



BARRICK

Application of Automated detection techniques in
Magnetic Data for Identification of Cu-Au
Porphyries
August 2010



1. Background

2. Porphyry Magnetic Signatures

3. Filter Theory - Exploration

4. Application Examples

5. Summary. Where to next?

Background



What?

- ❑ Research agreement between CET and Barrick signed in 2008 to sole-fund "Porphyry Texture Filter"

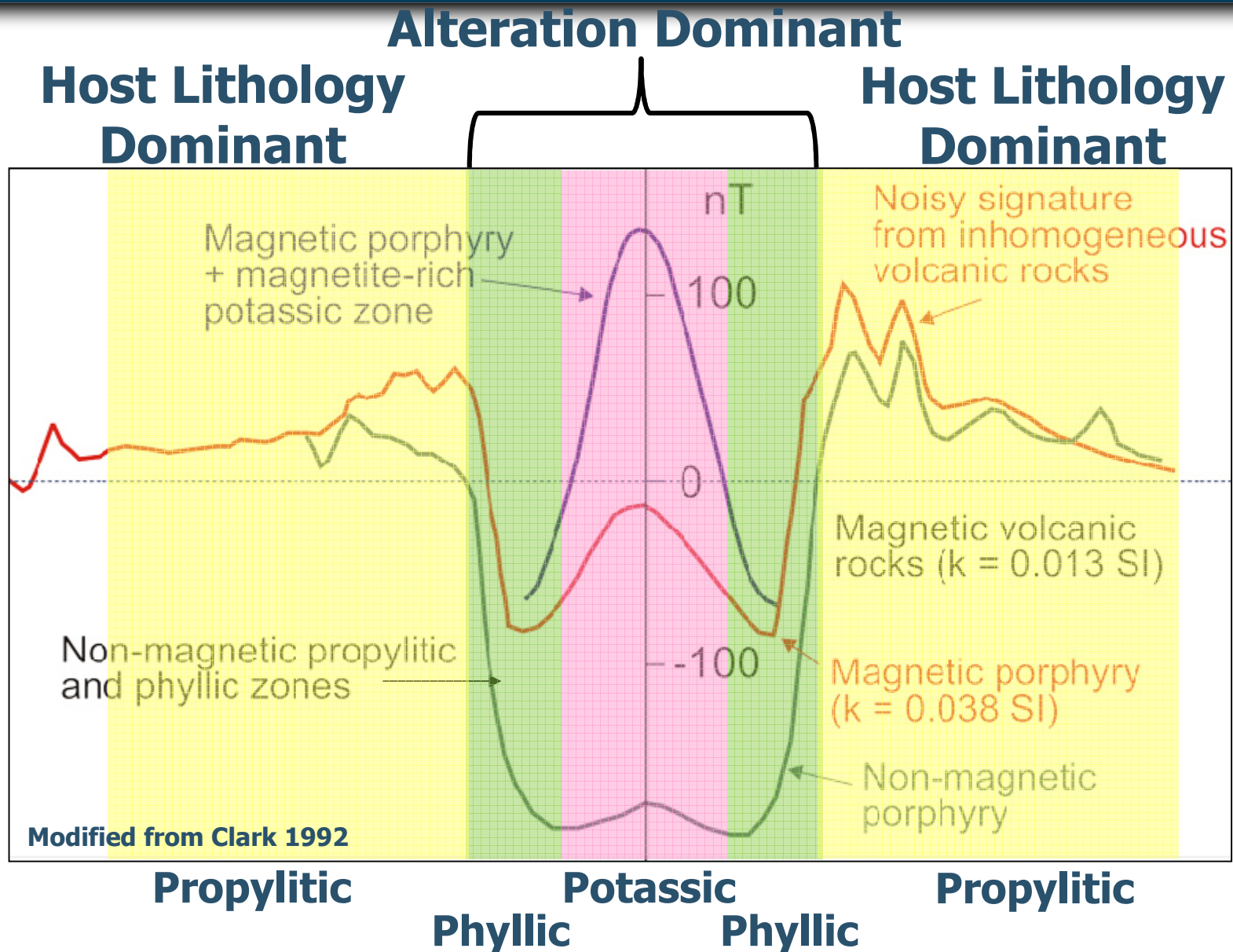
Why?

- ❑ Au rich porphyry focus
- ❑ Magnetic coverage available over most projects – capitalise investment
- ❑ Rapid objective analysis of large datasets with strong geological context
- ❑ Discrimination within highly magnetic terrains

How?

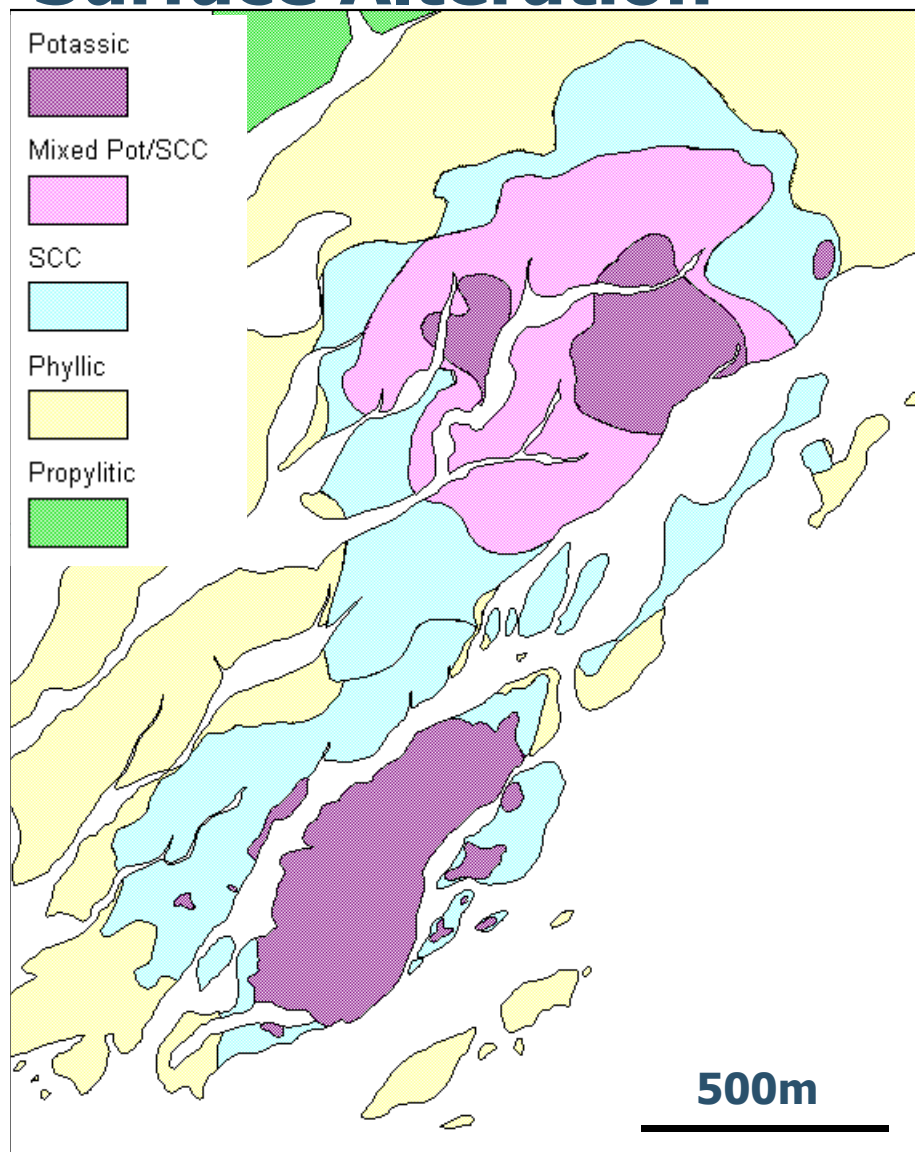
- ❑ Automatically detect and quantify porphyry magnetic signatures via user defined application of porphyry target model and remove the dependency on finding the "bump"

Porphyry Idealised Signature

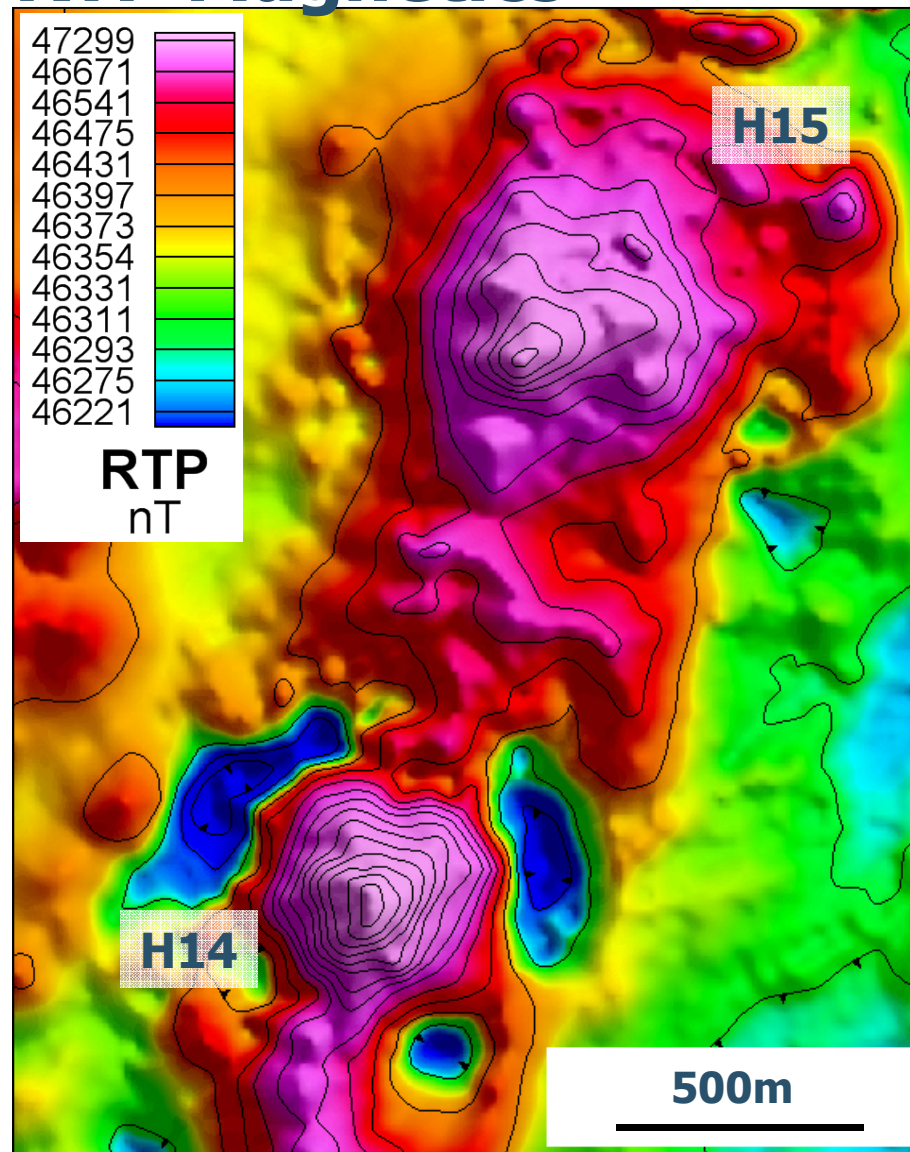


Porphyry Idealised Signature

Surface Alteration



RTP Magnetics



1. CIRCULAR FEATURE DETECTION

- ☐ Define radius and shape of target porphyry
- ☐ Enhance target response
- ☐ Suppress non-circular features
- ☐ Output RST grid

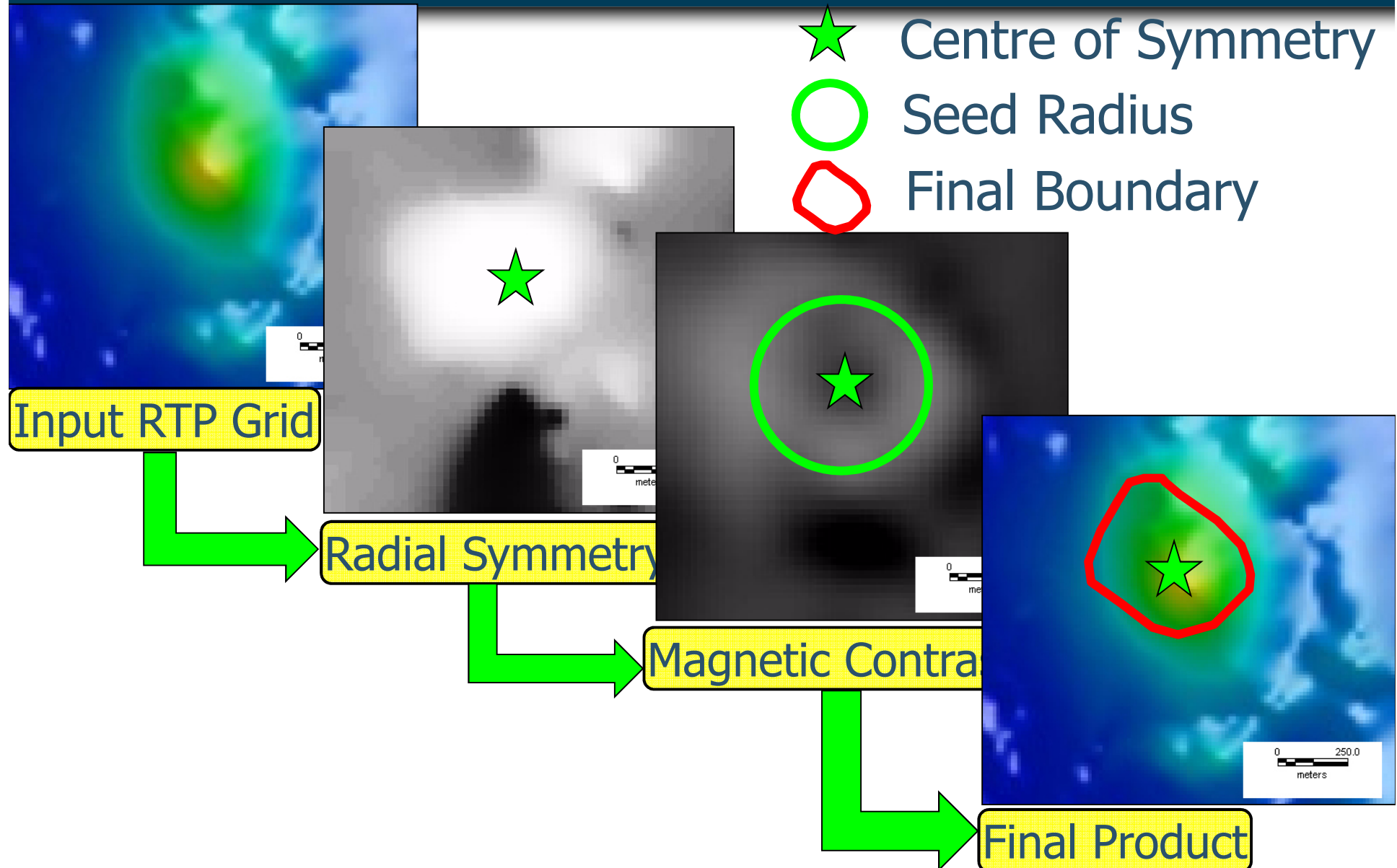
2. FEATURE VALIDATION

- ☐ Define expected magnetic contrast
- ☐ Pass features meeting criteria
- ☐ Assign threshold strength and radius to each centre
- ☐ Grid and database product

3. BOUNDARY SPLINES

- ☐ Select appropriate threshold from feature validation
- ☐ Quantify outer edge of alteration dominant zone
- ☐ Polygon file output

Theory – Simple Example



Application Considerations



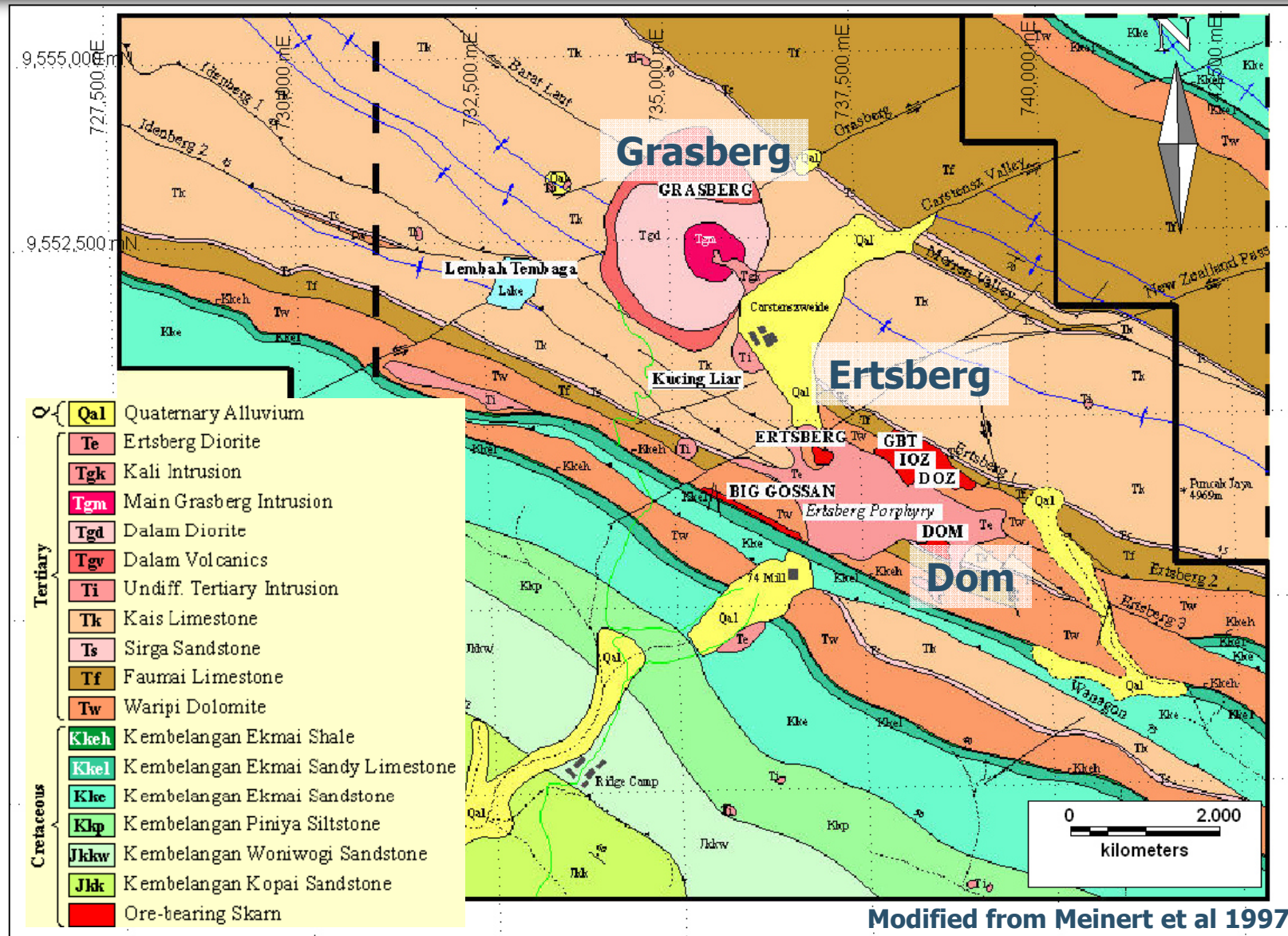
MAGNETIC DATASET

- ☐ Gridded and of appropriate scale
- ☐ Reduced to Pole
- ☐ Inducing Field
- ☐ No need for excellent data quality

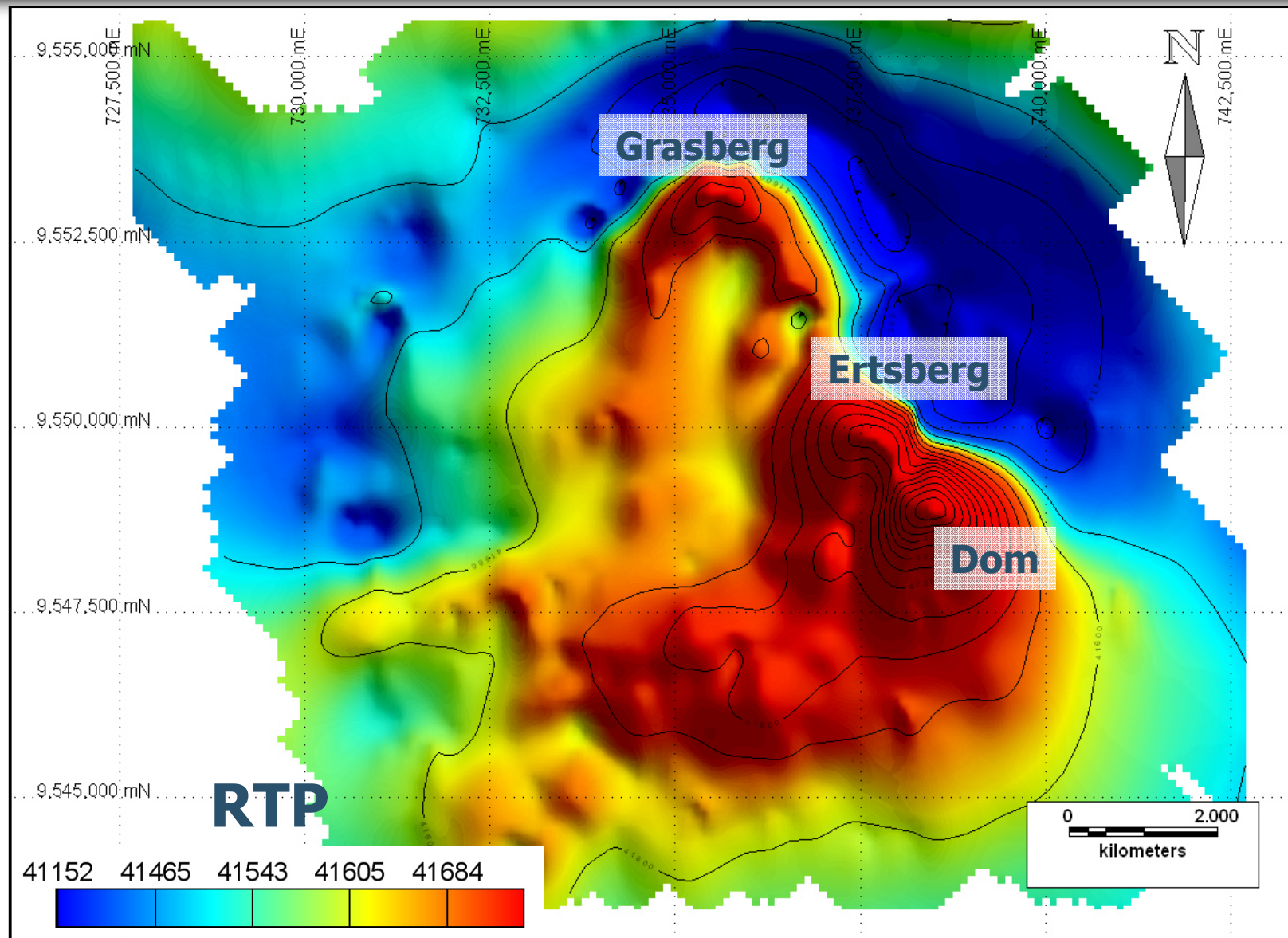
GEOLOGICAL/TARGET SETTING

- ☐ Structural regime – geometry
- ☐ Host lithologies
- ☐ Target characterisation – shape, size, contrast
- ☐ Depth of emplacement

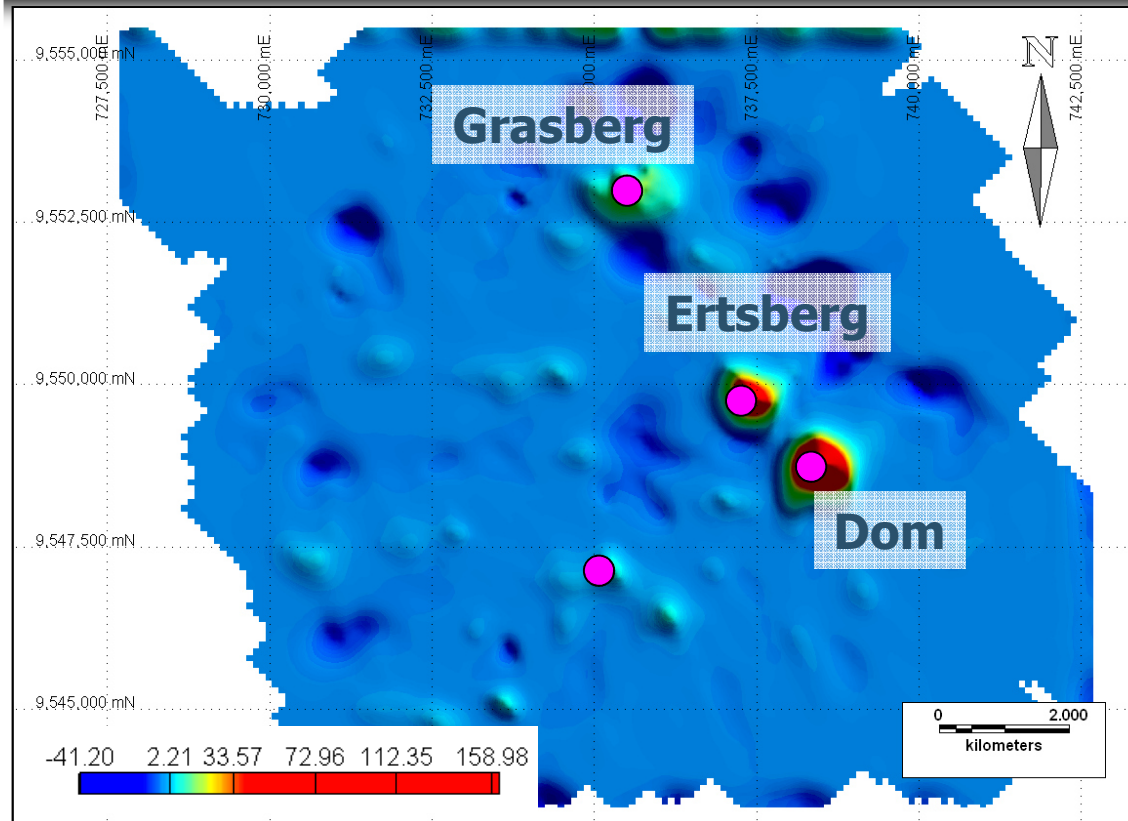
Application - Grasberg



Application - Grasberg



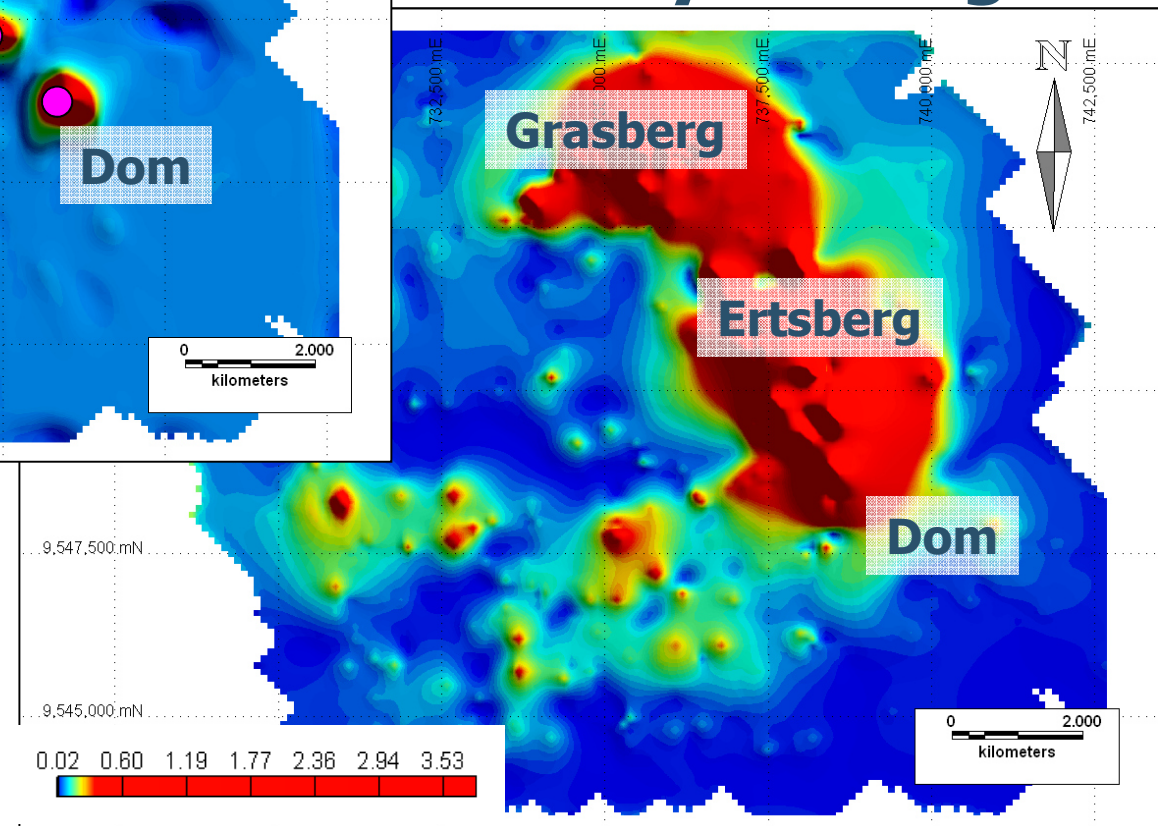
Application - Grasberg



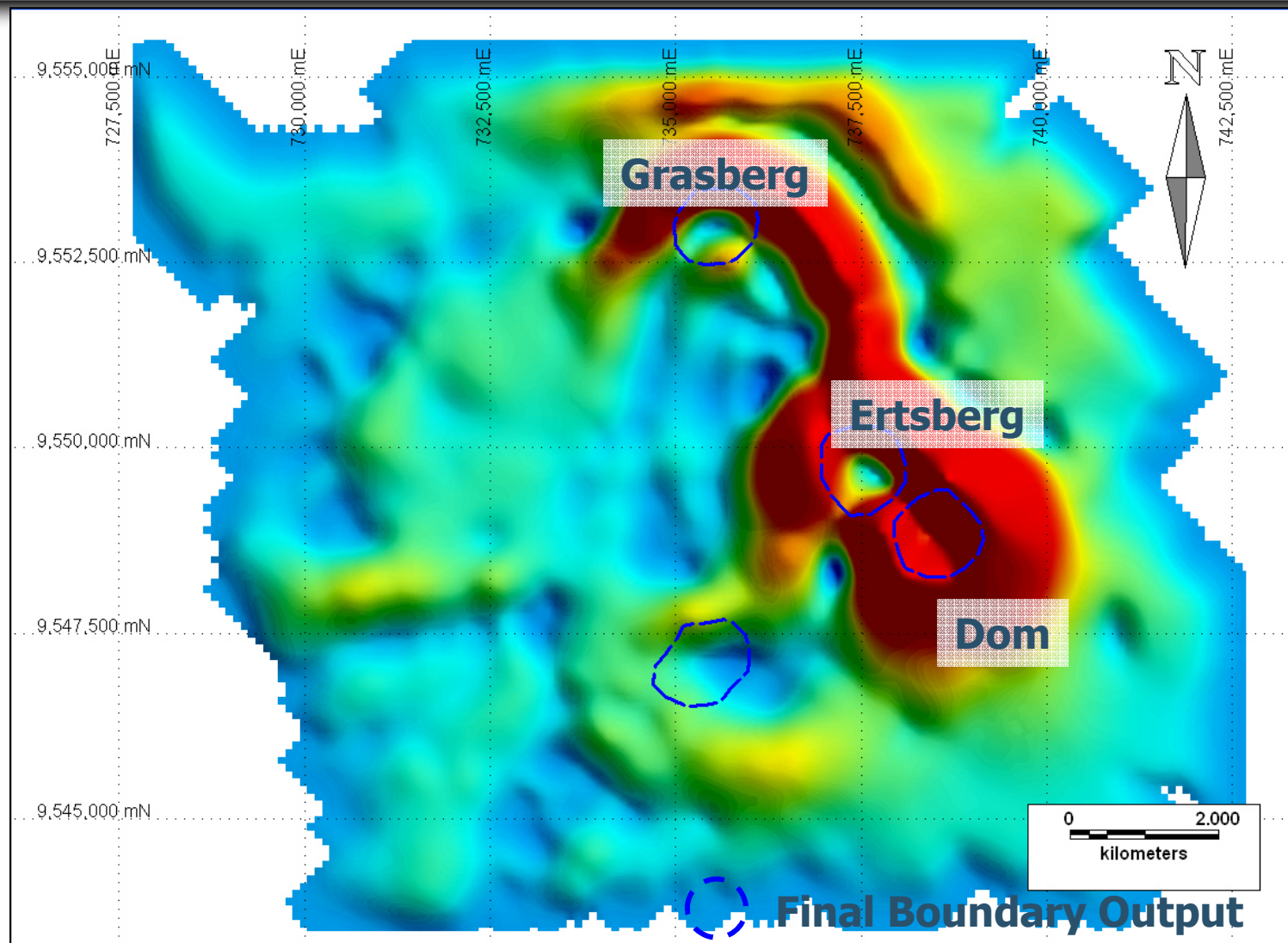
Radial Symmetry

● Central of radial symmetry

Analytical Signal



Application - Grasberg

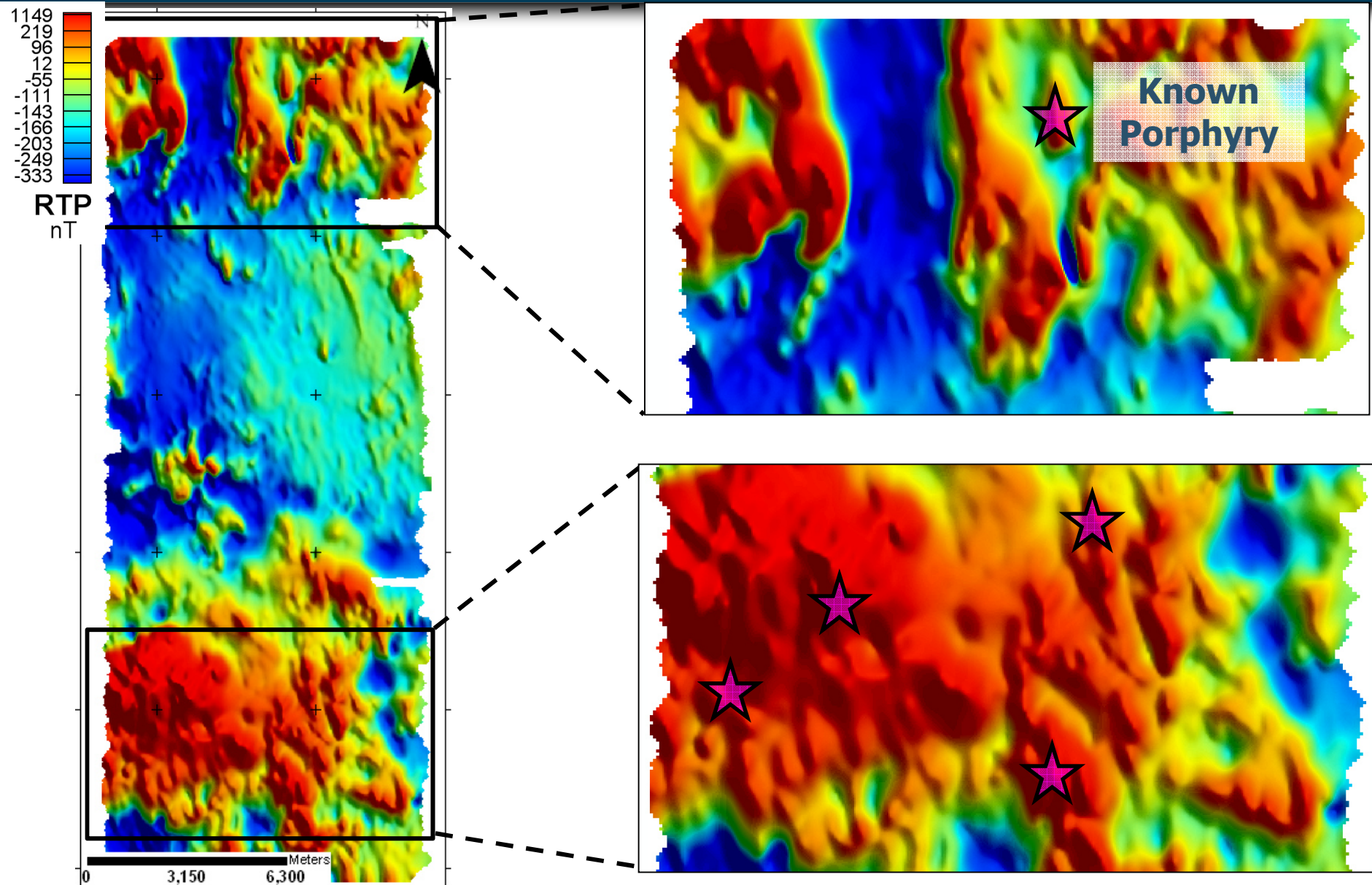


Contrast Enhanced

● Central of radial symmetry



Application - Exploration

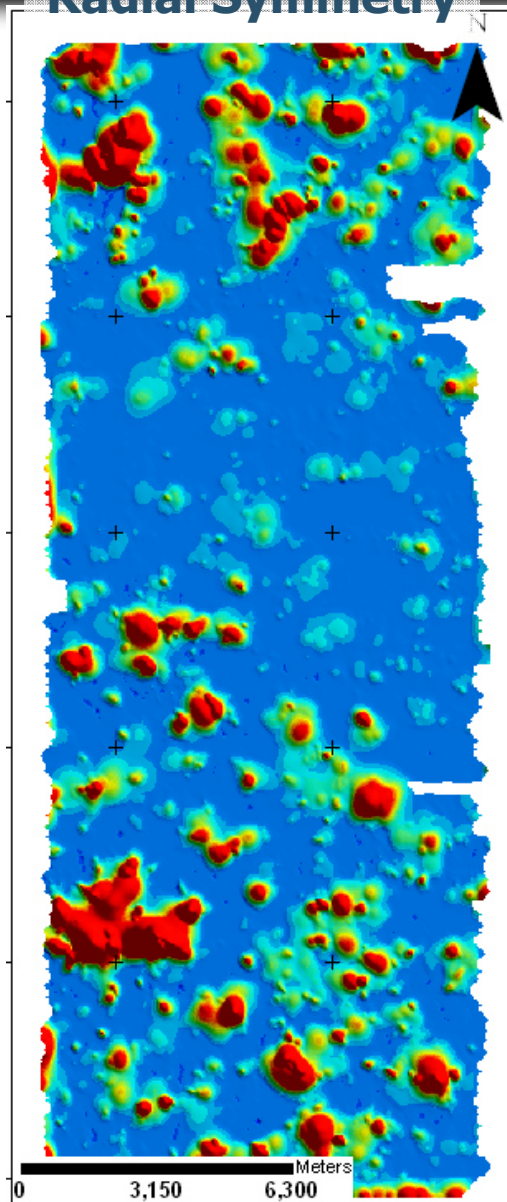


Application - Exploration

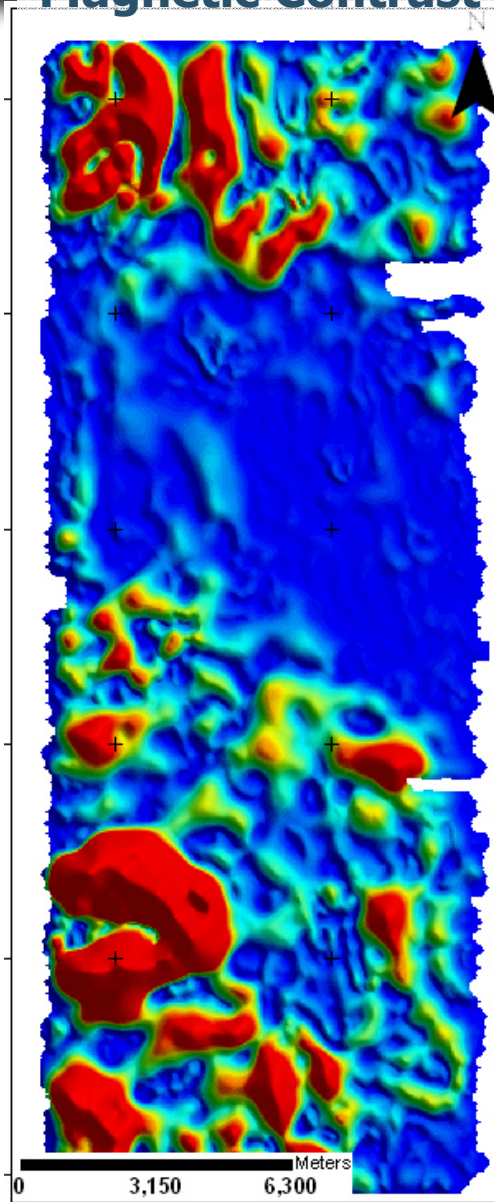


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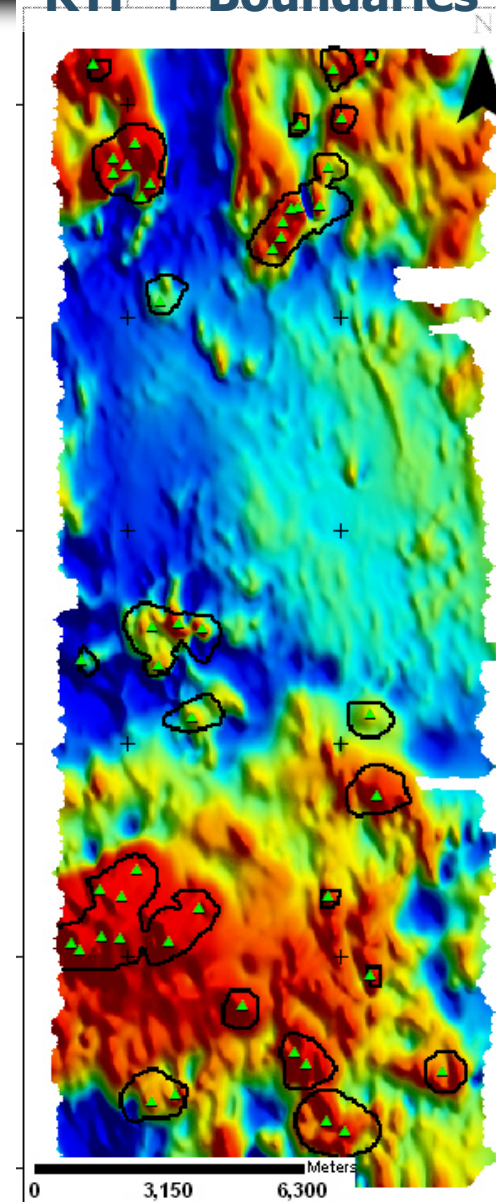
Radial Symmetry



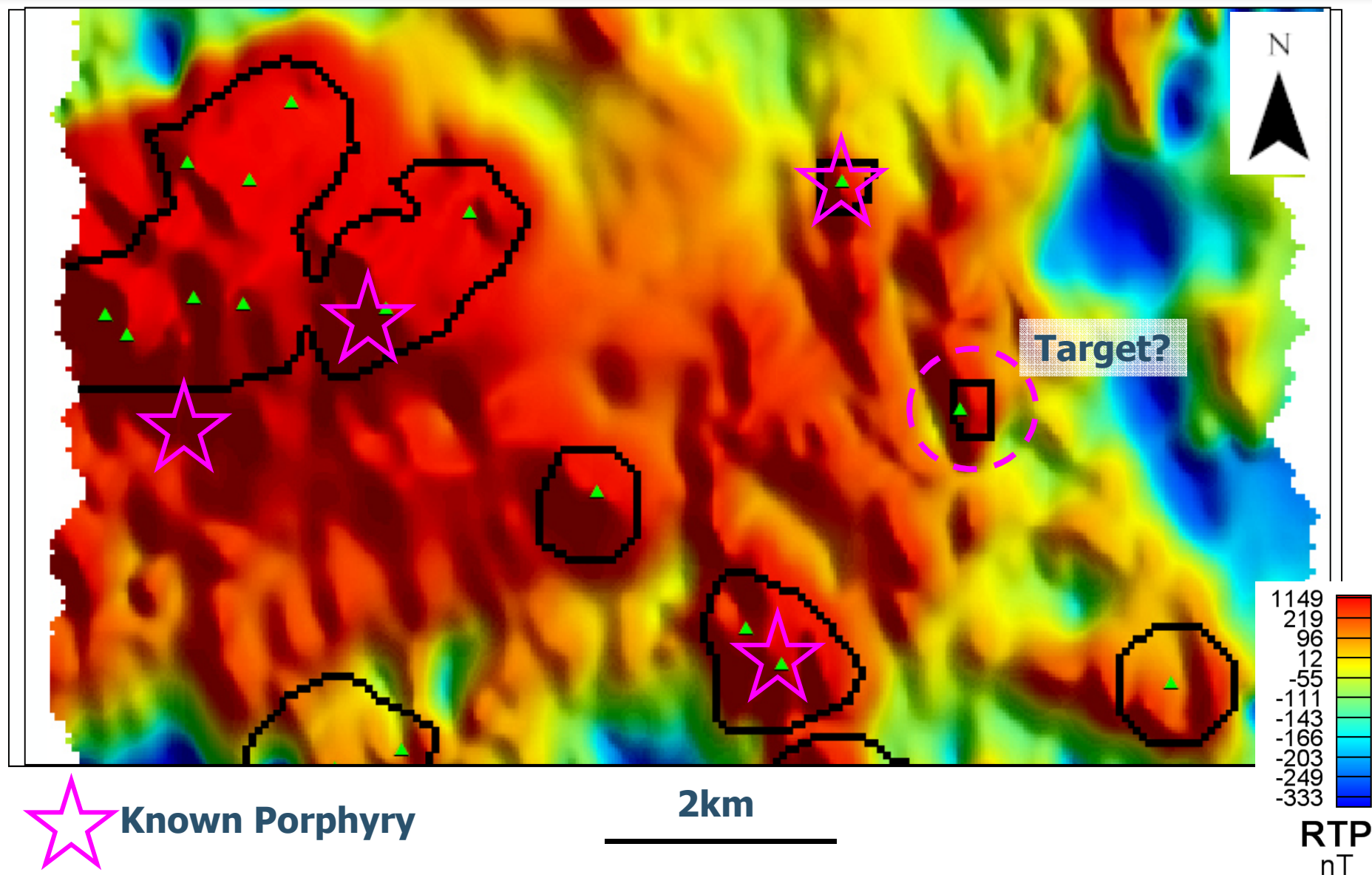
Magnetic Contrast



RTP + Boundaries



Application - Exploration



Filter Limitations



TARGET CRITERIA REQUIRED

- ☐ Requires some knowledge of geology
- ☐ Existing porphyry in data significant

RTP REQUIRED

- ☐ Remanence
- ☐ Low latitudes

LEARNING CURVE

- ☐ Familiarisation time required

Filter Advantages



REJECTS NON-CIRCULAR NOISE

- ☐ Noisy data has reduced impact
- ☐ Differentiate edge gradients

SIGNIFICANT USER INPUT

- ☐ Geologically robust
- ☐ Tuned
- ☐ High rate of prediction for known porphyries

INTERMEDIATE PRODUCTS

- ☐ Simple analysis on the fly
- ☐ Suite of results

Filter Advantages



QUANTIFICATION

- ☐ Integration into GIS packages
- ☐ Qualitative and quantitative

EASE OF USE

- ☐ Operates in Geosoft environment
- ☐ Fast and objective

Conclusions



A successful research project which has given an additional layer for porphyry exploration. Actively applied to all Barrick projects with ground truthing demonstrating continued success.

Acknowledgements



**University of Western Australia and the Centre
of Exploration Targeting**

Barrick Gold Technical Group

My Family