

# AUSTRALIA MINERALS

REALISE THE OPPORTUNITY

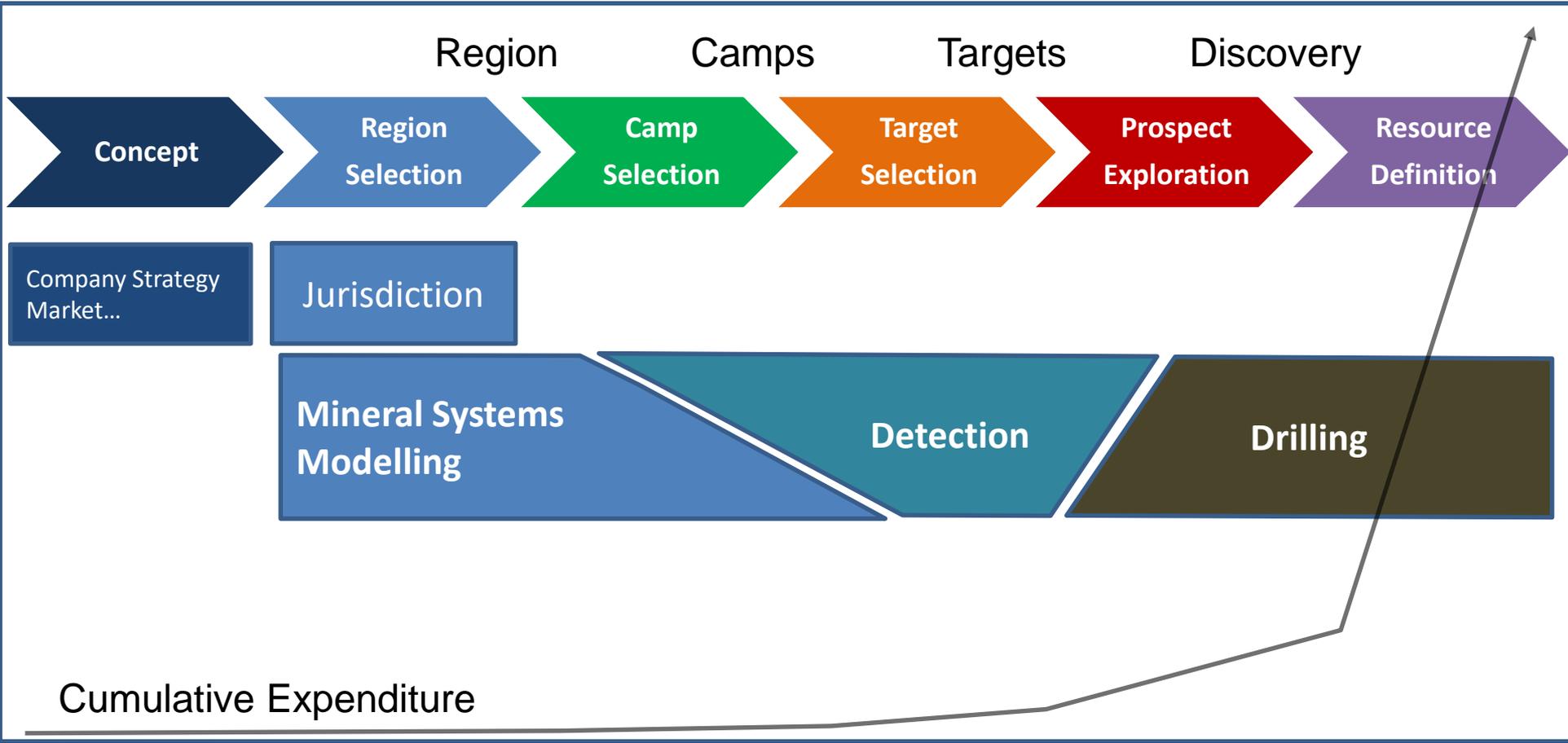
## Mineral systems modelling of sediment-hosted Zn-Pb and Cu-Co mineralisation within the Mount Isa Inlier, Queensland

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Vladimir Lisitsin; Joe Tang; Tony  
Knight (DNRME)

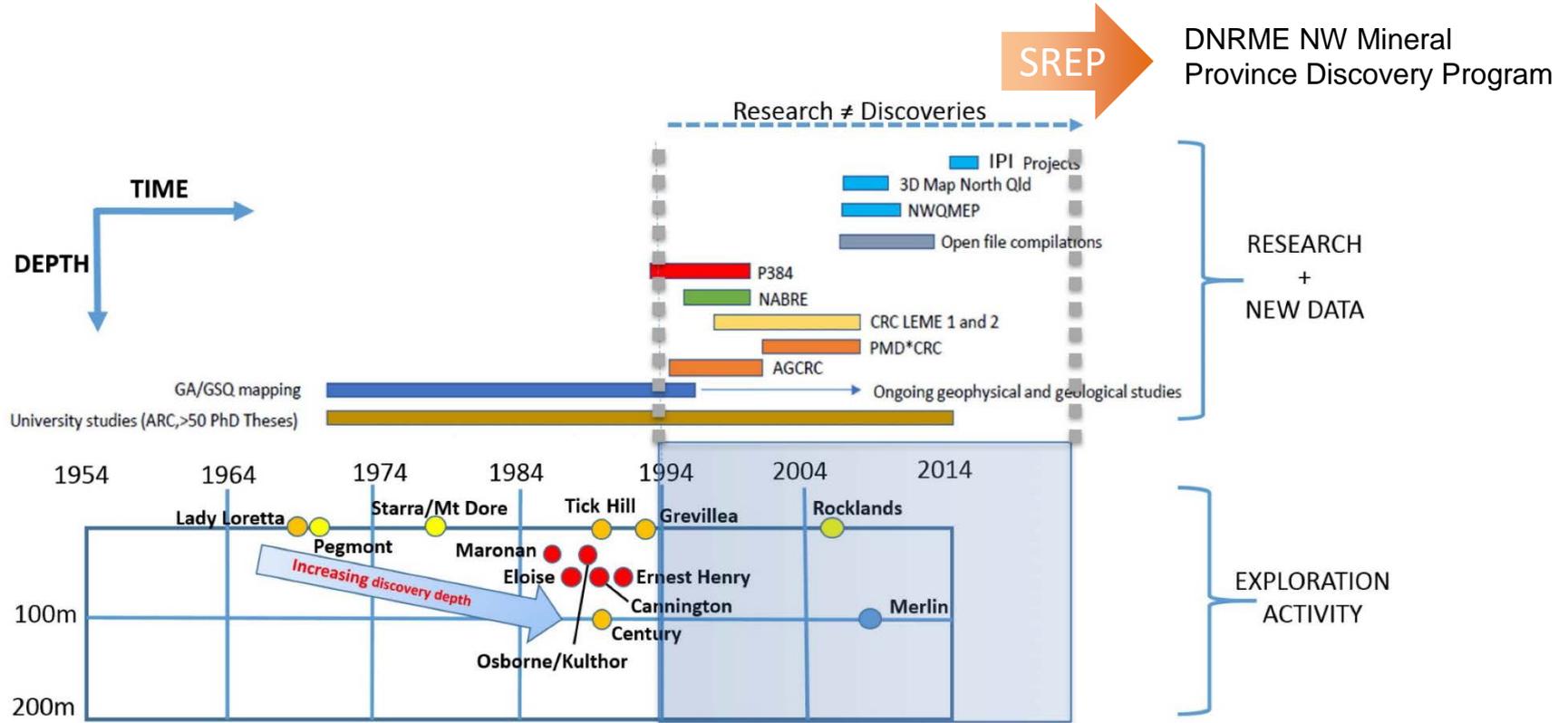
# Summary

- Long history of mineral systems modelling of Zn-Pb and Cu-Co mineralisation – relatively well understood
- Primarily aids camp-scale targeting, and must be complemented by deposit and footprint insights
- Large opportunity to extract additional value from existing studies and data to create value for explorers
- Current SREP NW Mineral Province Discovery Program has this value creation as its central aim

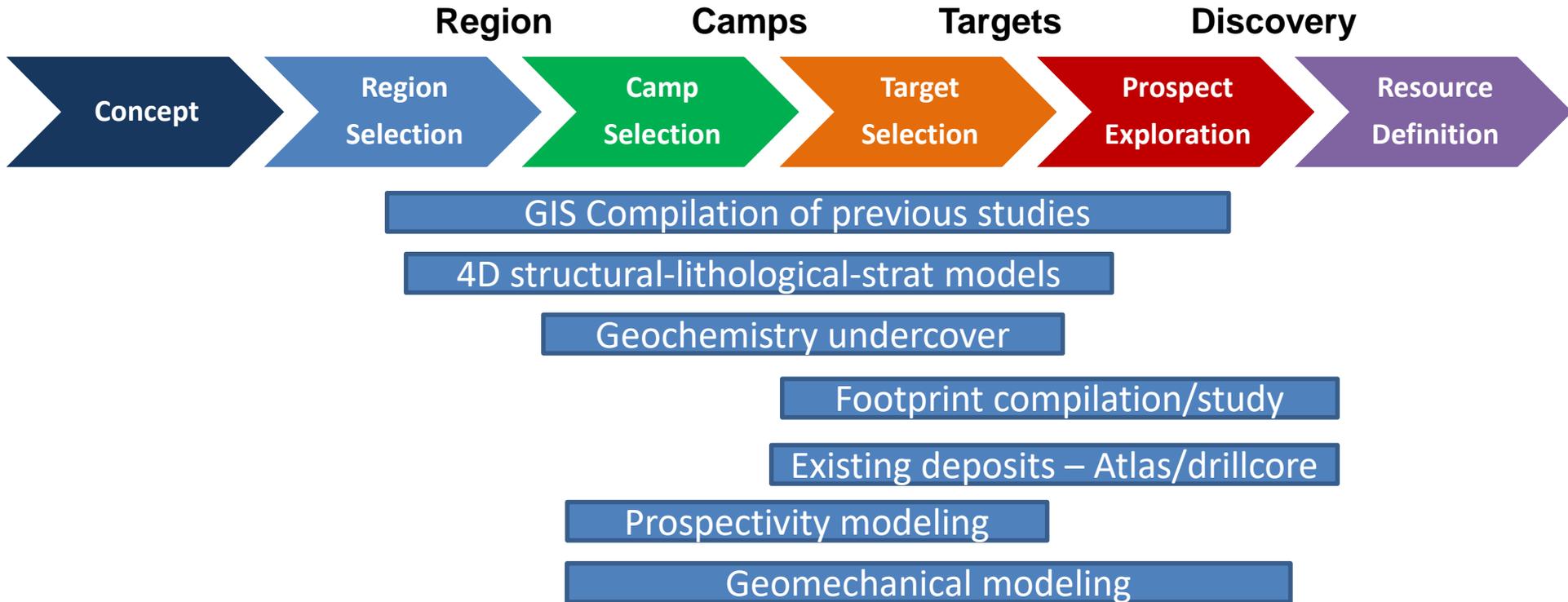




# Recent history – discoveries and studies



# NW Mineral Province – value from existing and new data





Concept

Region  
Selection

Camp  
Selection

Target  
Selection

Prospect  
Exploration

Resource  
Definition

Mineral System Component I:  
metal and fluid sources

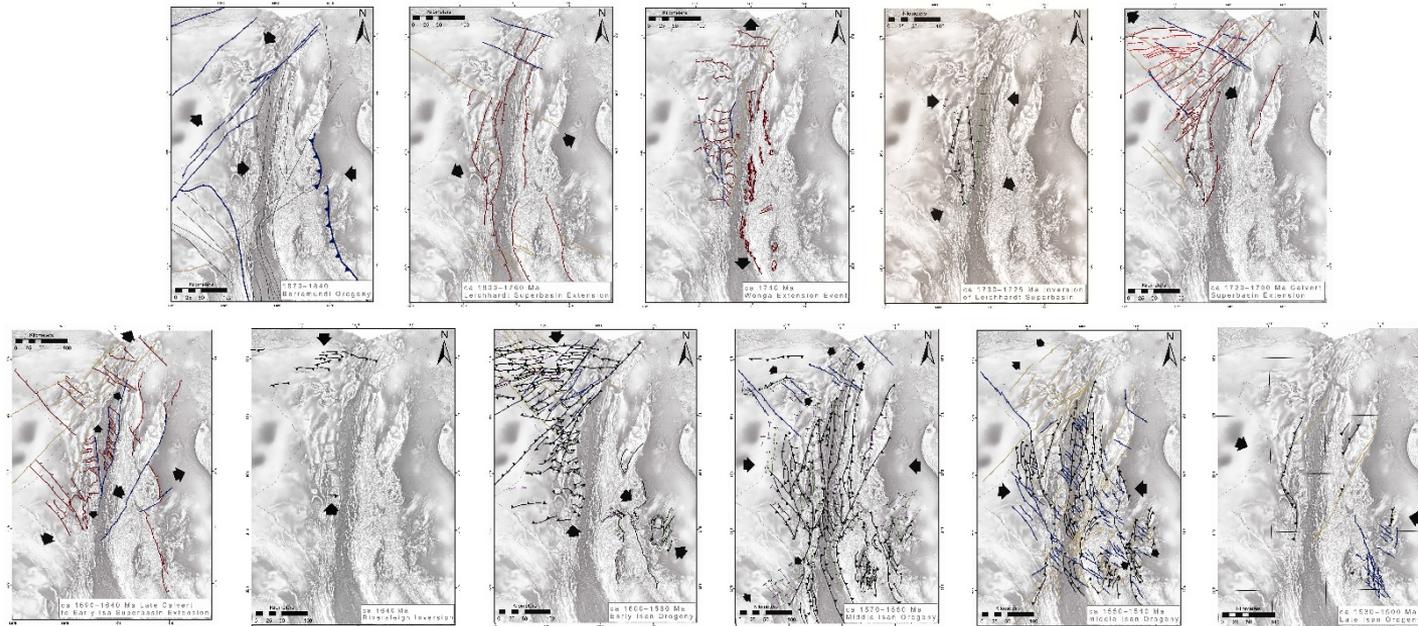
Mineral System Component II:  
triggers and drivers

*Both well-addressed by Previous Speakers...  
(clearly in place for the NW Mineral Province)*

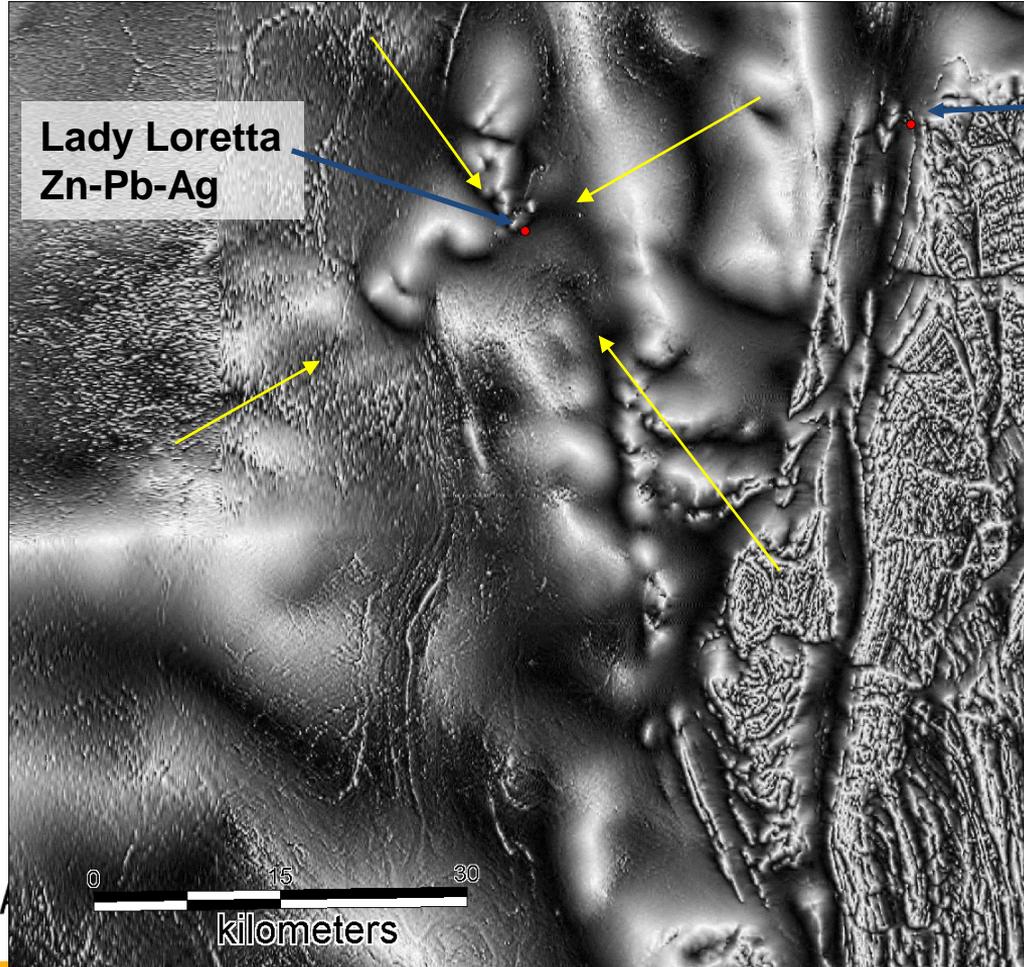
# Mineral System Component III: Architecture and fluid pathways

# Regional Structure

- Relatively well-studied and understood



# Zn-Pb-Ag targeting criteria

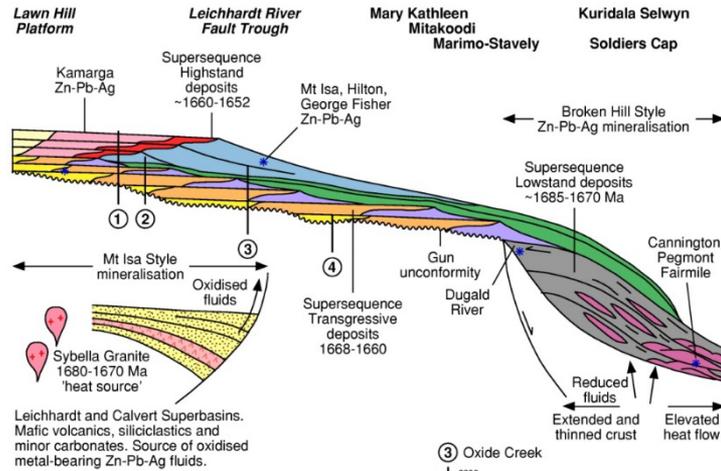


## Gunpowder Cu

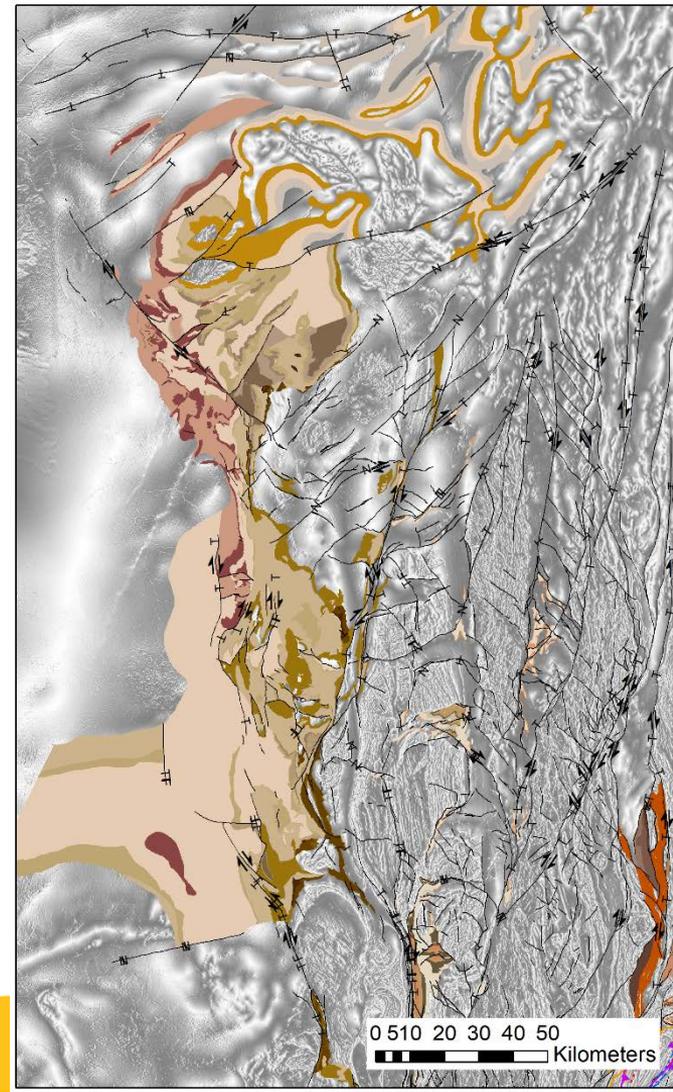
- Zn-Pb-Ag - Important features in magnetics
  - Identify basin-stage and pre-existing basement structures
  - Major intersection zones focus formation of thick, carbonaceous basins and subsequent fluid flow
  - Must use a combination of geology and magnetics to be effective

# Favourable Hosts

- Gun, Loretta and River supersequences

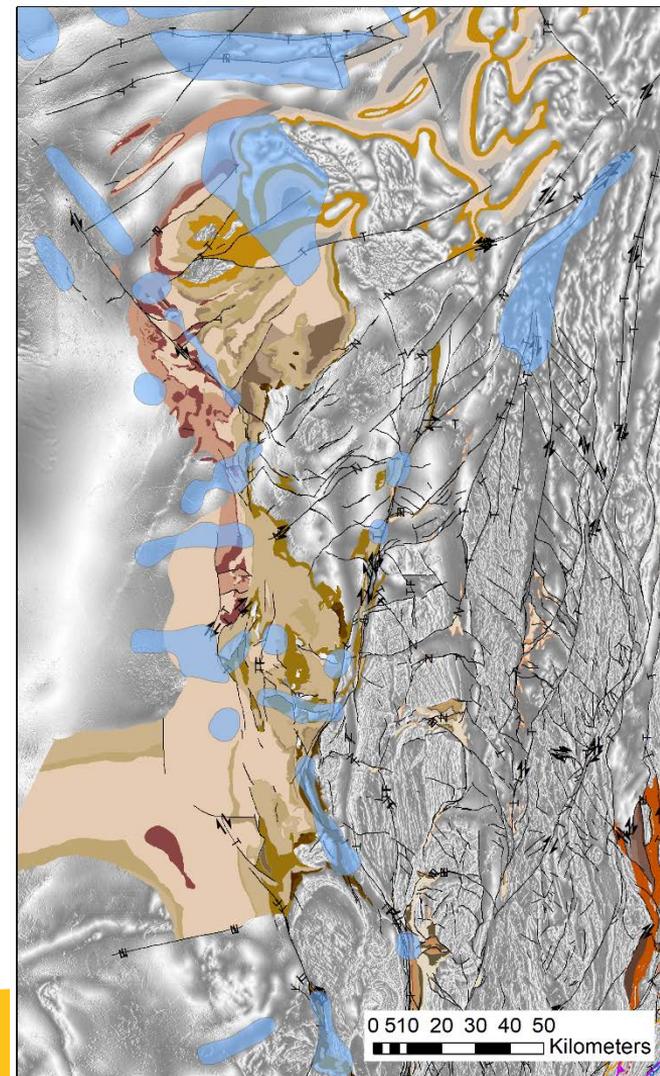


(Huston, 2018)

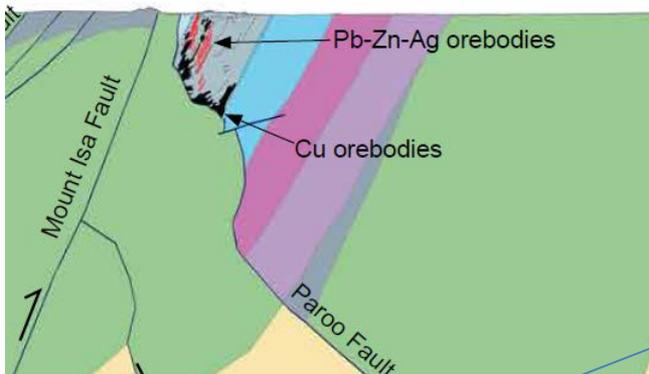


# Camp-scale target zones

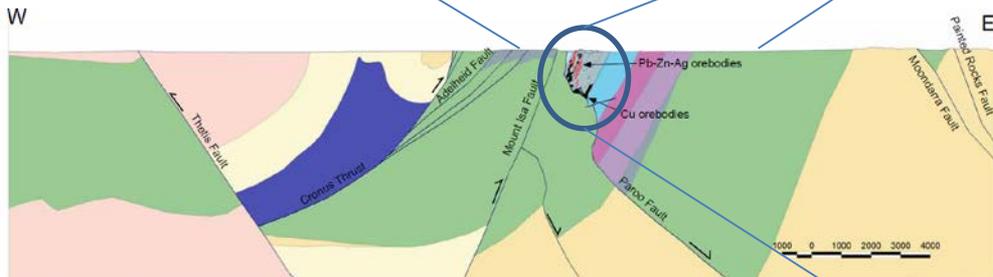
- Intersections of basin-stage faults
- Favourable stratigraphy
- Followup
  - Dense, conductive pyrite haloes
  - Halo geochemistry



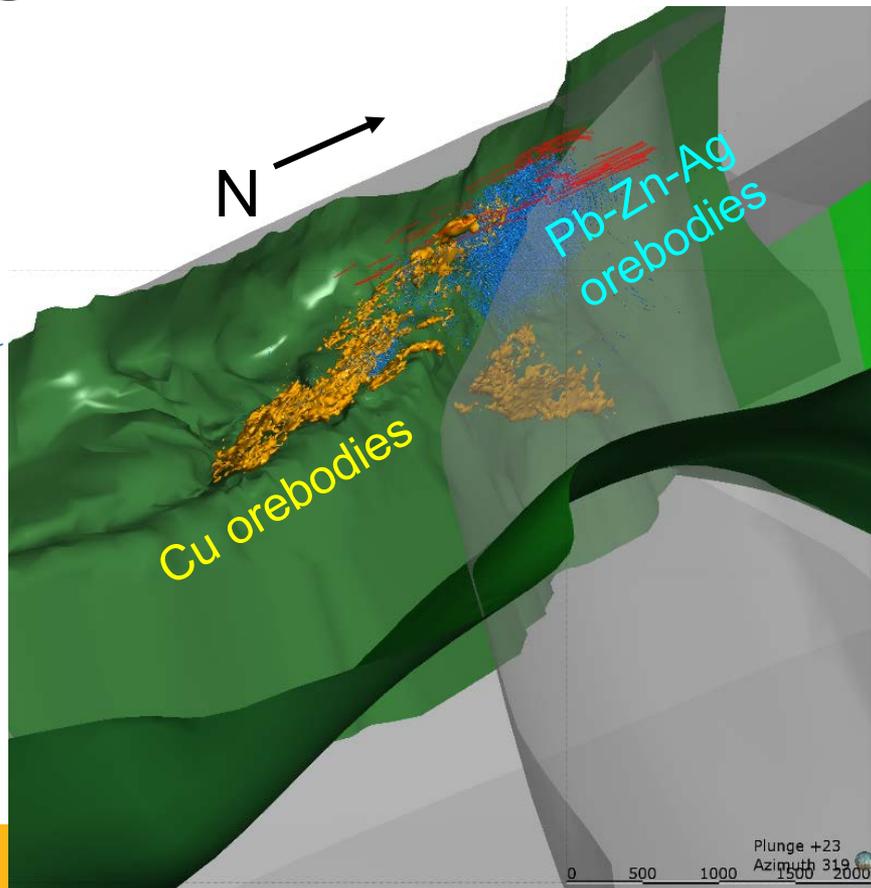
# Regional Setting – Isa Cu (Co)



50% Shortening



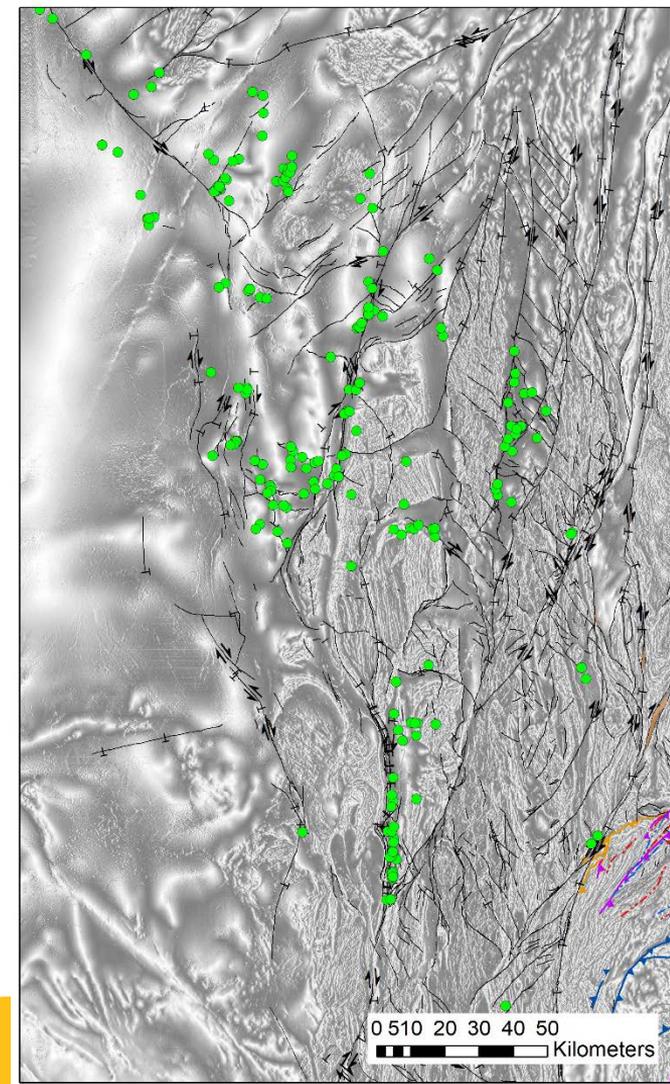
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Plunge +23  
Azimuth 319

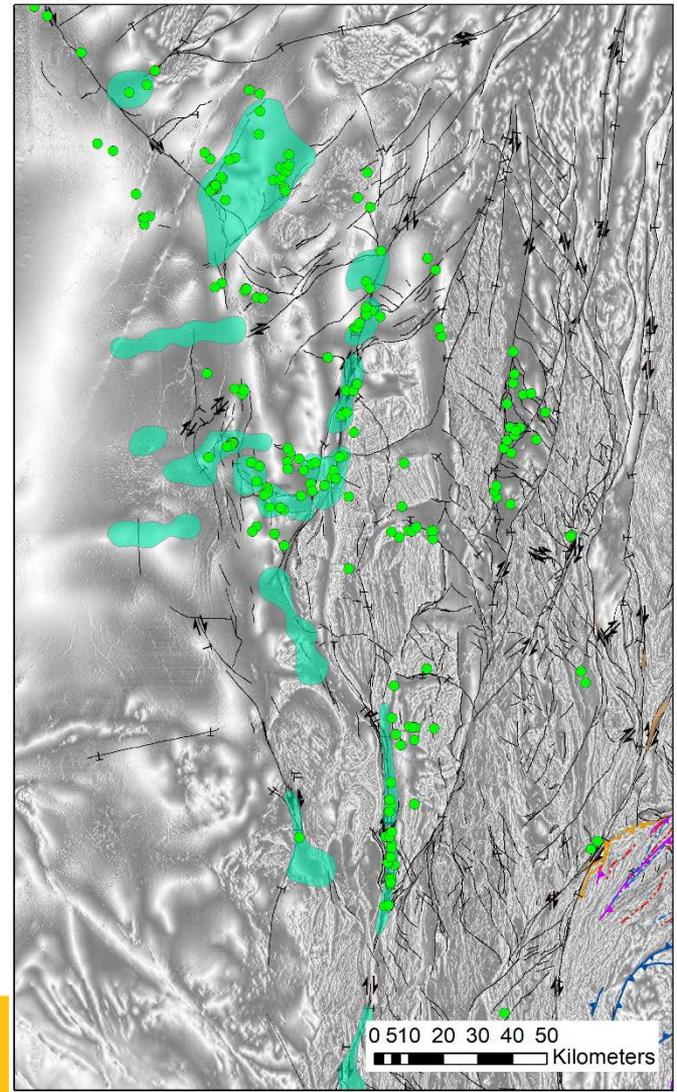
# Cu (Co) occurrences

- Strong structural control
- Close to mafic volcanics



# Cu-Co target zones

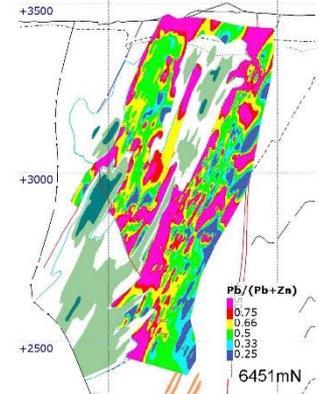
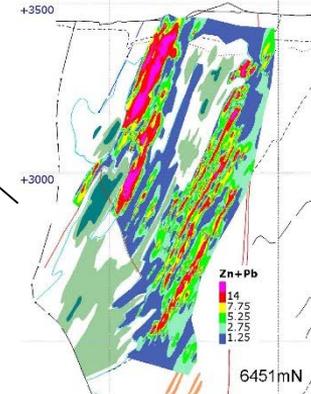
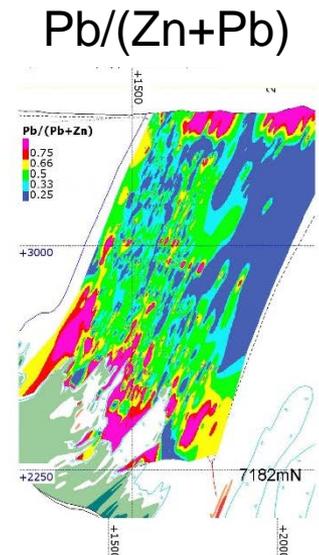
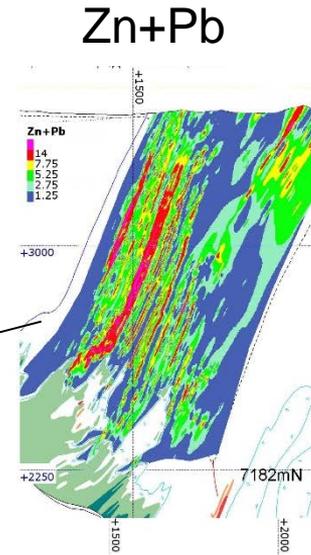
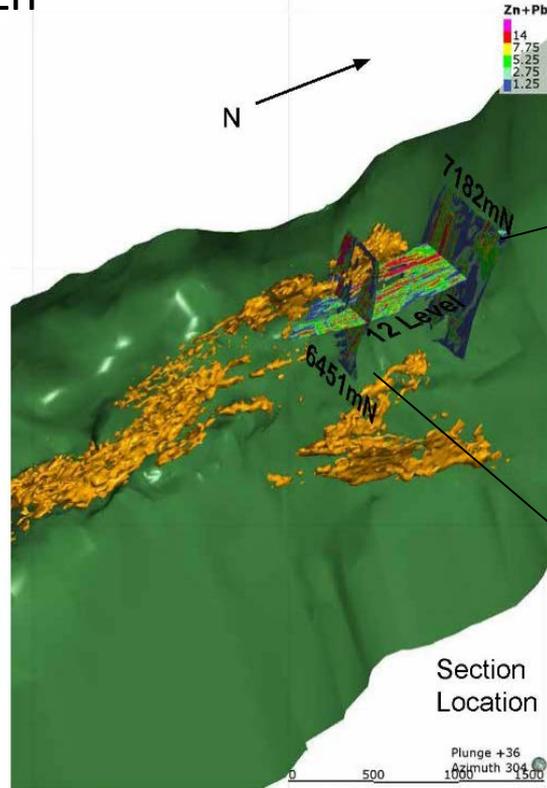
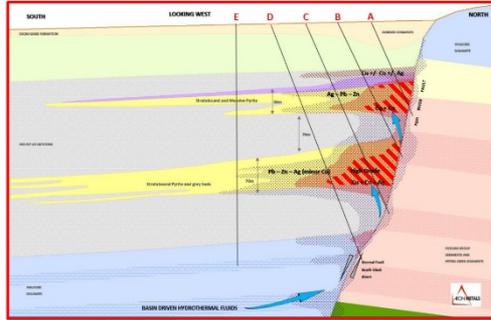
- Strong structural control
- Close to mafic volcanics
- Carbonaceous host
- High strain zone during E-W shortening event



# Mineral System Component IV: Depositional mechanisms

# Cu – Pb – Zn zoning

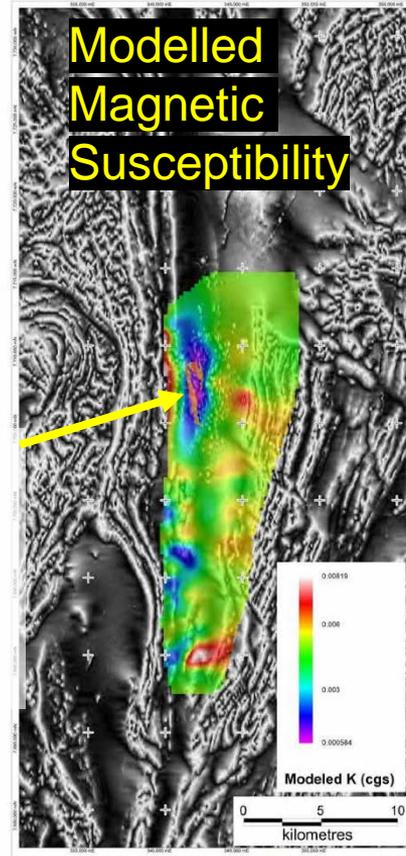
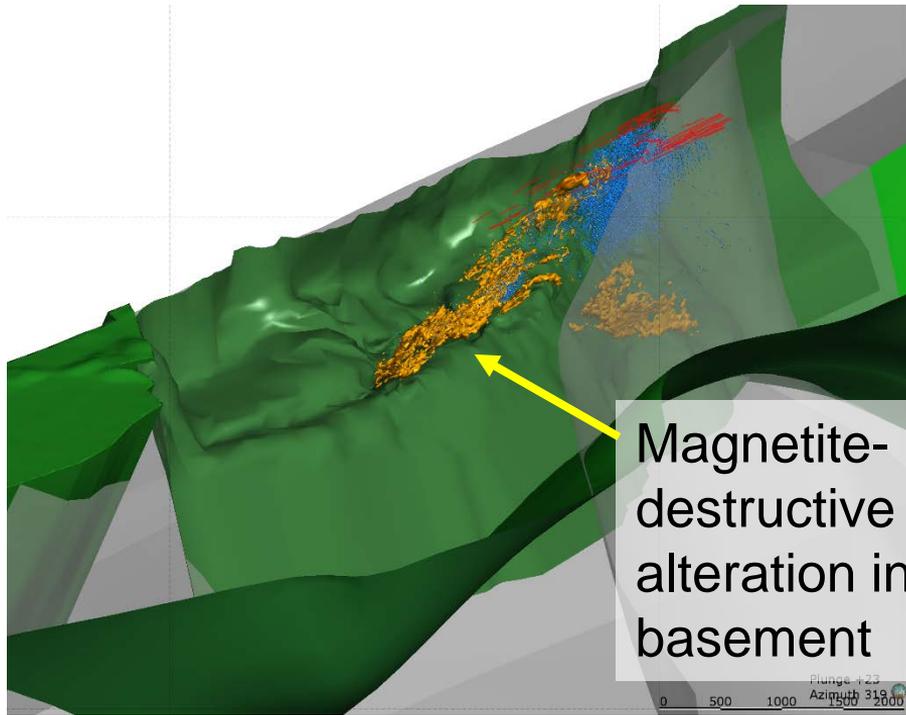
- Current Cu and Pb-Zn consistent with a single zoned system



of Walford Creek (less studied)  
 Aeon Metals (2017)  
[www.aeonmetals.com.au](http://www.aeonmetals.com.au)  
 (Dan Johnson)

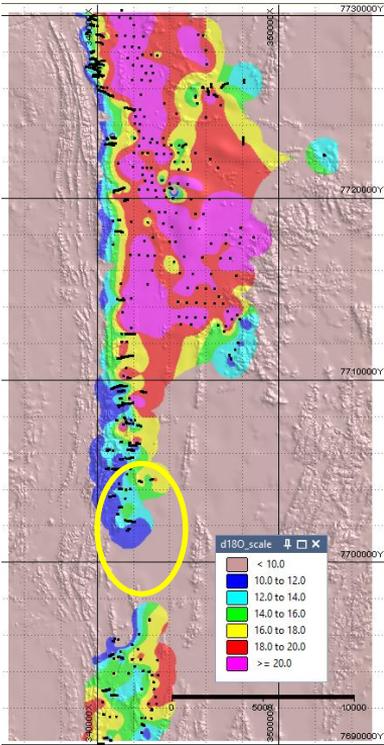
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# Basement Alteration



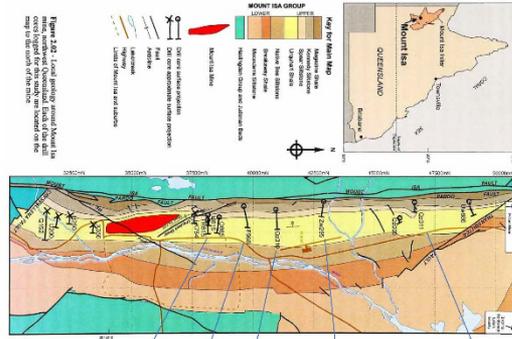
# Isa System Halo Zoning

$\delta^{18}O$

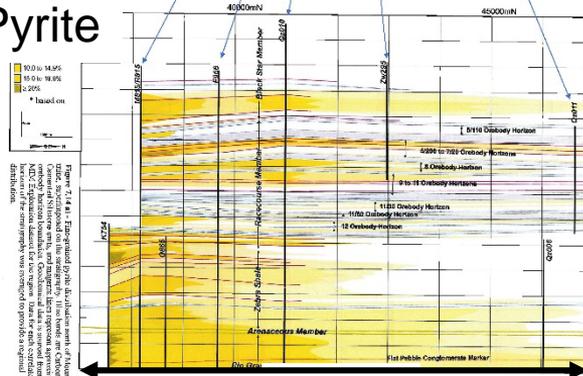


(Waring, 1991)

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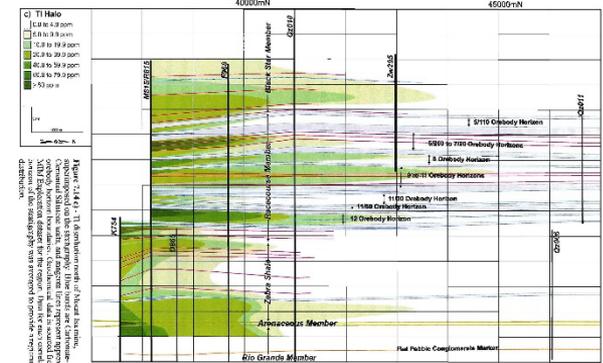
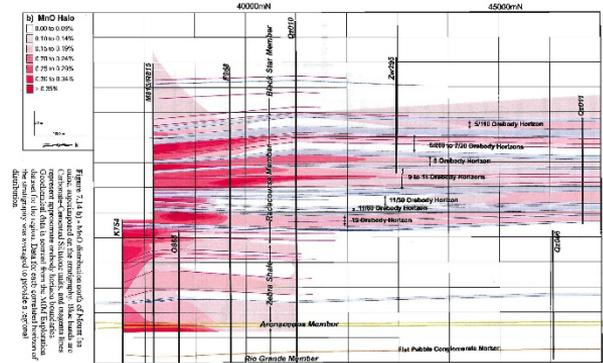


Pyrite



10km

Manganese



(Painter, 2003)

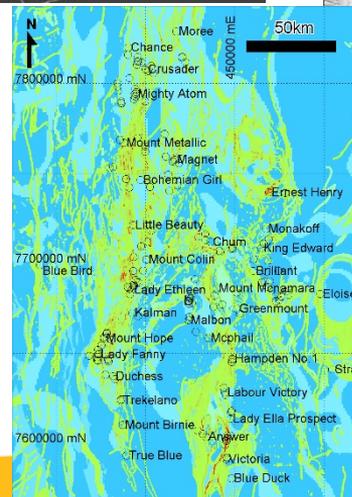
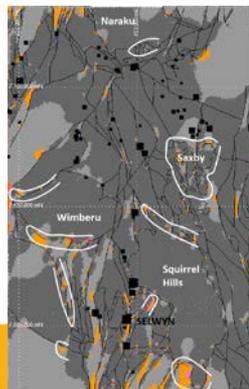
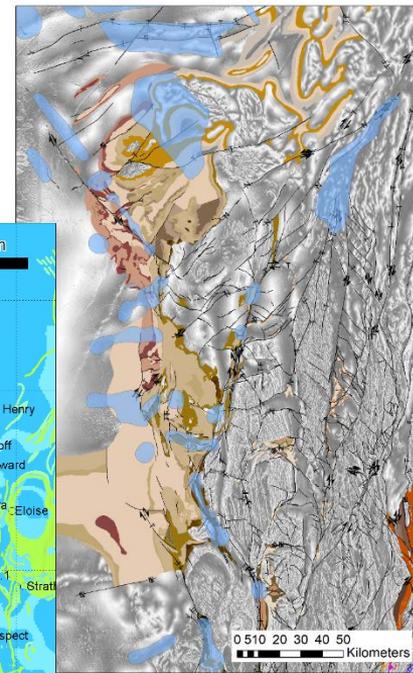
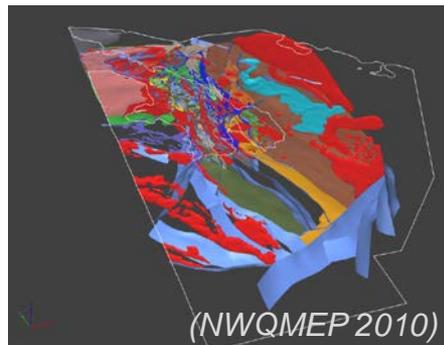
Thallium

# Depositional mechanism

- Structural control
  - Syn to pre-basin fault geometries, focusing sub-basin development and fluid flow
- Depositional control
  - Redox control of carbonaceous lithologies, with permeability enhanced within rheologically heterogeneous rhythmites

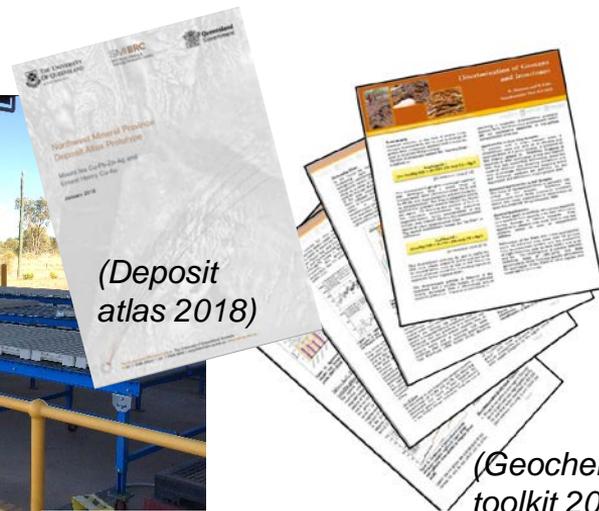
# Toolkit – camp selection

- Solid geology
- 4D tectono-stratigraphic models from geology and geophysics
- Targets based on prediction of sites of sub-basin formation and fluid focusing
- Innovative predictive models – data analysis/geomechanical



# Toolkit – camp exploration

- Deposit atlas and core library – halo recognition
- Electrical geophysics (eg MT for mapping of pyritic halo)
- Geochemical toolkit – targets under cover
- Litho-geochemical and mineralogical halo analysis
- Geomechanical modelling



*(Deposit atlas 2018)*

*(Geochem toolkit 2018)*

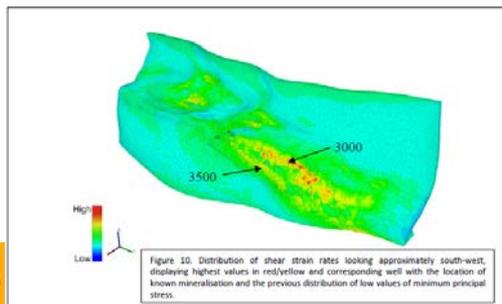
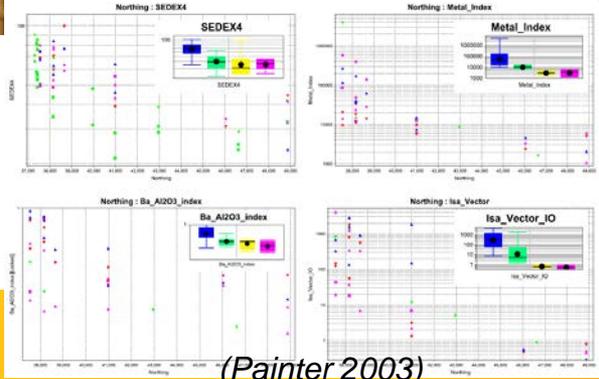


Figure 10. Distribution of shear strain rates looking approximately south-west, displaying highest values in red/yellow and corresponding well with the location of known mineralisation and the previous distribution of low values of minimum principal stress.



*(Painter 2003)*

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