Which anomaly should I drill?

Using spatial statistics to inform exploration in covered IOCG terranes

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AEGC Conference, 2019

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Overview of Residual Bouguer Gravity and Residual RTP TMI in Australia.
Olympic Copper Gold Province
Gawler Craton (onshore)

8,510 Gravity anomalies coincident with TMI
Magnitude (mGal)
- 3.09 - 10.90
- 0.87 - 3.06
- 0.24 - 0.86
- 0.06 - 0.23
- 0.00 - 0.05

20,345 TMI anomalies coincident with gravity
Magnitude (nTesla)
- 7908 - 18924
- 3667 - 7907
- 1394 - 3666
- 327 - 1393
- 0 - 328
High-Low Clustering Report - Residual Gravity (Magnitude)

Observed General G: 0.011243
z-score: 7.351424
p-value: 0.000000

Distance Threshold: 28,000m

Given the z-score of 7.35142370562, there is a less than 1% likelihood that this high-clustered pattern could be the result of random chance.

High-Low Clustering Report - Residual TMI (Magnitude)

Observed General G: 0.009018
z-score: 39.721393
p-value: 0.000000

Distance Threshold: 21,000m

Given the z-score of 39.7213932612, there is a less than 1% likelihood that this high-clustered pattern could be the result of random chance.
Cluster and Outlier Analysis (Anselin Local Morans I)

- >93% of IOCG occurrences within 1000m of a gravity anomaly
- 90% of IOCG occurrences within 1000m of a TMI anomaly

Distance Threshold:
- 28,000m
- 21,000m

Cluster and Outlier Analysis

- Copper-gold deposits
- Selected IOCG deposits

Gravity Anomaly Clusters (2835 features > 0.4 mGals)
- No spatial clustering (0 - 7.9mGal, 1193 >0.4 mGal)
- High-Low Outlier (530 >0.4 mGal)
- Low-Low Cluster (2442 <0.4 mGal)
- High-High Cluster (1111 >0.4 mGal)
- Low-High Outlier (1259 <0.4 mGal)

TMI Anomaly Clusters (6340 features > 136 nTeslas)
- No spatial clustering (0 - 13,000nTesla, 2463 >136 nTesla)
- High-Low Outlier (1047 >136 nTesla)
- Low-Low Cluster (6876 <136 nTesla)
- High-High Cluster (1830 >136 nTesla)
- Low-High Outlier (2301 <136 nTesla)

Olympic Copper Gold Province
- Gawler Craton (onshore)
The figure shows a map of Australia with various geological features and anomalies. The map includes annotations for copper-gold deposits, IOCG deposits, and gravity anomaly clusters. The map is titled "Gravity Anomaly Clusters (2835 features > 0.4 mGal)" and includes the following categories:

- No spatial clustering (0 - 7.9 mGal, 1193 >0.4 mGal)
- High-Low Outlier (530 >0.4 mGal)
- High-Low Cluster (1112 >0.4 mGal)
- Olympic Copper Gold Province
- Gawler Craton (onshore)

There are also markers for TMI Anomaly Clusters (6340 features > 136 nT) and selected IOCG deposits. The map is color-coded to represent different clusters and features. Notably, there are annotations for 798 features and 3211 features as indicated on the map.
28 IOCG occurrences
58 IOCG occurrences
Residual Gravity Magnitude (mGal) Gravity Clusters and Outliers

- High-High Cluster
- TMI Contours
- Gravity Contours
- Occurrence
- Mine - metals and industrial minerals
- Mineral Drillholes

- Copper-gold deposits
- Selected IOCG deposits

Residual Gravity mGals

- 4.3 - 11
- 2.2 - 4.2
- 0.39 - 1.0

Residual TMI Magnitude (nTeslas)

- 1600 - 3800
- 0.10 - 360

GDA 2020 - Lambert Conformal Conic
TARGETS

Residual Gravity Magnitude (mGal) Gravity Clusters and Outliers
- Copper-gold deposits
- 1.1 - 2.1
- 0.39 - 1.0
- Residual TMI Magnitude (nTeslas)

High: 2.12296
Low: -3.22458

High-Low Outlier
- TMI Contours
- Gravity Contours
- Occurrence
- Mineral Drillholes

GDA 2020 - Lambert Conformal Conic
Residual Gravity mGals
High: 2.55621 Low: -2.00199

Residual TMI Magnitude (nTesla)
0.10 - 360

Gravity Clusters and Outliers
- Not Significant
- High-Low Outlier

TMI Contours
Gravity Contours
Mineral Drillholes

GDA 2020 - Lambert Conformal Conic
• Spatial statistics have determined that high magnitude gravity and TMI anomalies cluster spatially.

• Spatial statistics established a residual Bouguer anomaly magnitude threshold of 0.4 mGals for the dataset used in this study.

• Gravity clusters and outliers define three geological terranes associated with IOCG deposits across the Olympic copper-gold province.

• Regions of low-grade, intermediate-grade and high-grade metamorphism are manifested in clustering of gravity features.

• There is a high degree of spatial correlation between high magnitude gravity and TMI anomaly clusters in the Gawler Craton.

• Maps of gravity and TMI clusters and outliers has potential to aid the interpretation of geological domains.

• Vector polygons of gravity and magnetic anomalies are mappable criteria that can be applied to IOCG prospectivity modelling.

• This work facilitates interpretation at a range of scales from regional scale to camp scale, forming a basis for site selection and further analysis.

• Gravity station spacing should be <4000m to reliably capture clustering of high magnitude features.


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