Magmatic History, Fertility and Metallogenesis of the Mary Kathleen Domain of the Mt Isa Inlier

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Summary:

- Introduction
- JCU team, current projects and future plans
- Some preliminary results from the Tick Hill area (geochronology)

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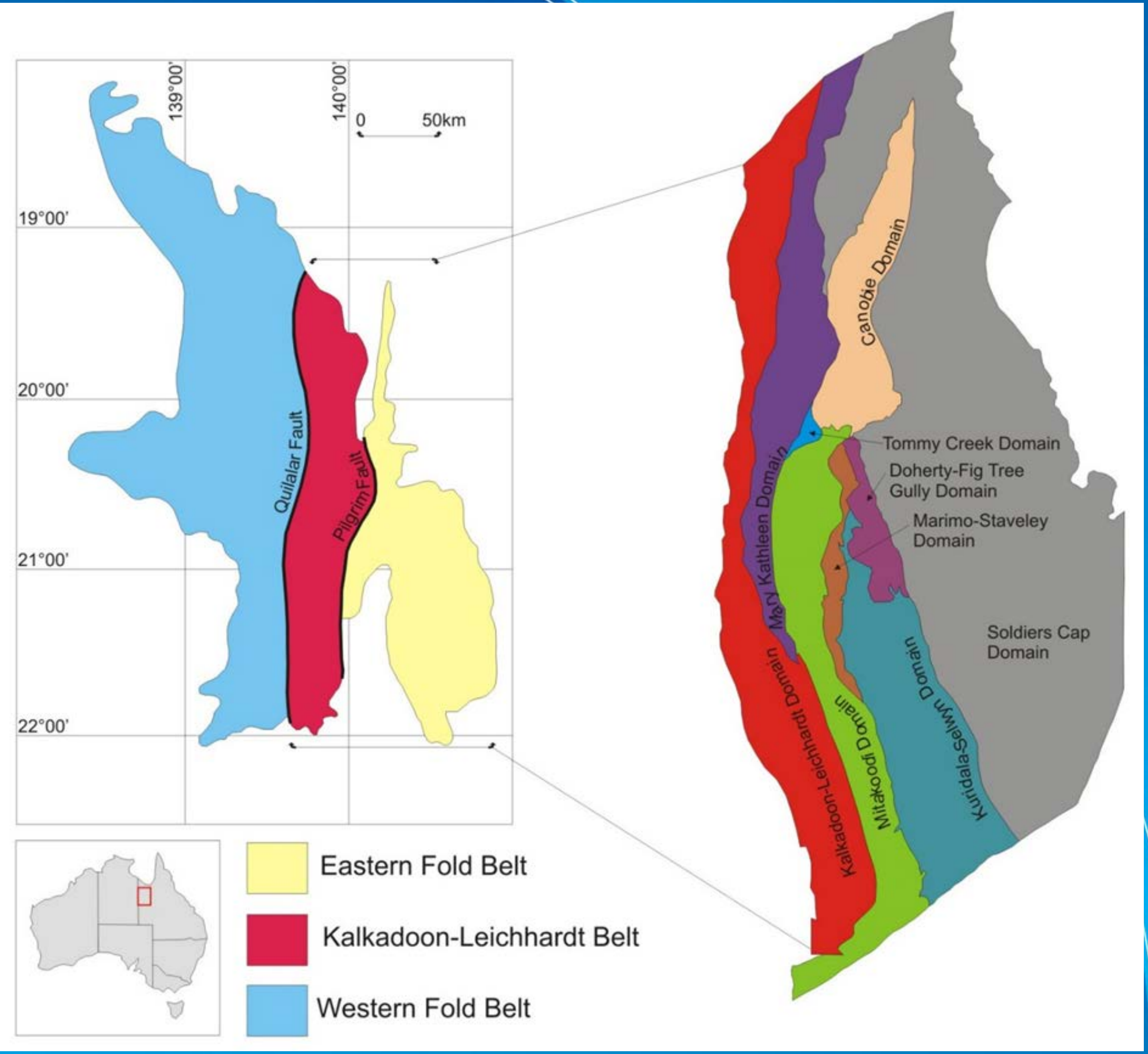
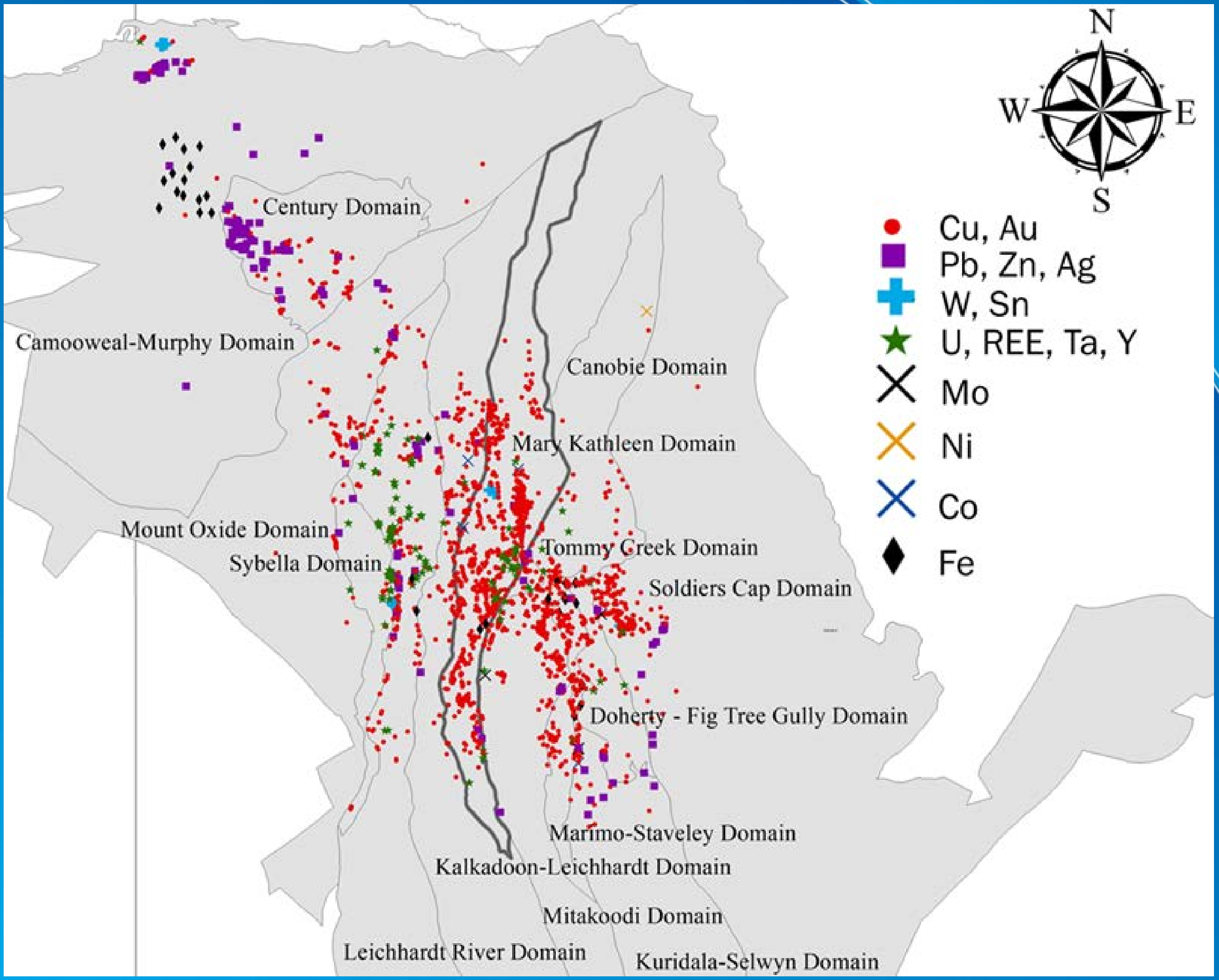
Introduction



Simplified geology of Mt Isa Inlier



Cu-Au:

- ***Mount Colin, Trekelano, Duchess, Overlander, Elaine Dorothy, Little Eva***

Au only:

- ***Tick Hill***

U-REE:

- ***Mary Kathleen***

Pb-Zn-Ag:

- ***Dugald River***

Distribution of mineral occurrences in the Mt Isa Inlier

The geology of the MKD appears to be notably different:

- The stratigraphy dominated by Argylla (~1780 Ma) and Corella (~1740 Ma) Formations
- Intruded by 1740 Ma granites
- The structure is dominated by an *extensional shear zone*, the Wonga Belt
- Metamorphism is mainly amphibolite facies
- There is evidence of pre-Wonga deformation
- The extent of Isan Orogeny overprint is somehow less obvious
- It lacks 1550-1500 Ma intrusives

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Is MKD prospective for large deposits?

Characteristics	Interpretation
Numerous mineral occurrences	Large scale flow of mineralized fluids
A good number of mineral deposits	Good capacity for trapping
A predominance of Cu-Au deposits/occurrences	Similar metal source/processes with deposits further East
Strong structural control	Good fluid conduits
Variable metamorphic grade	Similar to deposits further East
Mineralization postdates peak metamorphism	Similar to deposits further East
A strong lithological/stratigraphic control	Similar to deposits further East
Cl rich fluids	Similar to deposits further East
Age of mineralization 1550-1500 Ma where dated/inferred	Similar source/genesis to deposits further East
Lack of 1550-1500 Ma intrusions	Inferred to be present at depth
Lack of very large deposits	Waiting to be discovered

Summary of main characteristics of Cu-Au deposits in the MKD

JCU team and projects

Personnel	Position
Paul Dirks, Ioan Sanislav, Carl Spandler	Academic staff
Yanbo Cheng	Post-doctoral fellow (60%)
Robbie Coleman, Alex Brown, Truong Le, Joshua Spence	PhD students
Eric Zurek-Haidamous, Alex Edgar	Honours students

EGRU in Mt Isa region

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On-going projects in Mt Isa region

Personnel	Project
Robbie Coleman, Alex Brown, Eric Zurek-Haidamous	Tommy Creek Domain

Not part of the New Discovery Program

Personnel	Project
Yanbo Cheng	Magmatic evolution of MKD and implications for metallogenesis
Truong Le	Tick Hill deposit – deposit model, genesis and setting
Joshua Spence	Skarns, stratigraphic horizons, structure and mineralization in the MKS area
Alex Edgar	Scapolite around Elaine Dorothy

Part of the New Discovery Program

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Future work in Mt Isa region

Personnel	Project
PhD student 1	Dugald River mine (structural and geotech study)
PhD student 2	**Tectonic evolution of the MKD**
PhD student 3	Breccia pipes in Soldiers Cap Group – IOCG connection?
PhD student 4	**Comparison between IOCG deposits in Mt Isa Inlier and SW China**
Honours student 1	**Pilgrim Fault**
Honours student 2	**Fountain Range Fault**
Honours student 3	**Mt Godkin granite**
Honours student 4	**Fluid inclusion database for EFB**

To start in early 2019

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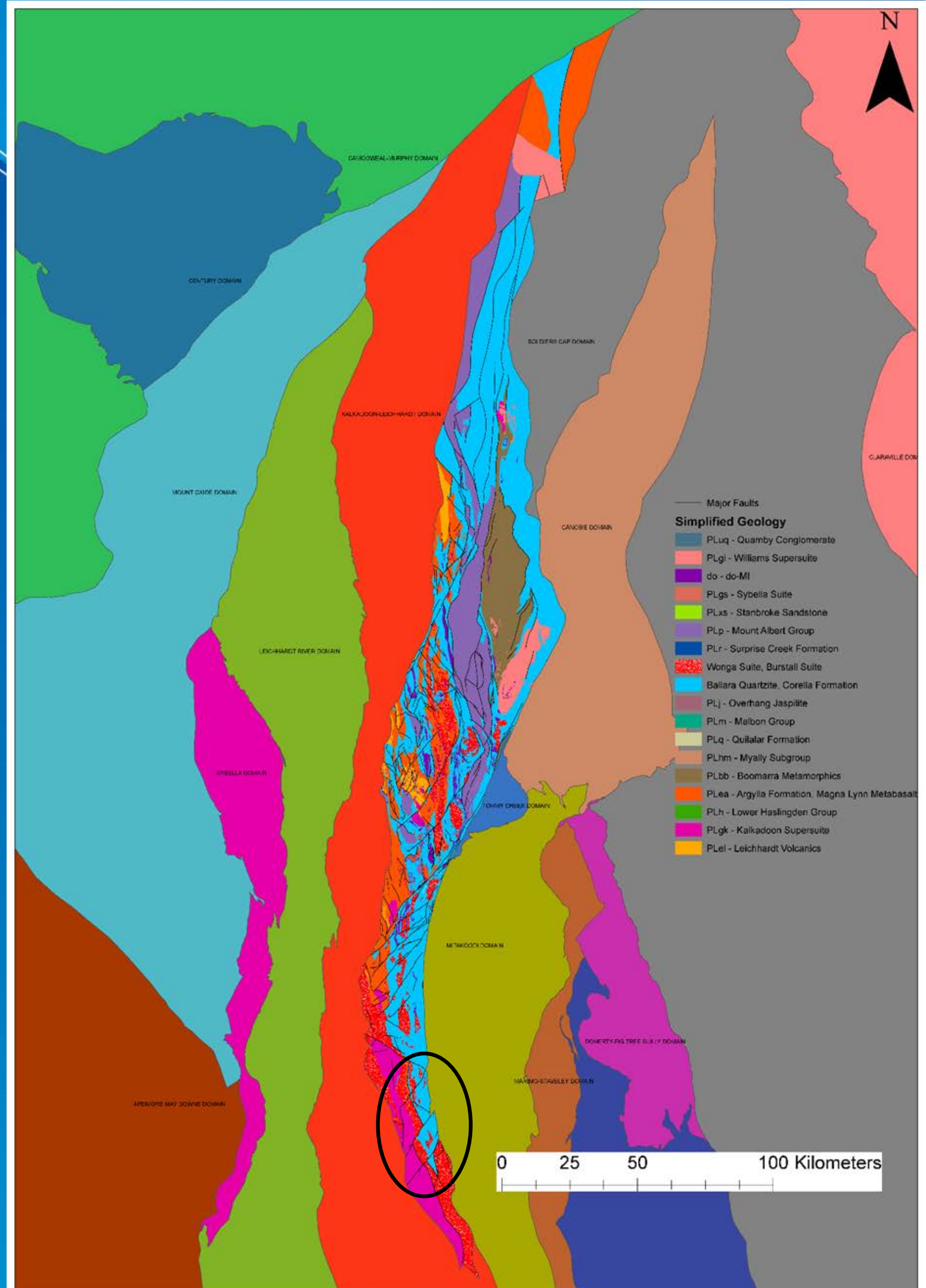
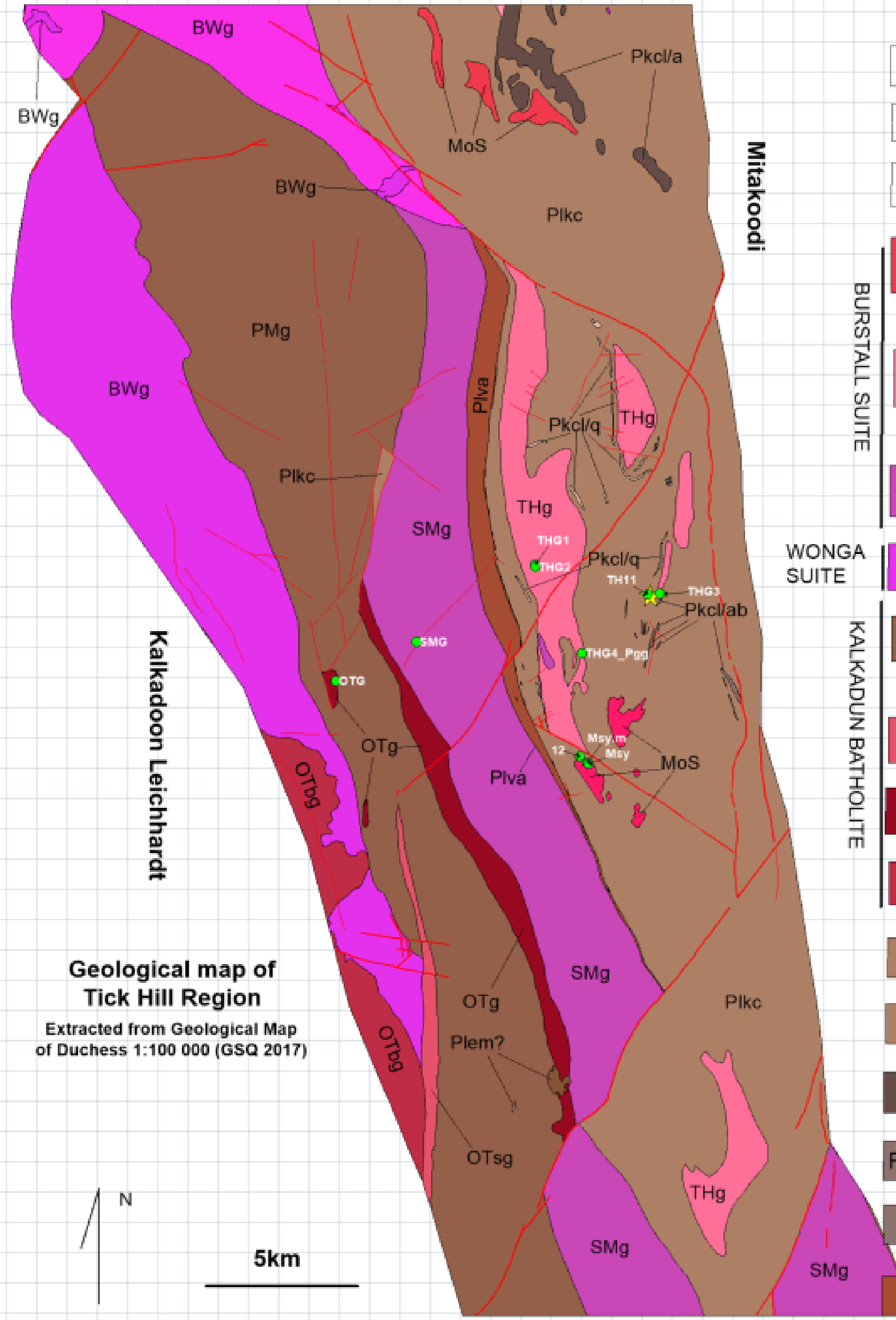
Some preliminary results from the Duchess Belt





Geological map of Tick Hill Region

Extracted from Geological Map of Duchess 1:100 000 (GSQ 2017)

LEGEND

- Interpreted trends of bedding/foliation Interpreted
- Interpreted major and minor fault trace
- Tick Hill Deposit

BURSTALL SUITE

- **MoS** — The Monument Syenite, Undated (considered Palaeoproterozoic) Cream, medium to locally coarse-grained, equigranular to locally porphyritic, moderately to poorly foliated, biotite-hornblende syenite; commonly exhibits good linear fabric
- **THg** — Tick Hill Granite, Undated (considered Palaeoproterozoic) Cream to pink, massive to strongly foliated, fine to medium-grained leucogranite;irregular patches of coarser graphic to egmatitic granite; local tourmaline and vuggy quartz zones; scattered calc-silicate granofels rafts and grey to pink granitic gneis
- **SMg** — Saint Mungo granite, Undated (considered Palaeoproterozoic) Porphyritic hornblende-biotite granite; minor porphyritic biotite granite, aplite. Weakly foliated to gneissic

WONGA SUITE

- **BWg** — Birds Well Granite? Undated (considered Palaeoproterozoic) Medium to coarse biotite granite, strongly foliated to massive

KALKADUN BATHOLITE

- **PMg** — Plum Mountain Gneiss (1862 ± 3 Ma) Quartzofeldspathic gneiss, augen gneiss, weakly foliated to gneissic even-grained and porphyritic granite; minor calc-silicate rocks, meta-arenite, mica schist, amphibolite; aplite and pegmatite veins
- **OTsg** — One Tree Granite, Undated (considered Palaeoproterozoic) Sheeted tourmaline pegmatite and microgranite dykes
- **OTg** — One Tree Granite Undated (considered Palaeoproterozoic) Dark grey, fine to medium biotite-rich granite. Weakly foliated to gneis
- **OTbg** — One Tree Granite Undated (considered Palaeoproterozoic) Medium to coarse biotite granite, locally porphyritic, minor microgranit aplite, pegmatite. Massive to strongly foliated

- **Plem** — Magna Lynn Metabasalt Metabasalt, amphibolite; minor quartzite, meta-arenite, mafic schist and quartz +/- feldspar porphyry
- **Plkc** — Corella formation: undiferentiated rocks Calcareous siltstone, limestone, calcareous scapolitic granofels, quartzite, amphibolite, shale
- **Plkc/a** — Corella formation: Feldspathic granofels, meta-arkose, feldspar porphyry
- **Plkc/ab** — Corella formation: Cream, massive to layered, albitically altered calc-silicate granofels
- **Plkc/q** — Corella Formation: Quartzose to feldspathic sandstone, locally calcareous quartzite; grades into schistose quartzite in places
- **PLva** — Argylla Formation?: Porphyritic rhyolitic to dacitic tuff, andesite, quartz feldspar porphyry, quartzite, schist, gneiss; minor siltstone, arkose, conglomerate and metabasalt

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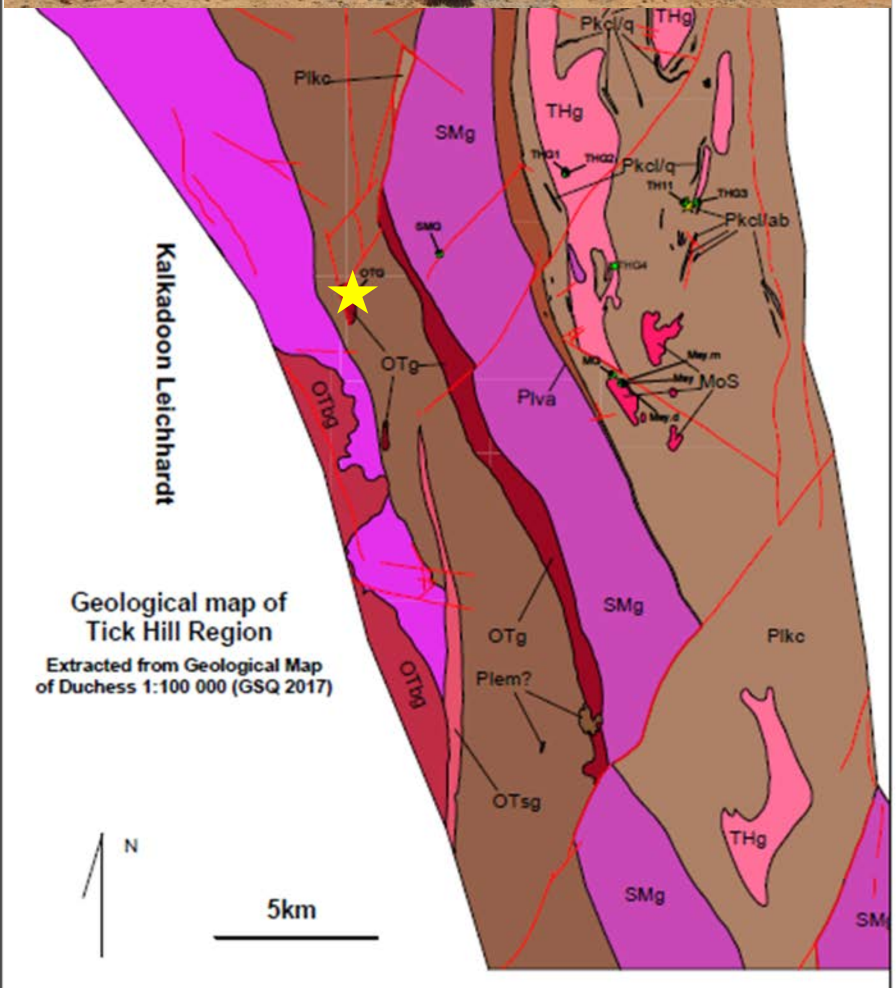
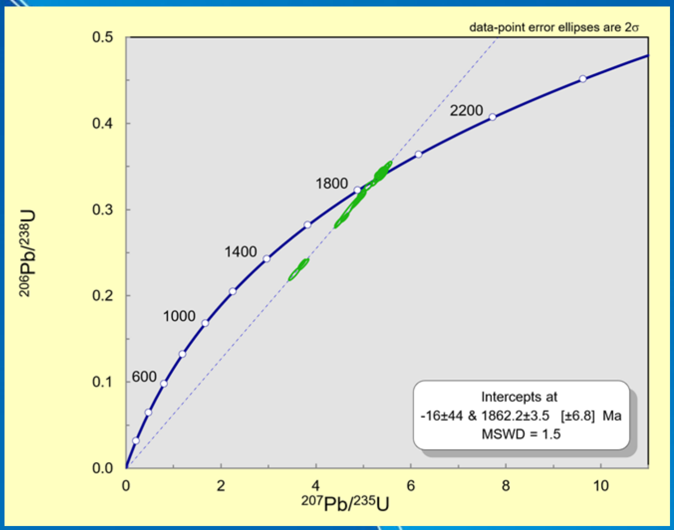
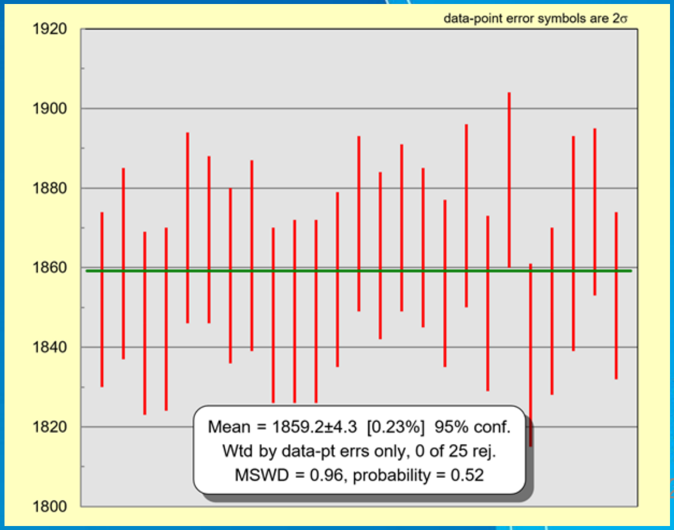
One Tree Granite







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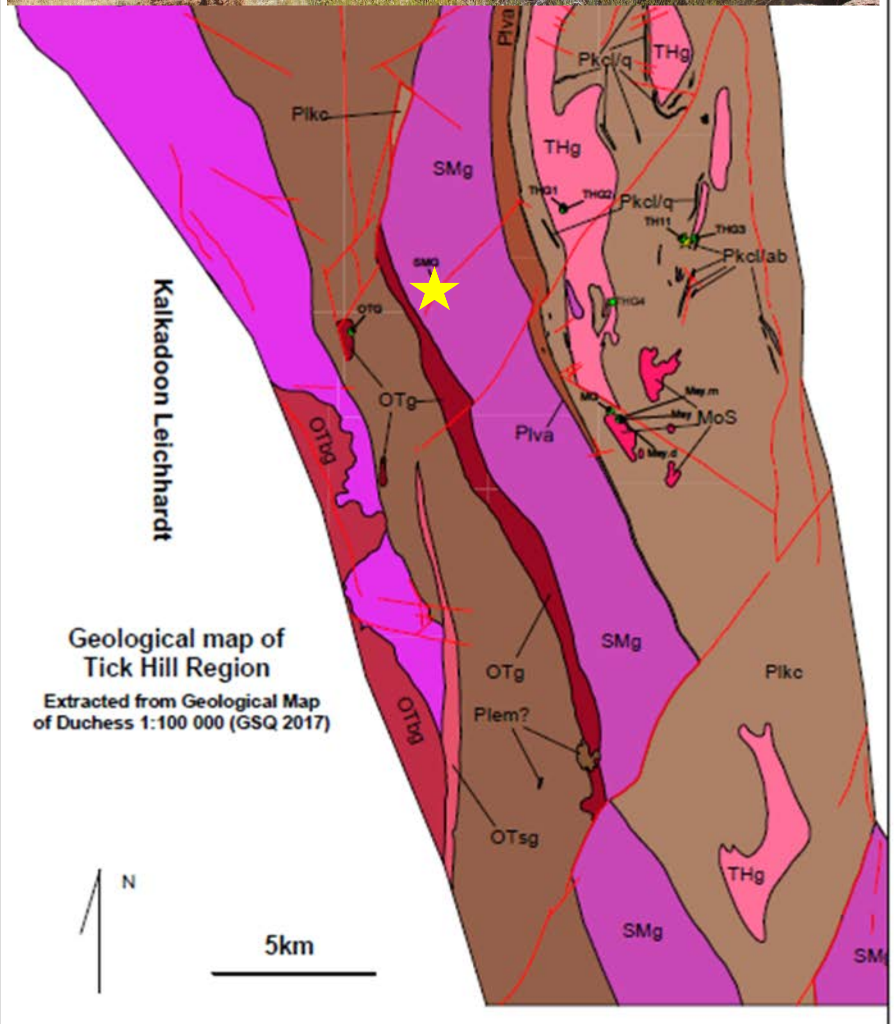
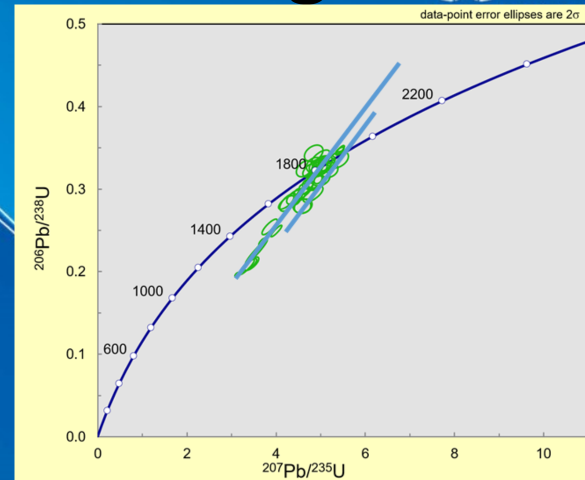
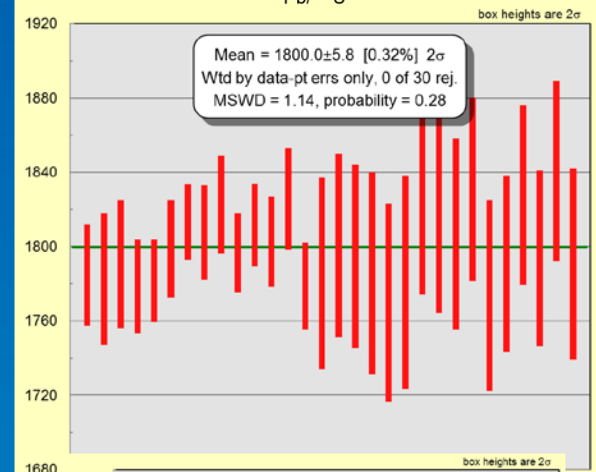
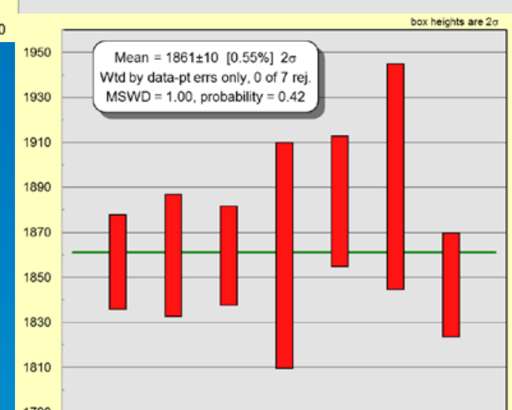
Saint Mungo Granite









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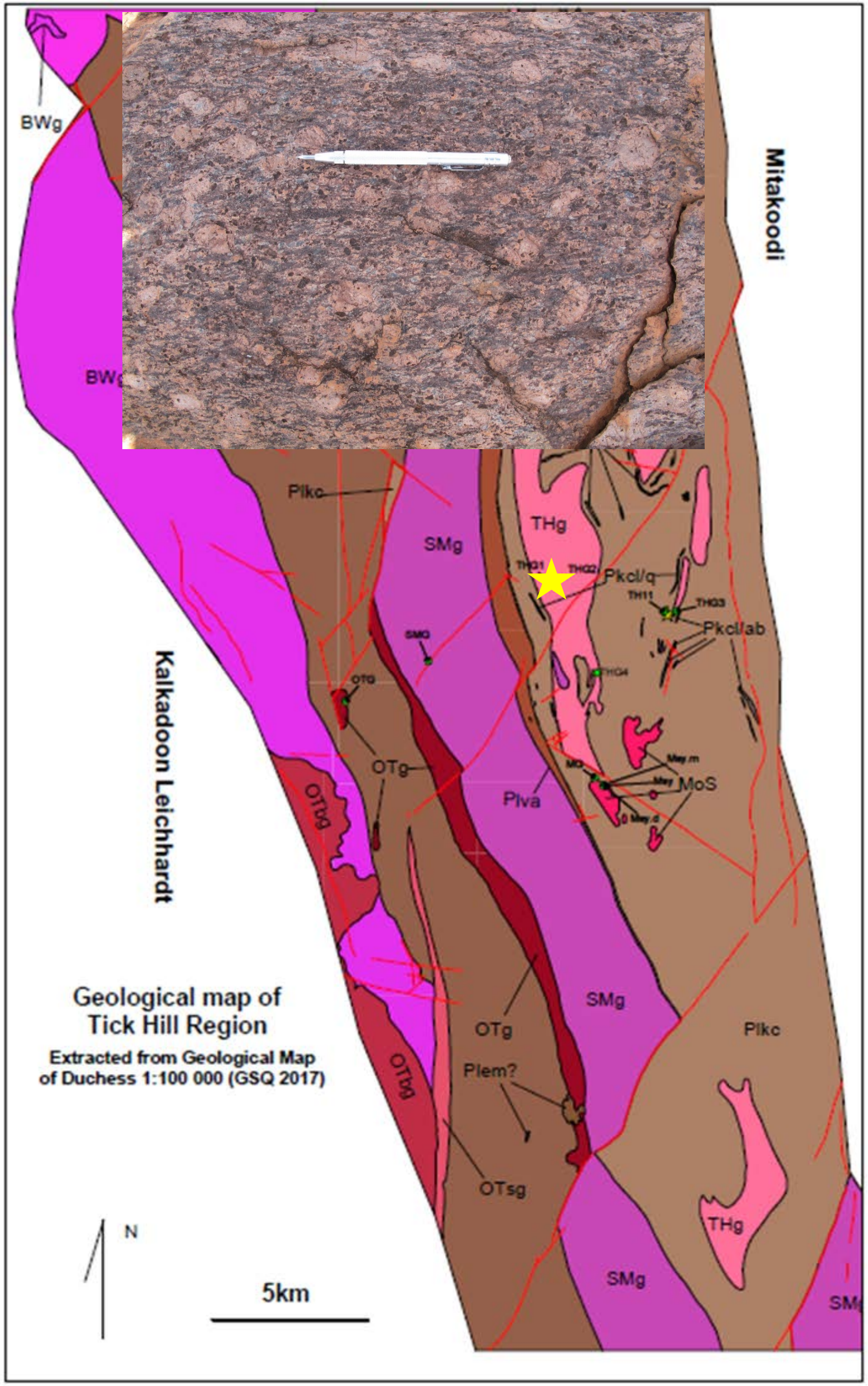
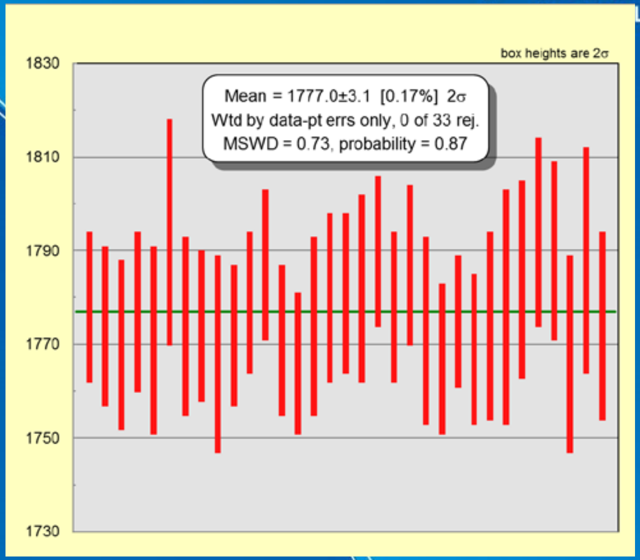
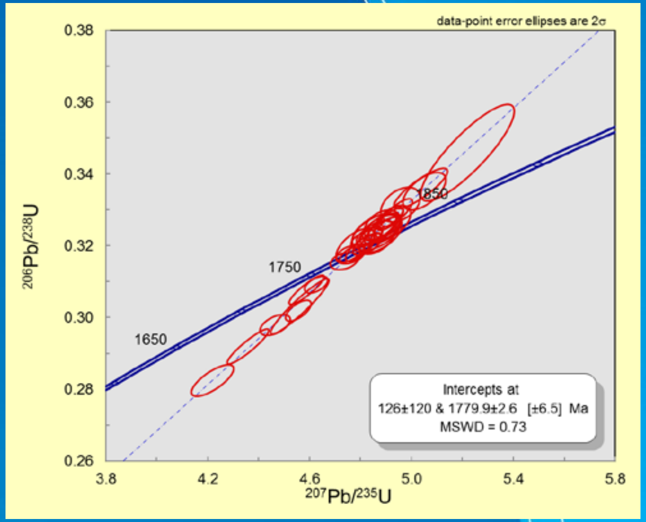
Tick Hill Granite

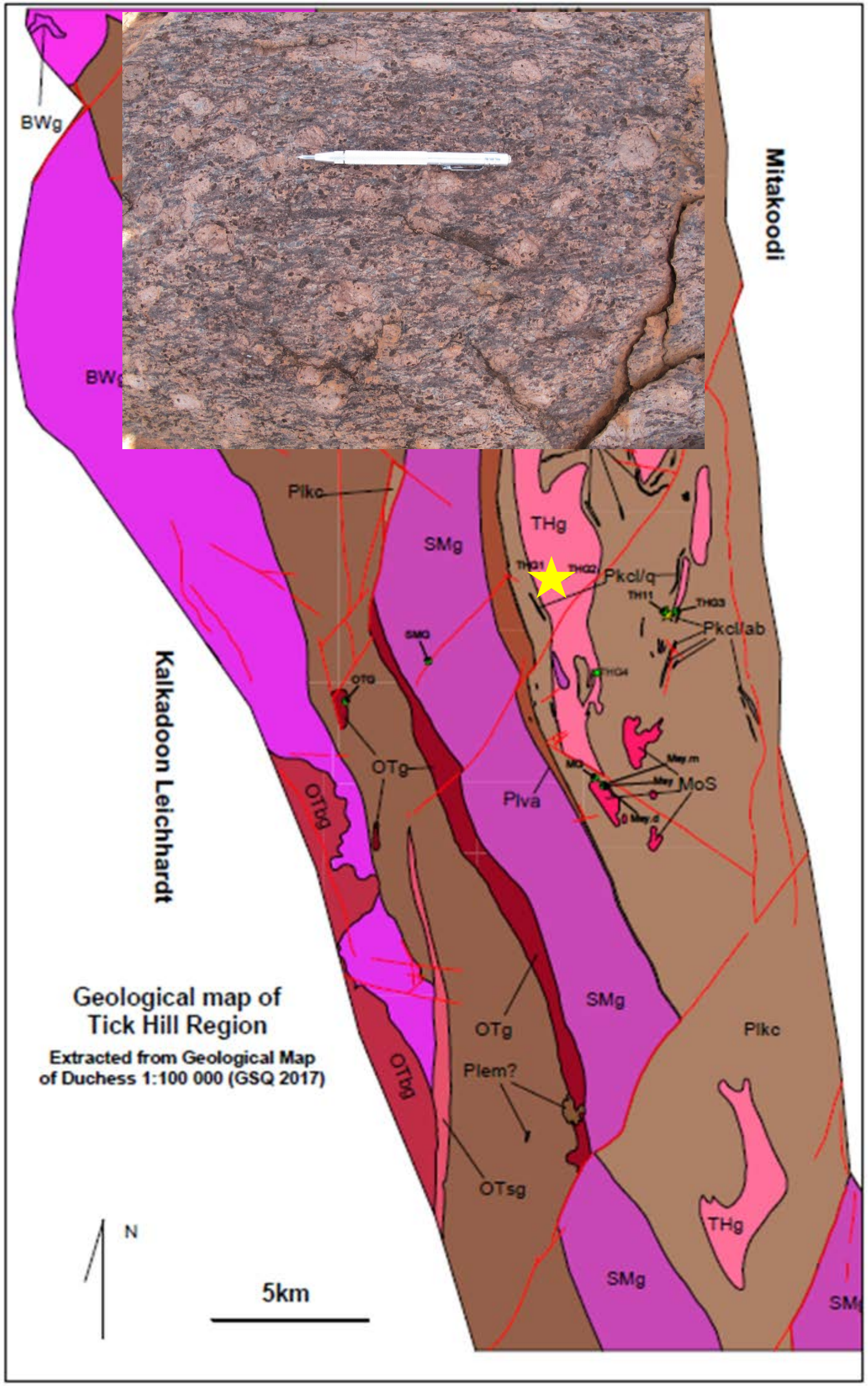


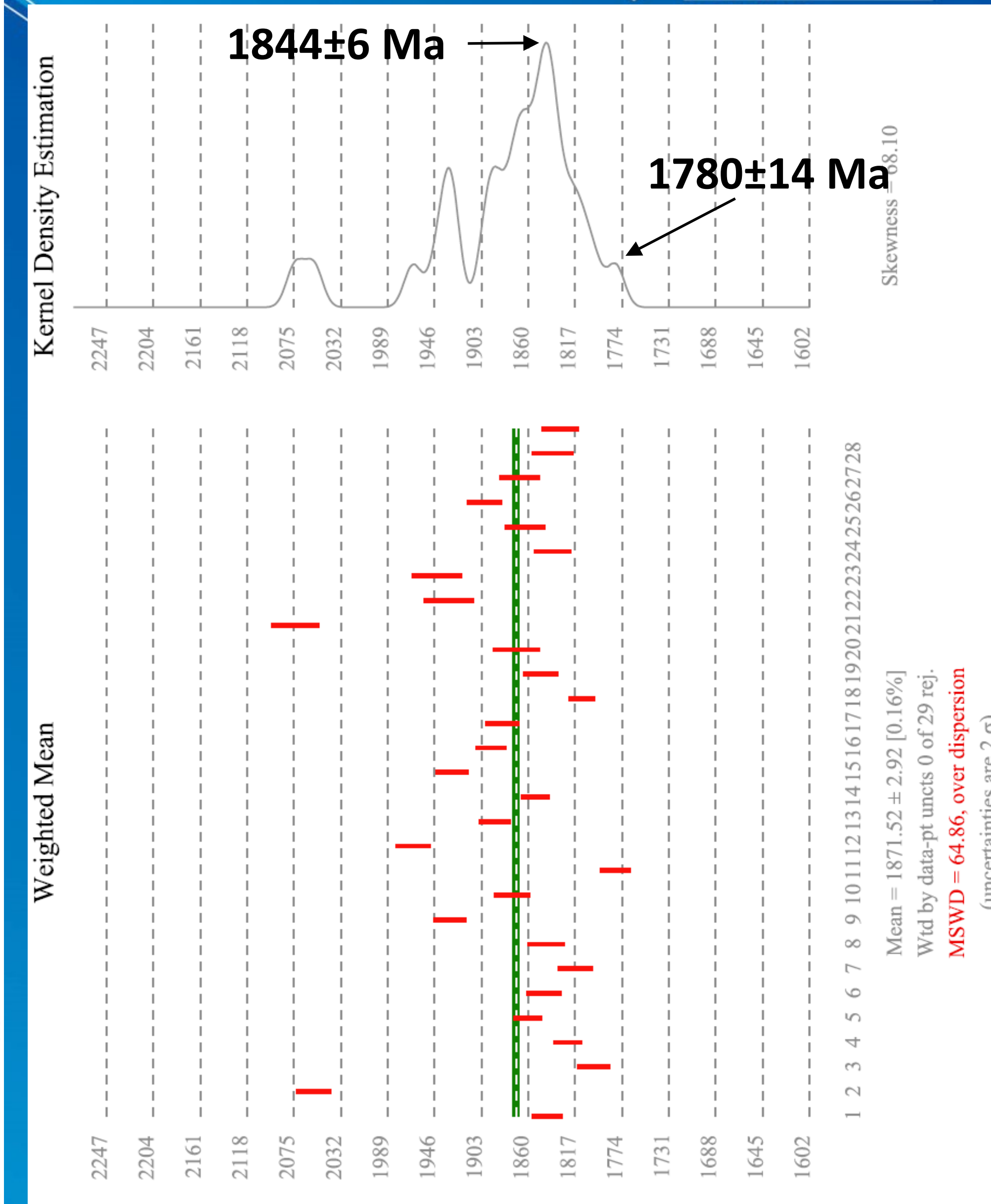




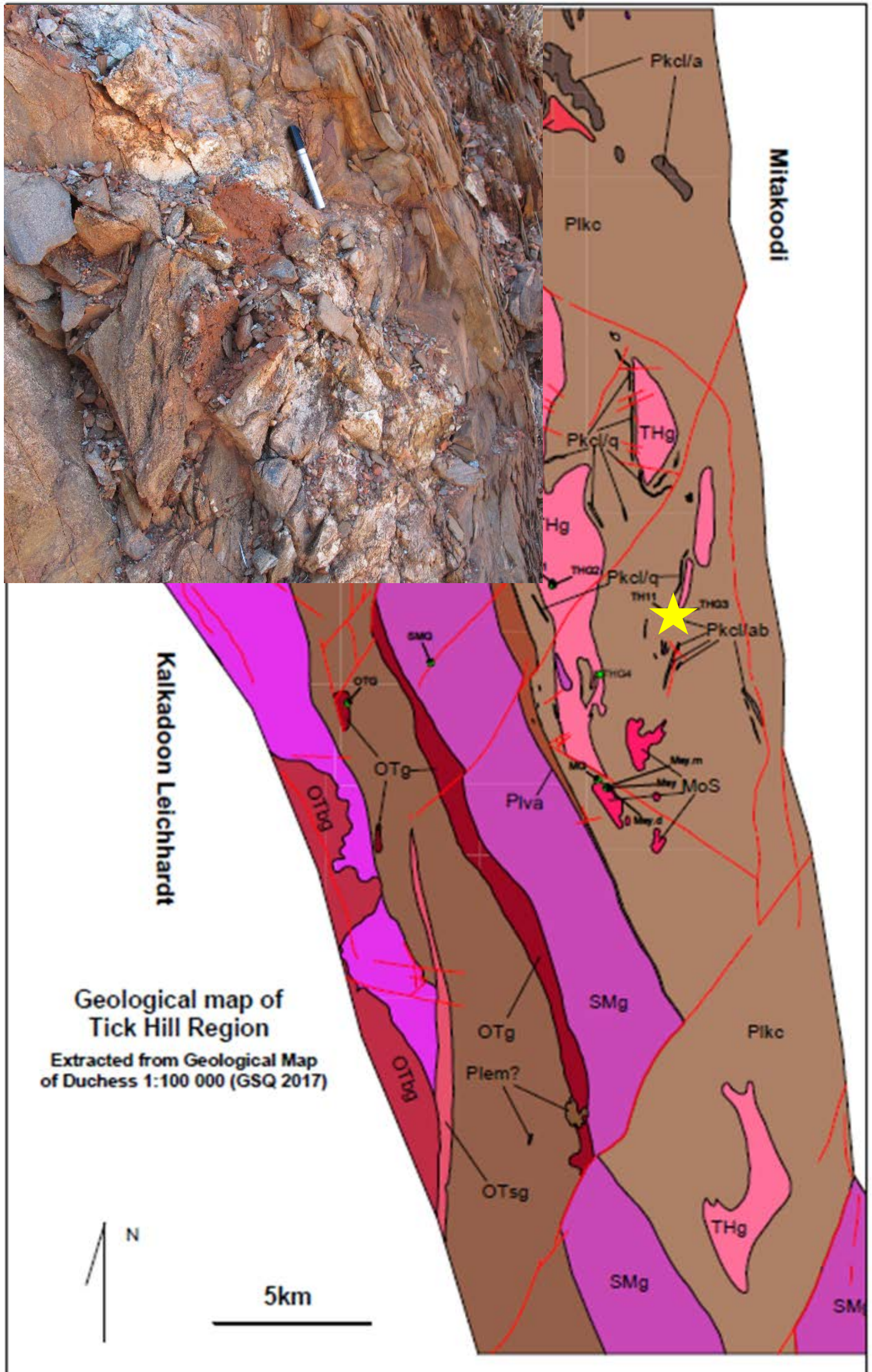
Xenocrysts at 1834±12 Ma

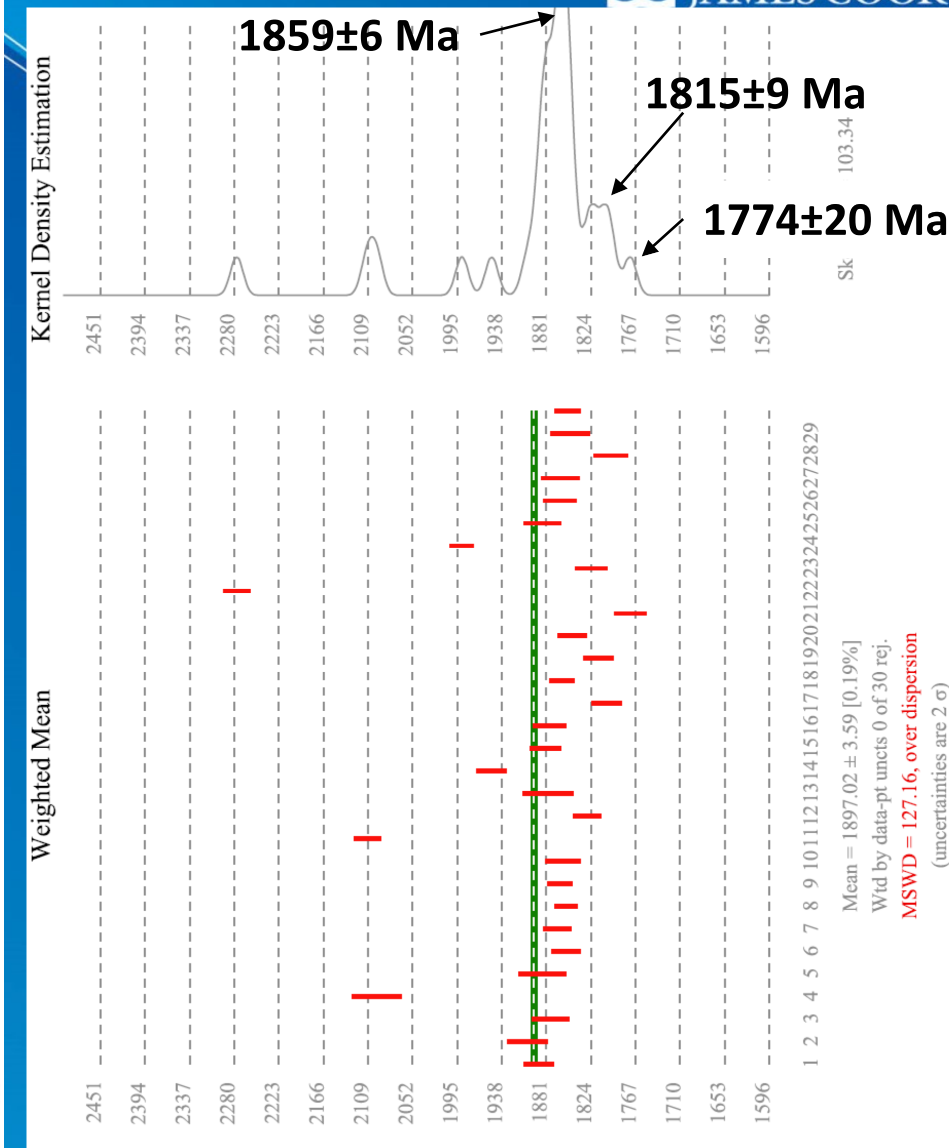
Tick Hill Granite





Pegmatite dyke





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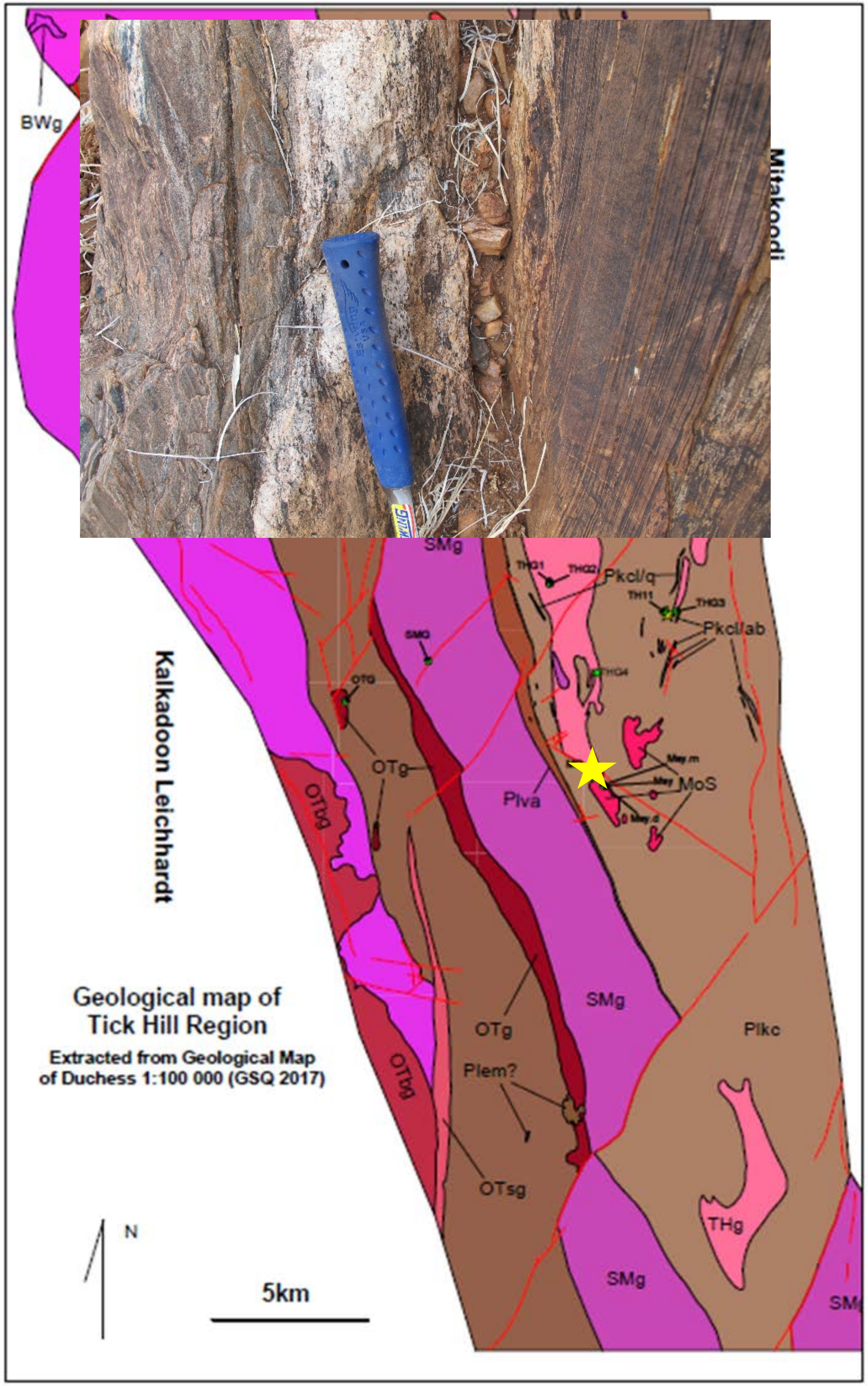
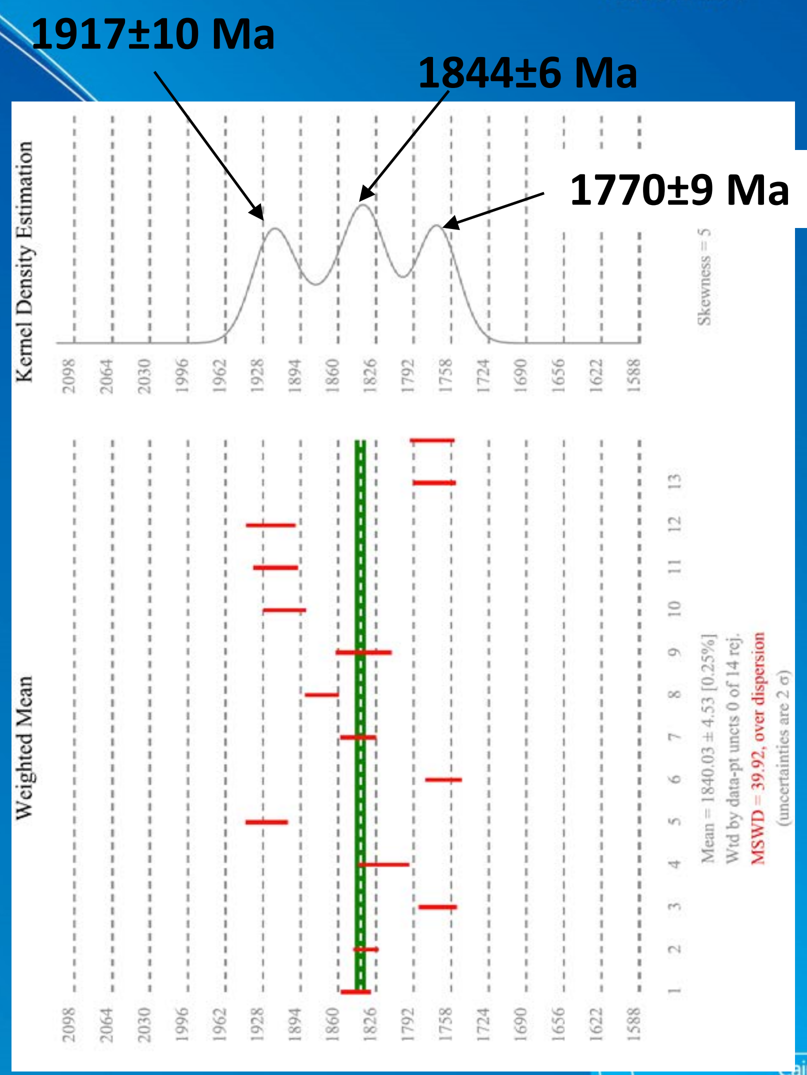
Granitic dyke





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Conclusions:

- Saint Mungo Granite is not Burstall age and intrude around 1800 Ma
- Tick Hill granite intruded at ~1780 and is most probably not related to the Wonga-Burstall event
- Deformation and metamorphism south of the Plum Mountain fault appears to be old ≥1770 Ma
- It is unlikely that Corella Formation extends south of this fault,
- The Isan overprint – work in progress

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