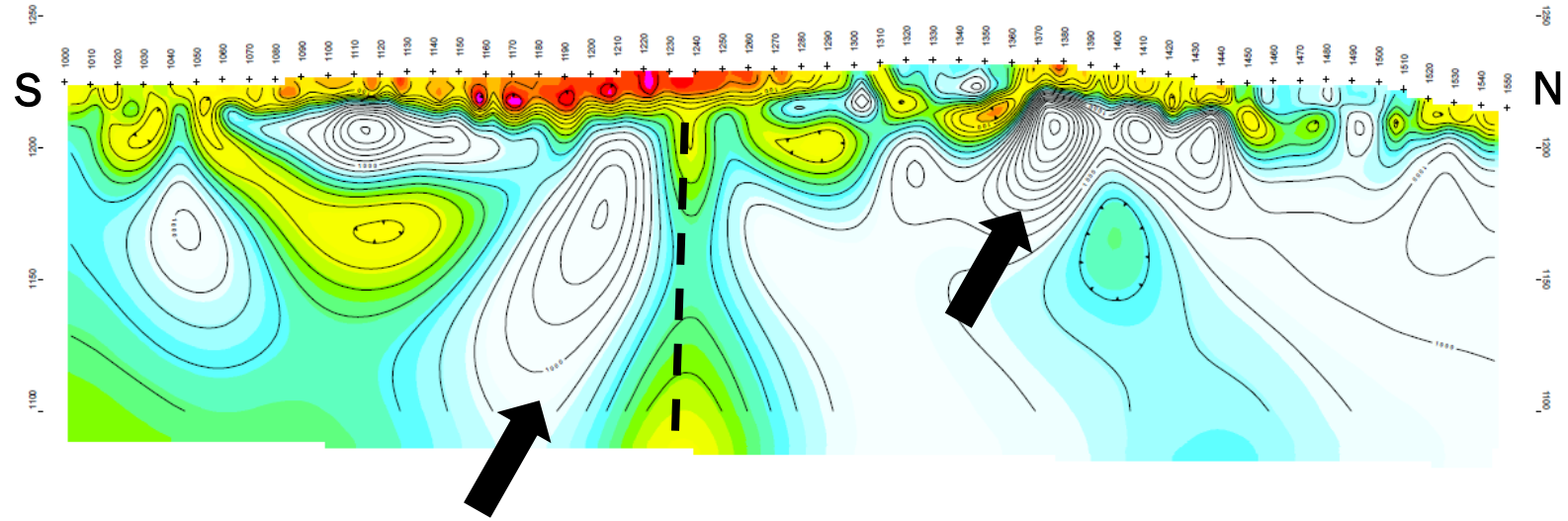




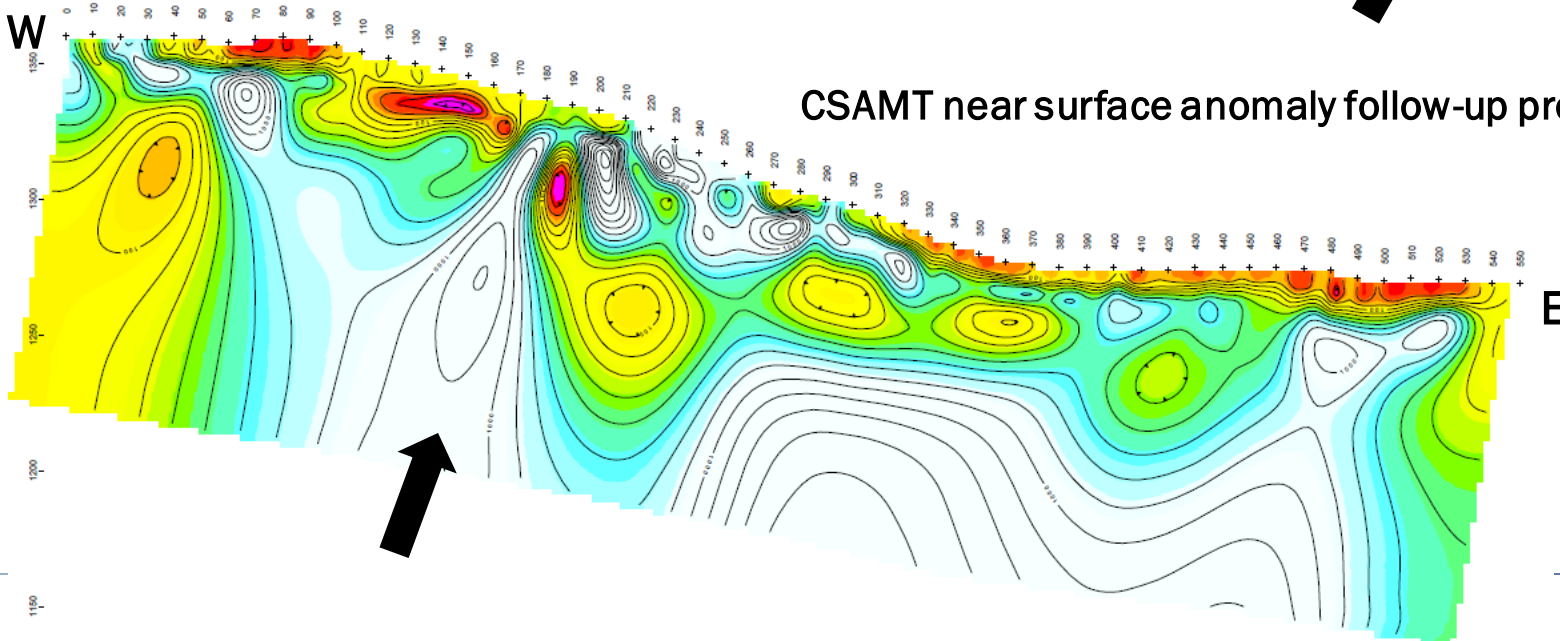
# PENDING DC RESISTIVITY SECTIONS

## CSAMT near surface anomaly follow-up program- southern end of survey area

- ✓ data from a single test line (#6) suggest an east-west trending conductive fault flanked to the south by a 20-30m wide steeply dipping resistive feature with a stronger depth limited response to the north – all capped by conductive cover (probable 10-15m overburden?)



## CSAMT near surface anomaly follow-up program- west side of survey area



- ✓ data from a single test line (#7) suggests a narrow resistive feature extending from depth to surface, and potentially truncating/offsetting more conductive material
- ✓ sections for Romeo Zone still pending