REE-Zr-Nb enriched alkaline-silicate magmatic systems in Victoria

AIG Victoria Minerals Roundup

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Geoscientist – Critical Minerals

RESOURCES VICTORIA

We acknowledge and respect Victorian Traditional Owners as the original custodians of Victoria's land and waters, their unique ability to care for Country and deep spiritual connection to it.

We honour Elders past and present whose knowledge and wisdom has ensured the continuation of culture and traditional practices.

Resources Victoria is committed to genuinely partnering with Victorian Traditional Owners and Victoria's Aboriginal community to progress their aspirations.

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Collaboration

GEOLOGICAL SURVEY OF VICTORIA

CSIRO

Australian Government
Geoscience Australia

Curtin University

Alkaline silicate igneous rocks

- (Per)alkaline-silicate igneous rocks enriched in REE + HFSE elements
- Potential source of REEs, Zr, Nb, Sc, Y, Ta & Hf
- Fractionated mantle melts – extension

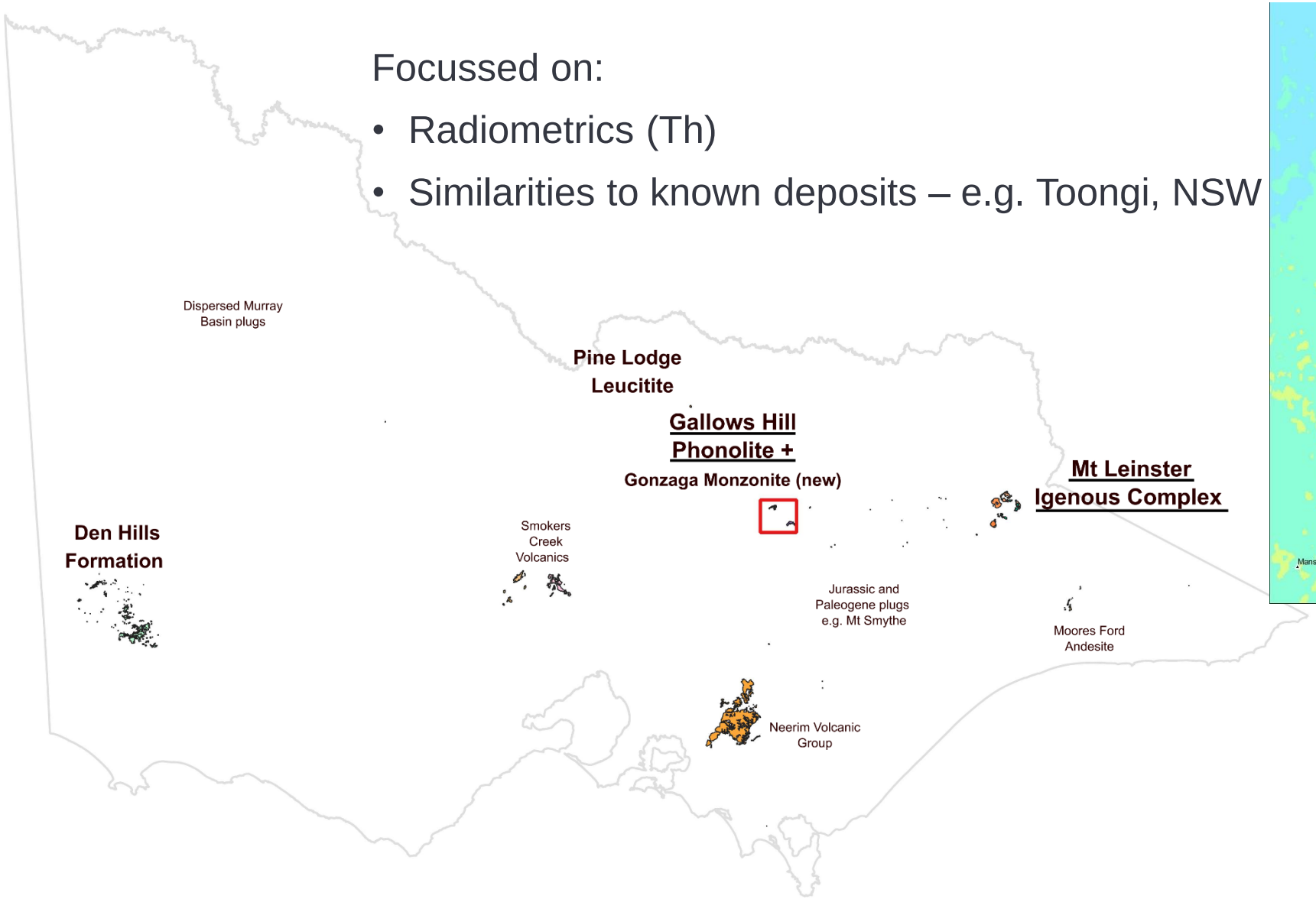
Iridescent sanidine phenocryst. Brothers Syenite. Benambra.

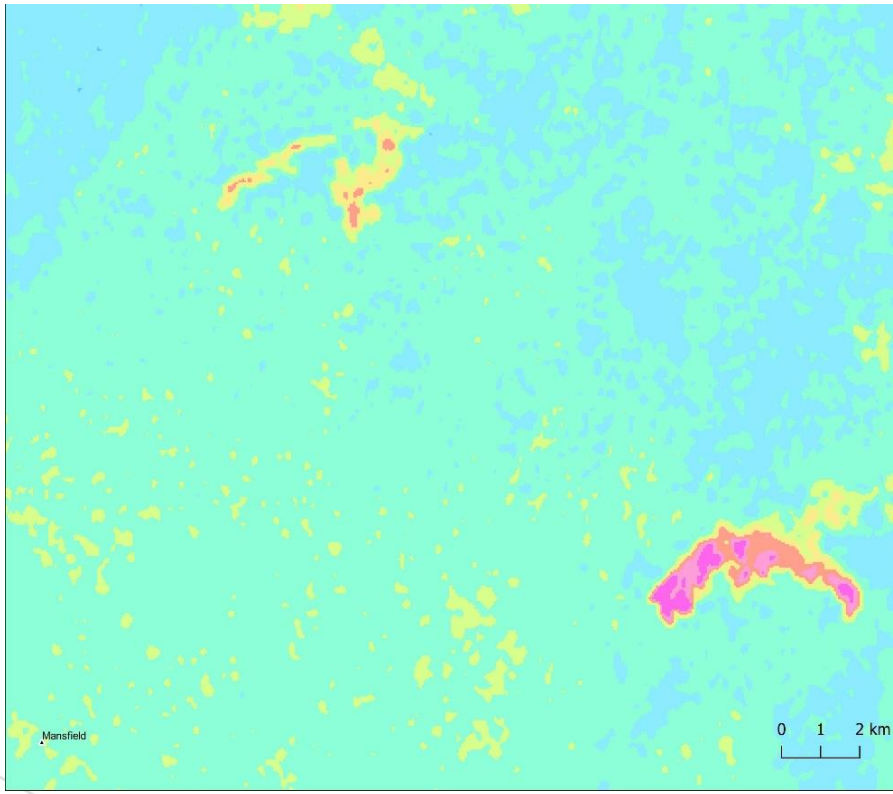
Altered trachyte. Den Hills Formation, Coleraine.

Victorian systems

Focussed on:

- Radiometrics (Th)
- Similarities to known deposits – e.g. Toongi, NSW





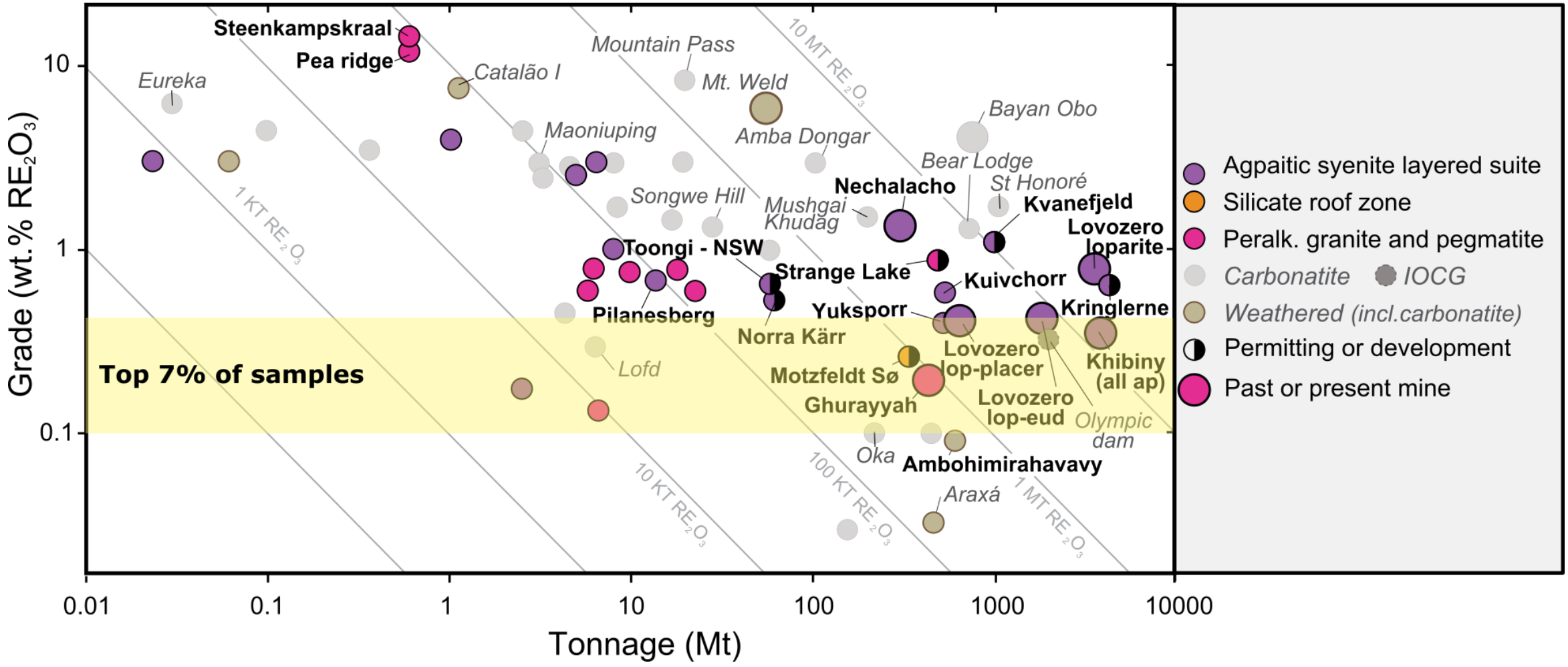
Th radiometric image. Gonzaga Monzonite and Gallows Hill Phonolite.

Geochemistry highlights

- Reconnaissance sampling – comprehensive geochemistry
- 71 samples across 5 systems
- 0.35% total rare earth oxide (TREO)
- 0.35% Zr_2O_5
- 0.1% Nb_2O_5

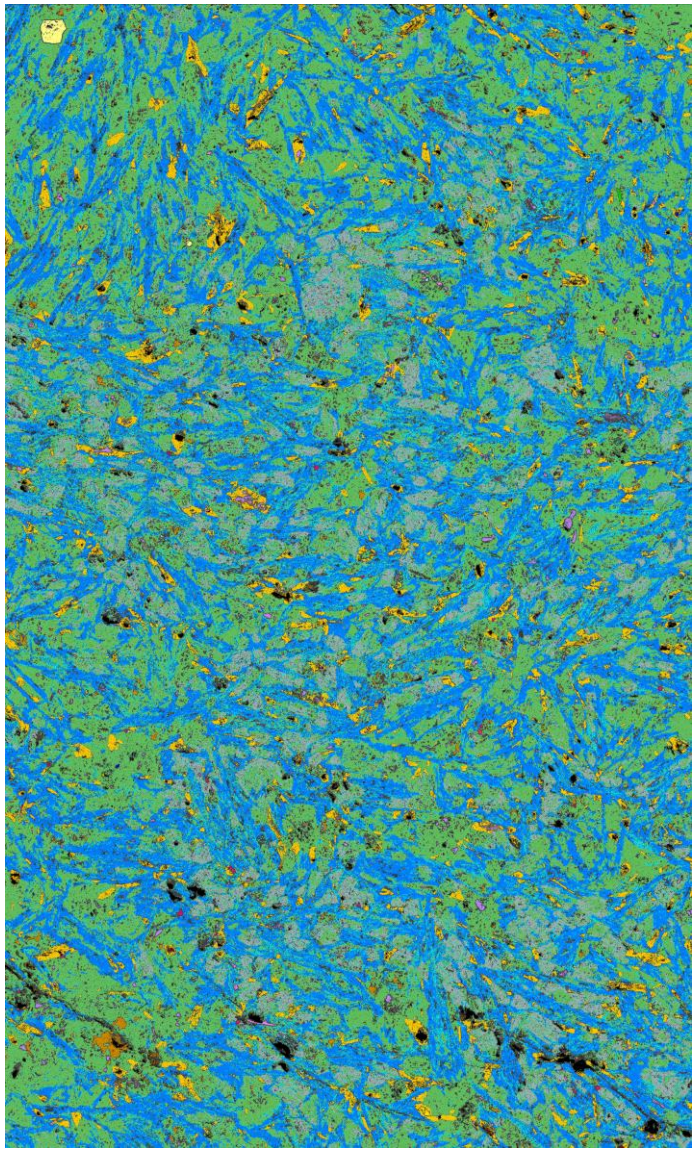
Gonzaga Monzonite

Comparison to worldwide resources



Modified from Beard *et al* 2023

CSIRO characterisation

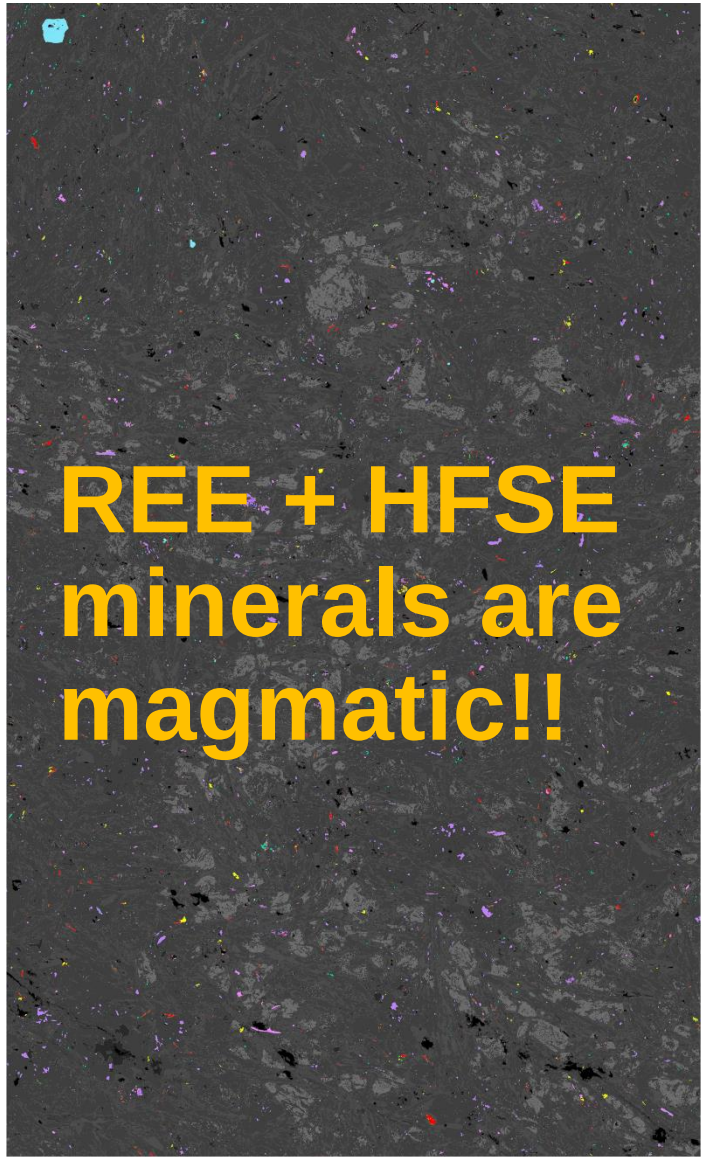


1 mm

- Jadeite
- K feldspar
- Sanidine
- Nepheline
- Albite
- Aegirine-augite
- Muscovite
- Carbonates
- Apatite
- Rutile (Nb, Fe)
- Pyrite
- Mongolite
- Biotite
- Vlasovite
- Fluorides
- Corundum
- Pyrochlore
- Zr Ti silicate (unidentified)
- Chlorite
- Sphalerite
- Loparite-(Ce)
- Monazite-(Ce)
- Ilmenite (Mn)
- Eggletonite
- Lorenzenite
- Burpalite
- Lorenzenite (Nb rich)
- Kupletskite
- Lovozerite

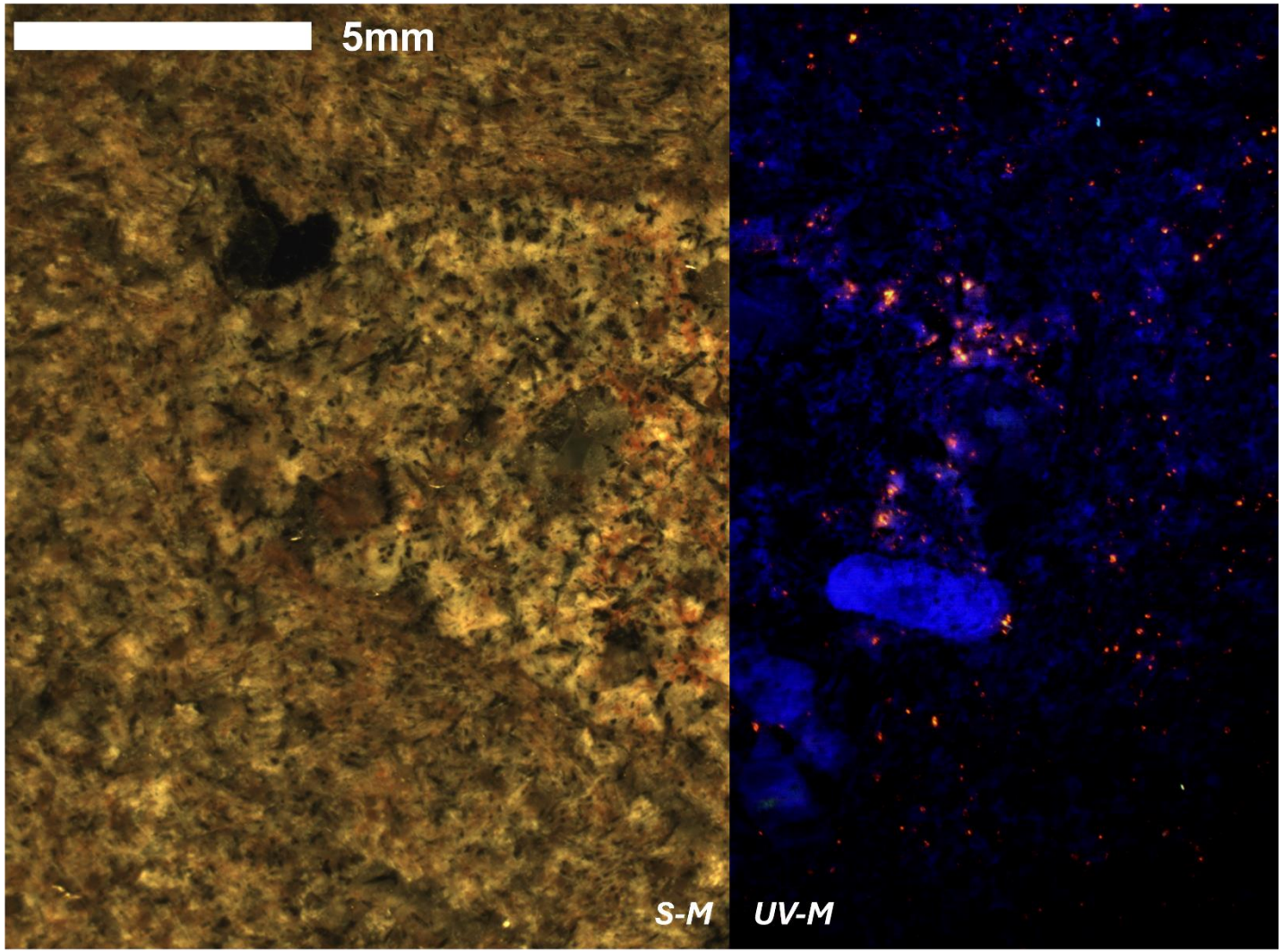
Electron probe microanalyser map (Andrews *et al* in prep)

Gallows Hill Phonolite



Carbonates
Phosphates
Nb phases
Sulphides
Zr/Ti/Ca silicates
Fluorides
Loparite-(Ce)
Eggletonite

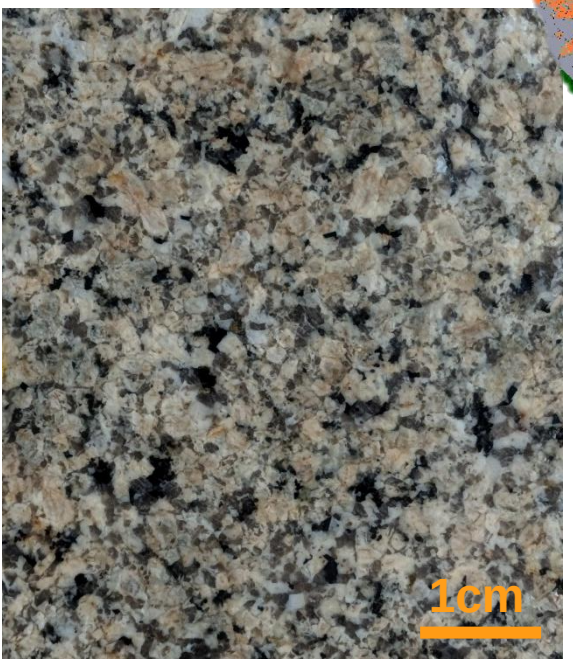
Electron probe microanalyser map (Andrews *et al* in prep)



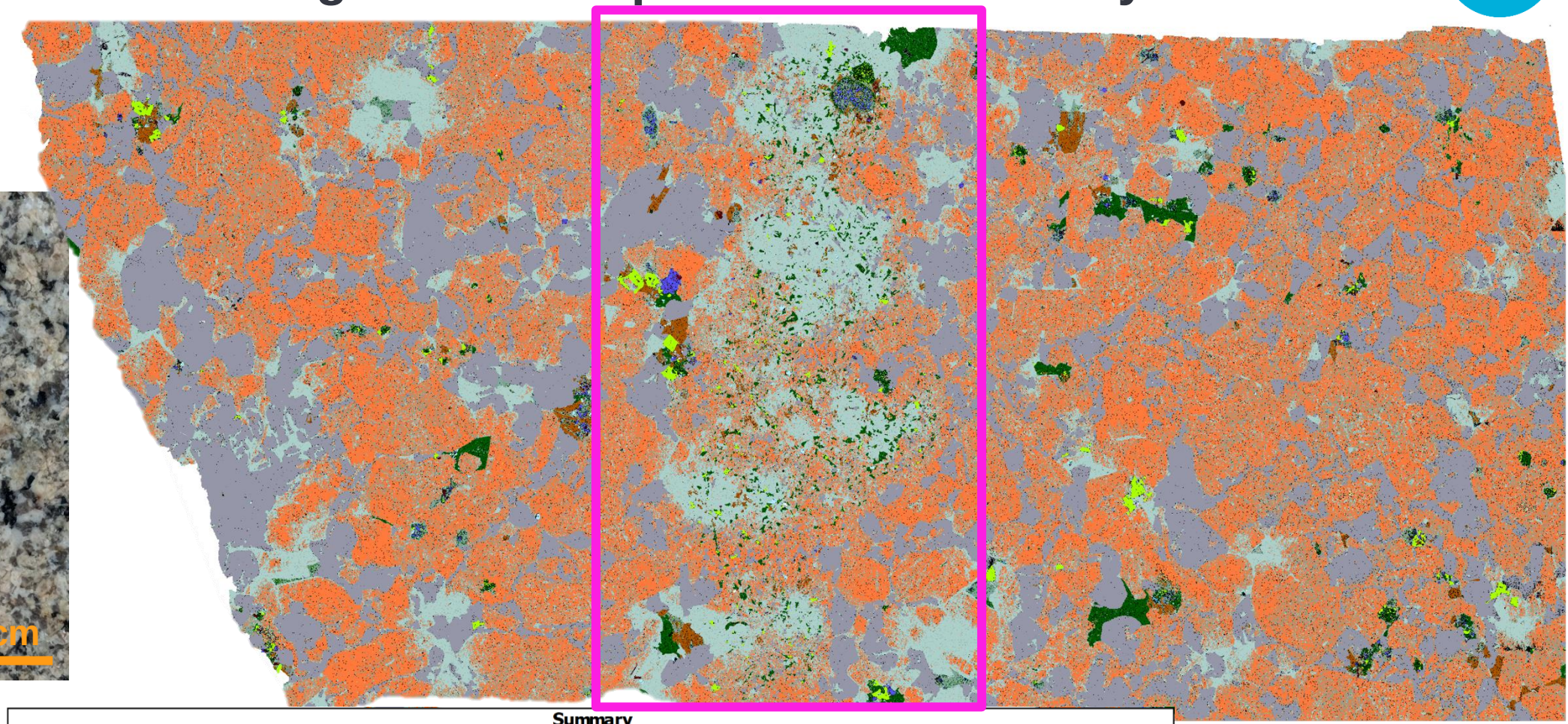
Polarised UV light (Andrews *et al* in prep)

CSIRO characterisation

Mt Leinster Igneous Complex - MacFarlane Syenite

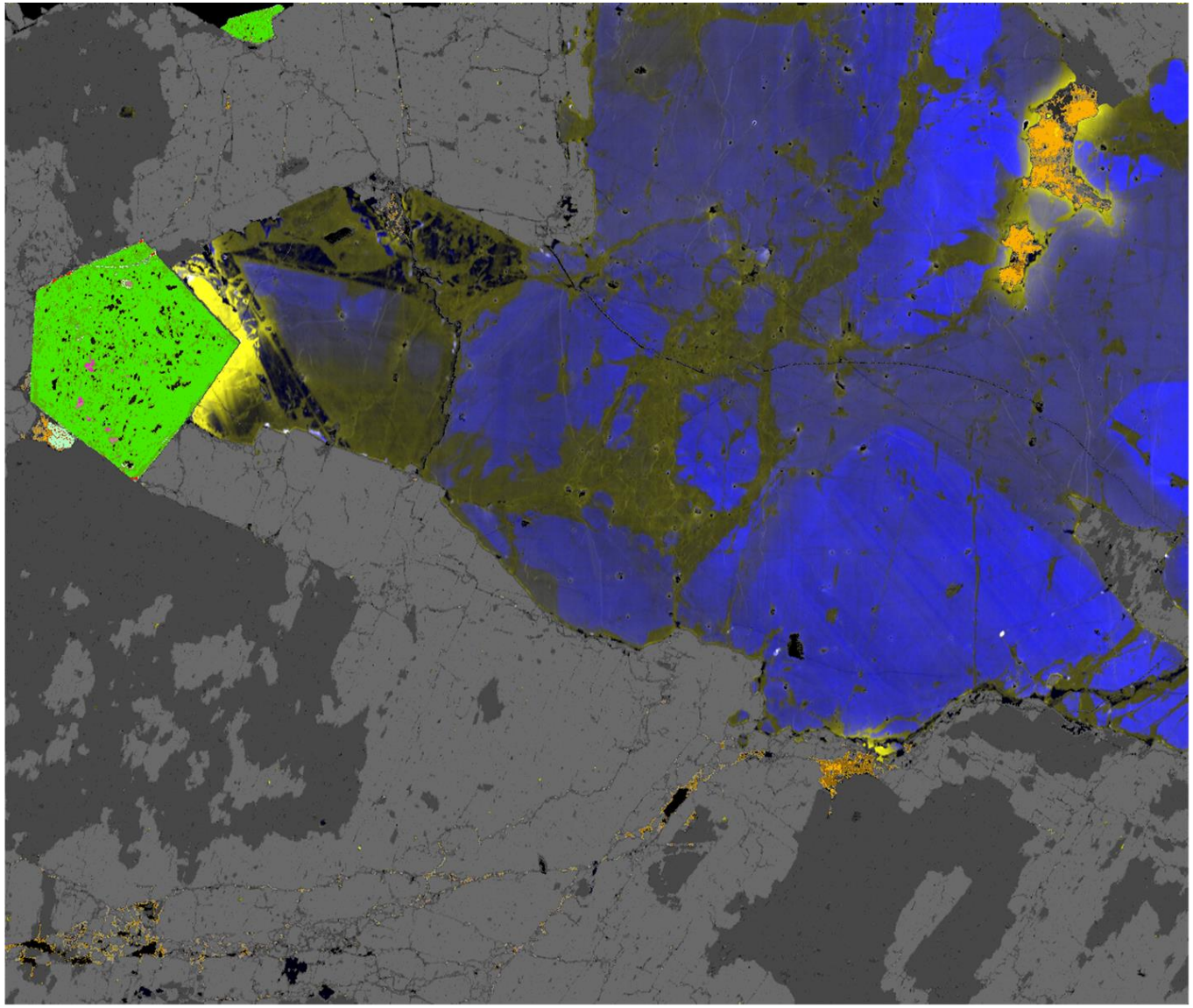


Sample 321633



TIMA automated mineralogy (Andrews *et al* in prep)

MacFarlane Syenite



Quartz (Cathodoluminescence)

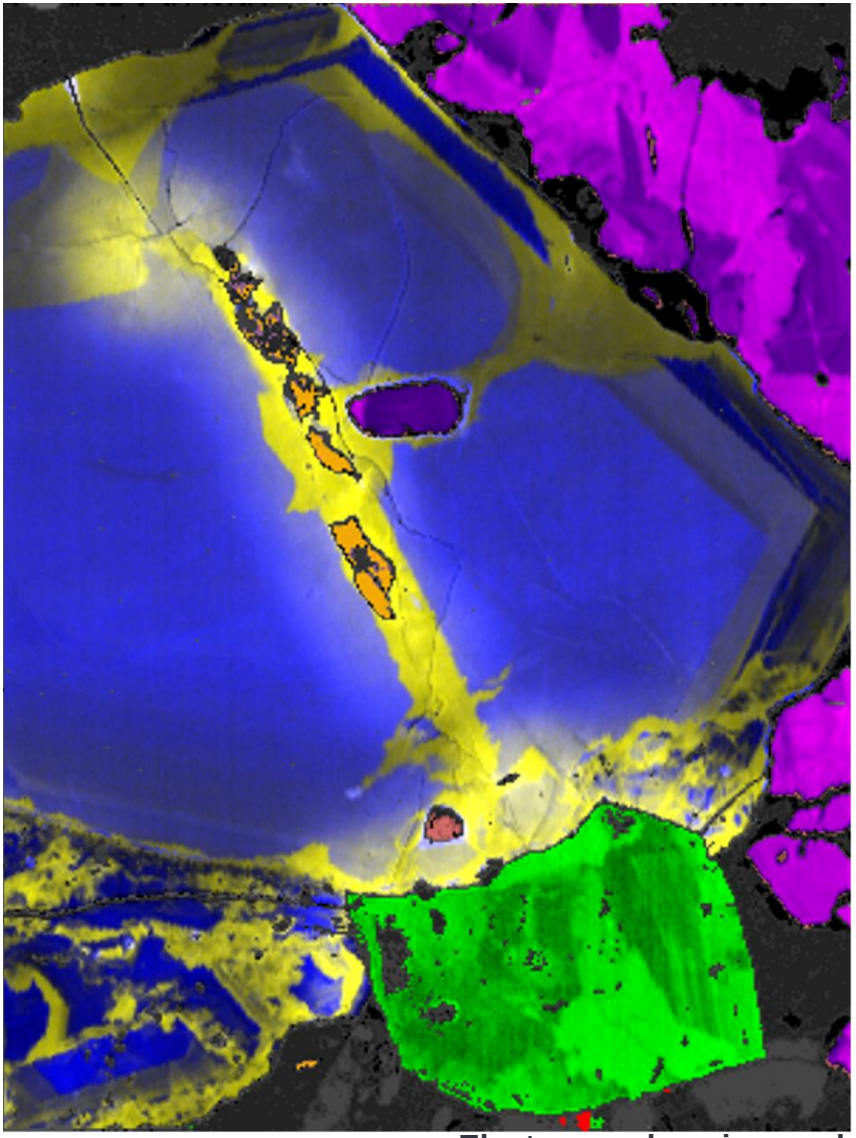
Ti^{4+}

NBOHC

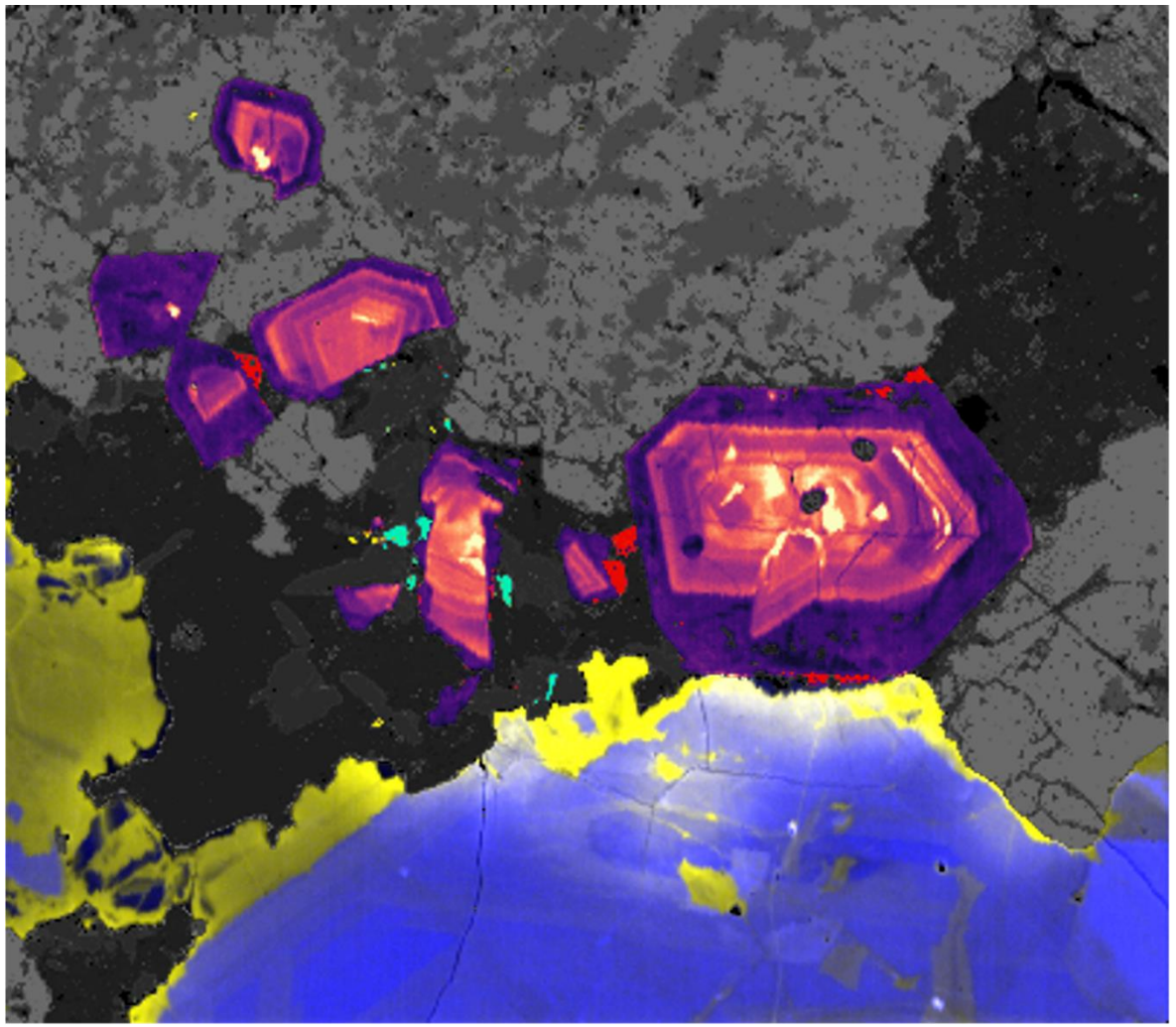
Zircon
Bastnäsite
Zr silicate (Th, Y, Al)
Thorianite
Xenotime-(Y)
Fluocerite (La, Ce)
Albite
K feldspar
Kaolinite
Fe oxide
Ilmenorutile

Electron probe microanalyser & cathodoluminescence map (Andrews *et al* in prep)

MacFarlane Syenite



100 µm



100 µm

Quartz (Cathodoluminescence)

Ti^{4+}

NBOHC

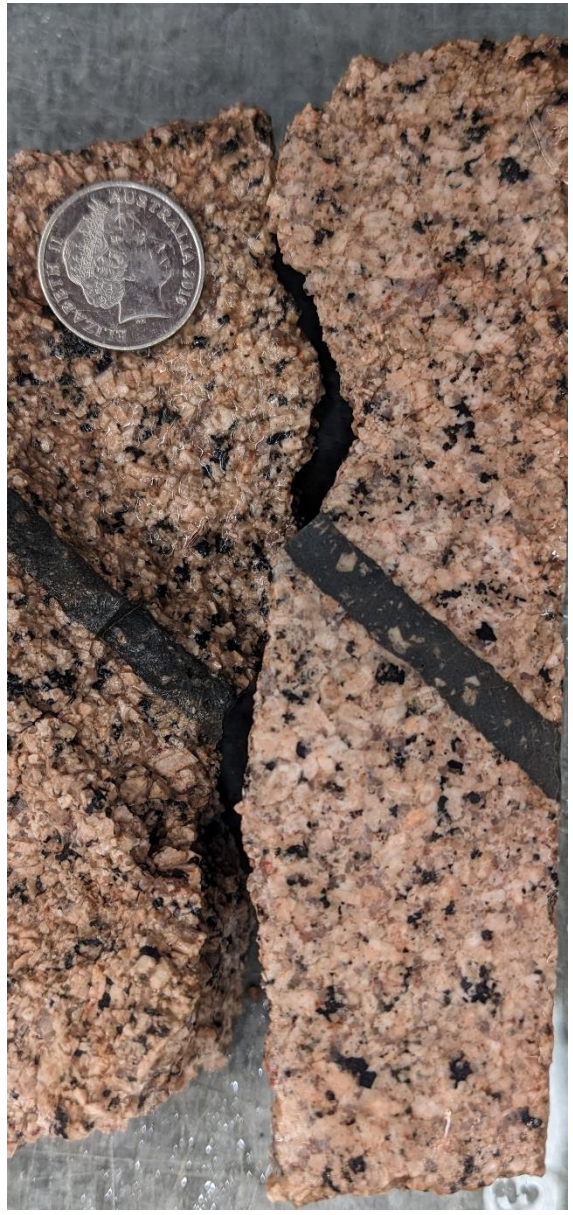
Zircon total CL counts

Xenotime-(Y)
Nb oxide
Cassiterite
Bastnäsite
Albite
Fe oxide
Zircon
K feldspar
Ilmenorutile

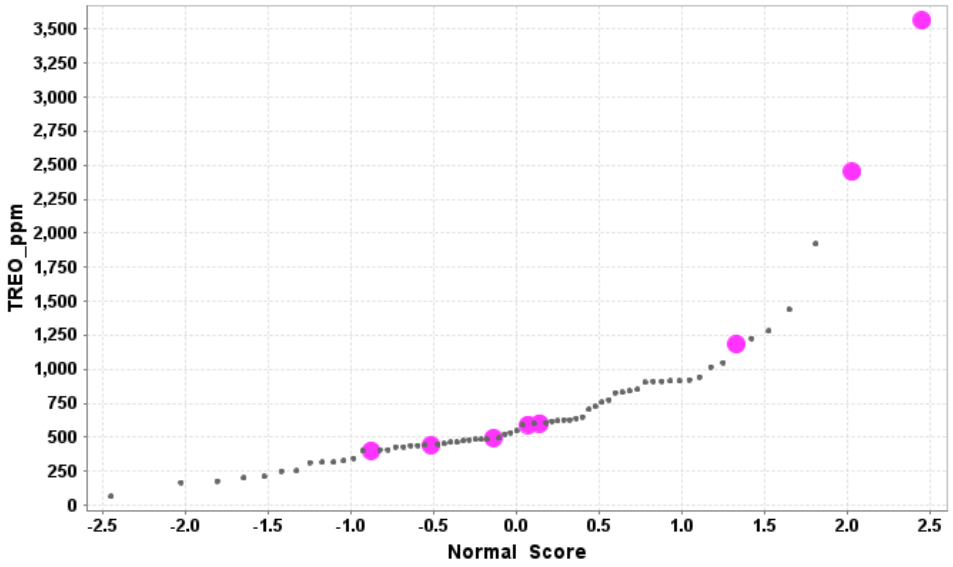
Electron probe microanalyser & cathodoluminescence map (Andrews *et al* in prep)

Implications

- REE + Zr + Nb were introduced by a post-magmatic hydrothermal fluid
- This fluid was chemically different to the host rock
- This fluid will be most highly focussed somewhere

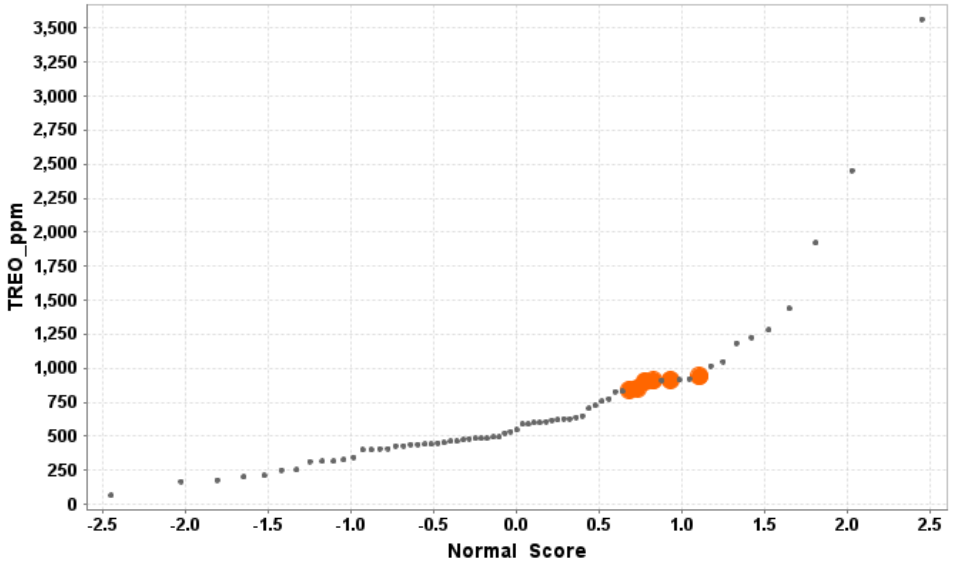


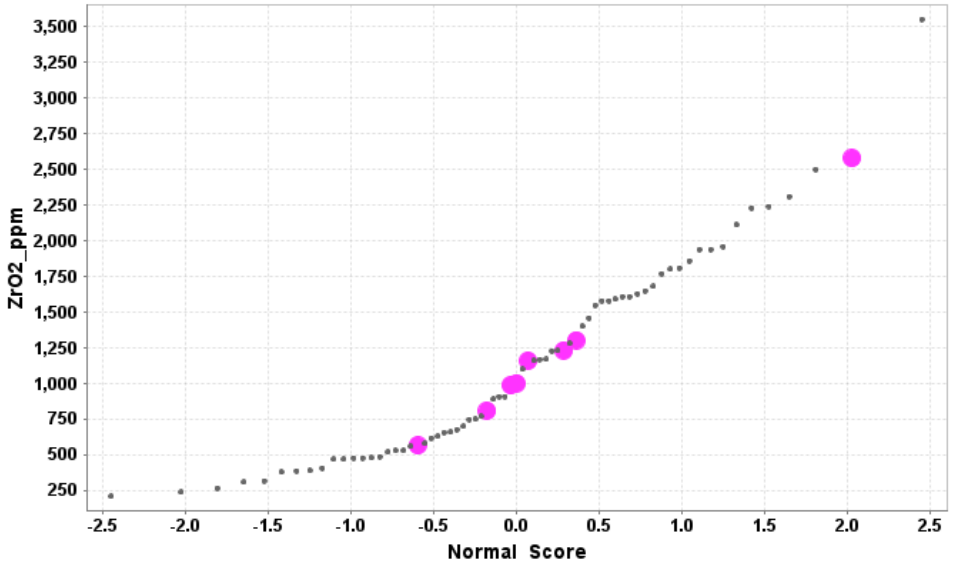
Mineralisation distribution



TREO Range

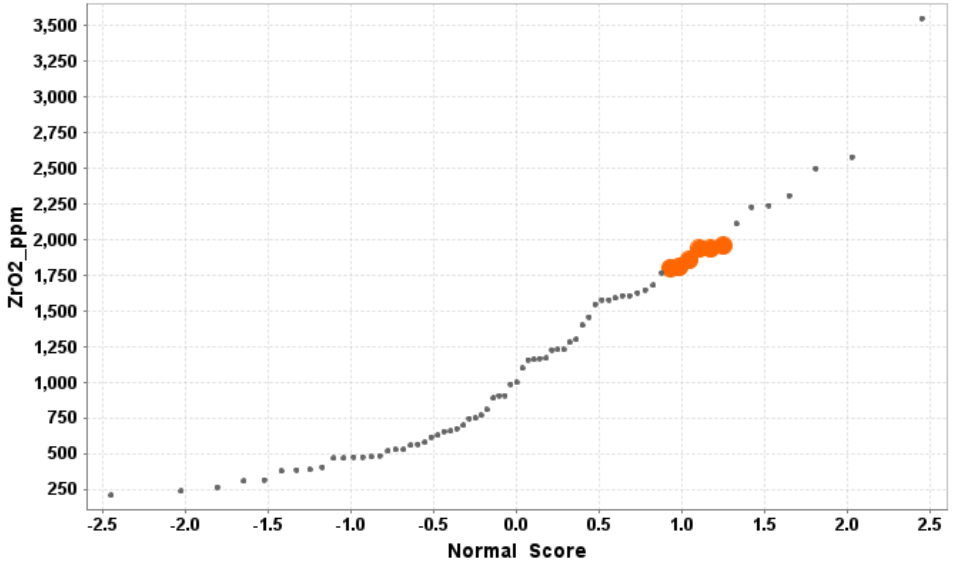
3,163 ppm 99 ppm





Zr_2O_5 Range

2,012 ppm 155 ppm



Summary

- Multiple systems with elevated REE + Zr + Nb mineralization in Victoria
- **Mt Leinster Igneous Complex – hydrothermal**
- **Gallows Hill Phonolite - magmatic**
- Unidentified magmatic source and locus to the Mt Leinster hydrothermal mineralization
- Reconnaissance sampling – sparsely tested

Report to come:

  - Den Hills Formation
  - Gonzaga Monzonite
  - Pine Lodge Leucitite
- Geochronology
- Tectonic model to help with prediction

Thank you

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