

Project Update: *Vancouver Island North Regional Project*



Campbell River | Feb 26, 2020

Richard Truman | Brady Clift | Todd Ballantyne

Photo: Eric Keyser, Precision GeoSurveys

Vancouver Island North Regional Project:

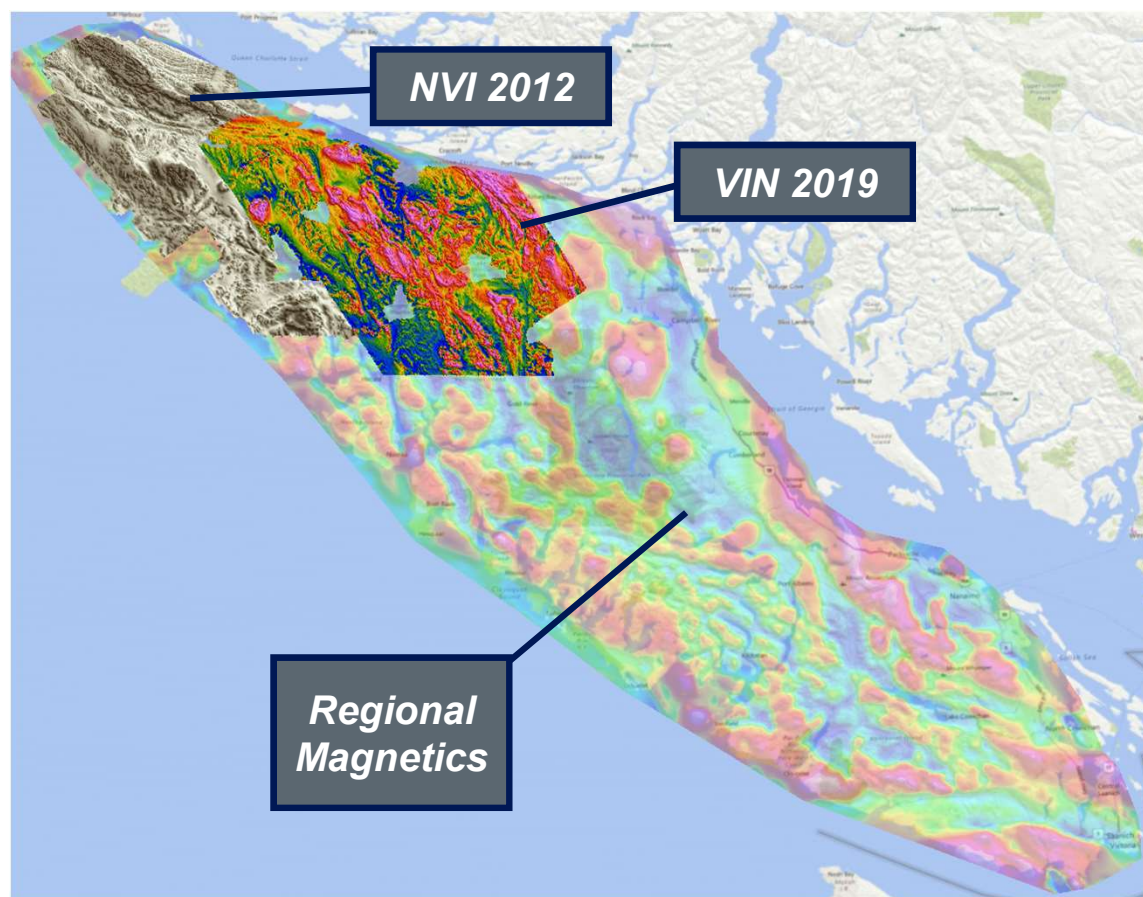
1. Provide high-resolution geophysical data for 20% of Vancouver Island
2. Encourage mineral exploration
3. Inform decision-making.

Project is complete; renewed interest in northern Vancouver Island.



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; 6,132 km²
- British Columbia Geological Survey: 2 papers in new *Geological Fieldwork 2019*
- Northern Vancouver Island (NVI)
 - Geoscience BC – 2012



Who We Are



Non-profit organization

Generate and share high quality, unbiased earth science research and data

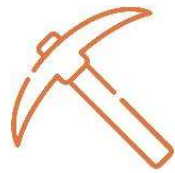
Collaboration between governments, communities, Indigenous groups, resource sectors, academia

... improves our collective level of geoscience knowledge

... informs responsible natural resource decisions

.... catalyzes socio-economic opportunities

... stimulates innovation and geoscience technologies



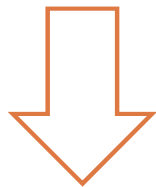
Minerals



Energy



Water



**For every \$1 spent on Geoscience BC minerals research,
there is \$6.60 invested in mineral exploration***

*2005 to September 2018. Assessment Report Index System (ARIS) reports mentioning Geoscience BC: \$211.9 million. Geoscience BC minerals research: \$32.1 million

- Helicopter completed survey October 2019; data compiled over winter
- Data published at AME Roundup 2020 - standing room only!
- \$1.1m investment.
 - Vancouver Island: 39%
 - BC: 59%
 - Outside BC: 2%



Where is Initial Interest?

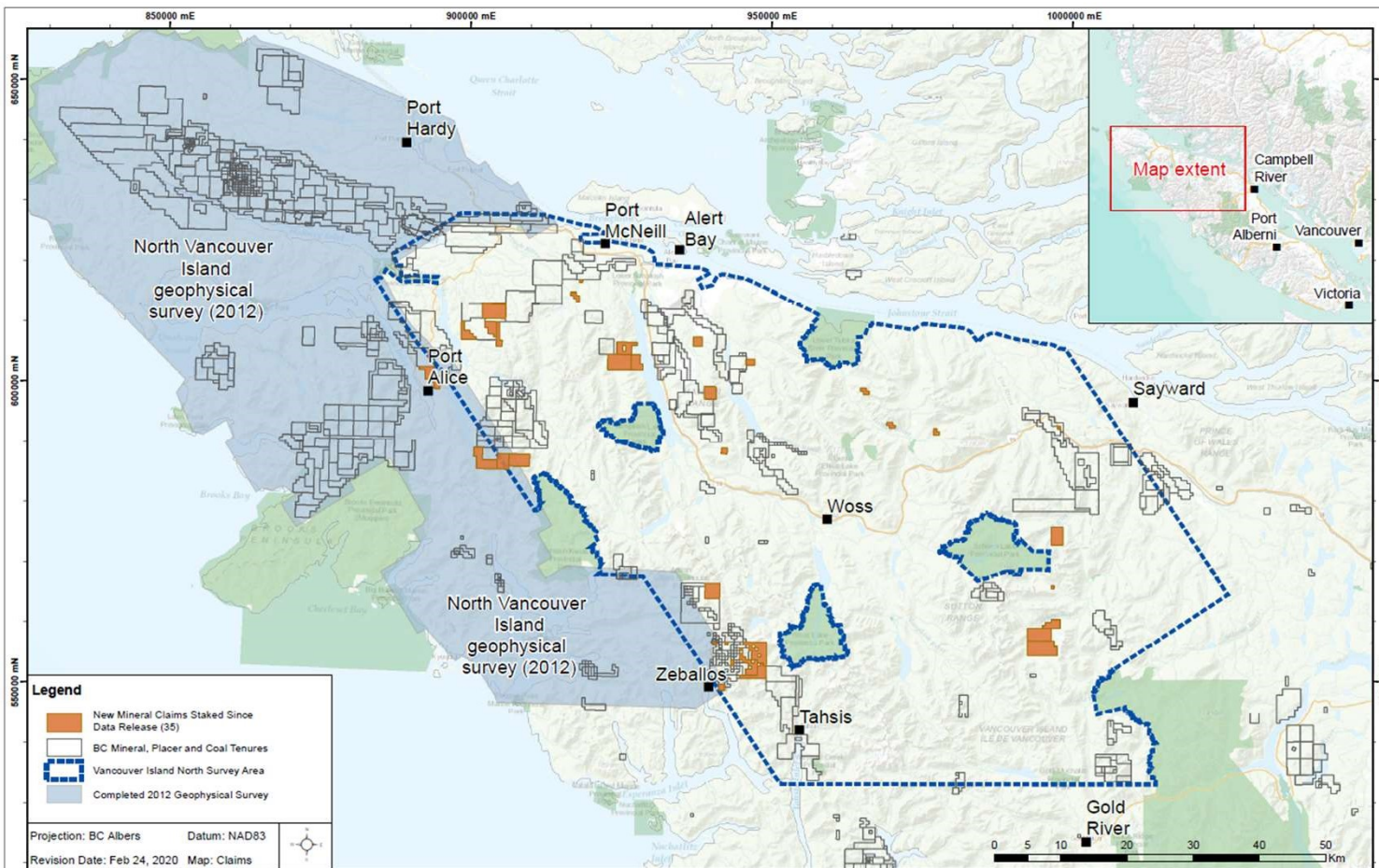


Survey area:

- 20% of Vancouver Island (6,127 km²)
- 35 new claims and 113km² staked since data release on Jan 21, 2020

Orange: New minerals claims Jan 21 to Feb 24, 2020

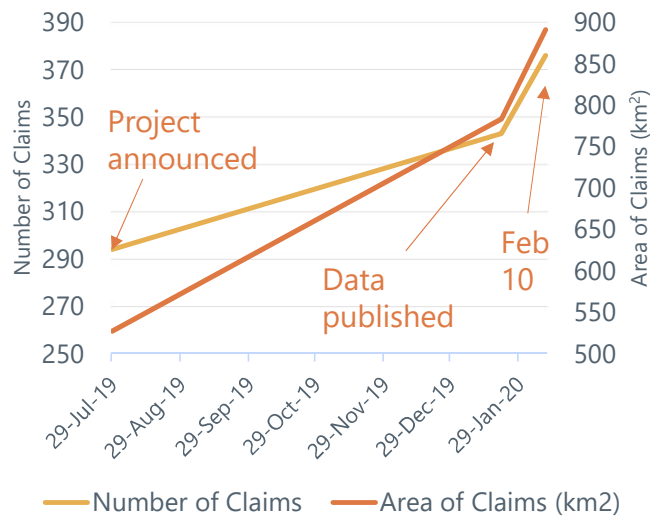
Grey: Existing active minerals claims



Interest in New Data



Vancouver Island North Regional Project Area – Minerals Claims



Greg Neeld, President & CEO, Hawkeye Gold and Diamond Inc. (TSX.V: HAWK)

"This high-resolution airborne geophysical data... will be key to new mineral exploration and potential discovery creating economic benefits to communities, businesses and First Nations."

Kendra Johnston, President & CEO, AME

"The publicly available data from this project is used and valued by all types of AME members, from grassroots prospectors to multinational mining corporations – as well as by the communities and Indigenous groups in the research area."

Dallas Smith, President, Nanwakolas Council Board of Directors

"I am confident that Geoscience BC's Vancouver Island North Regional Project's high-resolution, public geoscience data will bring new mineral exploration interest and investment to the Island."

Example: Search Phase III Project

- 2017 geophysical survey in northern BC
- All data made public; announced at AME's Roundup 2018 conference
- New staking: 64 new or expanded minerals tenures acquired in six months
- New mineral exploration programs started in 2018
- Industry agreements with First Nations



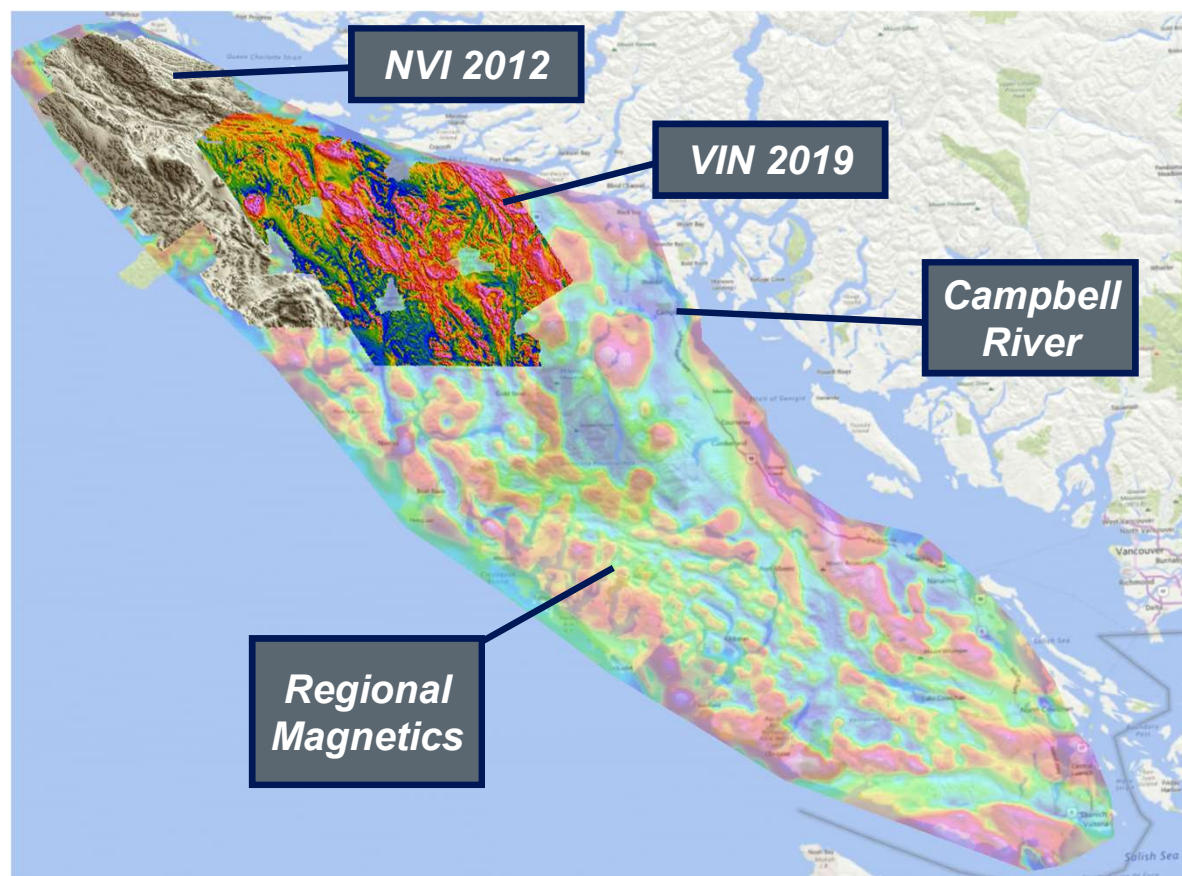
Geoscience BC adds to the Toolbox: New Geophysics for Northern Vancouver Island

Todd Ballantyne | 2020-02-26

Forging opportunities through earth science partnerships

Location & Coverage

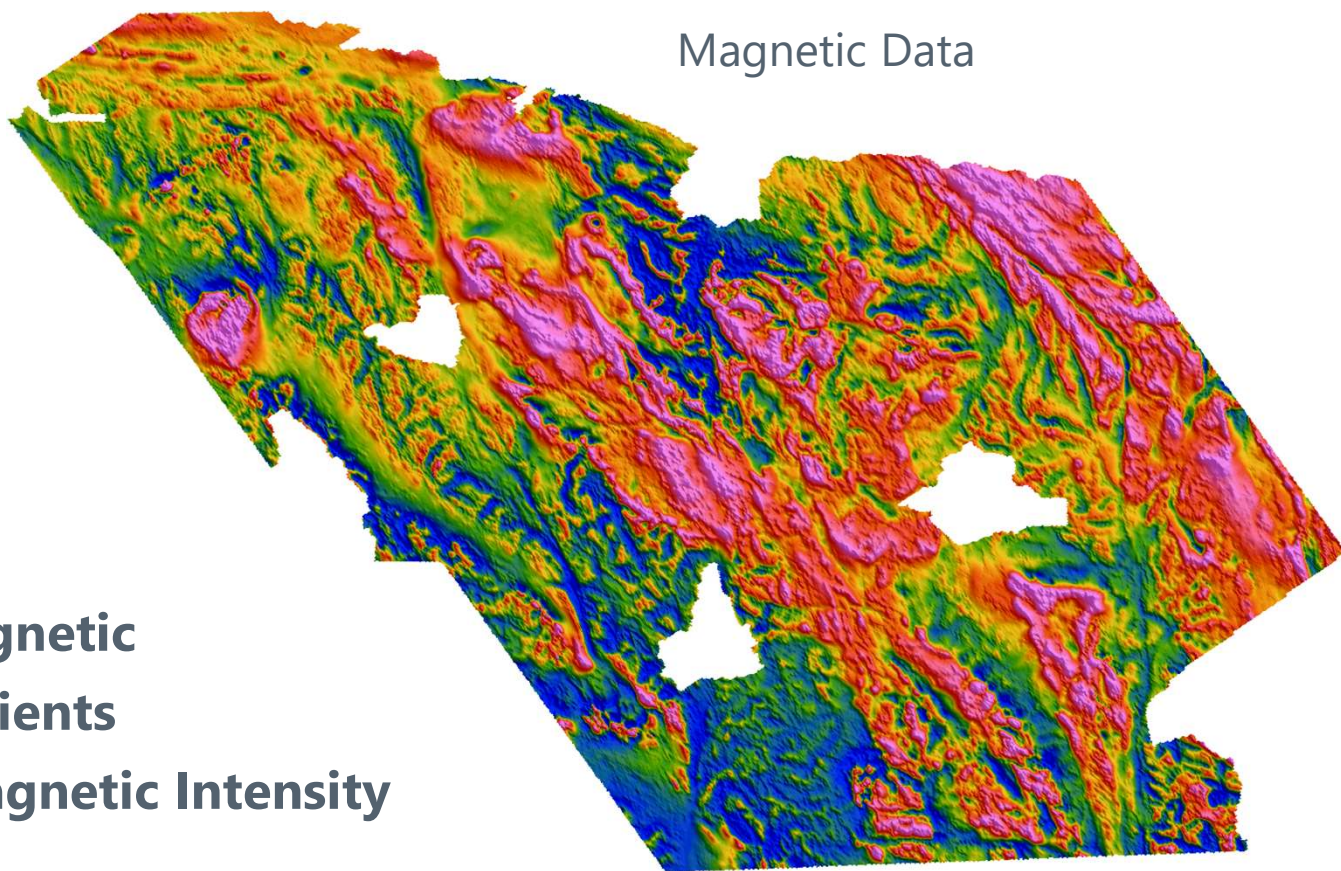
- **Vancouver Island North (VIN) 2019 survey** (rainbow)
- **~20% of Vancouver Island**
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- 250 m line spacing
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*regional data from Geosoft DAP server

Vancouver Island North Airborne Magnetic Data

Magnetic Data

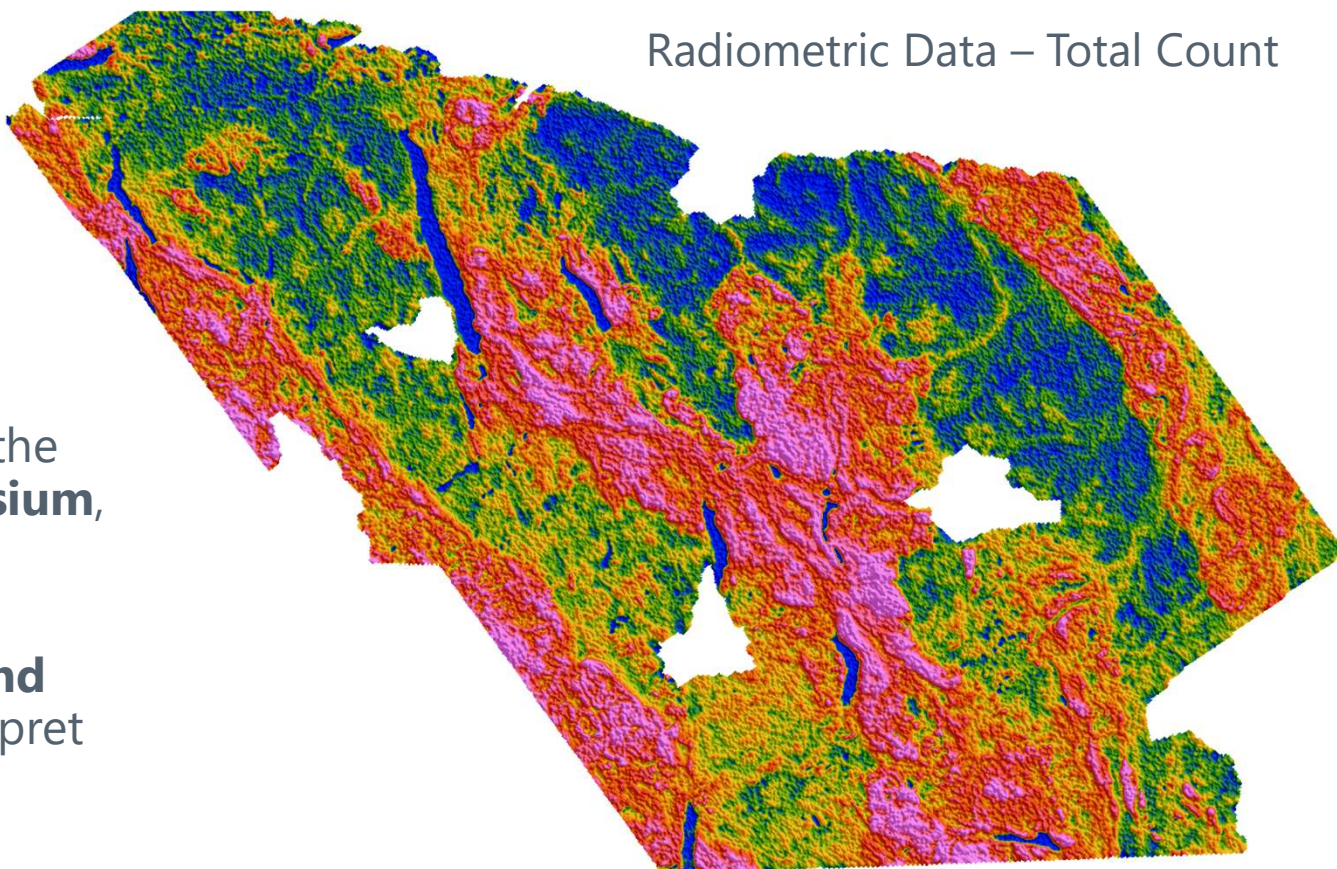


- **Horizontal Gradient Magnetic**
- **In-line & cross-line gradients**
- **Image showing Total Magnetic Intensity**

Vancouver Island North Airborne Radiometric Data

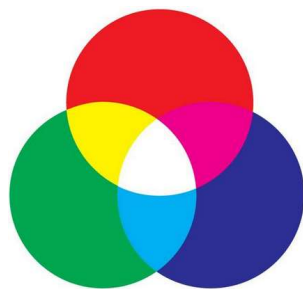
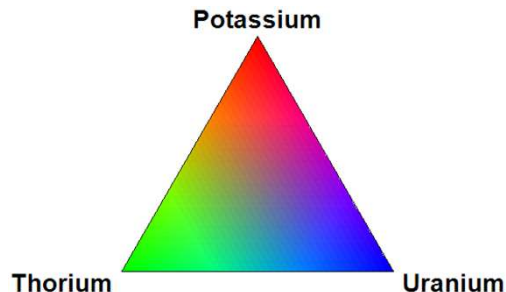
Radiometric Data – Total Count

- 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**

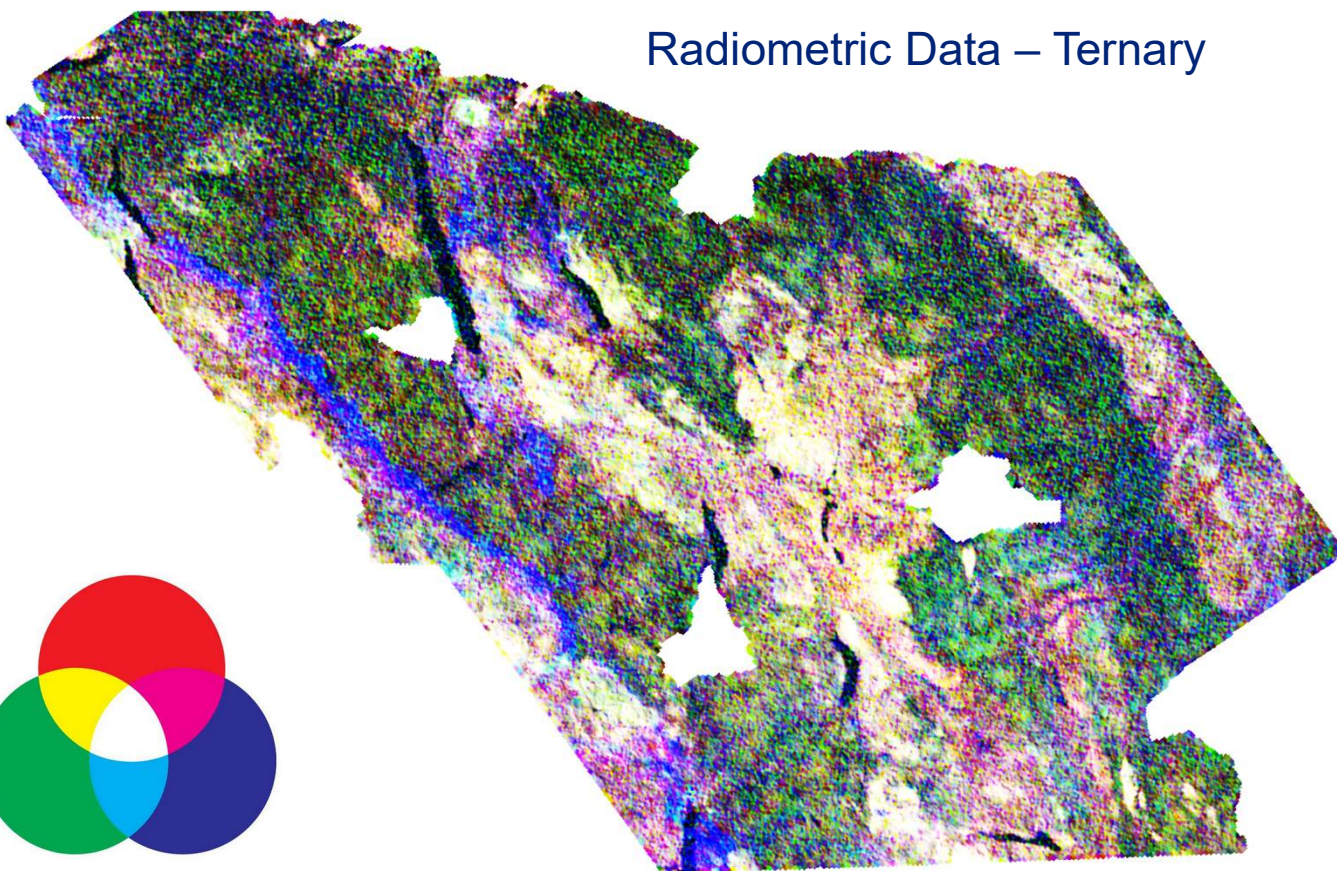


Vancouver Island North Airborne Radiometric Data

- **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**

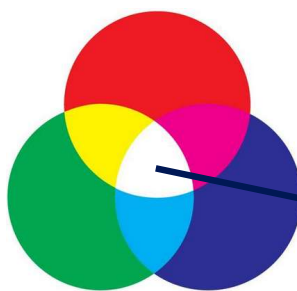
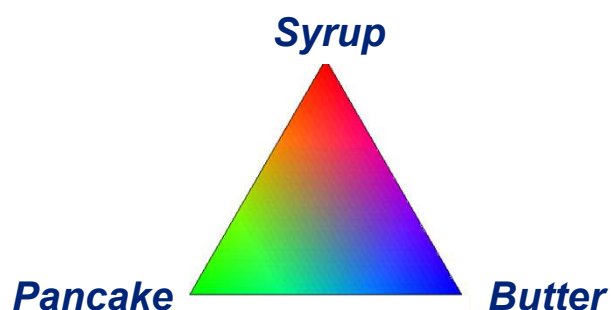


Radiometric Data – Ternary

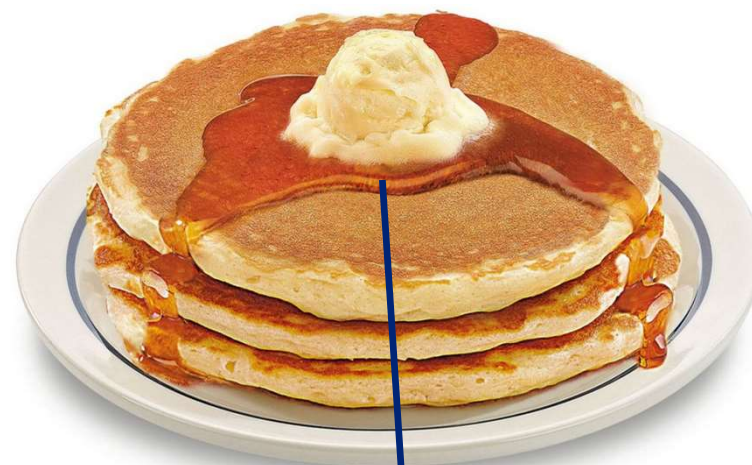


Ternary Data Illustration

- **Ternary** image of **Taste Factor** data composed of pancake, butter and maple syrup ingredients
- Different ratios of the three ingredients generate different colours which in turn help with mapping **optimum taste factor**
- If optimum taste was equal parts of all three then we **would map out white areas**.
- RGB colours used



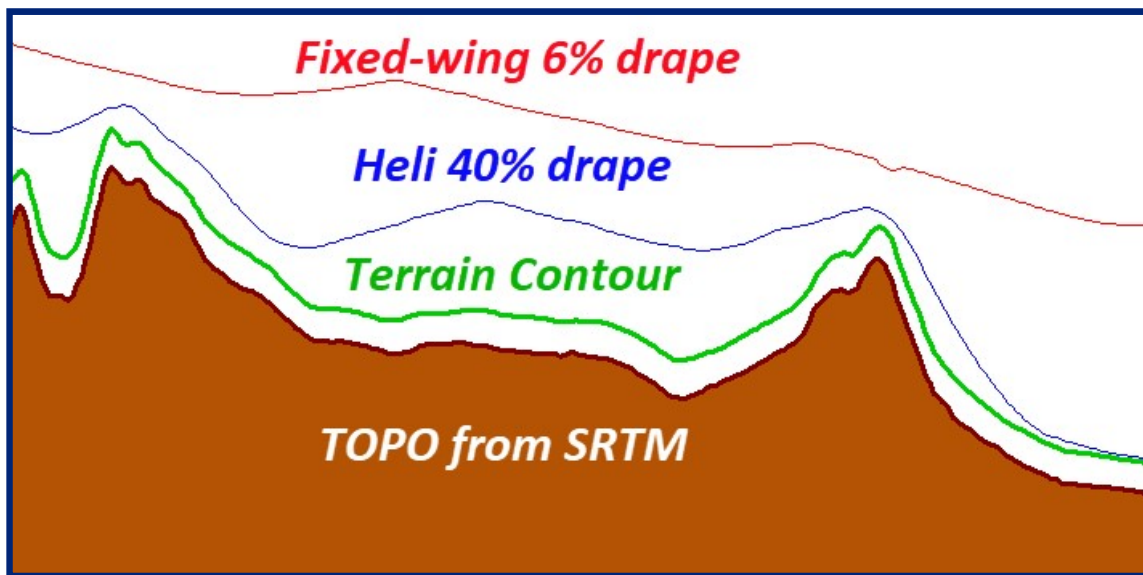
Prospect: Pancake Mountain
Budget: 3 forkful's
Objective: maximize Taste Factor



The Sweet Spot

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

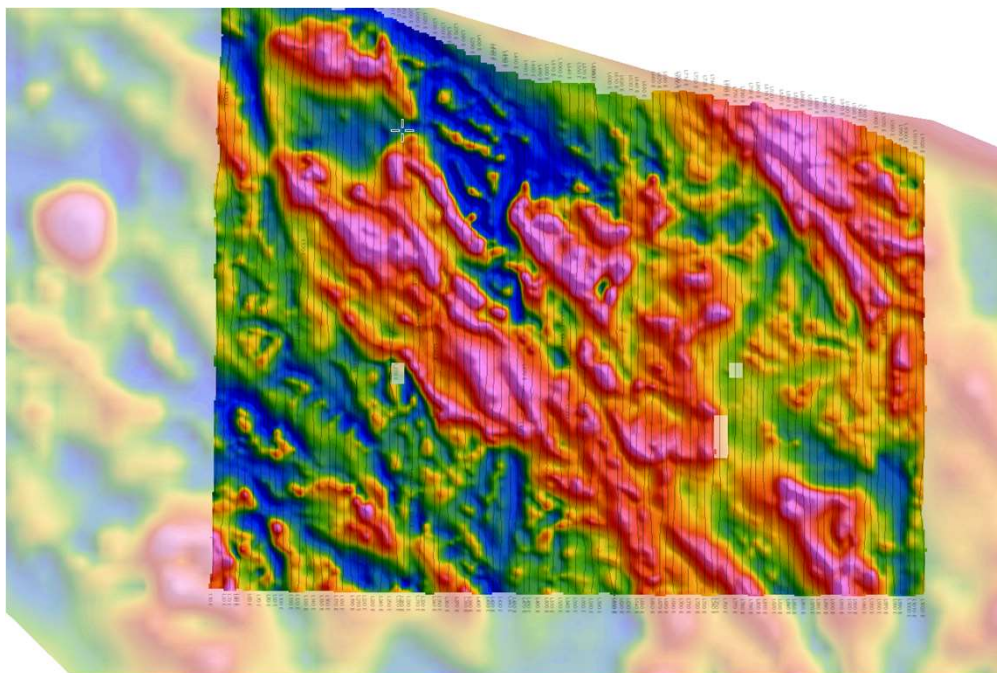


*** Disclaimer: This slide will make no sense unless you attended the talk*

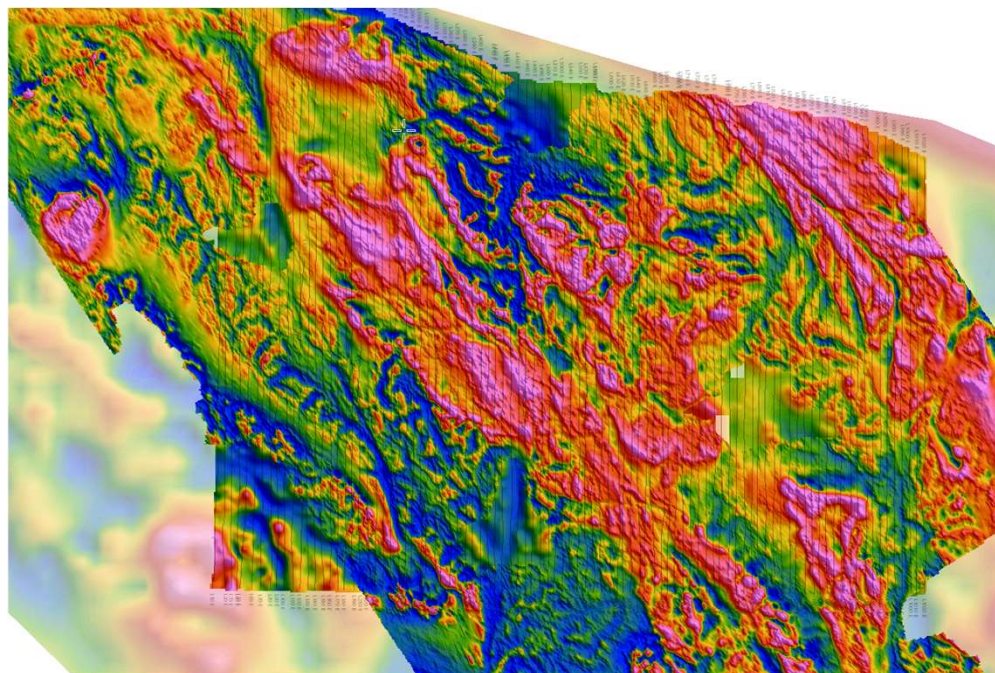
Historical Regional MAG & VIN 250 m

- 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

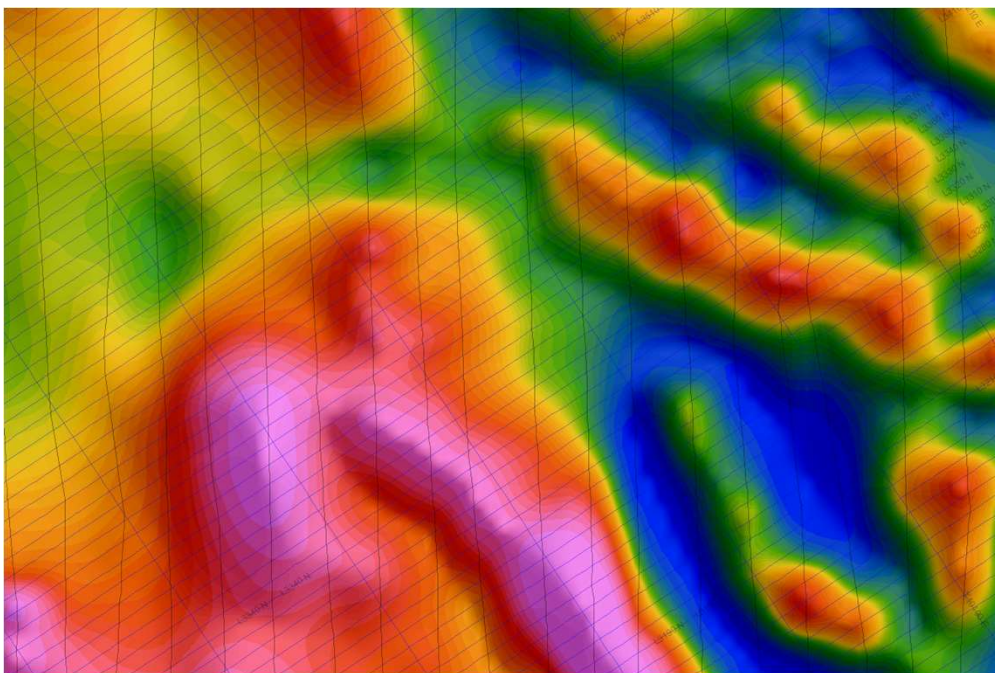


Forging opportunities through earth science partnerships

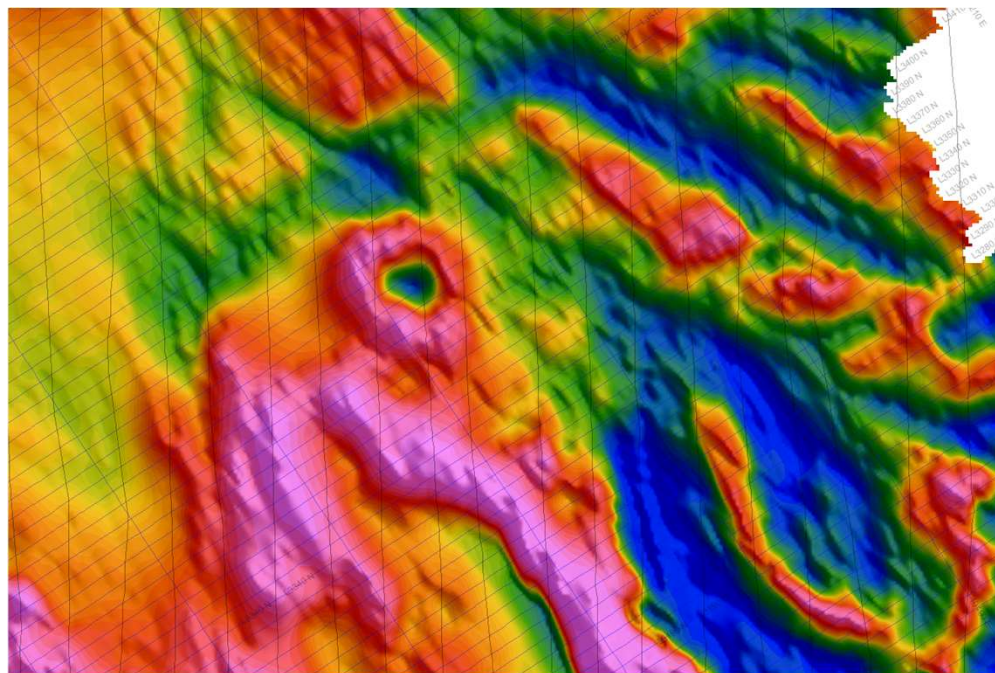
Historical Regional MAG & VIN 250 m

- 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)



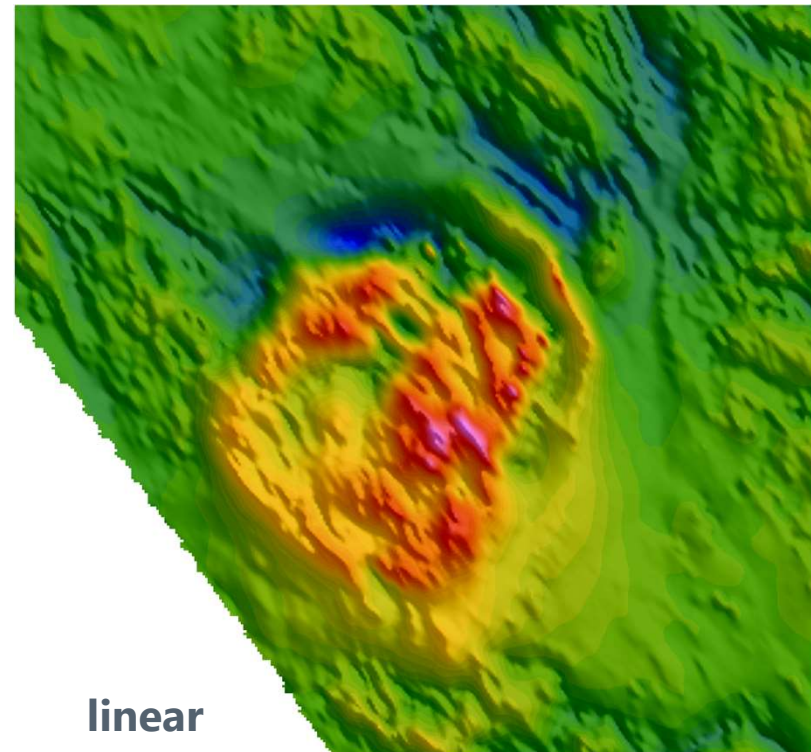
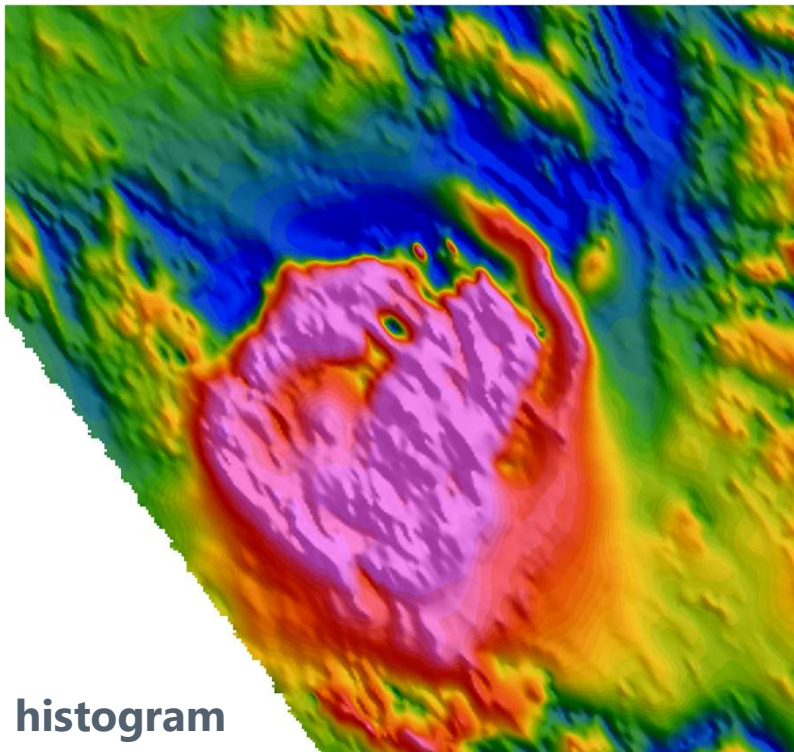
250 m lines data at nominal 80 m survey height



- Geophysical deliverables vary between survey types and contractors
- With magnetic data there is much more that can be done with geophysical data to maximize one's ability to study relationships and further geologic mapping.
- **Data should be assessed and visualized from different perspectives**
- Sometimes these products allow us to see new relationships or at least recognize them faster than viewing the original data alone

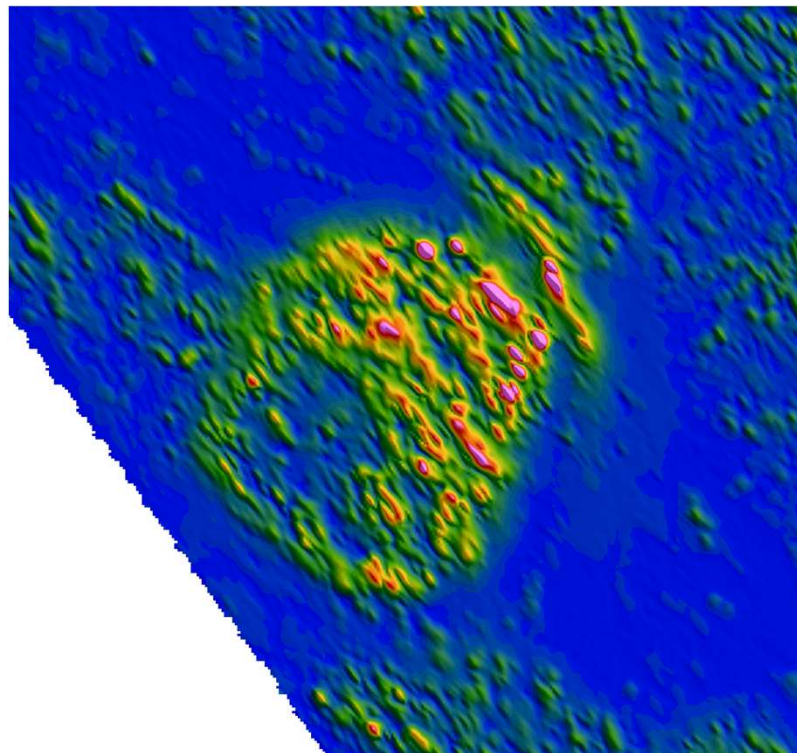
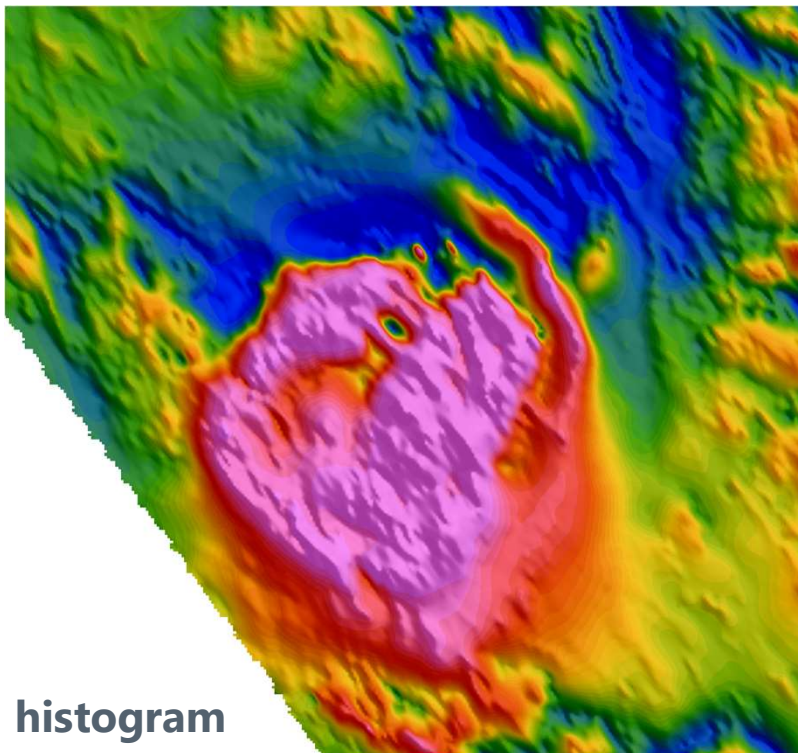
Value Added Data Processing

- Data processing/visualization – MAG TMI **histogram** versus **linear** colour bar
- Fully understanding data requires viewing it from different perspectives.



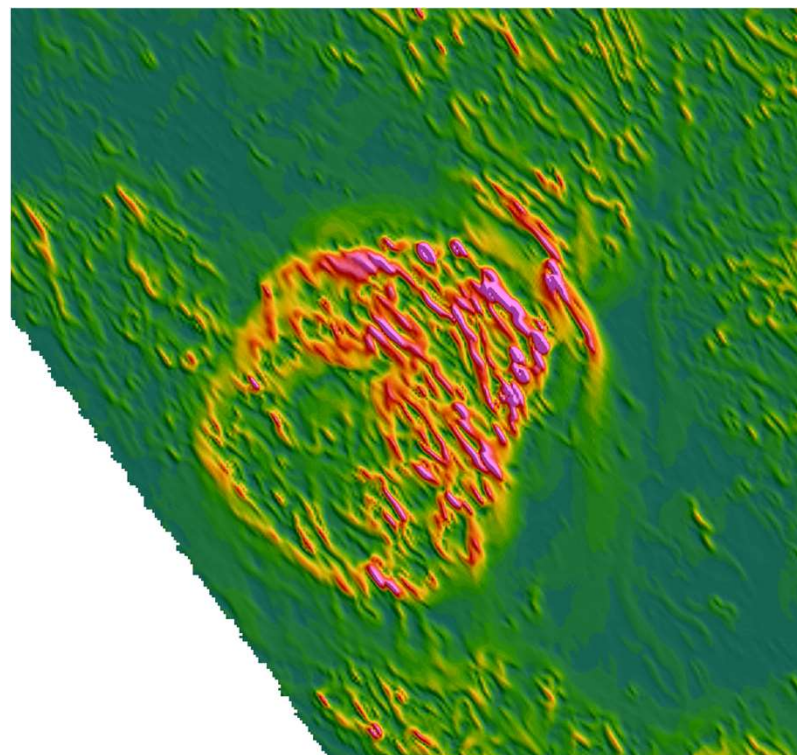
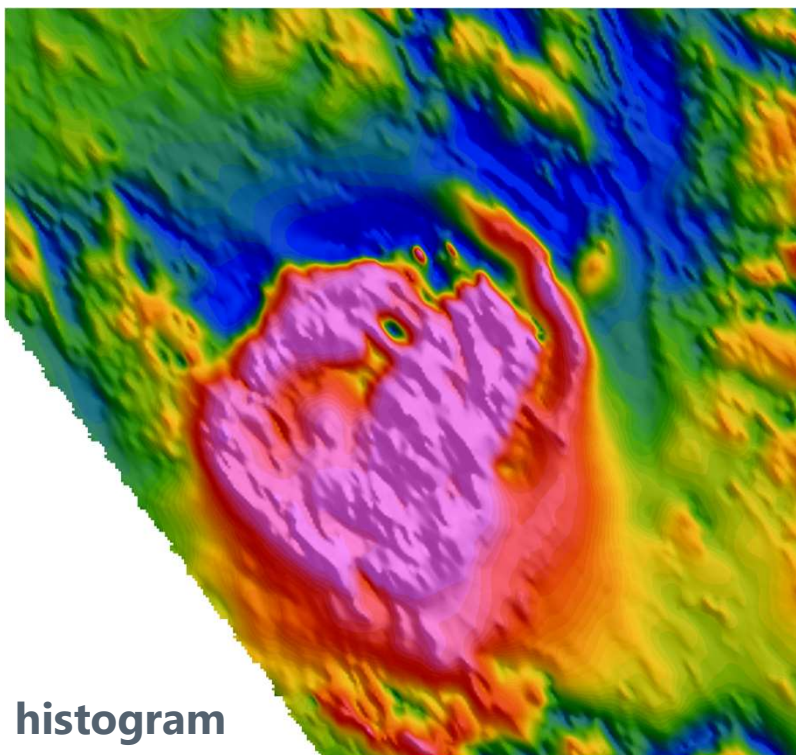
Value Added Data Processing

- Data processing/visualization – MAG TMI histogram versus MAG ASIG linear colour bar (**Vertical**)
- ASIG or Total Gradient minimizes long wavelength/deep-seated features focusing our attention on the near surface

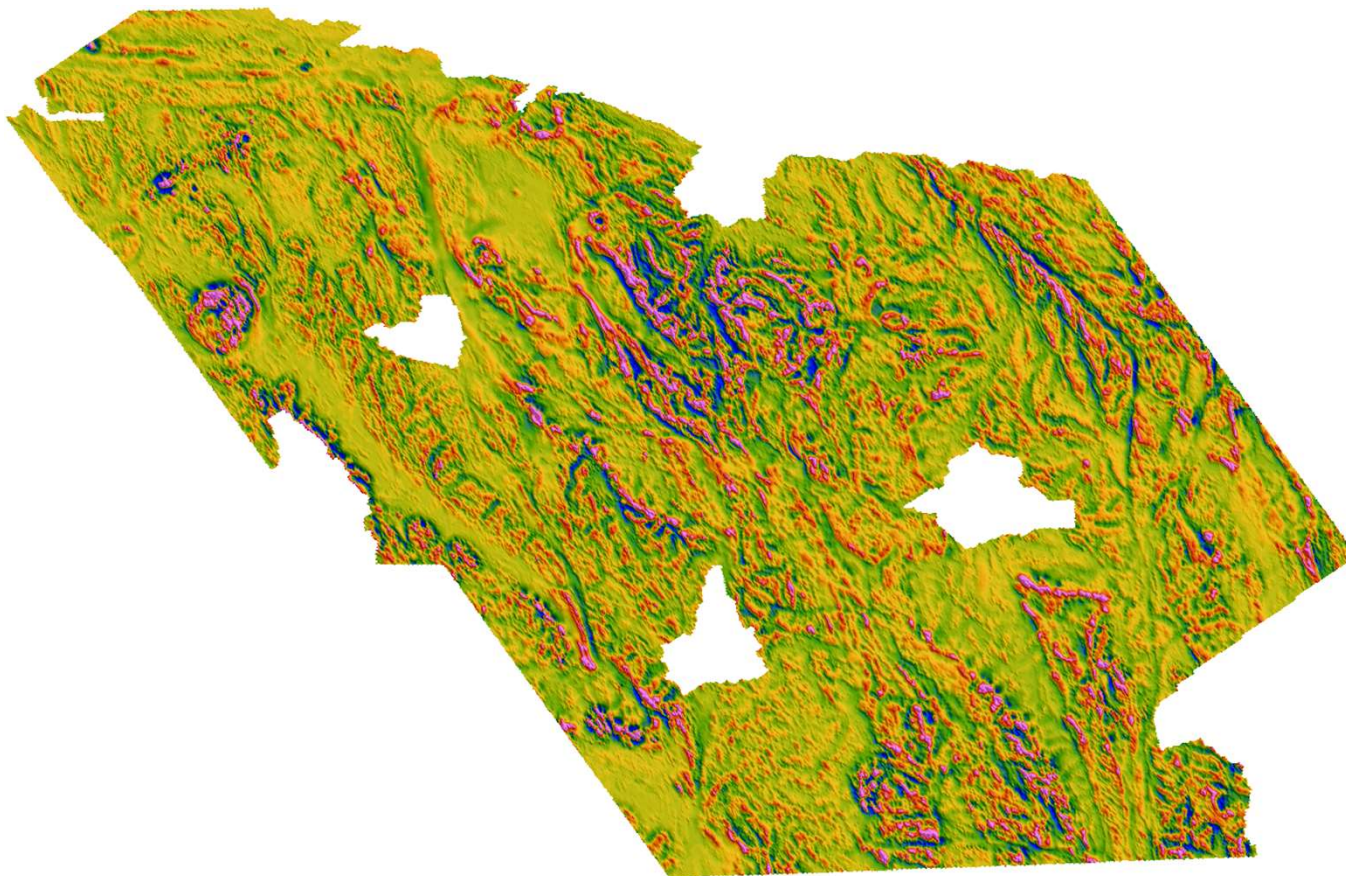


Value Added Data Processing

- Data processing/visualization – MAG TMI histogram versus MAG THDR linear colour bar (**Horizontal**)
- THDR - Total horizontal derivative helps us to locate edges of features

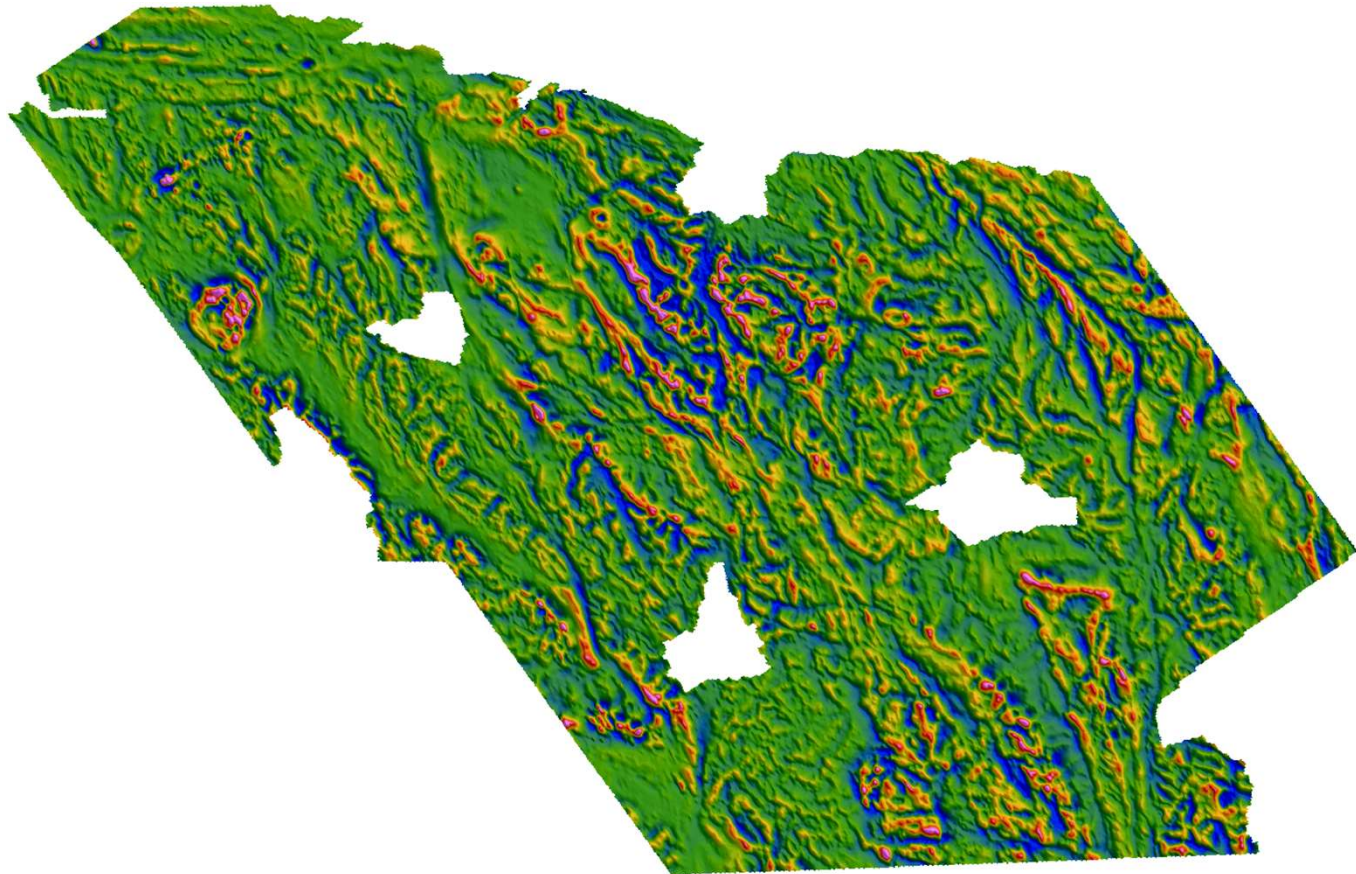


- **Depth Information**
- Magnetic layer extraction with **0 m depth to top** and **200 m thickness**
- **Regional residual separation** filtering attempts to isolate responses from approximate depth regions. A quick method to visualize regional geology without modelling.
- To visualize deep-seated regional structures imagine the magnetic survey being flown at 2000 m above ground...only deep prominent sources would be measured.



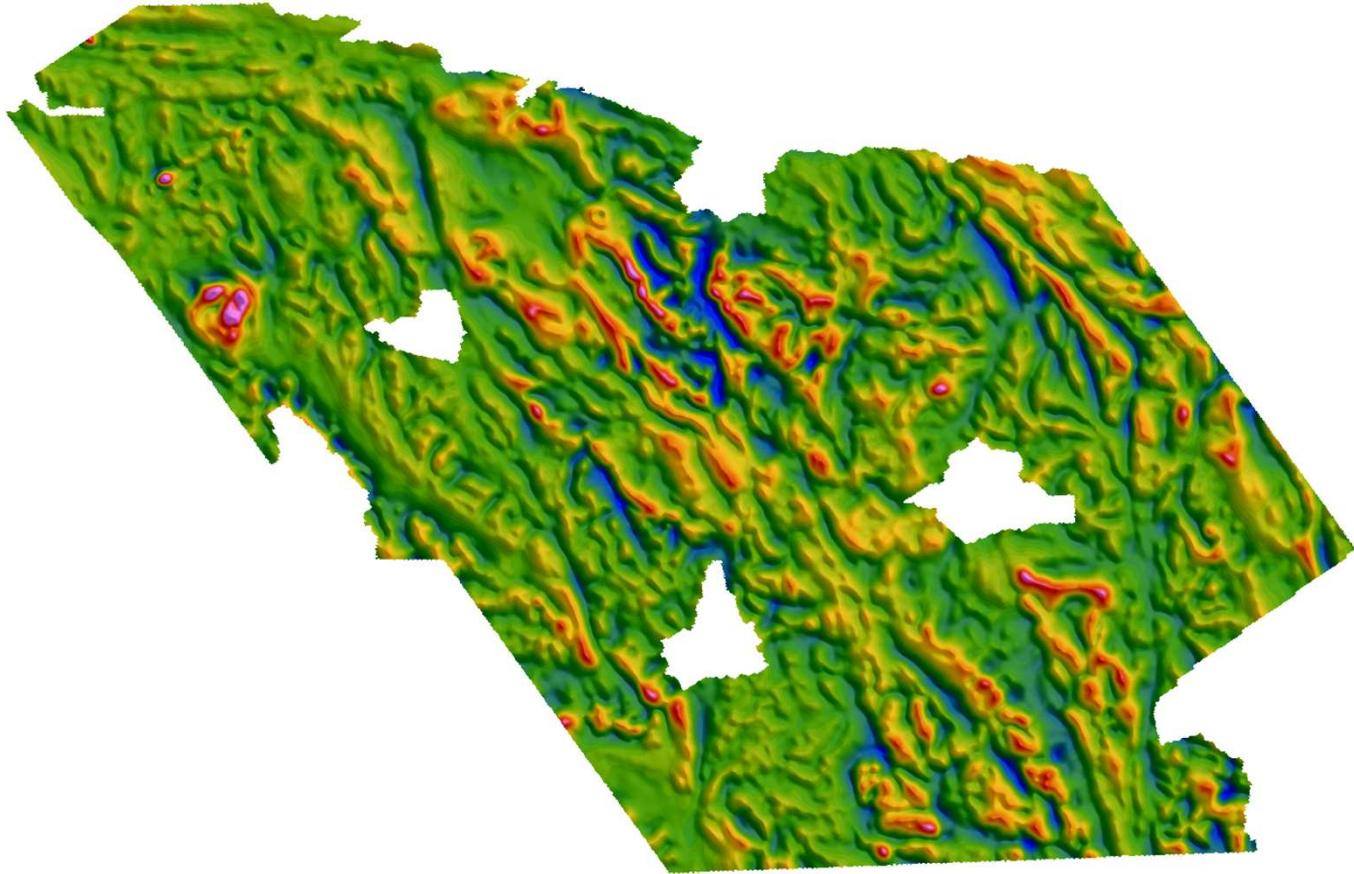
Value Added Data Processing

- Depth Information
- Magnetic layer extraction with **100 m depth to top** and **300 m thickness**
- Sometimes the near surface high-frequency responses can distract or interfere with visualization of deeper features and structure
- At other times we choose to focus on the near surface only and remove the long wavelength regional trends in the data.



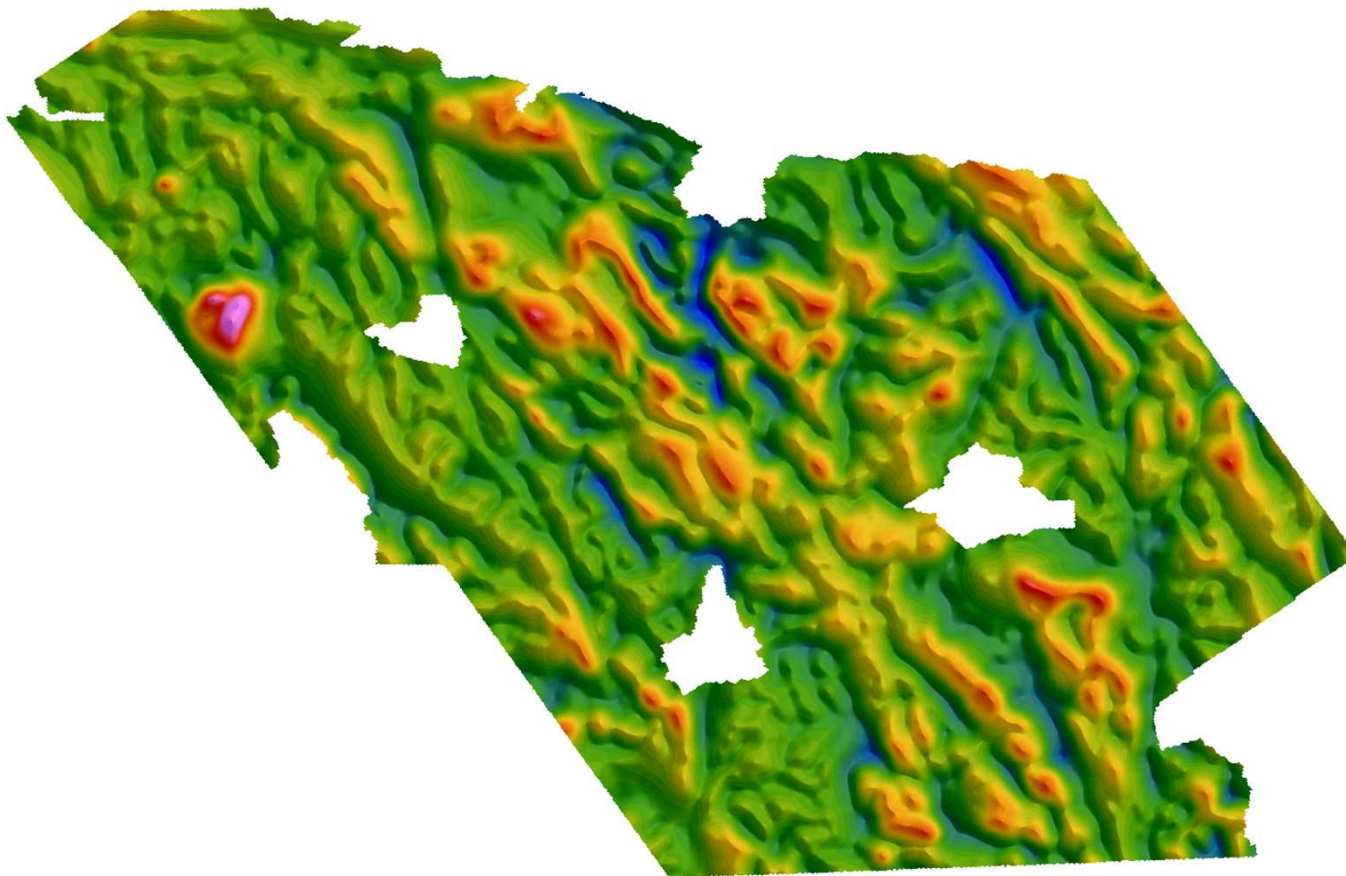
Value Added Data Processing

- Depth Information
- Magnetic layer extraction with **500 m depth to top** and **500 m thickness**
- Our tendency is to focus on the magnetic features first, but **equally valid for mapping geology are the regions of low magnetic intensity: faults/non-magnetic sources.**
- We must also keep in mind the **role that topography** or erosion plays in the magnetic responses we measure **in mountainous surveys.**



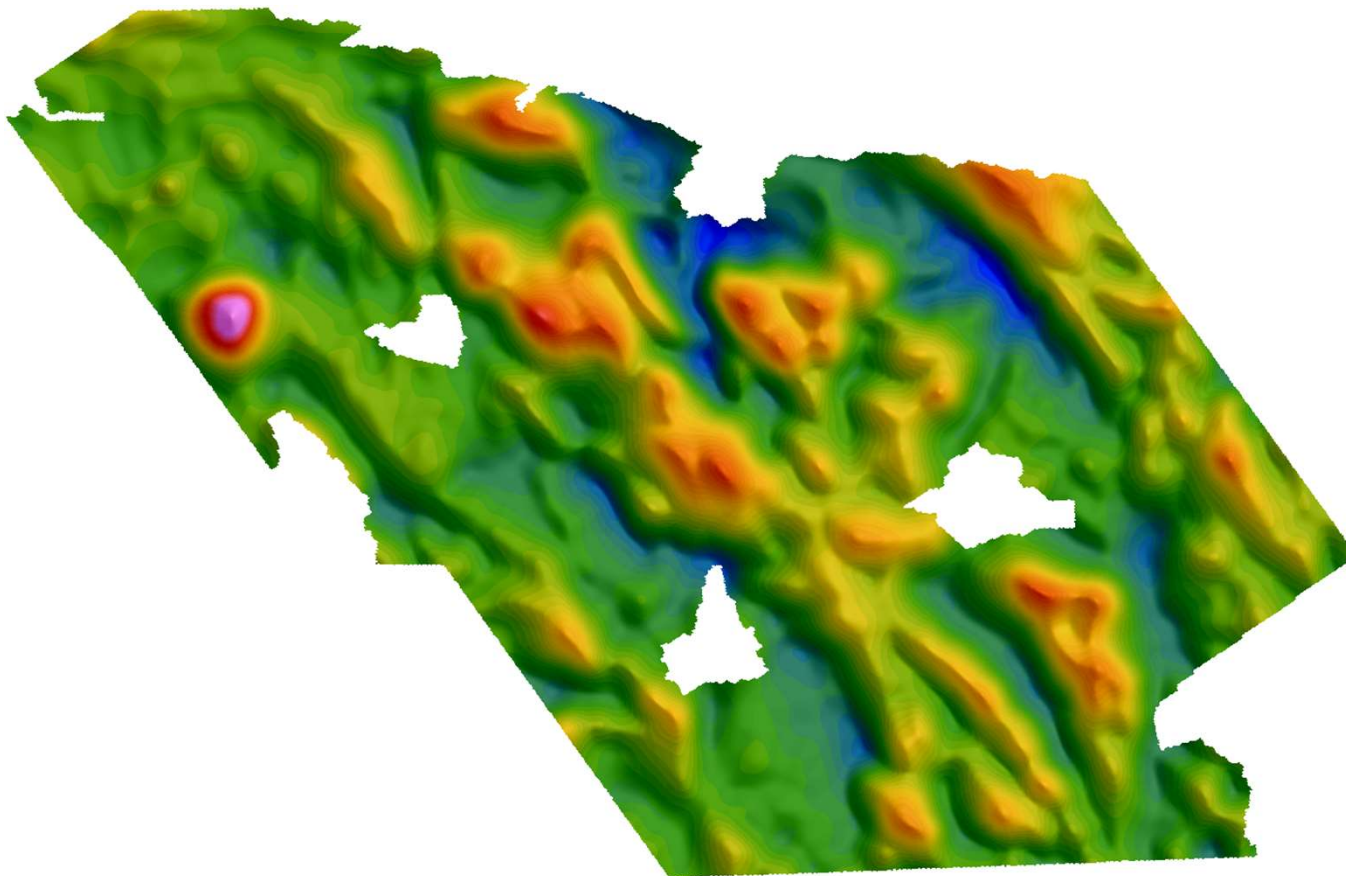
Value Added Data Processing

- Depth Information
- Magnetic layer extraction with **1000 m depth to top** and **1000 m thickness**



Value Added Data Processing

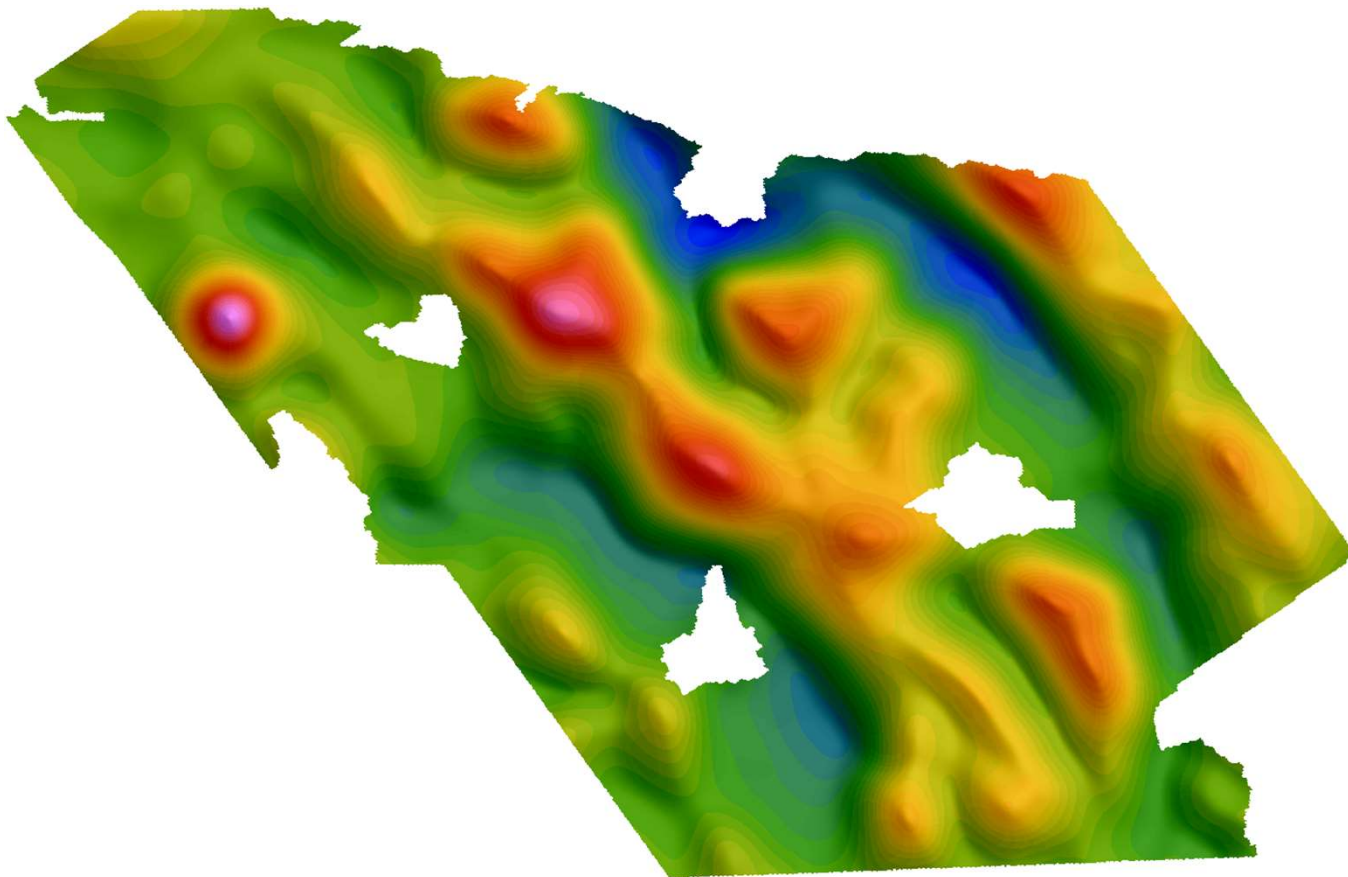
- Depth Information
- Magnetic layer extraction with **2000 m depth to top** and **2000 m thickness**



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Value Added Data Processing

- Depth Information
- Magnetic layer extraction with **4000 m depth to top** and **4000 m thickness**
- With these different layers we can map regions and faults to enhance our understanding of the geology
- Do this layer by layer or visualize three layers (shallow, intermediate and deep) together using a ternary image



Value Added Data Processing

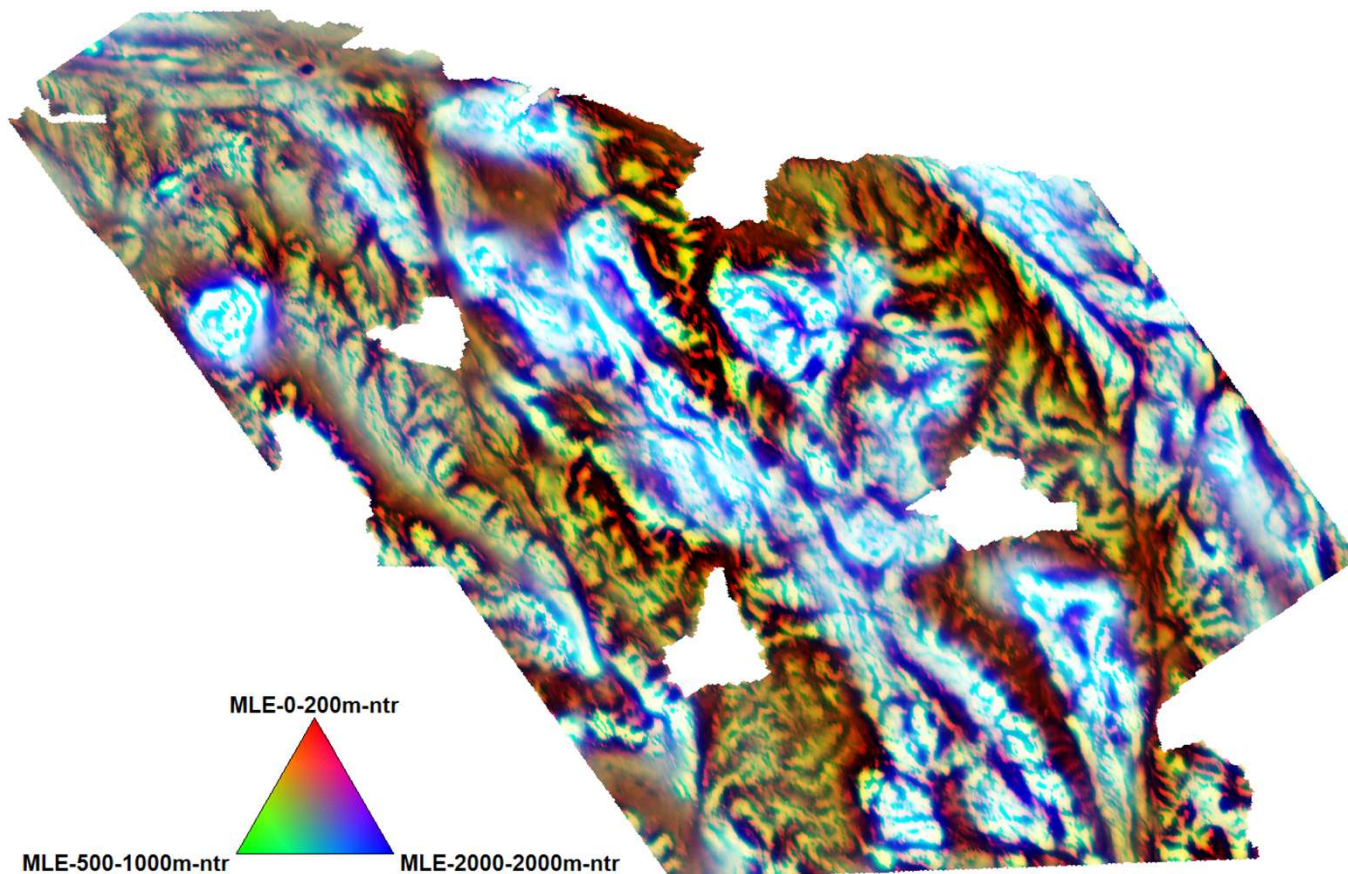
- Depth Information
- What if we combined the different depth inferences in a single ternary image?

0-200 m

500-1000 m

2000-2000 m

- Features with consistent response to depth appear as white
- The image tends to focus on magnetic features, but equally we need to consider non-magnetic regions

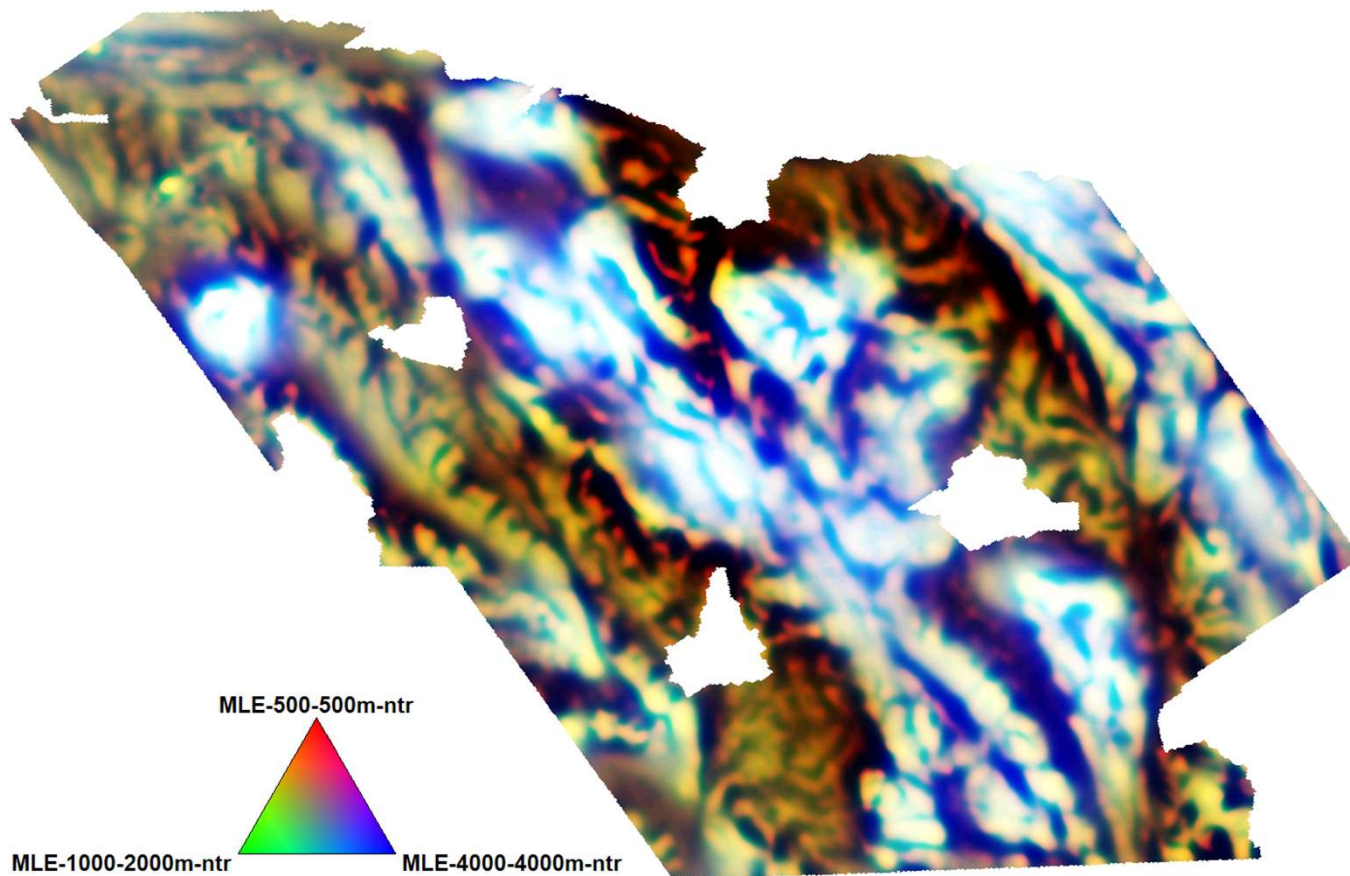


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Value Added Data Processing

- Depth Information
- Looking now at deeper sources

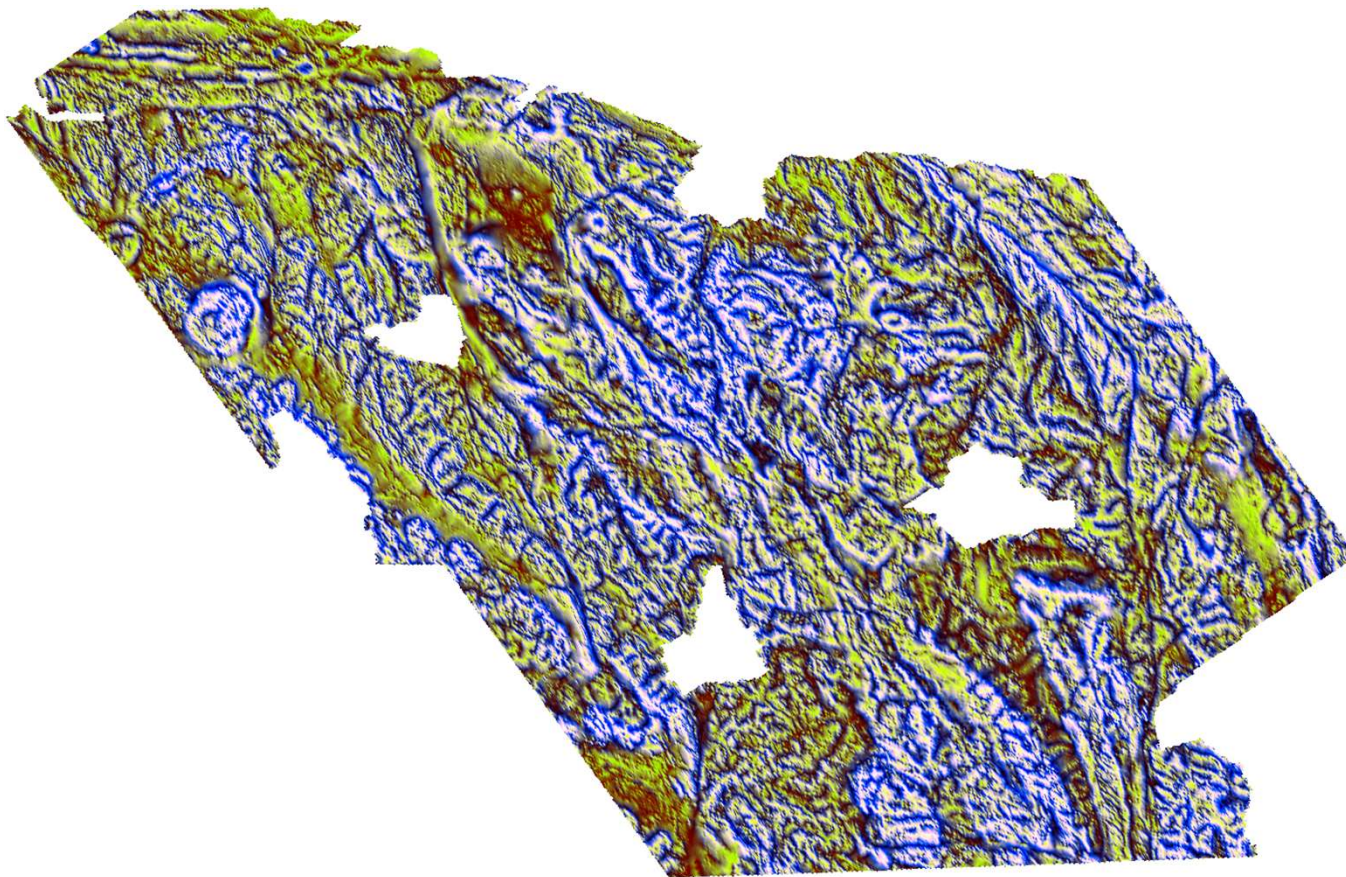
500-500 m
1000-2000 m
4000-4000 m



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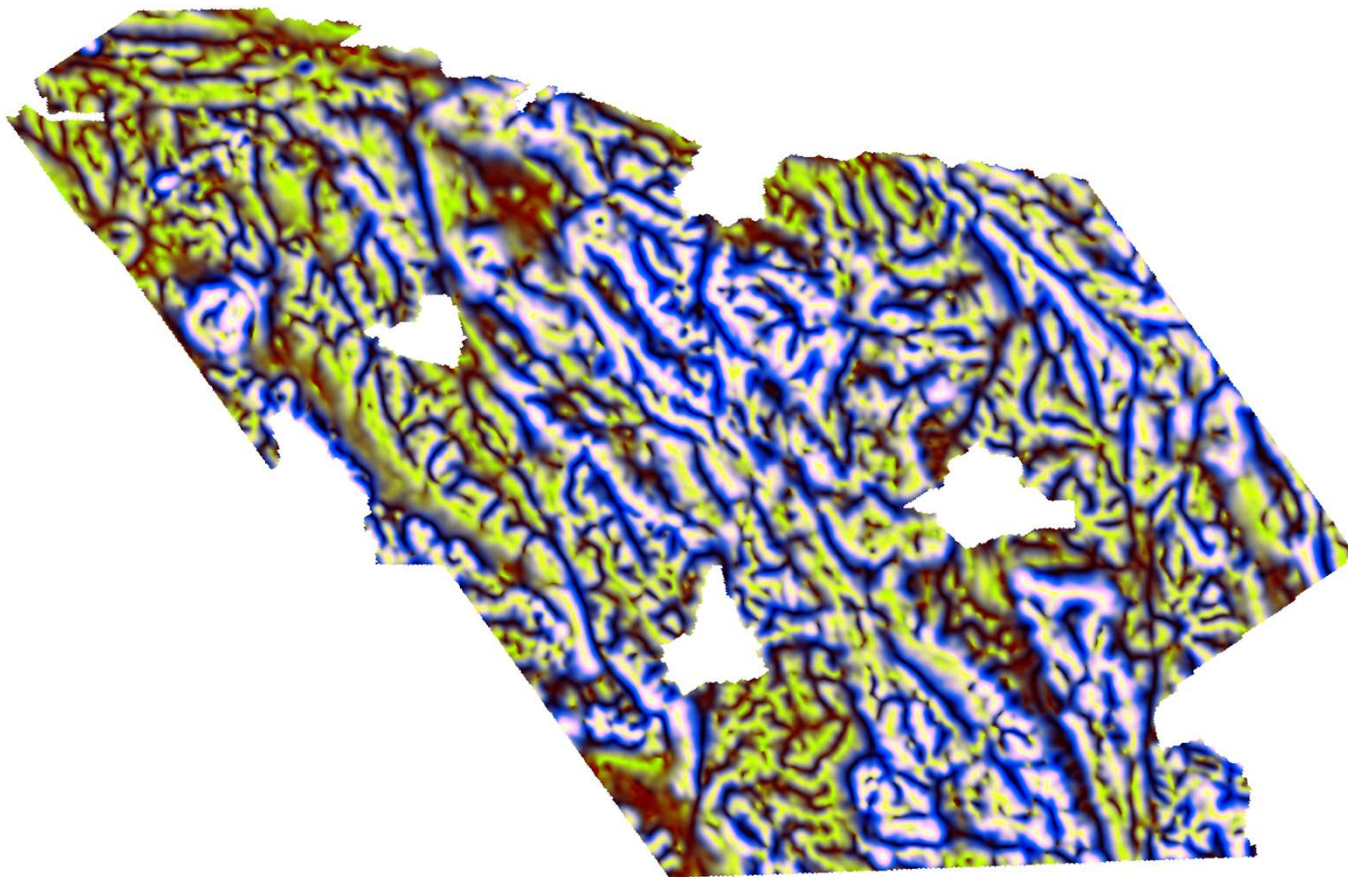
Value Added Data Processing

- **Structural Information**
- Studying textural domains and linear trends/breaks
- Both amplitude and texture can be used to map different geology
- Ternary image of 3 narrow feature filtered products for highlighting structure, trends, texture and domains
- Are we seeing structure or topographic effect or both?



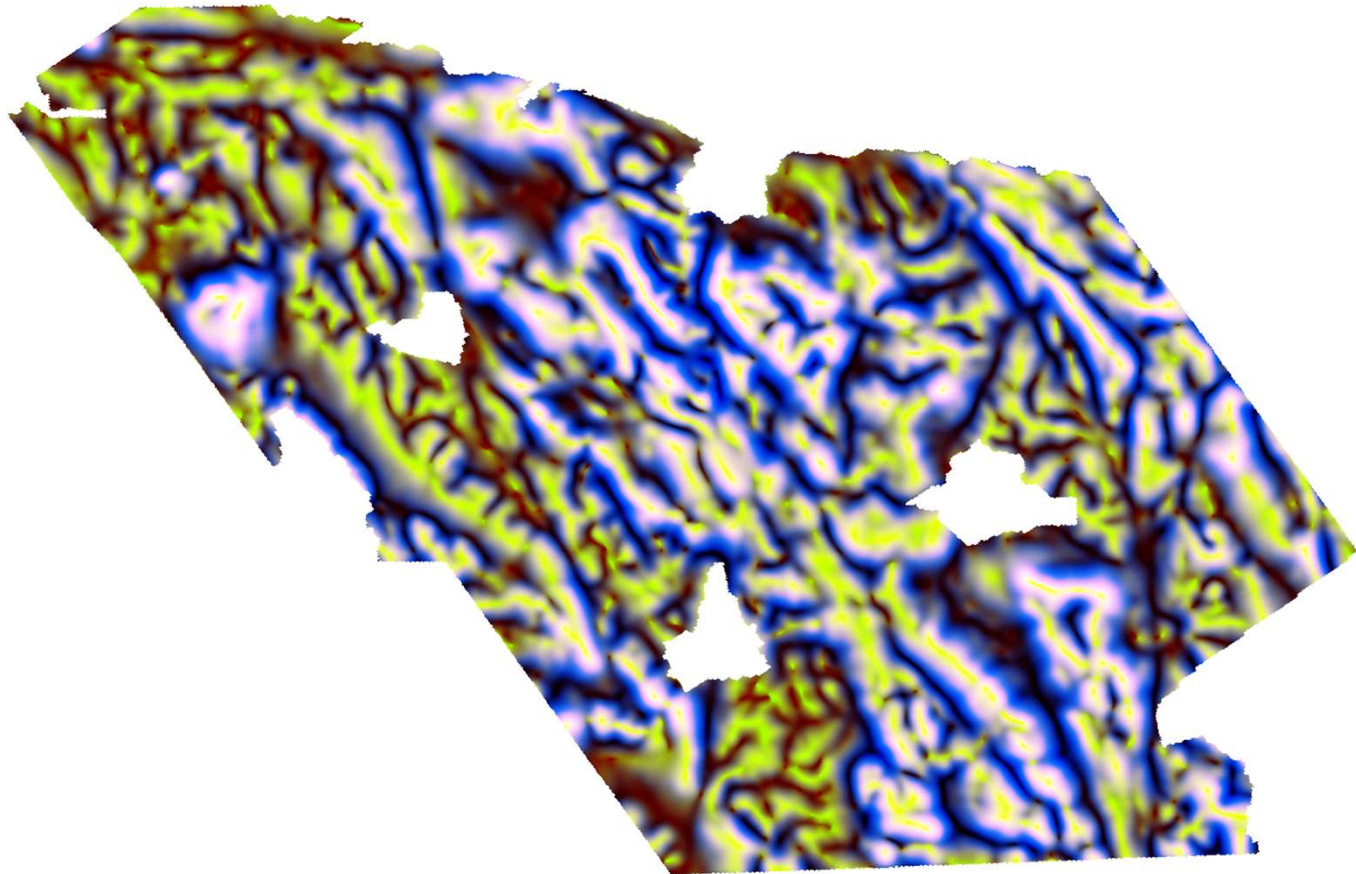
- **Structural Information**

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- Ternary image of 3 narrow feature filtered products for highlighting structure, trends, texture and domains
- Input data MLE-500-1000m regional residual separation
- As we look at deeper data the effect of topography will diminish



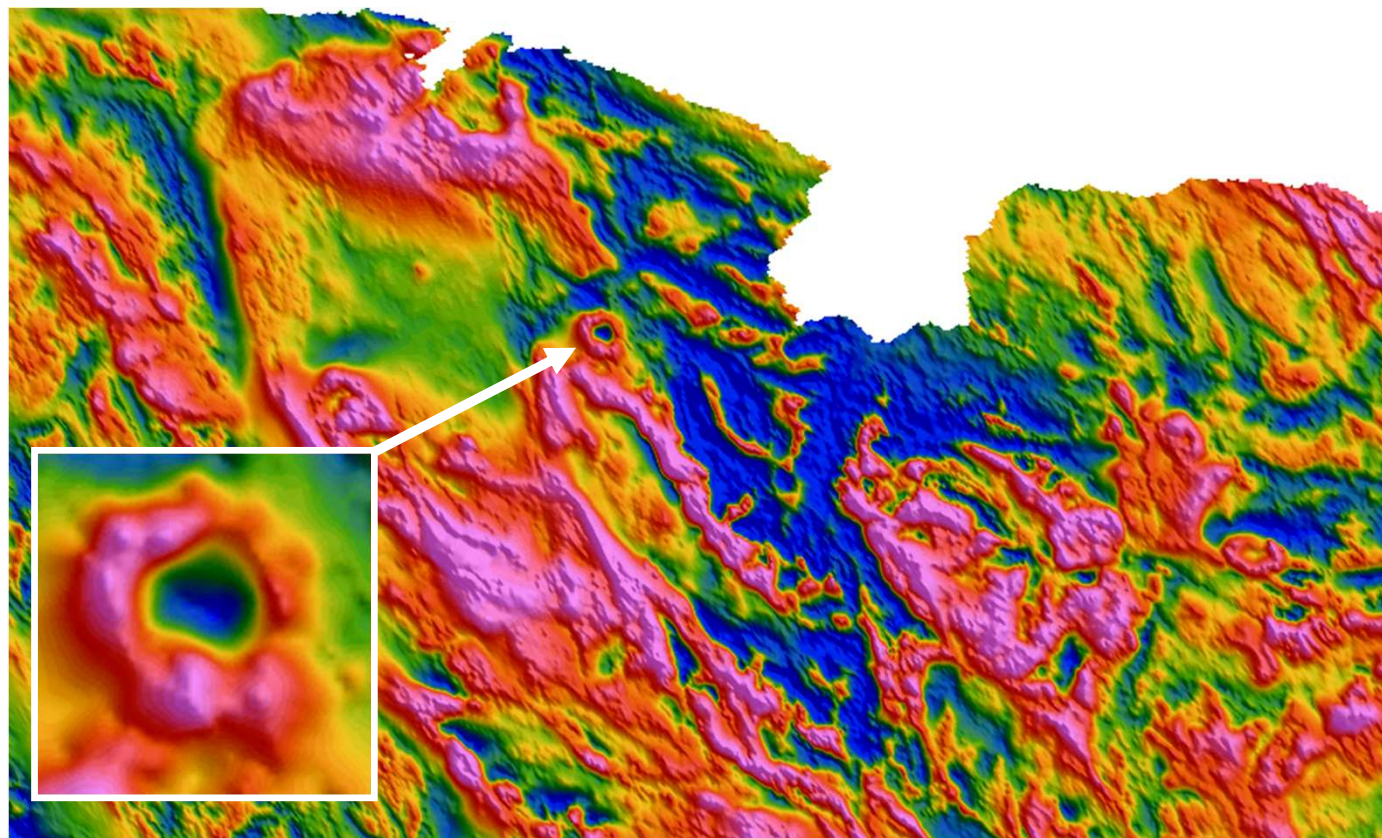
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- Input data MLE-1000-2000m regional residual separation



Public Geoscience: Micro & Macro

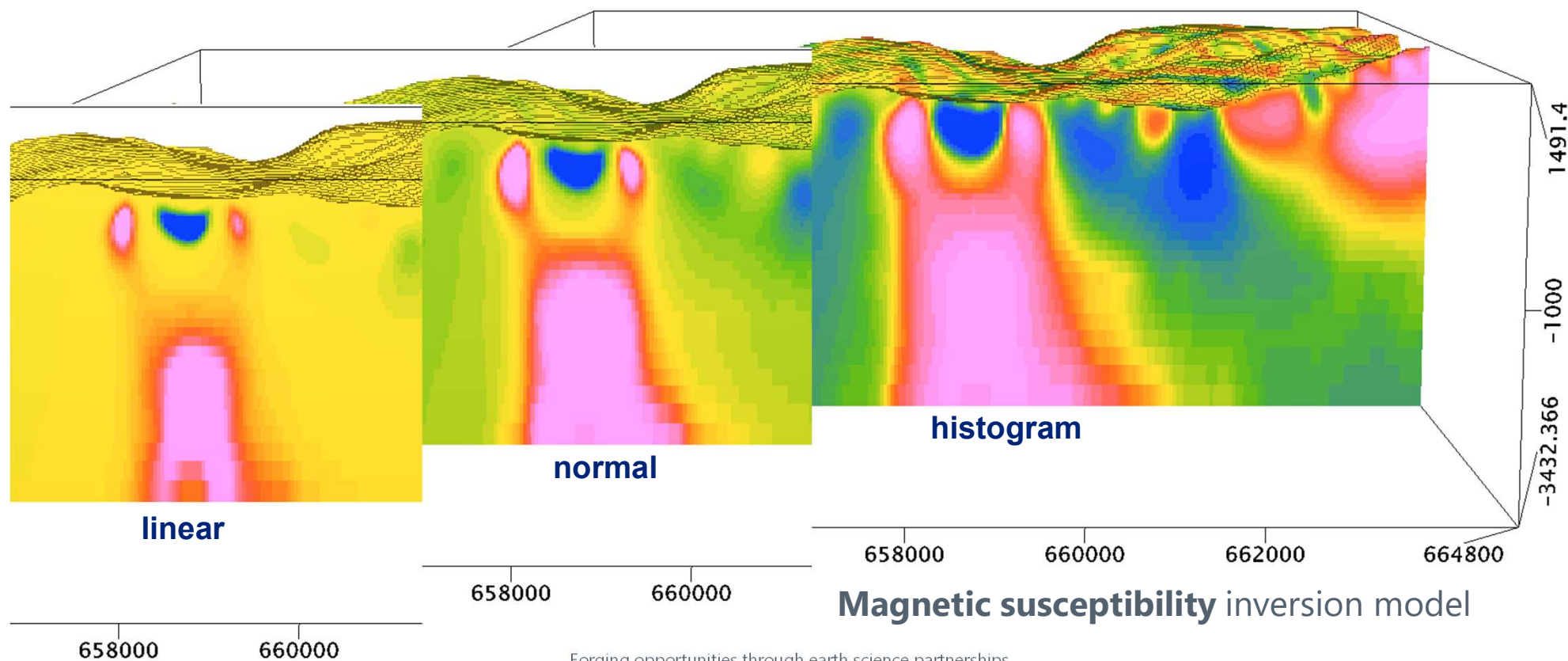
- **Perspective is key**
- Public domain data gives explorers the big picture
- **Provides information or context that is missing** at the project scale
- Are there important regional features that would help in **understanding the local scale observations?**
- **Magnetic inversion modelling** is a helpful step in answering these questions and **moving exploration forward**



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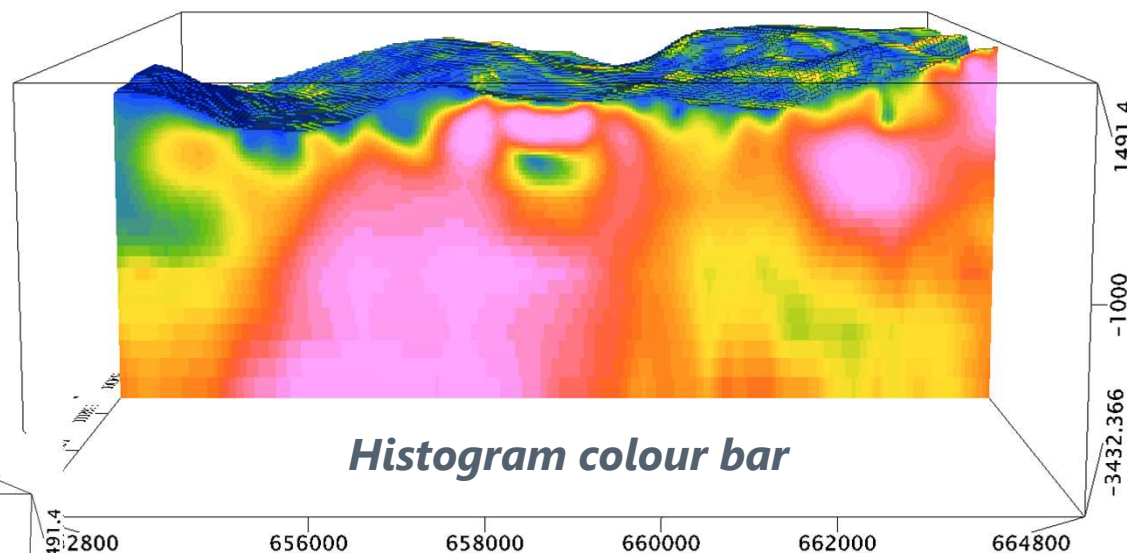
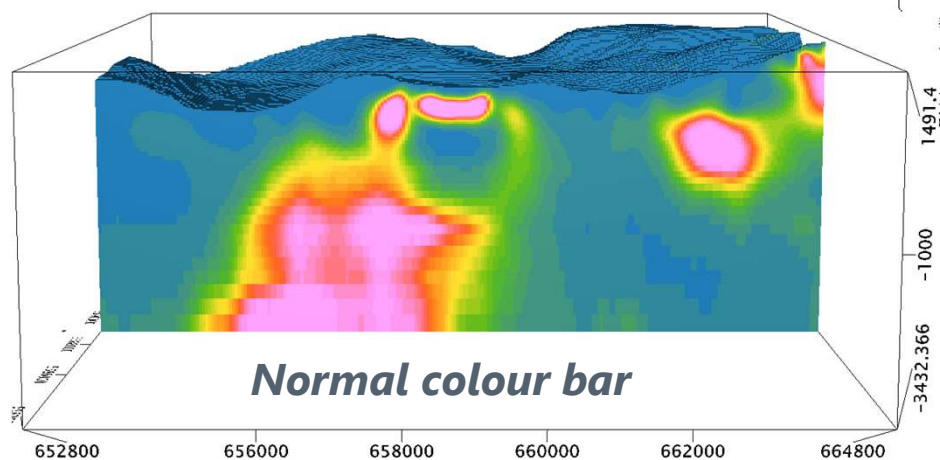
Seeing the big picture! Inversion

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



Seeing the big picture! Complexity?

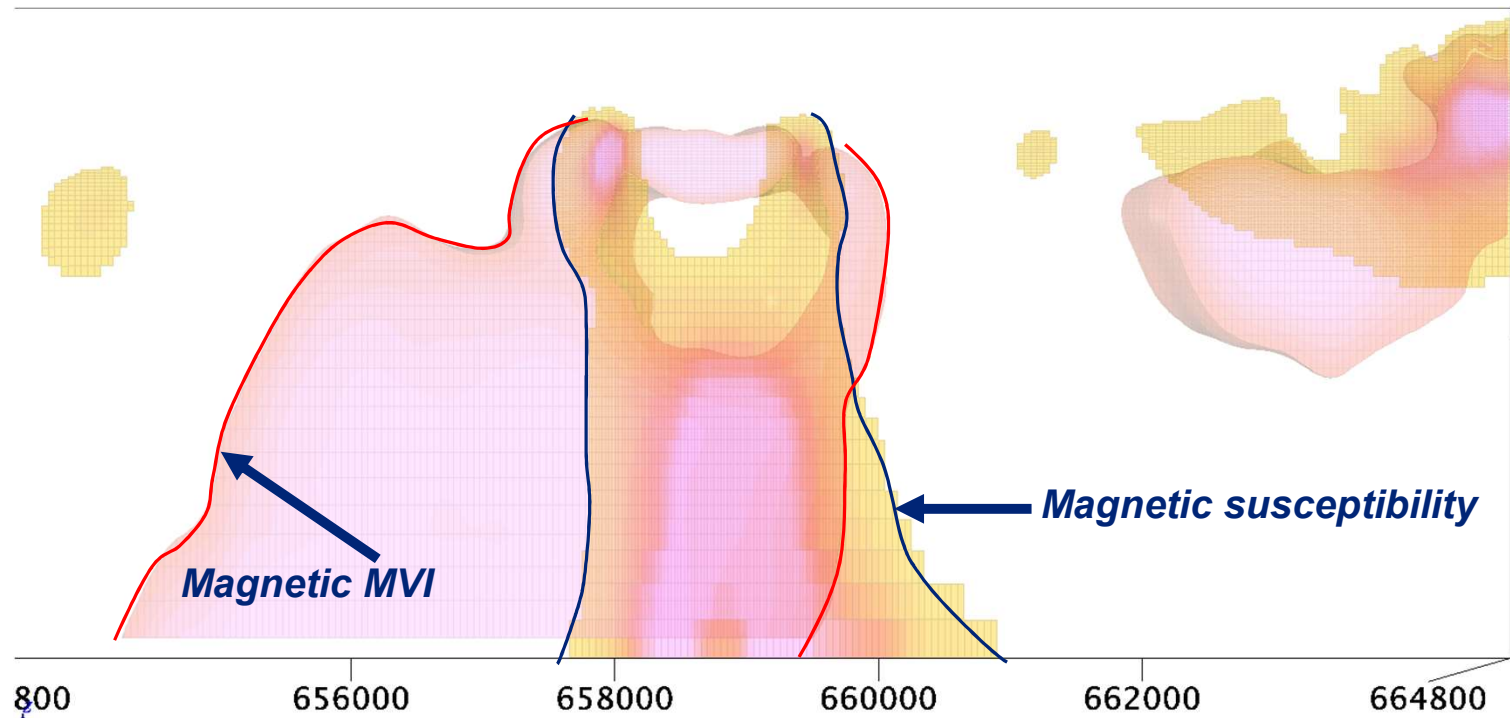
- **Alternate Inversion MVI (same area)**
- A new perspective, but more complex
- Magnetization vector intensity inversion is **used to consider/solve for the possibility of magnetic remanence** contributing to the measured survey data



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...



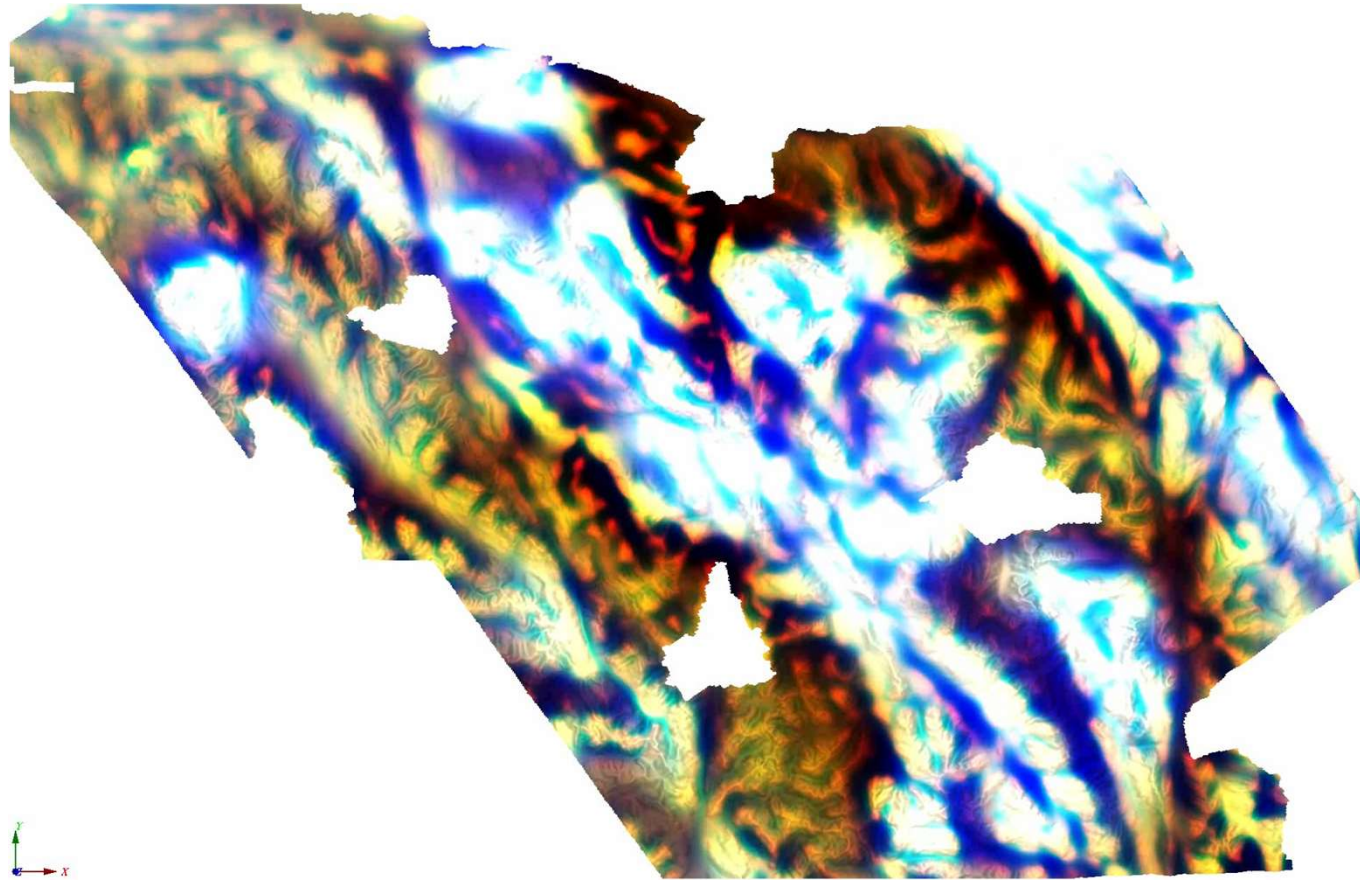
** the inversion models are not a Geoscience BC product

Vancouver Island North Regional Project

Download data: www.geosciencebc.com



**Deep features vs.
Regional MAG Inversion Highs**
(video)



Precision
GeoSurveys



in3D Geoscience Inc.

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

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Thank You

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Mineral Tenure



- Mineral tenure exists in three forms:
 - historical Crown-granted mineral claims
 - legacy ground-staked mineral claims and
 - claims acquired online.
- Since 2005, it has only been possible to acquire claims online. To maintain either a ground-staked claim or map-staked claim, a mineral tenure holder needs to either conduct work or pay cash in lieu of work done.
- Since 2008, mineral tenure holders have had to notify surface land owners before accessing a mineral claim.
- Mineral tenure holders cannot conduct work on the following: land occupied by a building, curtilage of a dwelling house (interpreted as generally being a 75 metre distance around a residence where the land is defined by gardens, lawns or other clear sign of use by that residence), land under cultivation and land occupied already for mining purposes. Mineral tenure holders are liable to the surface landowner for any loss or damage caused by accessing or using mineral tenure on private land.
- Surface and subsurface rights are discussed in detail here: <https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/mineral-exploration-mining/documents/mineral-titles/notices-mineral-placer-titles/information-updates/infoupdate7.pdf>.

Permitting



- A Notice of Work permit is required before any mechanical disturbance for mineral exploration is conducted. This includes drilling and mechanical trenching. Permit applications are referred to government ministries as well as First Nations for review. Depending on the extent of review, applications may take between two months and a year to process. Uncertainty regarding the timeline and requirements has been challenging for mineral explorers.
- A Notice of Work companion document is being developed by the provincial government to better inform mineral explorers, government staff and Indigenous groups on permit requirements, and should be available online shortly.

Reclamation



- All Notice of Work permits are accompanied by reclamation bonding that is held by the Ministry until an exploration program is complete and land is reclaimed. A reclamation bond calculator has provided greater certainty that the amount of bonding posted meets or exceeds the value of reclamation work to be completed.