Base metal mineralisation of the Rover field
Northern territory

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**Objective:**
Understand the *framework geology* and *mineral systems* of the entirely covered Rover field.
Location and geological background

Modified after Fraser et al. 2008
Rover field geological framework

Northern zone
- Positive Bouguer anomaly associated with mafic rocks, andesites and dacites

Central zone
- Stippled magnetic anomalies associated with magnetite-rich horizons
- Intermediate to felsic coherent volcanic rocks with minor siliciclastic facies
- E-W trending foliation

Western zone
- Negative Bouguer anomaly
- Dominated by fractionated felsic volcaniclastic and siliciclastic rocks
- N-S trending shear zones overprinting E-W foliation

Mineral deposits
Rover field geological framework

Central zone

Western zone

Northern zone

TDD01

Western zone

Central zone

Gravity BA
Value μm/s²
1099.68
1593.07

fault
dextral
Mag_trends_lines
sinistral
dykes

GDA2020 MGA Zone 53

A21-241.ai

NORTHERN TERRITORY GOVERNMENT
Lithology and petrology of drillhole TDD001, Bluebush area, Warramunga Province. NTGS Record 2021-006

Photomicrograph of mineralisation from TDD01

1.76 Ga mineralised Bluebush basalt

Apatite associated with mineralisation has a different REE pattern than apatite in non-mineralised basalt
Mineral systems

Magmatic Ni–Cr–Cu at Bluebush (northern zone)
Mineral systems

Base metal mineralisation in Explorer 108 and Curiosity

- Zn-Pb-Ag ± Cu-Au mineralisation with large alteration footprints

- Hosted in ca 1840 Ma fractionated volcanoclastic rocks (Yungkulungu Fm | Ooradidgee Gr)

- Fe-poor sphalerite and galena associated with hematite suggests oxidising conditions (at or above MH buffer zone)

- Low to moderate salinity

- Homogenisation temperatures of ~210°C

- Sulfide $\delta^{34}S \pm 10\%_o$ >> Magmatic-sourced sulfides (leached from host volcanic rocks)
Mineral systems

- **Base metal mineralisation in Explorer 108 and Curiosity (western zone)**

![Diagram of mineral systems and base metal mineralisation in Explorer 108 and Curiosity](image)

**Similarities with VHMS systems:**

- Mineralisation concentrated in the contact between two volcaniclastic packages
- Exhalites (?) in the contact between the two packages
- Cu-Au stringers below Pb-Zn-Ag semi-massive sulfide mineralisation
- Large alteration footprint (including phengite in hangingwall)
- Evidence of zone refinement (chalcopyrite replacing sphalerite)
- Sub-seafloor sulfide replacement (Cu-sulfides precipitating on detrital pyrite)

- Bornite and chalcocite rims on pyrite grains in host rock
- Cu-sulfide stringer veins below main Pb-Zn zone.
**Geochronology**

**Explorer 108**

In-situ Rb-Sr (hydrothermal biotite) 1.78 Ga

VHMS syngenetic phase?

**Curiosity**

In-situ hydrothermal apatite U-Pb 1.73 - 1.74 Ga

Zircon SHRIMP U-Pb ca 1730 Ma

Epigenetic mineralisation?
Modified after Fraser et al. 2008

1.78 Ga

- VHMS mineralisation (syngenetic phase ?)

1.76 Ga

- MORB basalt + Ni-Cu mineralisation

1.73 Ga

- Rover field base metals remobilisation (epigenetic phase)
Summary

- Deposition of 1.85–1.84 Ga Yungkulungu Fm (Ooradidgee Gr).
- ca 1.78–1.73 Ga Base metal mineralisation in the western zone
- ca 1.76 Ga juvenile magmatism in the northern zone (crustal-scale discontinuity)

Continuation of extensional Murchison Event?
Thank you

Questions?