Geoscience BC

Geoscience BC adds to the Toolbox: New Geophysics for Northern Vancouver Island

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Overview

Photo Credit: Eric Keyser, Precision GeoSurveys

Geoscience BC

Independent, non-profit society: public earth science

Minerals Energy Water

$1.00 Geoscience BC mineral research

$6.60 mineral exploration investment

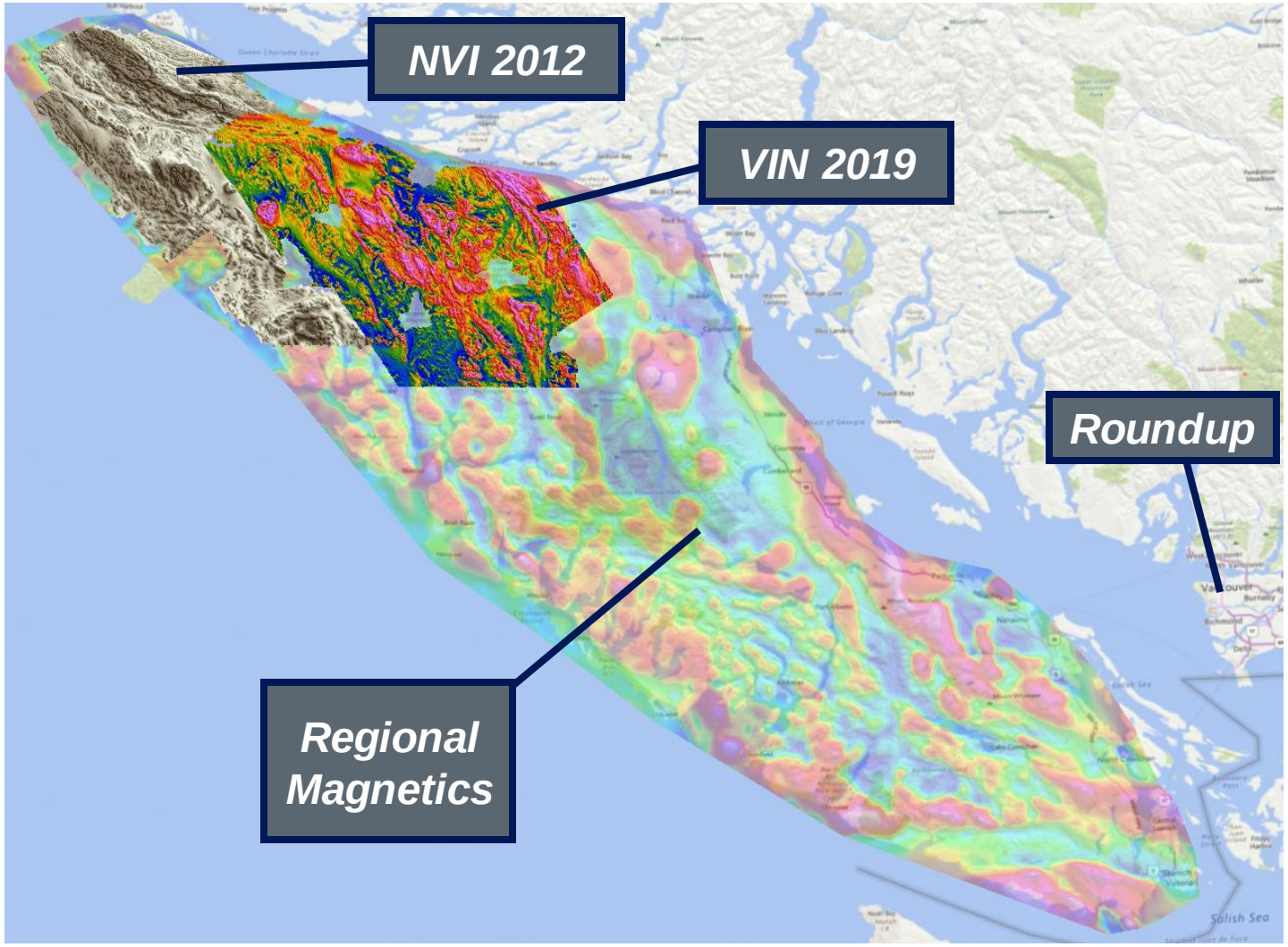
Vancouver Island North Regional Project

- Latest regional-scale geophysical project
- New mineral exploration & investment to Vancouver Island
- Strong support – thank you
- Survey: Precision GeoSurveys

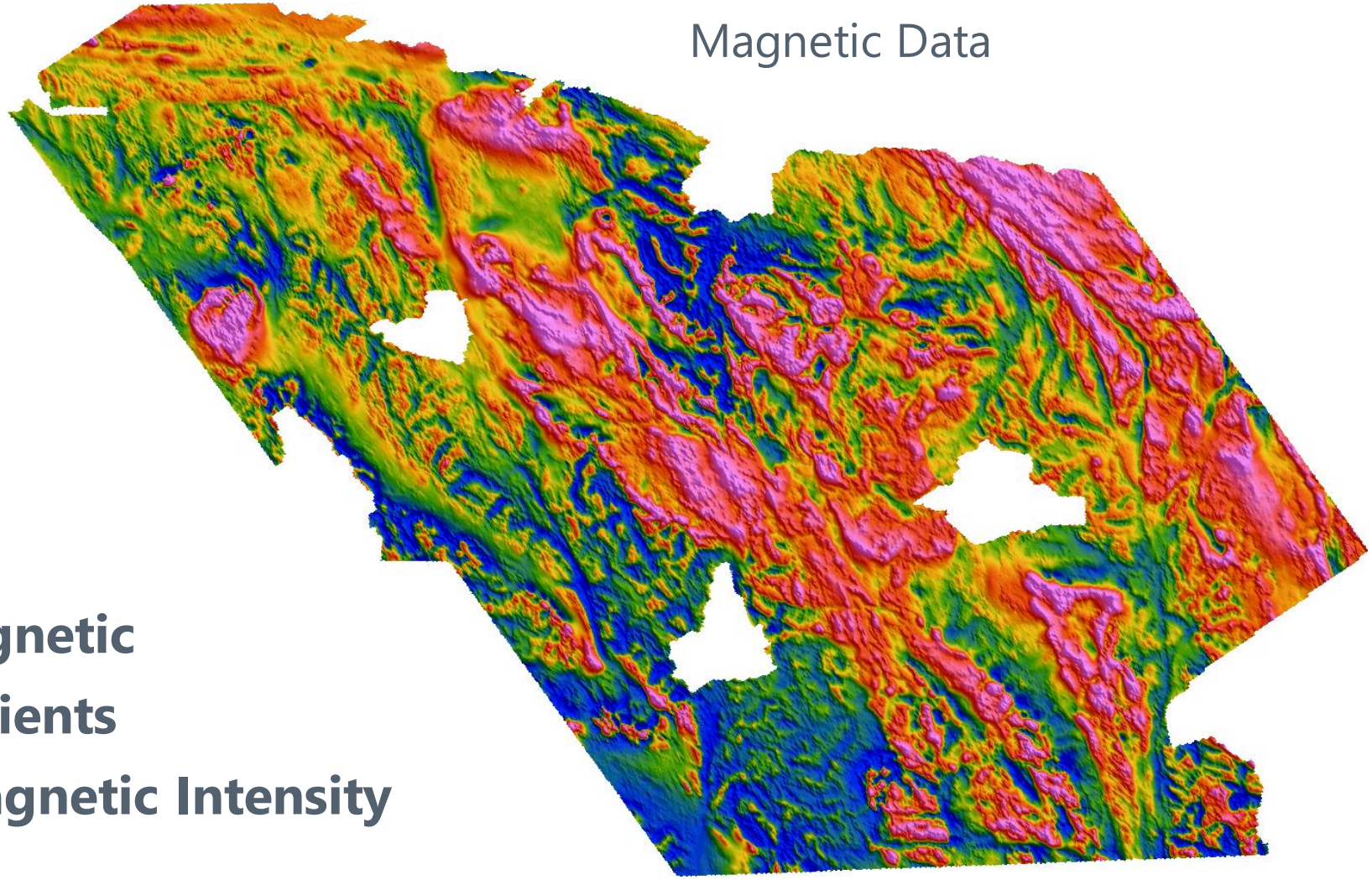
Location & Coverage

- **Vancouver Island North (VIN) 2019 survey** (rainbow)
- ~20% of Vancouver Island
- 80 m height above terrain
- 250 m line spacing
- 26,950 line km; 6,127 km^2

- British Columbia Geological Survey: 2 papers in new *Geological Fieldwork 2019*
- Northern Vancouver Island (NVI) – Geoscience BC – 2012



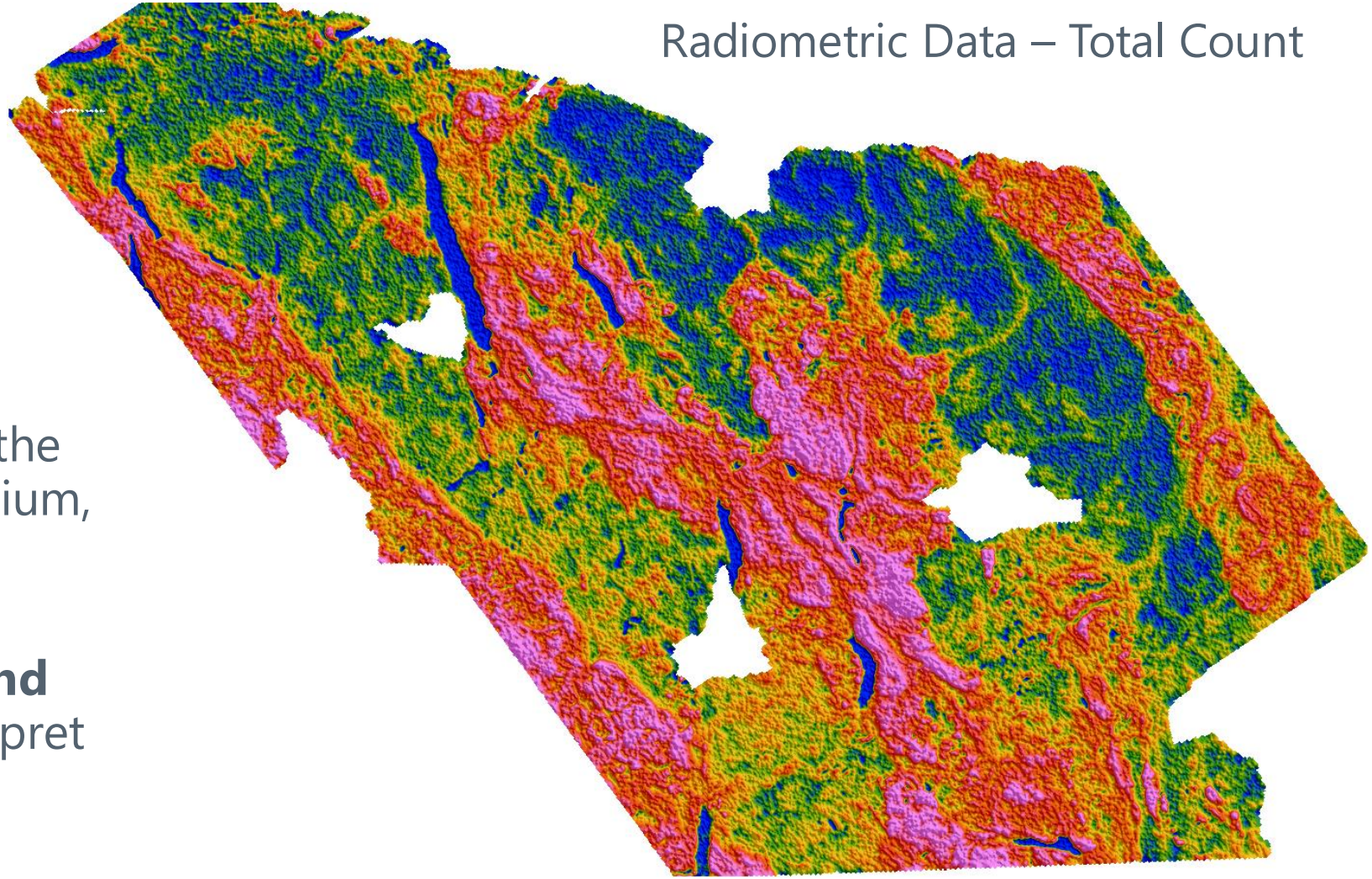
Vancouver Island North Airborne Magnetic Data



- **Horizontal Gradient Magnetic**
- **In-line & cross-line gradients**
- **Image showing Total Magnetic Intensity**

Vancouver Island North Airborne Radiometric Data

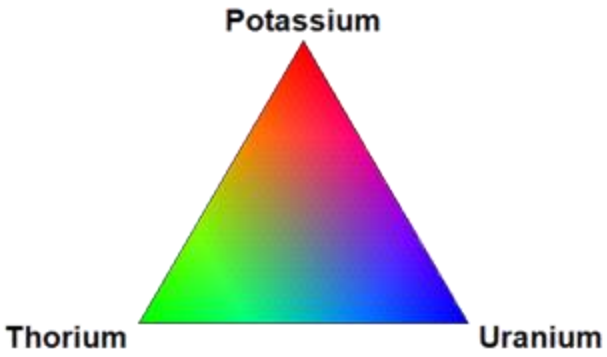
Radiometric Data – Total Count

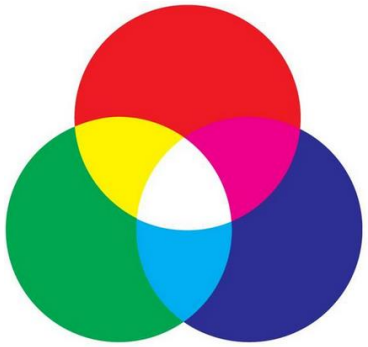


- **Radiometric data showing Total Count data**
- Total Count is the sum of all the radioelement data for potassium, thorium and uranium
- **Individual radioelements and their ratios** can help us interpret the **near surface geology**

Vancouver Island North Airborne Radiometric Data

- **Ternary image of radiometric data** composed of potassium, thorium and uranium radioelements
- Different ratios of the three elements generate different colours which in turn help with mapping geology
- **RGB colours used**

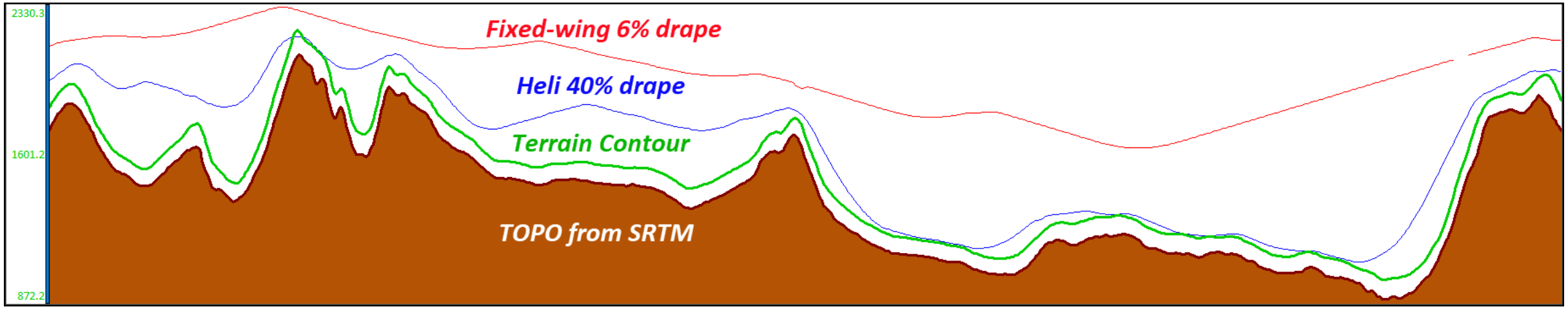




Radiometric Data – Ternary

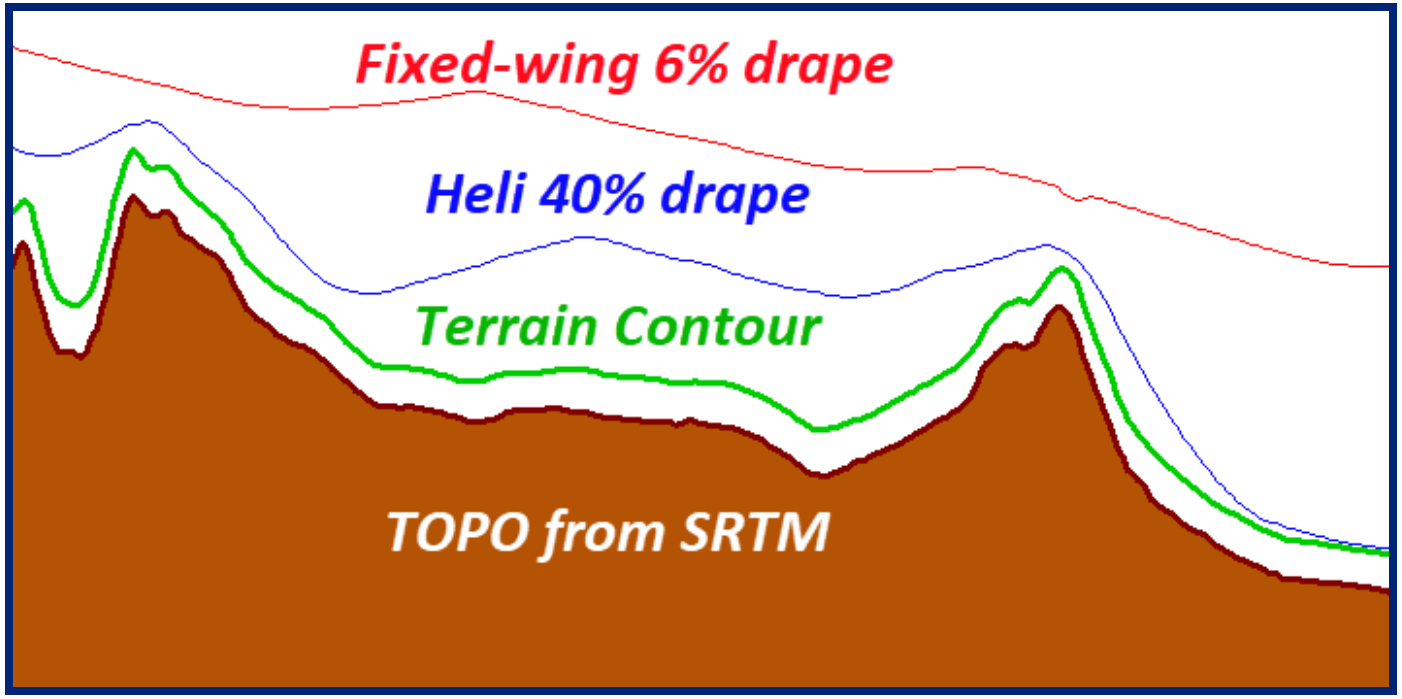
Drape Surveys vs. Constant Height

- Fixed-wing pre-planned drape surveys are economical, but have limitations in mountainous terrain
- Helicopter surveys contouring the terrain provide better data resolution and sensitivity
- VIN 2019 survey flown as **constant height above terrain** (not pre-planned drape)
- All of these surveys would be high quality – but the **Terrain Contouring** survey would be more sensitive to the subsurface and provide more consistent measurements



Survey Height Matters (Illustration)

- Drape surveys can lead to significantly higher than desired height in some areas
- Consistent survey height above ground results in more consistent data amplitudes and better-quality data

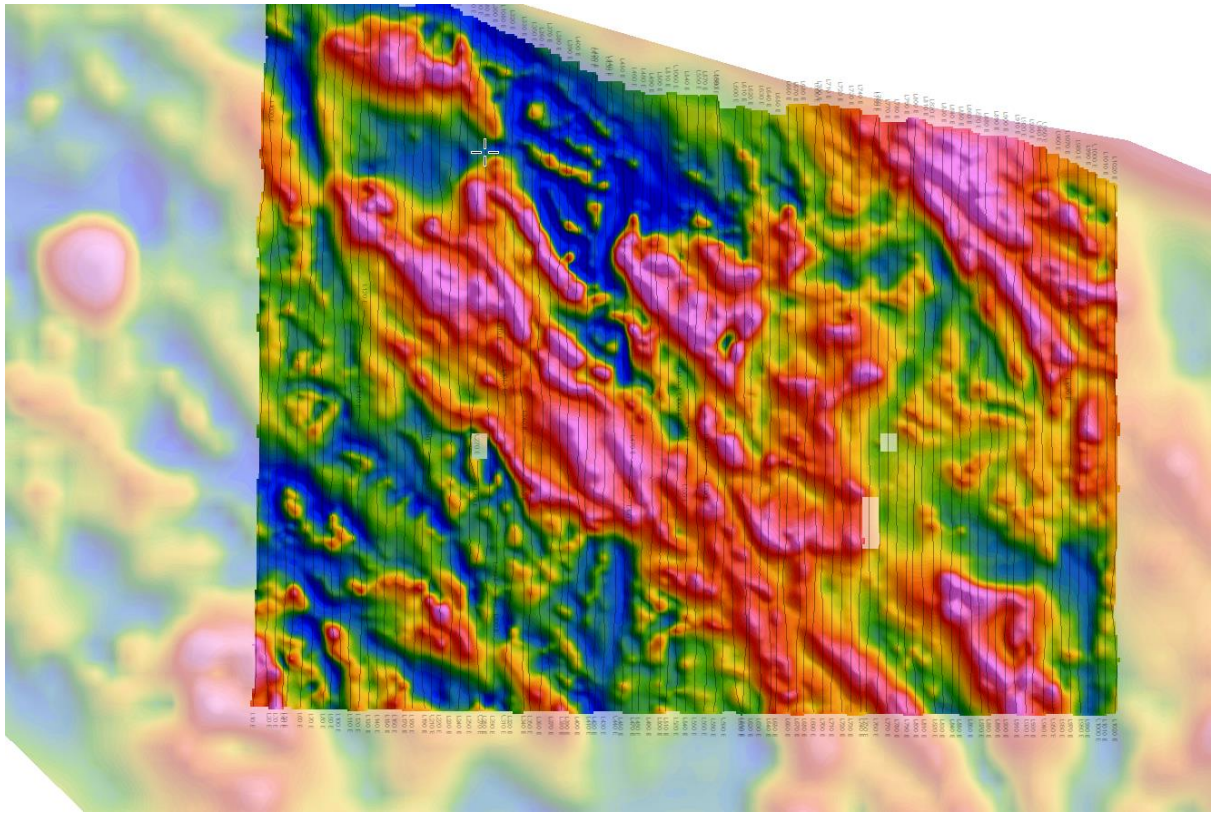


*** Disclaimer: This slide will make no sense unless you attended the talk*

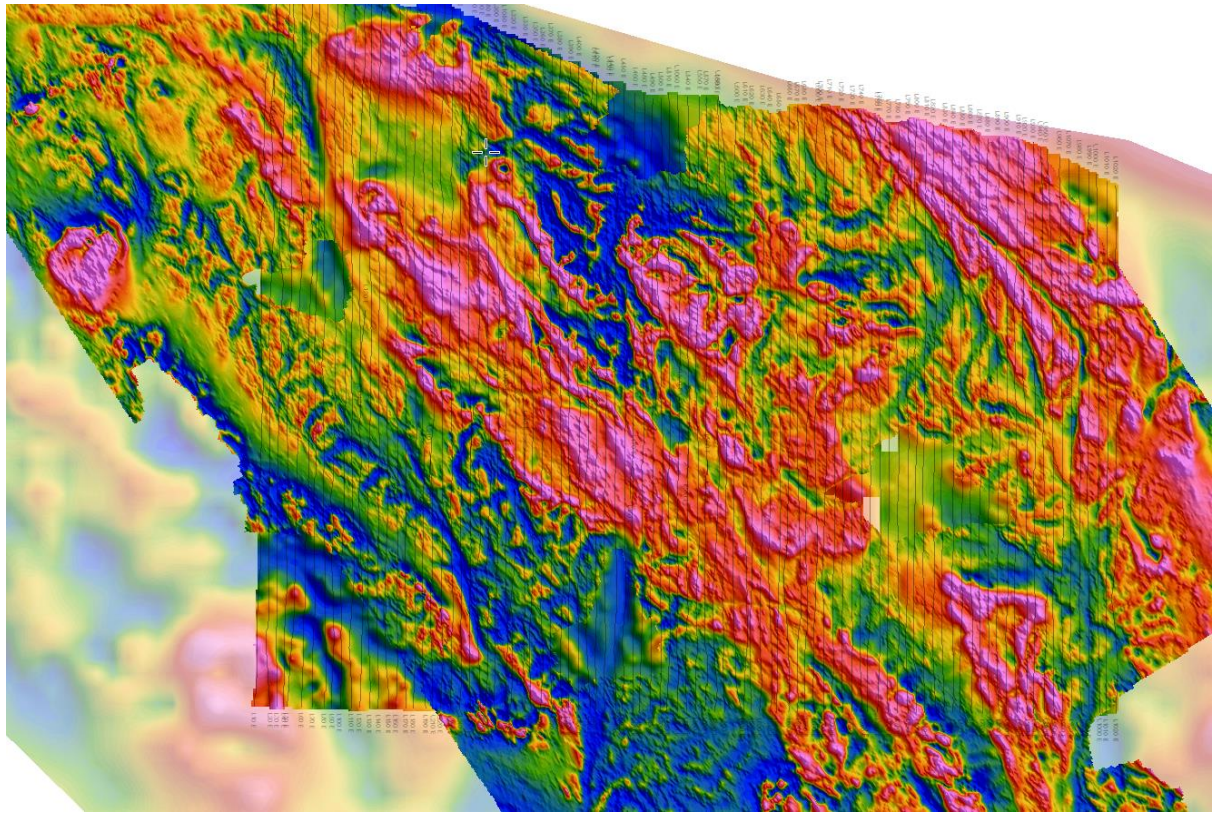
Historical Regional MAG & VIN 250 m

- Both data sets are high quality measurements
- Significant improvement in ability for detailed regional geologic interpretation

Historical Regional GSC MAG data (1971, 800 m lines)



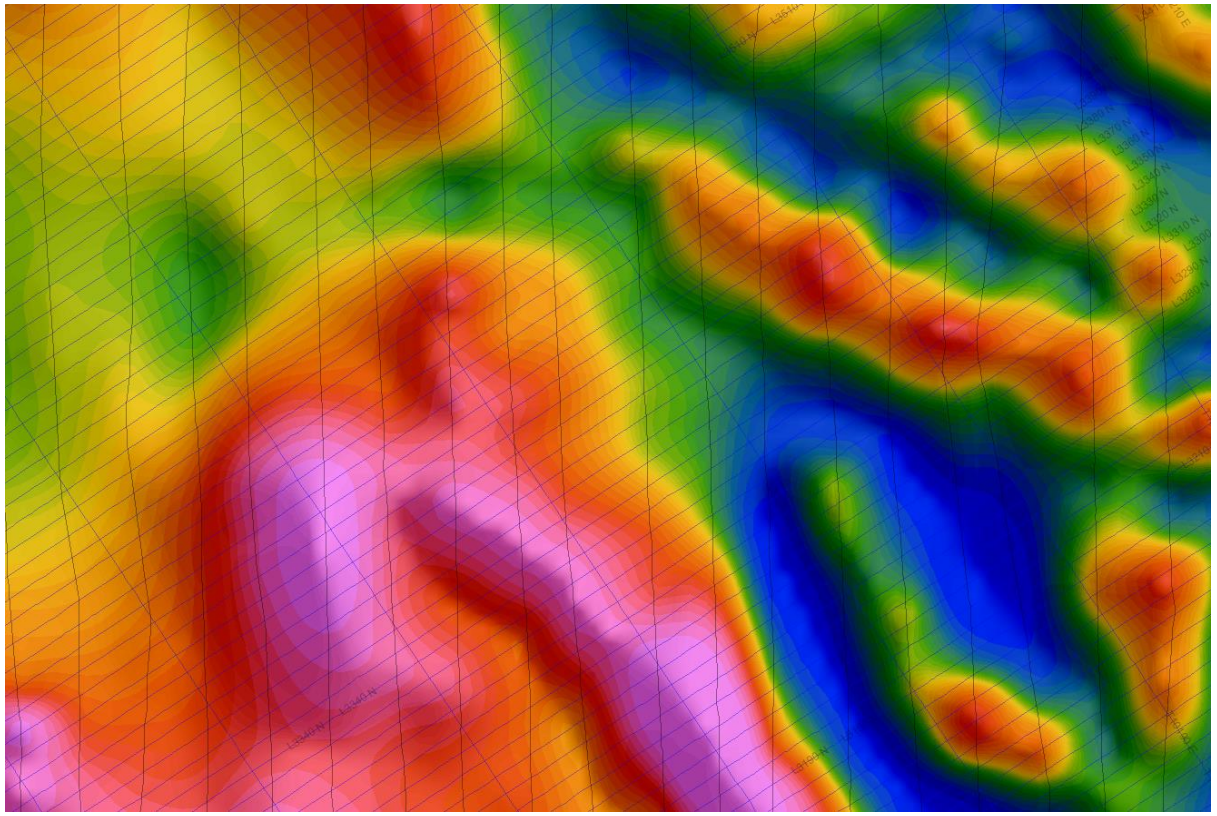
250 m MAG data at nominal 80 m survey height



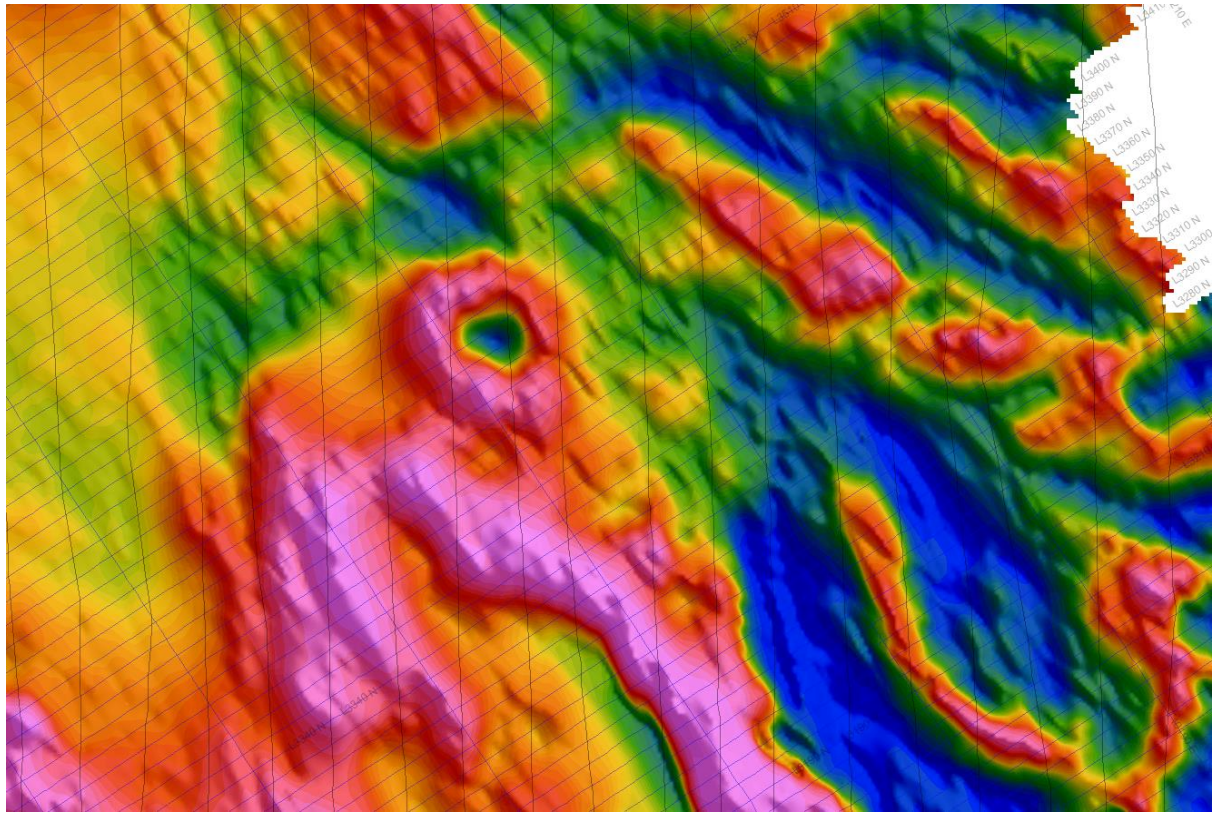
Historical Regional MAG & VIN 250 m

- 1971 regional magnetic data from N-S 800 m lines (left image)
- New VIN data can now be used at the project or prospect scale (note difference in line spacing)

Historical Regional GSC MAG data (1971, 800 m lines)



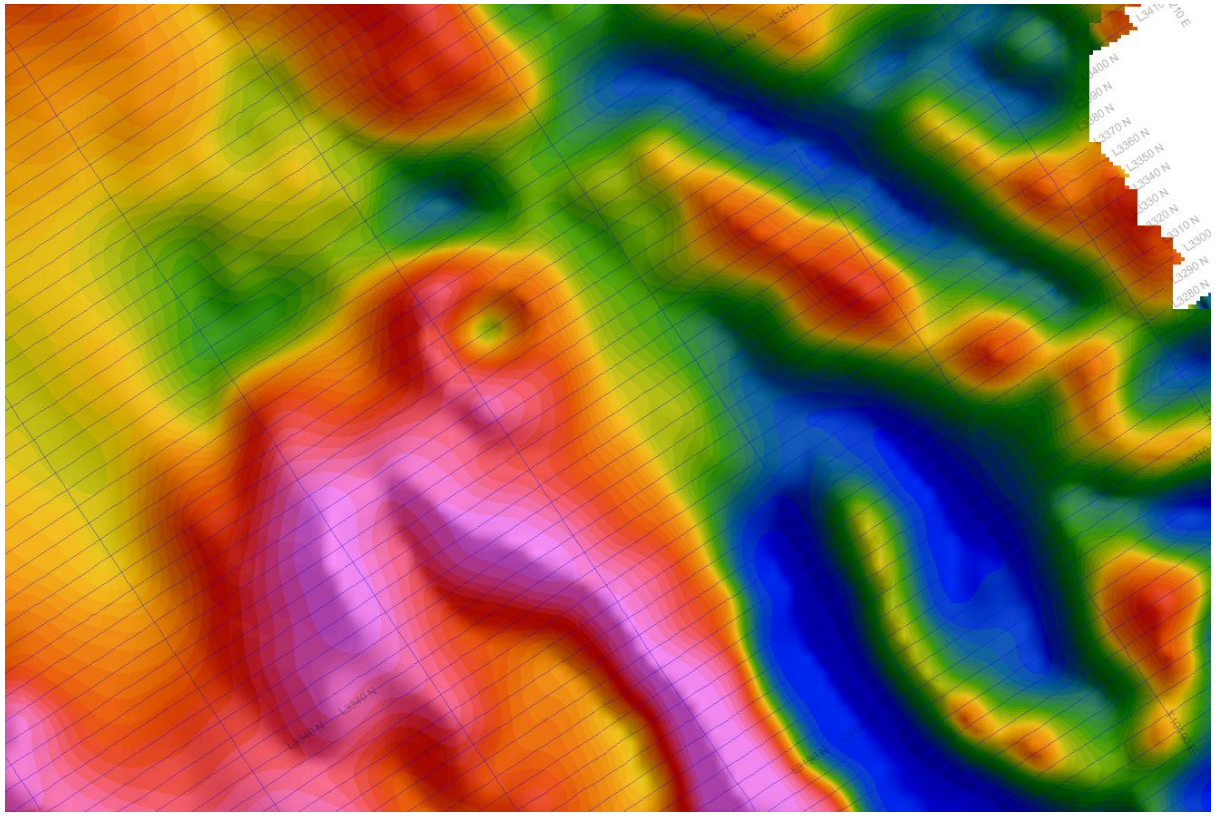
250 m lines data at nominal 80 m survey height



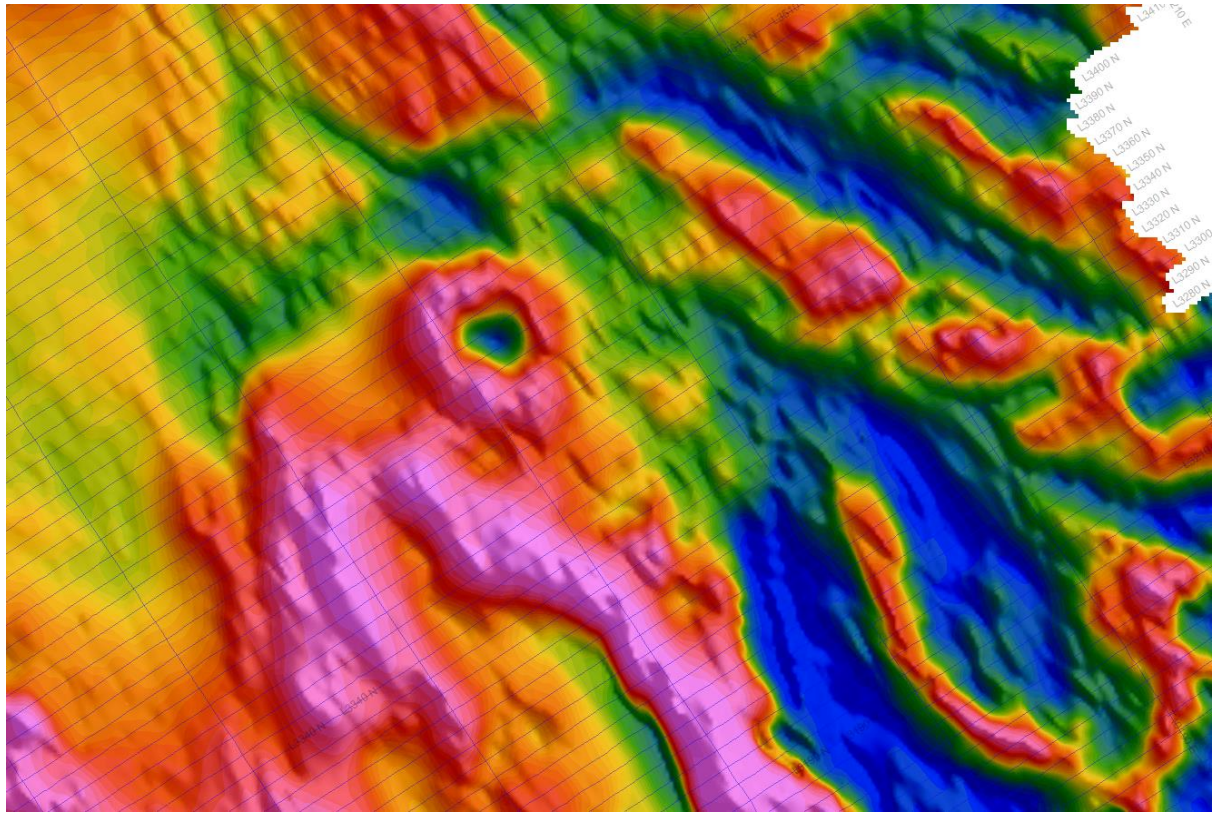
Resolution: 750 m vs. 250 m lines

- Simulating regional data from VIN using every 3rd line upward continued to a height of 240 m
- Same **"high" quality**, but **not the same resolution, resolving power and interpretive capability**

Simulated 750 m lines at **240 m height**



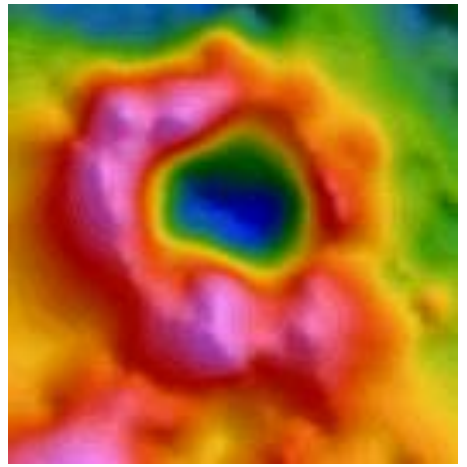
250 m lines data at nominal **80 m survey height**



Value in Public Domain Data

- You have just completed a 3 by 3 km ground magnetic survey and the **results are interesting**… next step?

- **Drill?**
- **Perform an airborne magnetic survey or run some IP?**
- **Add public domain data to your Toolkit?**



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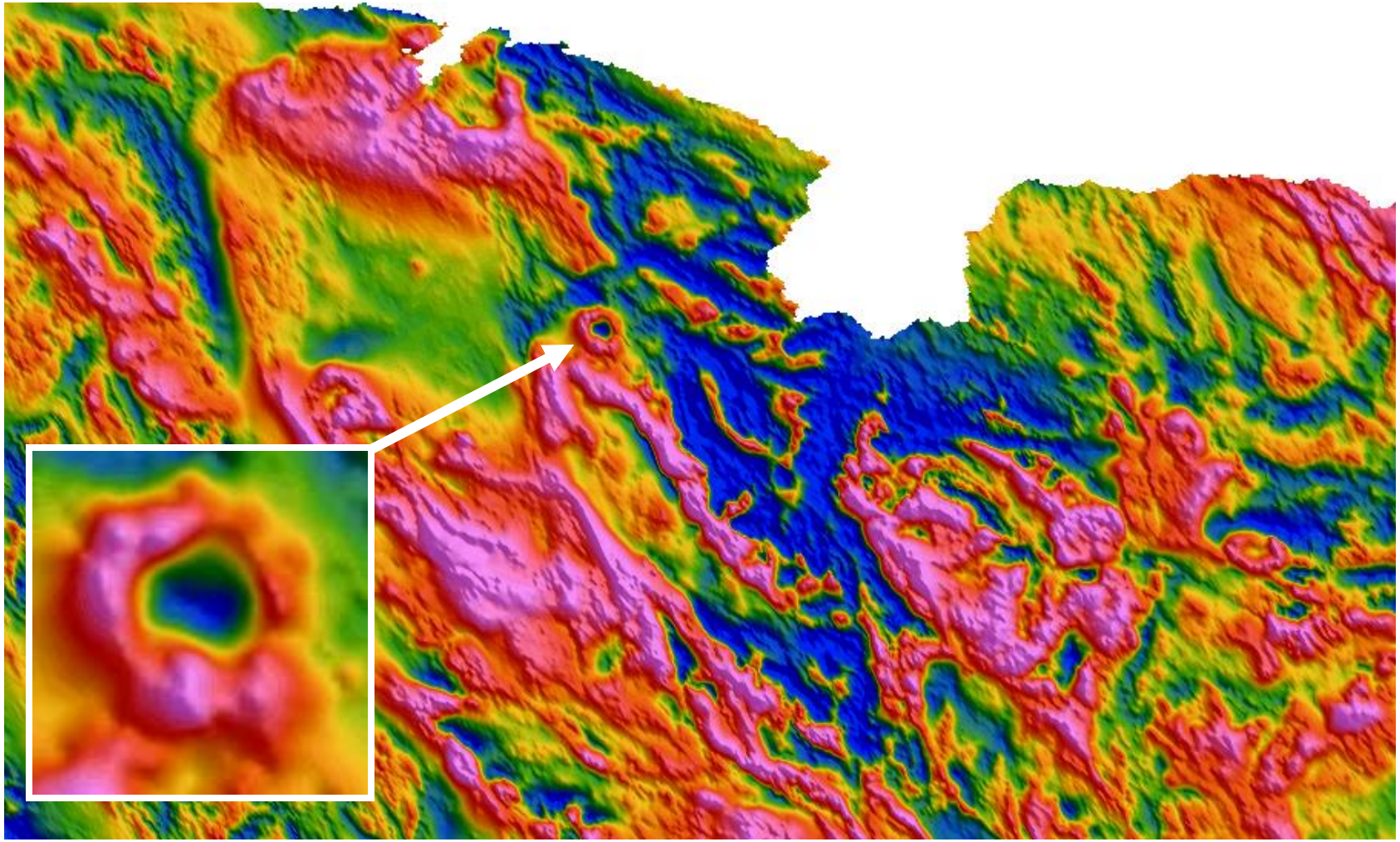
- Public domain data - very useful for seeing the big picture
- Would **regional data highlight important large-scale features or structure** that would help **understanding the local scale observations**?

- **Value added processing and visualization** can take public domain data to the next level

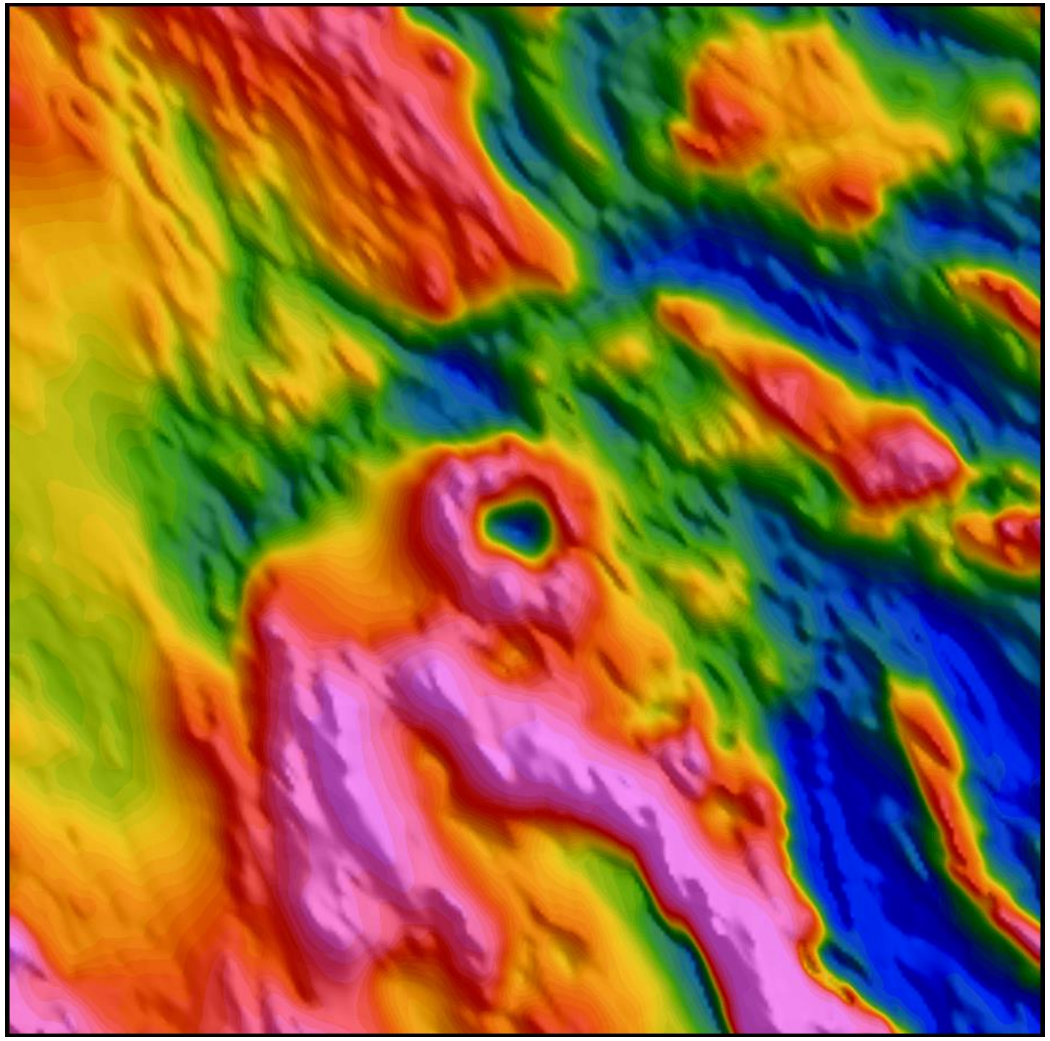
Public Geoscience: Micro & Macro

- **Perspective is key**
- Public domain data gives explorers the big picture
- **What information or context is missing** working only at the project scale?
- Are there important regional features **that would help in understanding the local scale observations**?



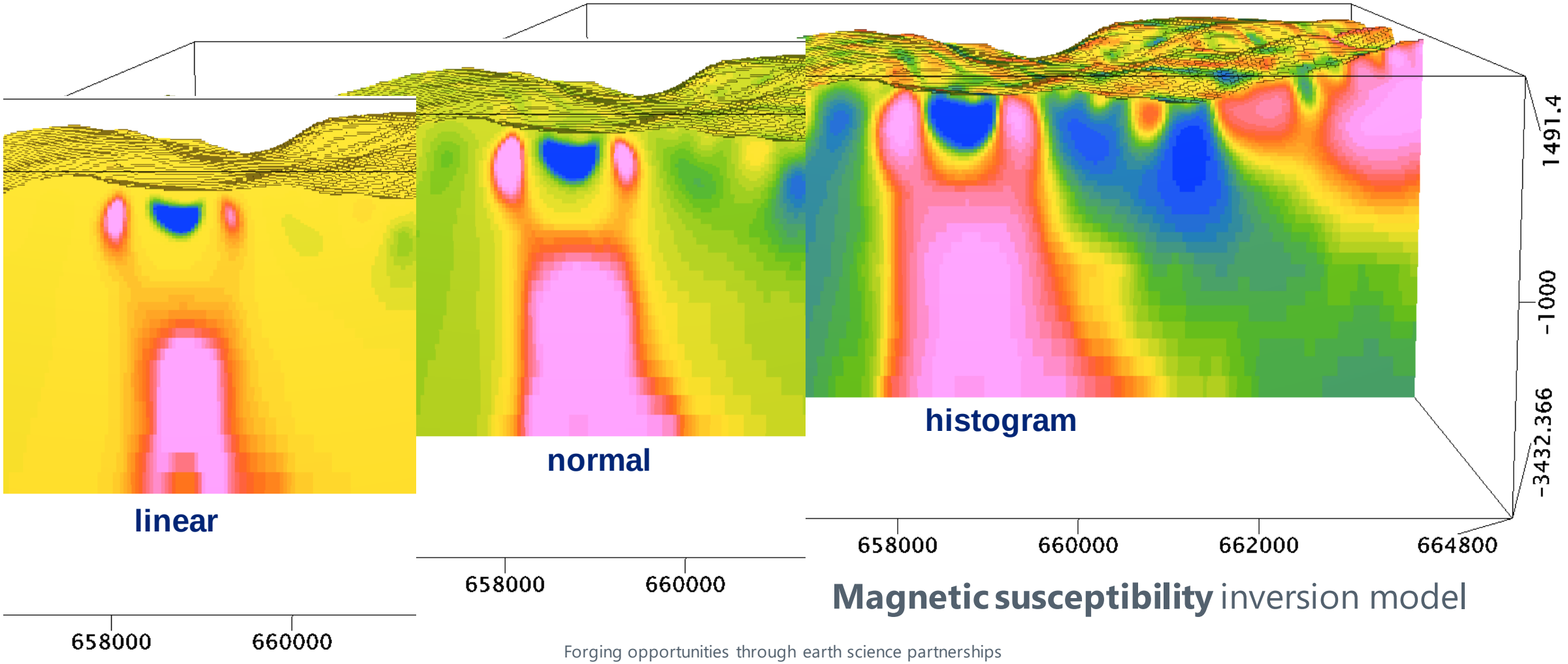
Seeing a way forward through Inversion

- Modelling publicly available data can be **a valuable prospecting/mapping tool**
- Model regional or local features
- Is this circular response as interesting as it looks?
- Could there be potential here…
- Is there any concern for magnetic remanence that could complicate interpretation?
- **Magnetic inversion modelling** is a helpful step in answering these questions and **moving exploration forward**



Seeing the big picture! Inversion

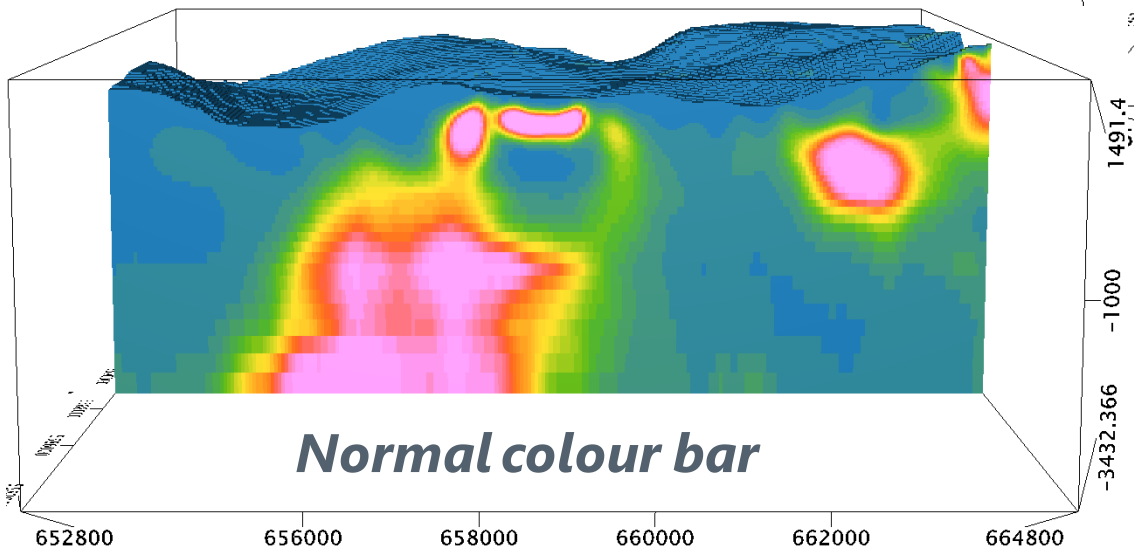
- Magnetic susceptibility model showing the **effect colour distributions have on how we see data**



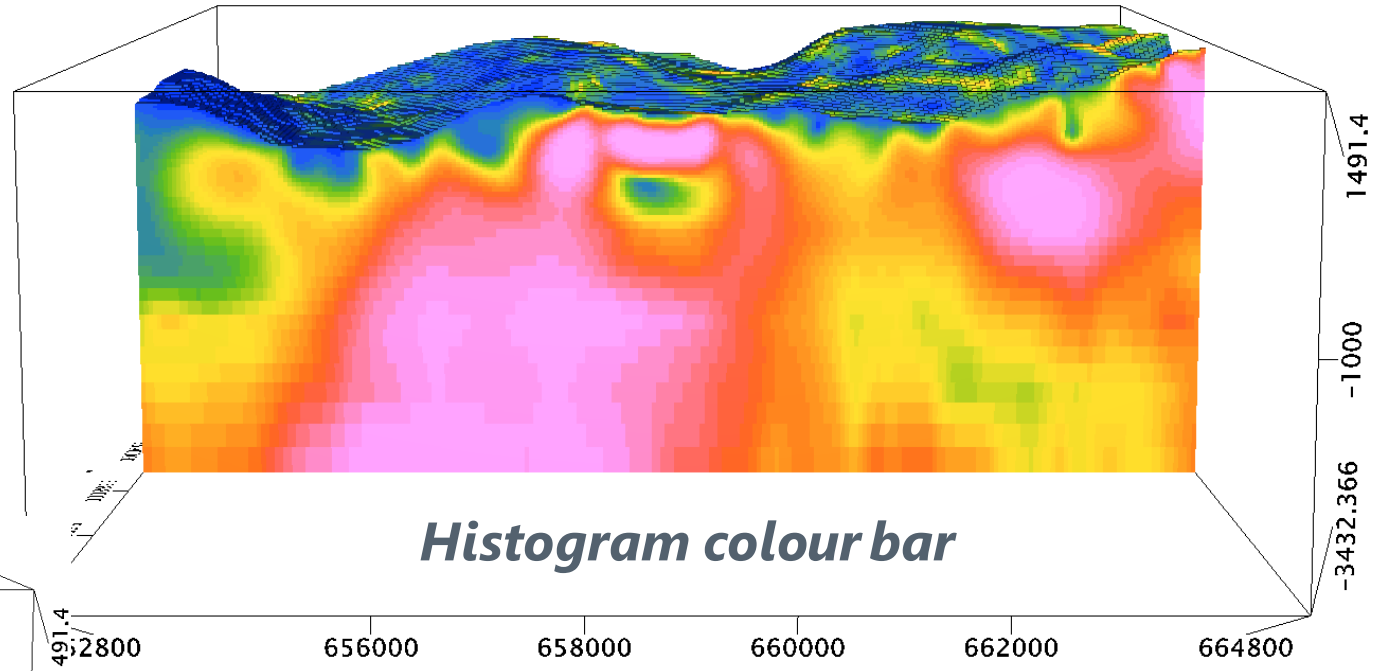
Magnetic susceptibility inversion model

Seeing the big picture! Complexity?

- **Alternate Inversion MVI (same area)**
- A new perspective, but more complex
- Magnetization vector intensity inversion is **used to consider the possibility of magnetic remanence** contributing to the measured survey data



Normal colour bar

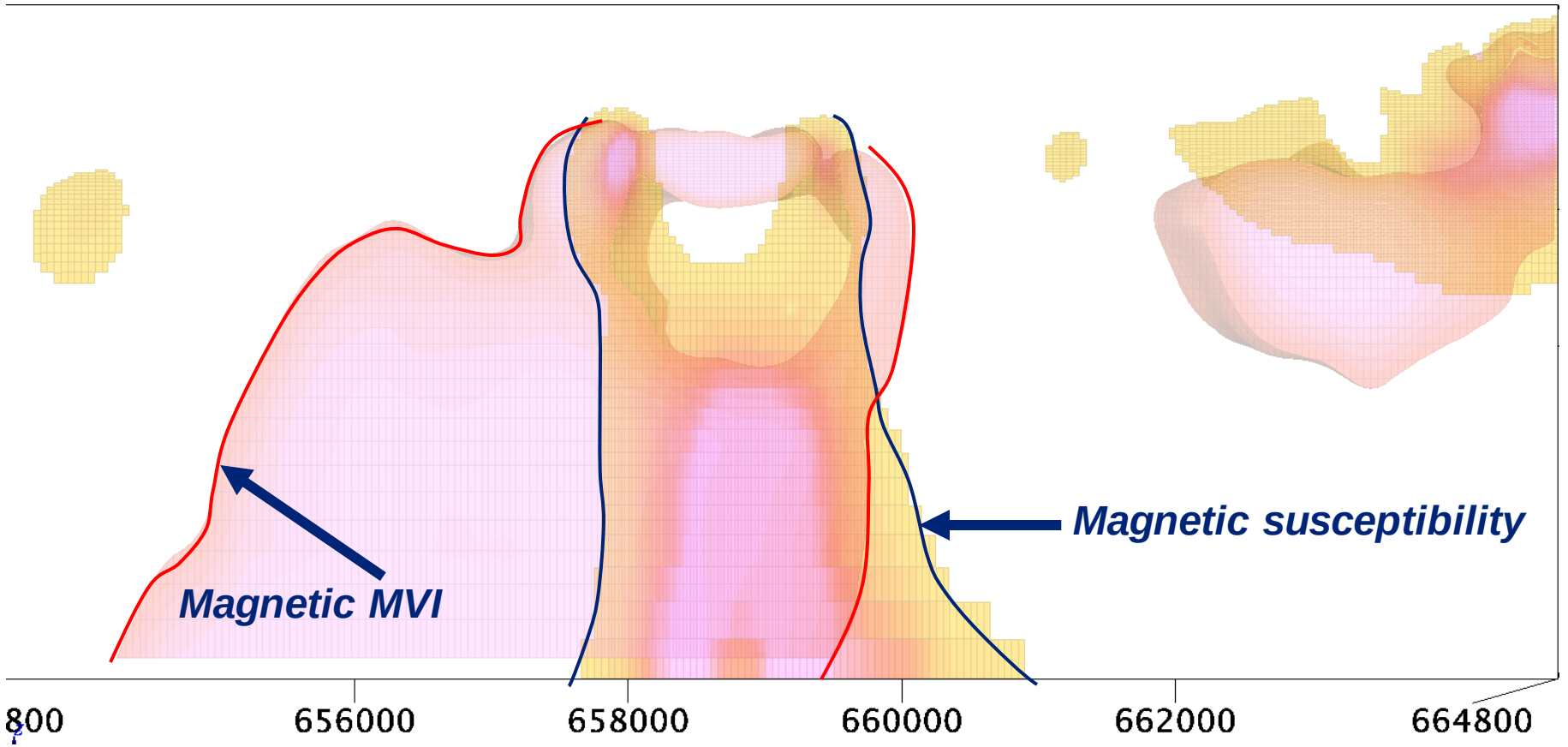


Histogram colour bar

Magnetization vector intensity inversion model

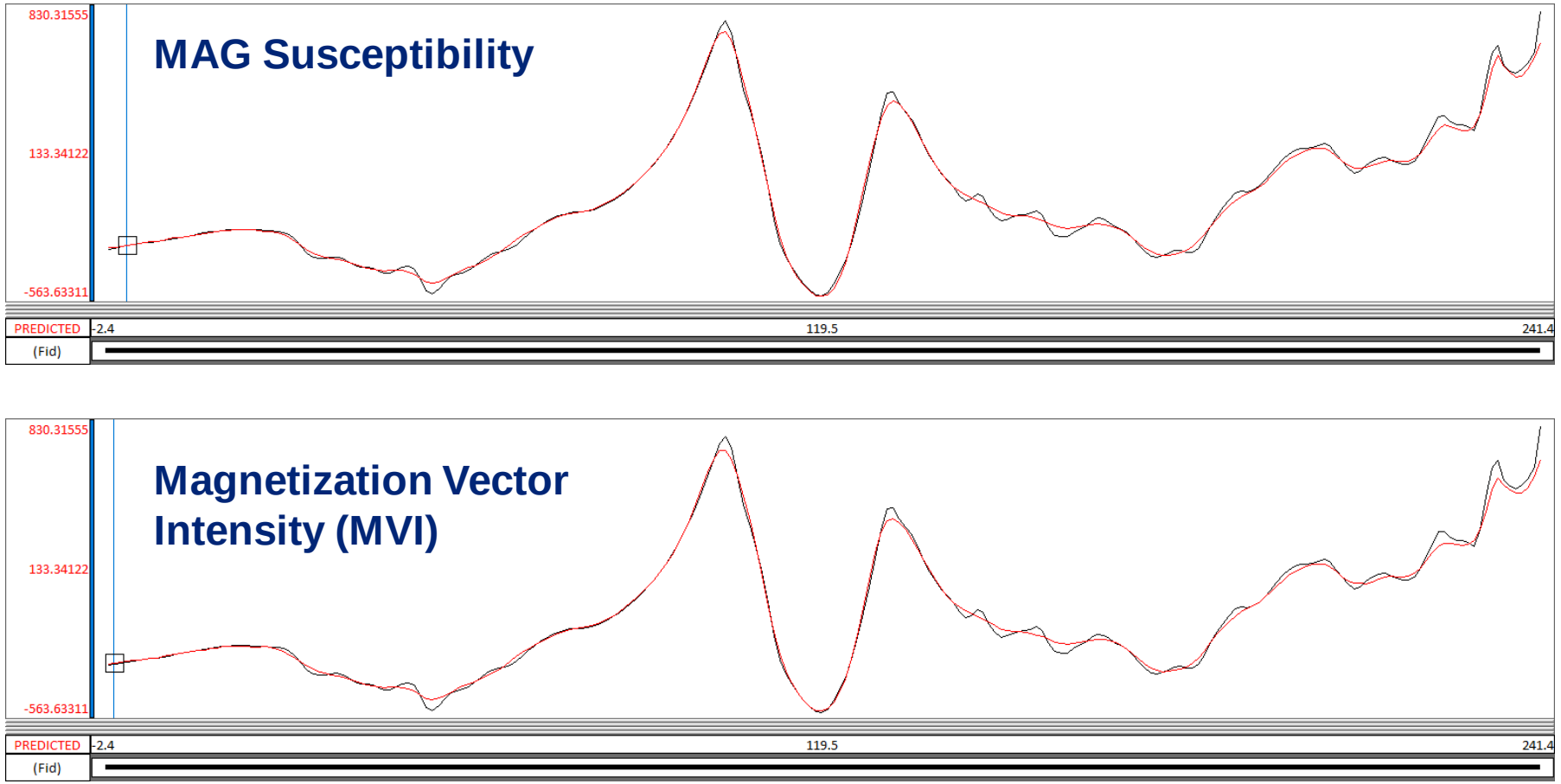
Inversion Model Space?

- Comparison of inversion models: SUS vs. MVI
- Observations…
- **More work needed** to understand differences between the two model results
- **Inversion model space** is a series of **models that can reproduce the original data –** however, all may not be reasonable…



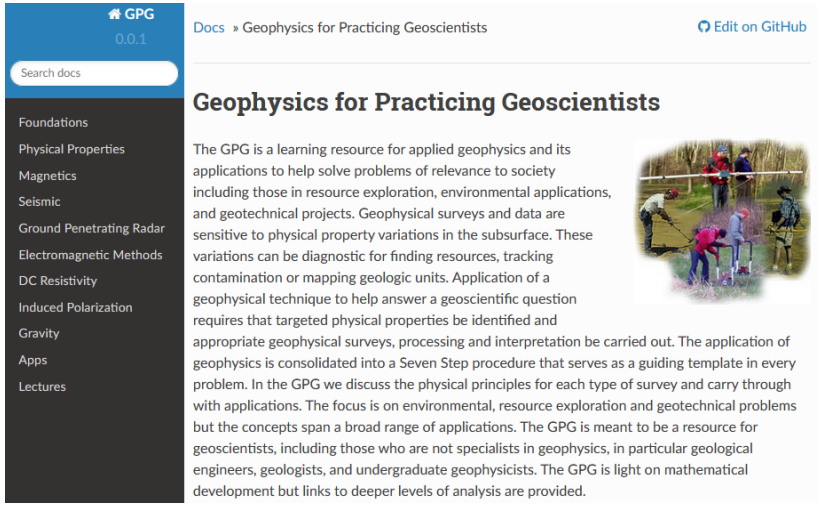
Inversion and Real-istic Models

- **Both models (red) fit or reproduce the input data** (black)
- Which more is [more] correct or realistic?
- **Inversion modelling is a helpful tool**, but may not be "*the answer*"
- **Modelling should be conducted to experiment and test a range of viable solutions**



Additions to the Geoscience Toolbox

- **<u>Public Domain Data</u>**:
  Geoscience BC, GSC, other Geologic Surveys, Geosoft DAP Server
- Additional Data Visualization and Compilation
- Earth Science Viewer (Geoscience BC website)
- **MDRU Geo Toolkit** for geophysics filtering
- Open Source Software such as: **QGIS or QField****
- QField will allow you to take raster geophysics images along with Minfile data into the field using an Android device.
- **Geophysics for Geoscientists:** https://gpg.geosci.xyz/ (UBC site)



** "Open Source Tablet Geologizing – QField Applications for Mineral Exploration" (PDAC Blog 20191216) By: Rohanna Gibson

Vancouver Island North Regional Project

Download data: www.geosciencebc.com

Roundup booth #217

We gratefully acknowledge the financial support of the province of British Columbia