Australian Government

Geoscience Australia

$^{40}Ar/^{39}Ar$ ages from sericitic alteration in Central Gawler gold prospects: timing constraints on gold mineralisation

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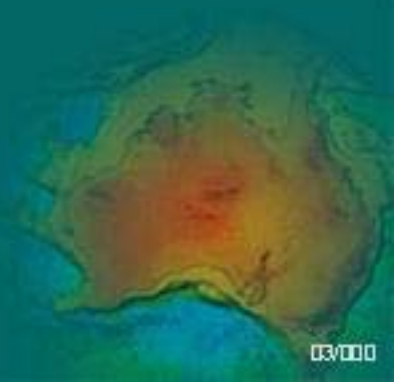
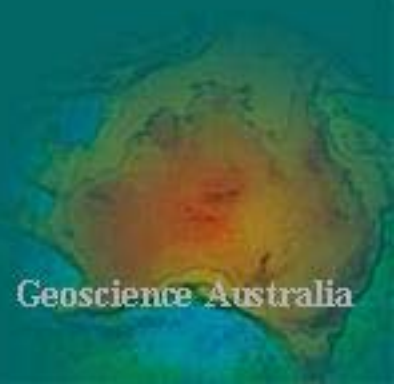
Geoscience Australia

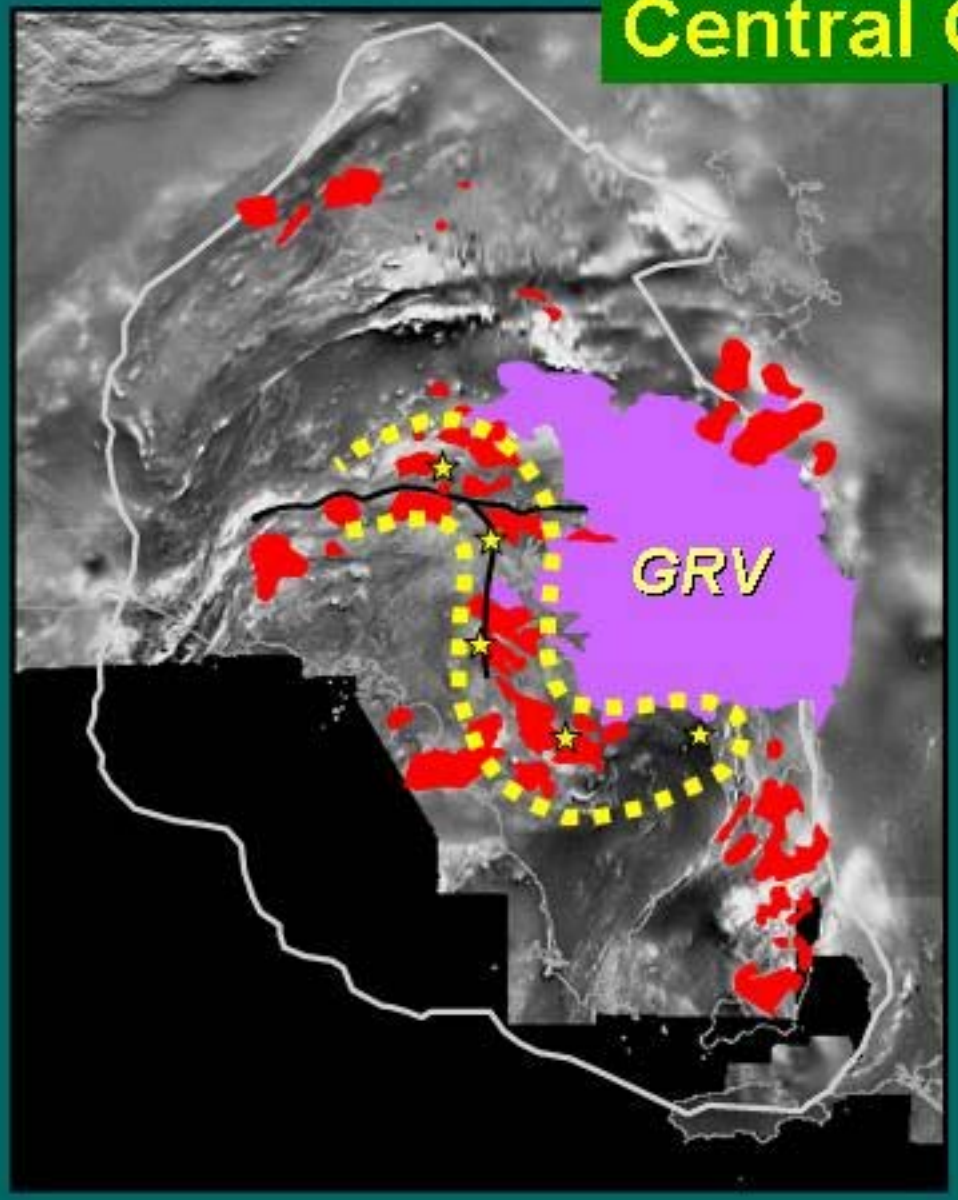


The title in plain language:

Is all the gold in the Central Gawler Gold province the same age?



Central Gawler Au province



Current Assumption:

CGGP prospects are genetically related

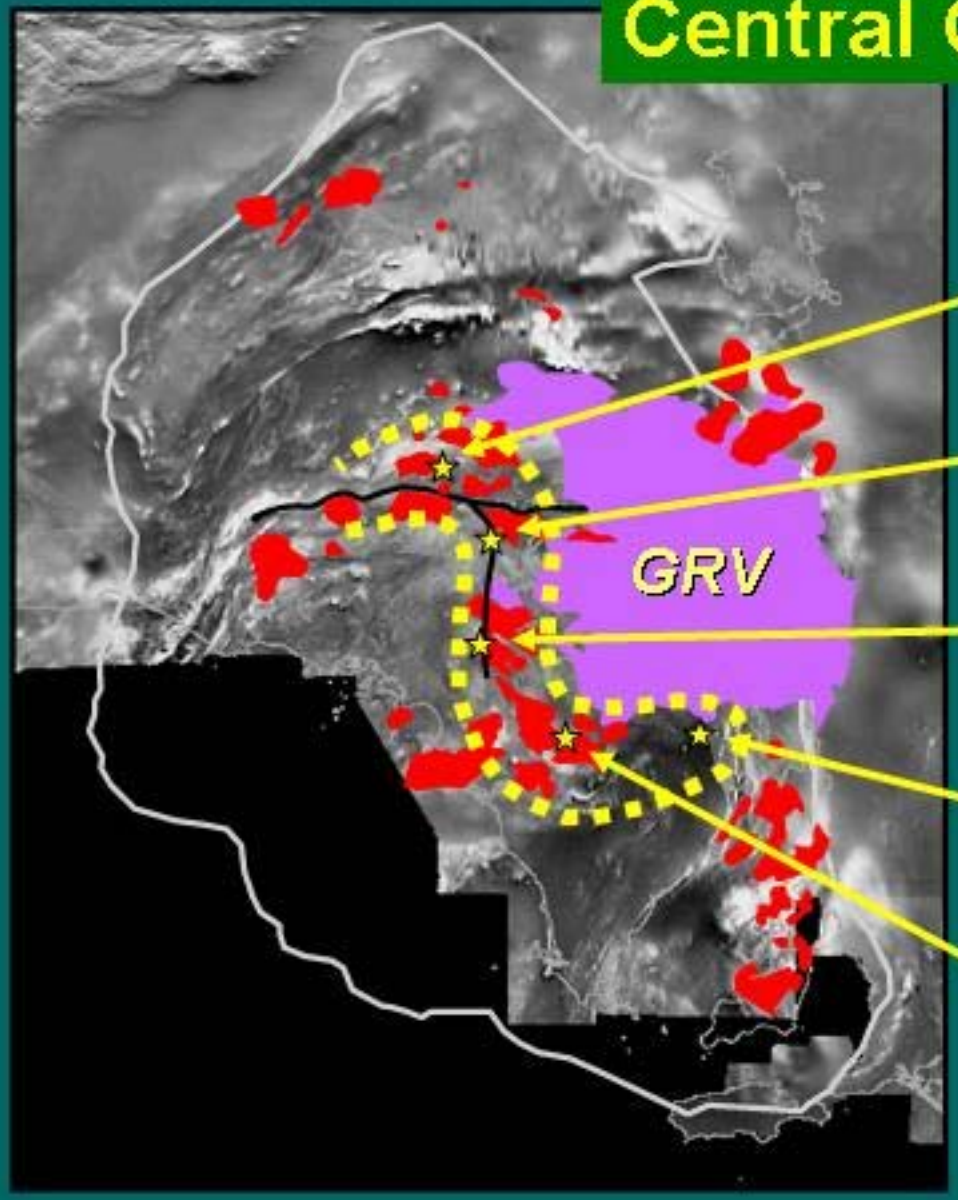
Implication:

Undiscovered gold between known deposits/prospects

One test:

Are all the prospects the same age??

Central Gawler Au prospects



Tarcoola

Tunkillia

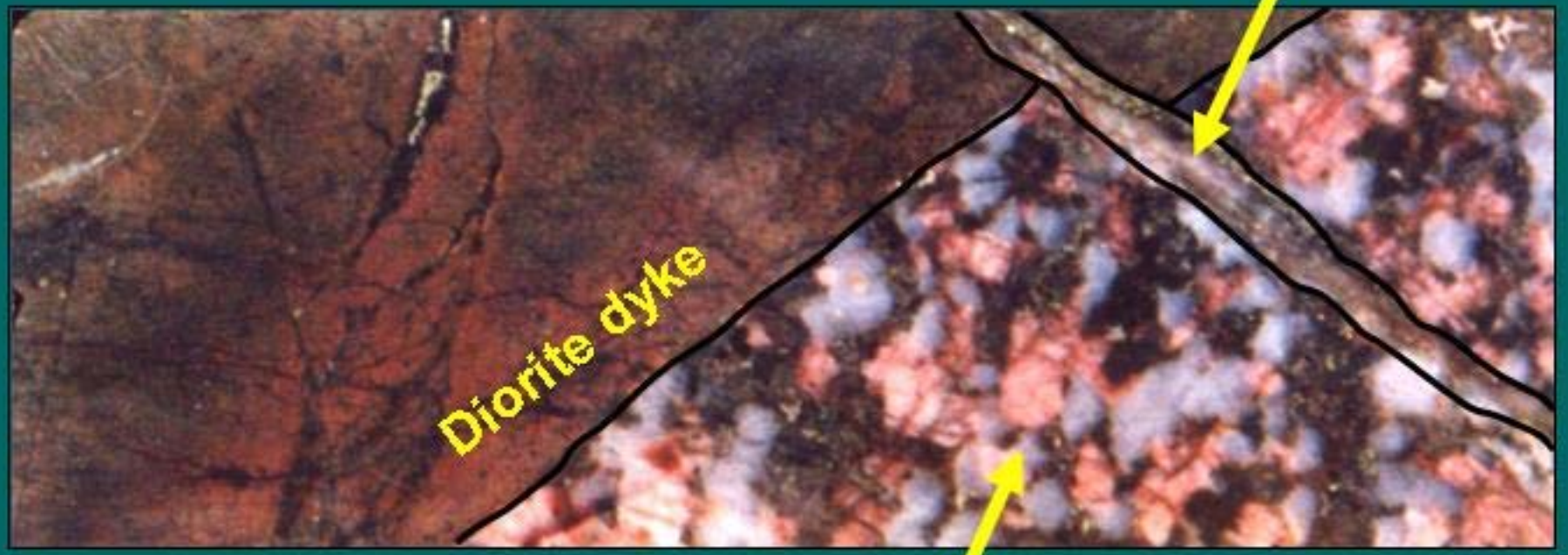
K/Ar 1609 ± 12 Ma

Nuckulla Hill

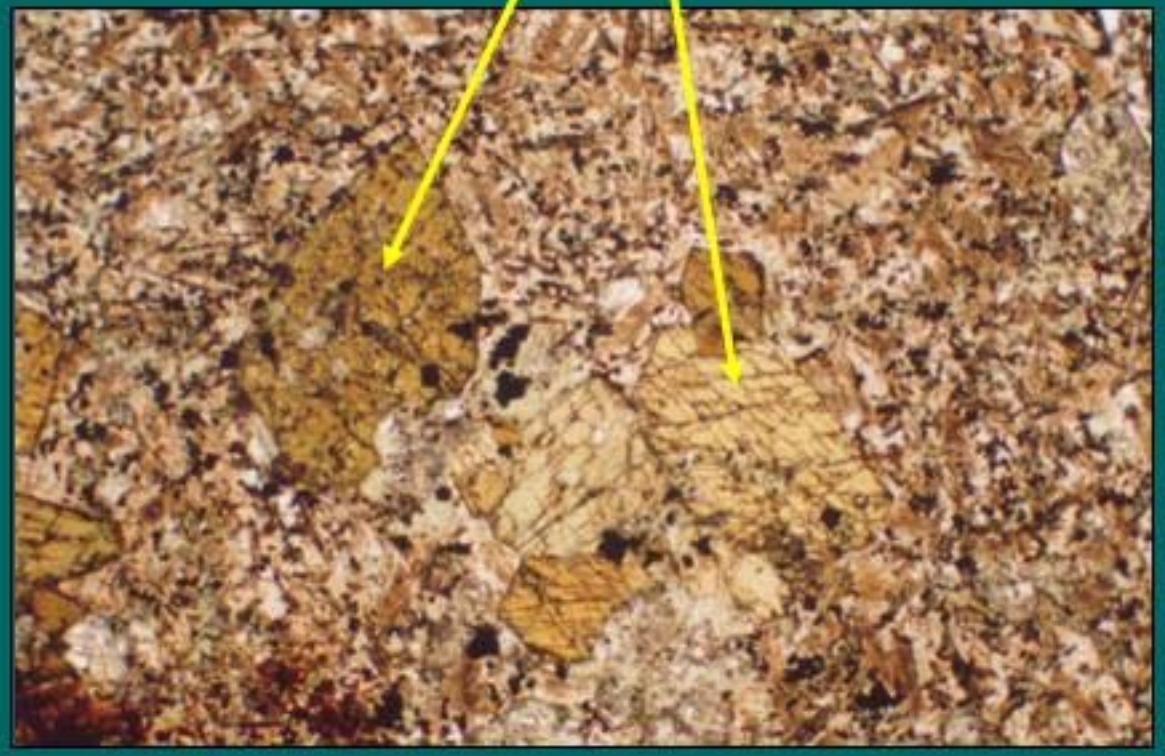
Weednanna

Barns

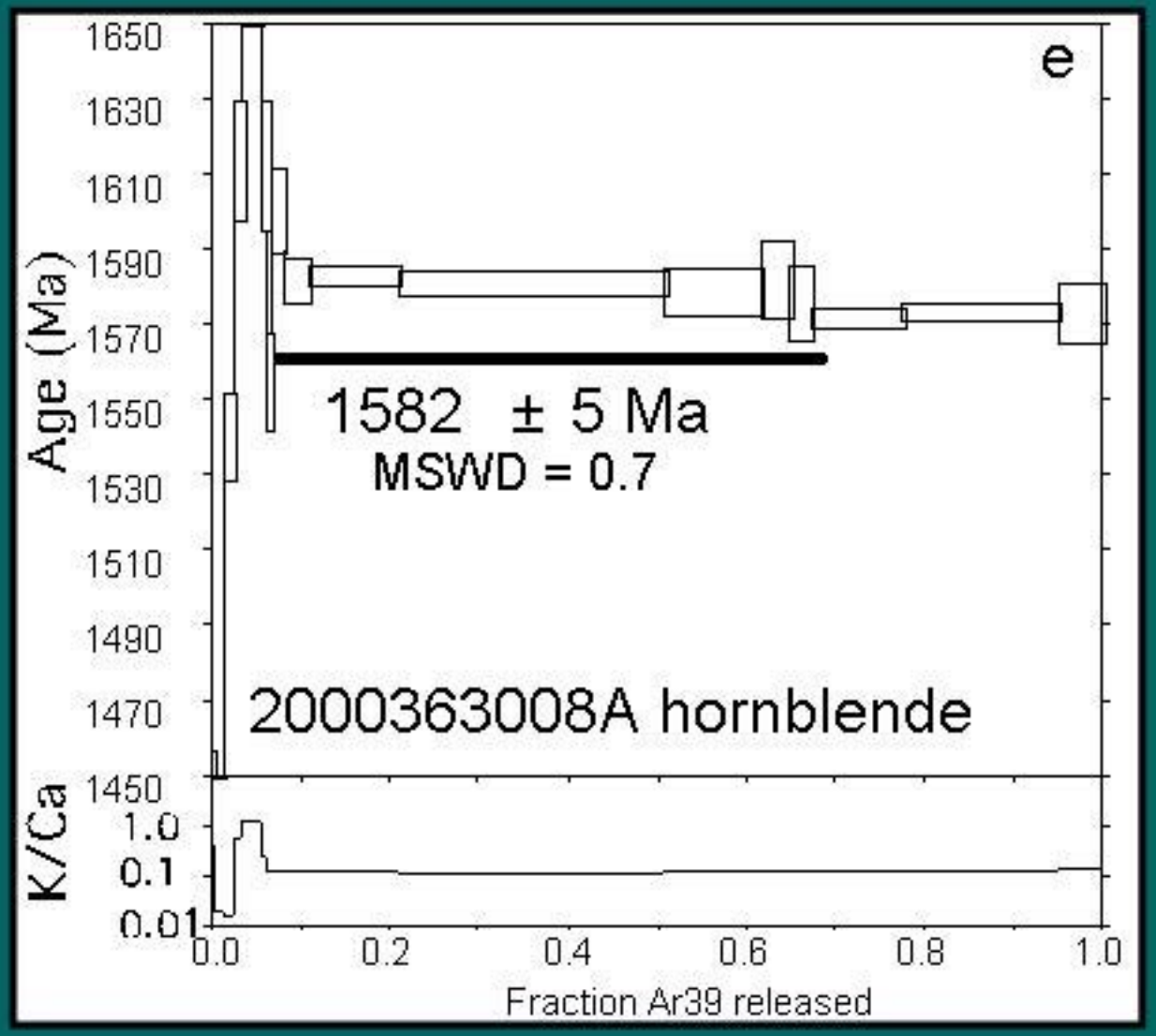
Tarcoola - rock relationships



Tarcoola - diorite dyke



Tarcoola - diorite dyke



Mineralisation maximum Age 1582 ± 5 Ma

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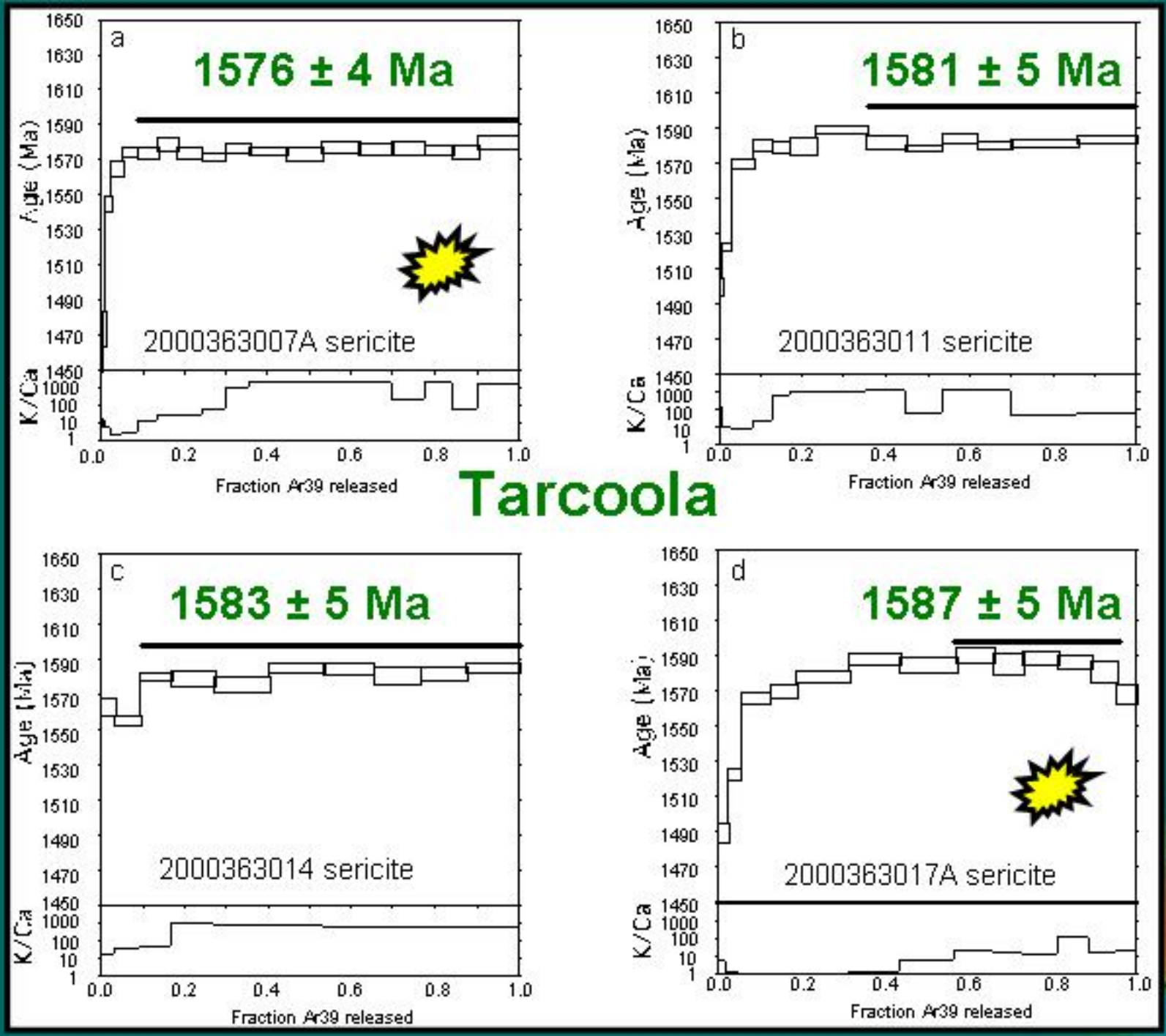
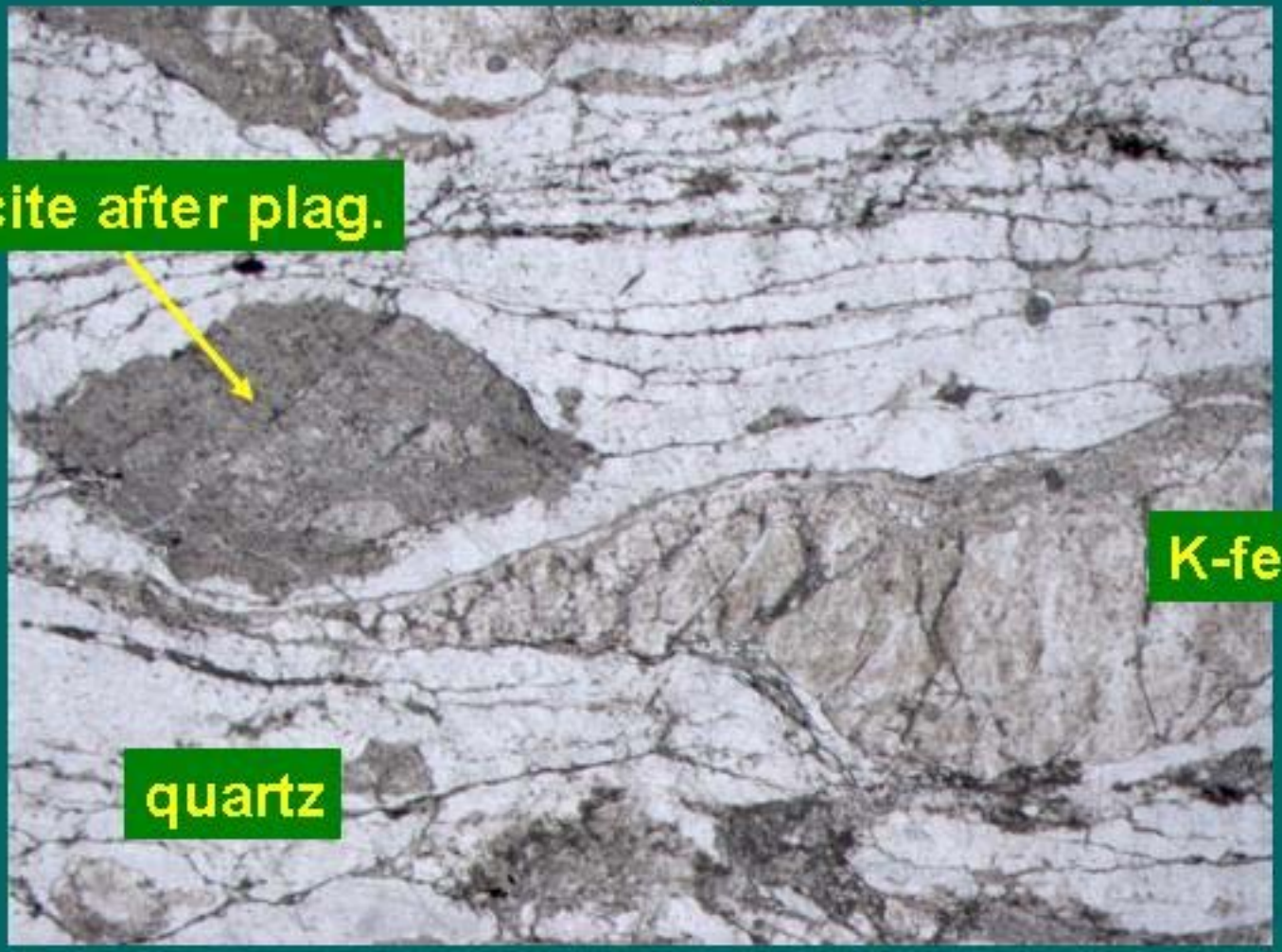

a
1576 ± 4 Ma
2000363007A sericite
b
1581 ± 5 Ma
2000363011 sericite
Tarcoola
c
1583 ± 5 Ma
2000363014 sericite
d
1587 ± 5 Ma
2000363017A sericite
Age (Ma)
K/Ca
Fraction Ar39 released

Tunkillia:

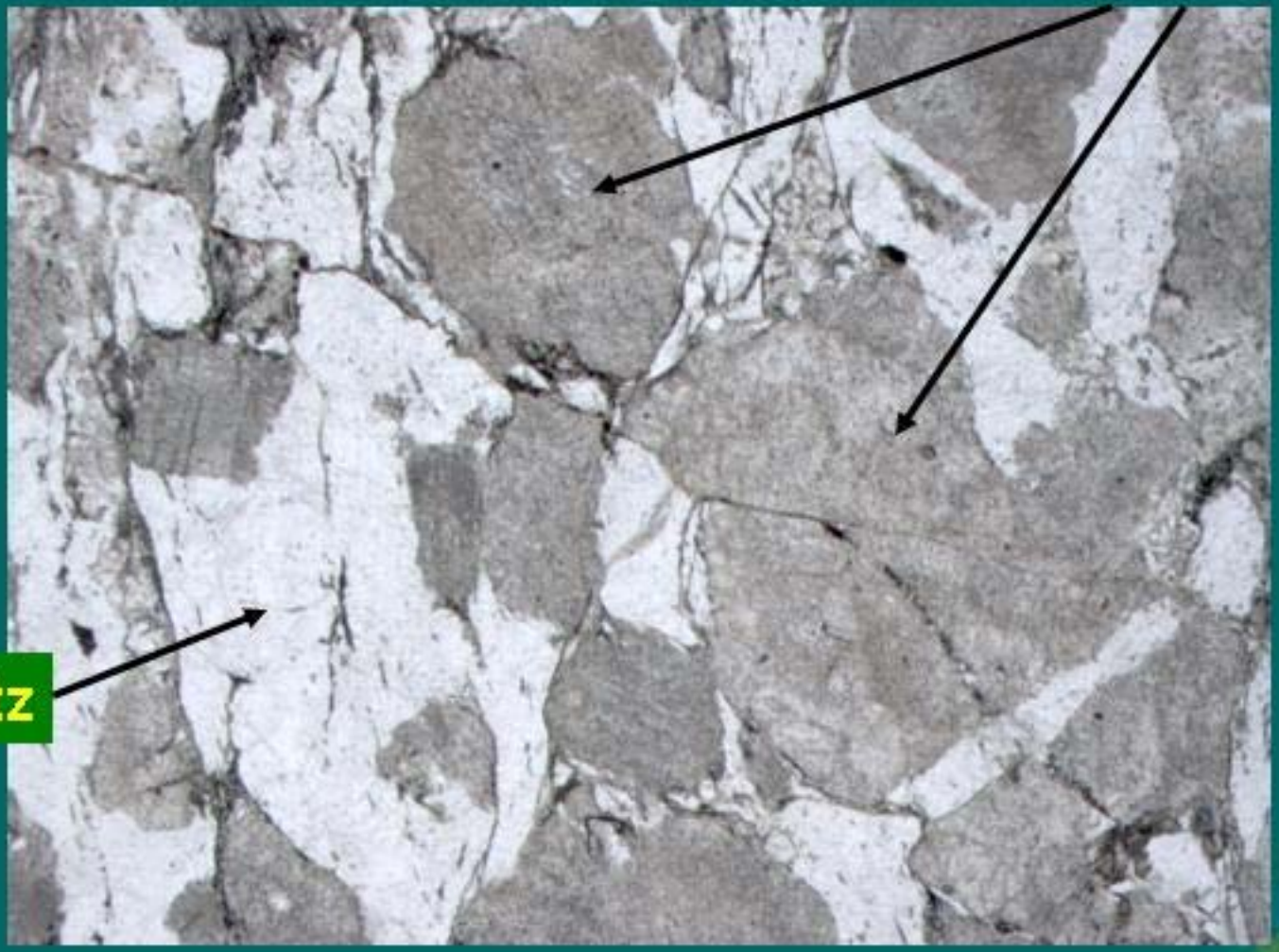
Yarlbrinda Shear Zone

sheared Tunkillia suite granite (~1680 Ma)



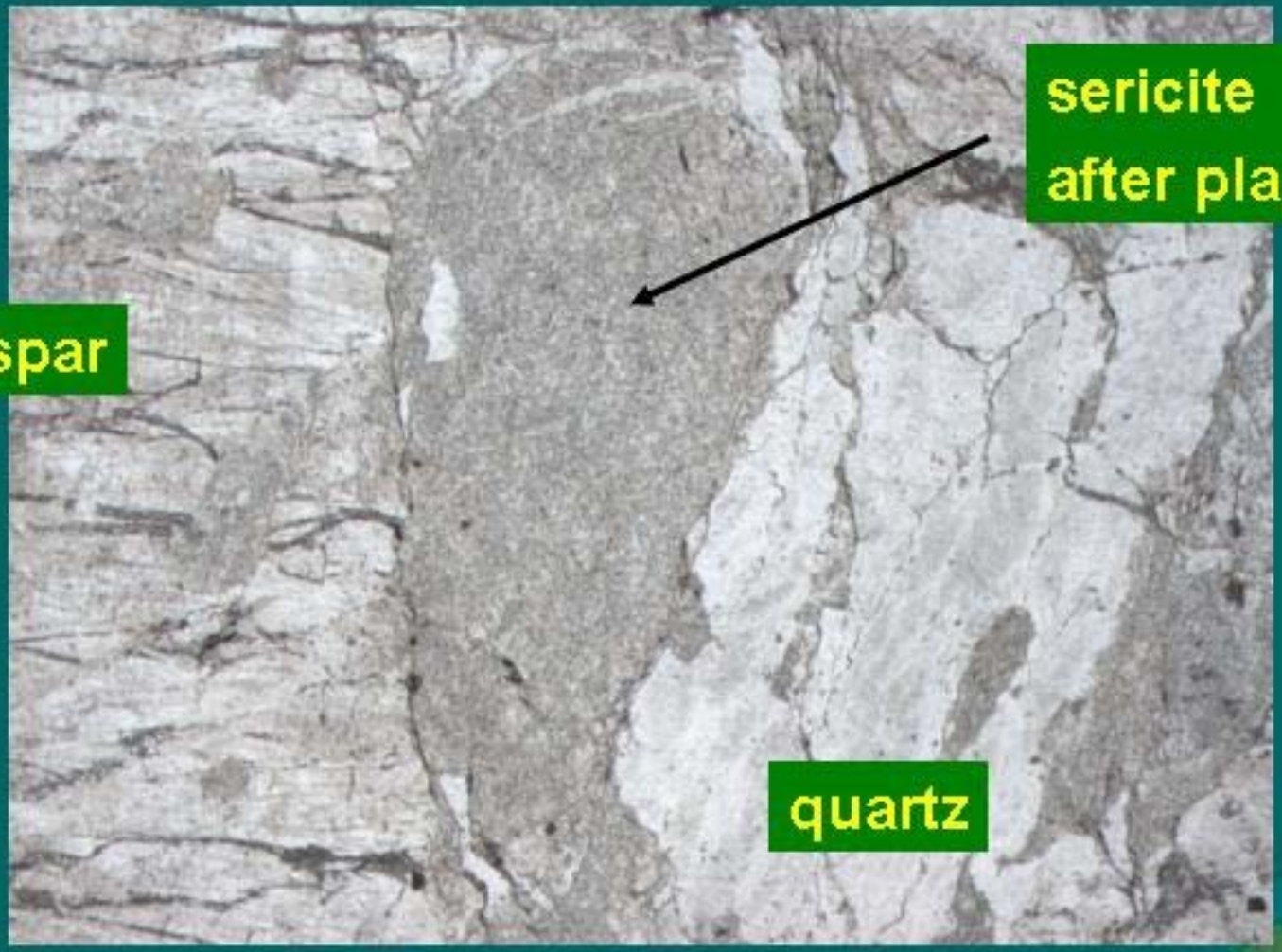
2003369004

Tunkillia



2003369003

Tunkillia

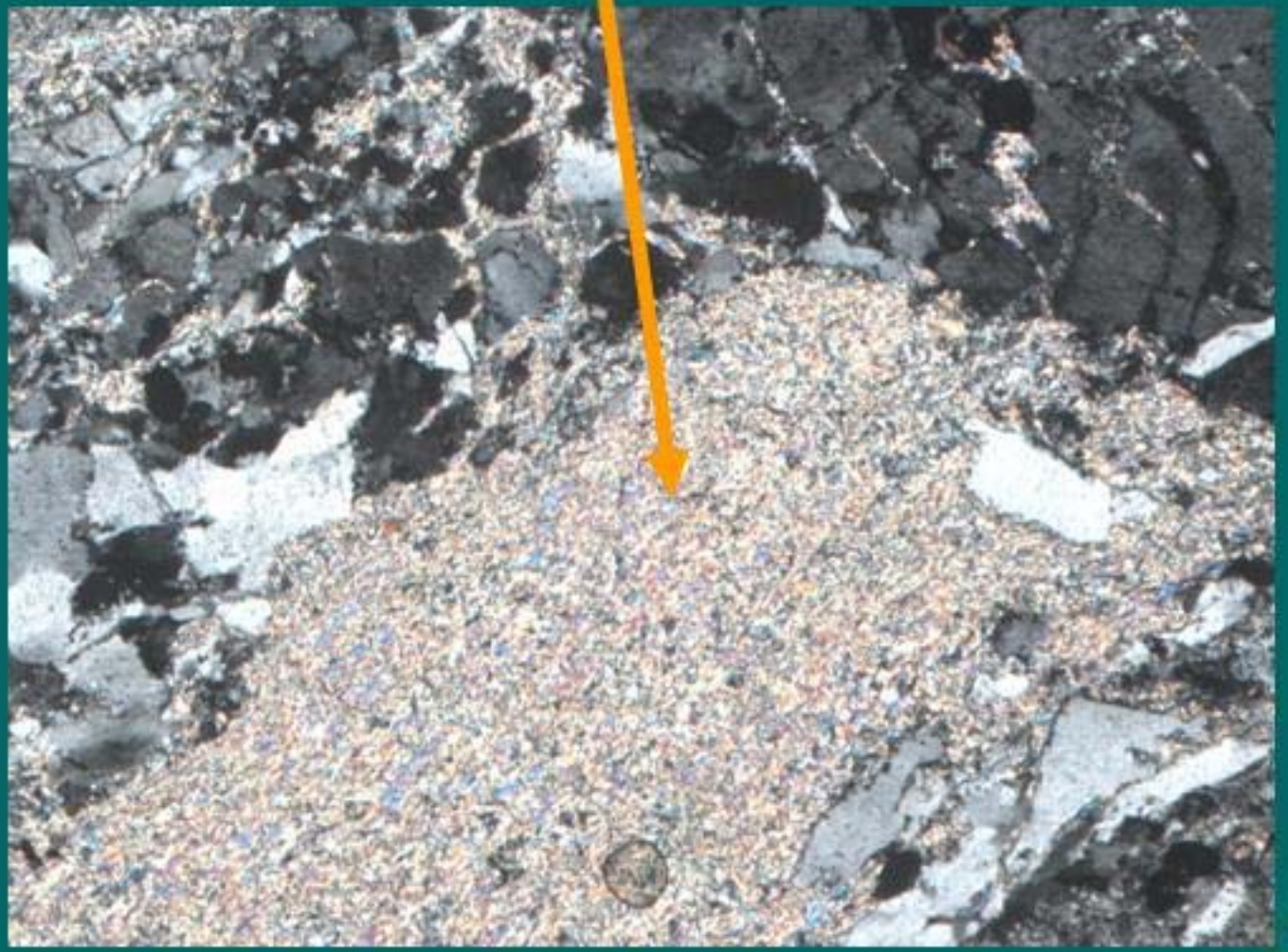


2 mm

2003369002

Tunkillia

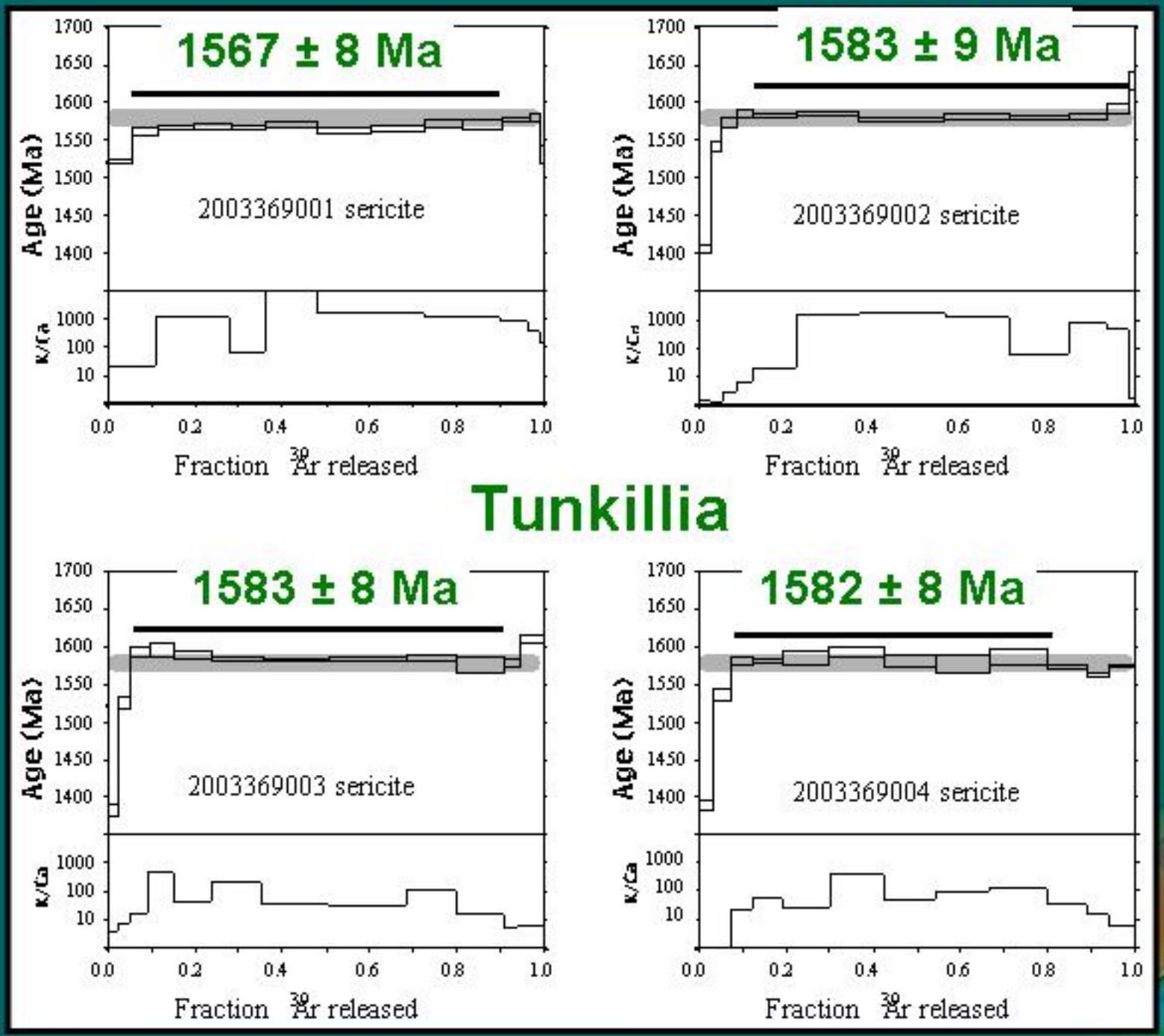
sericite after plagioclase



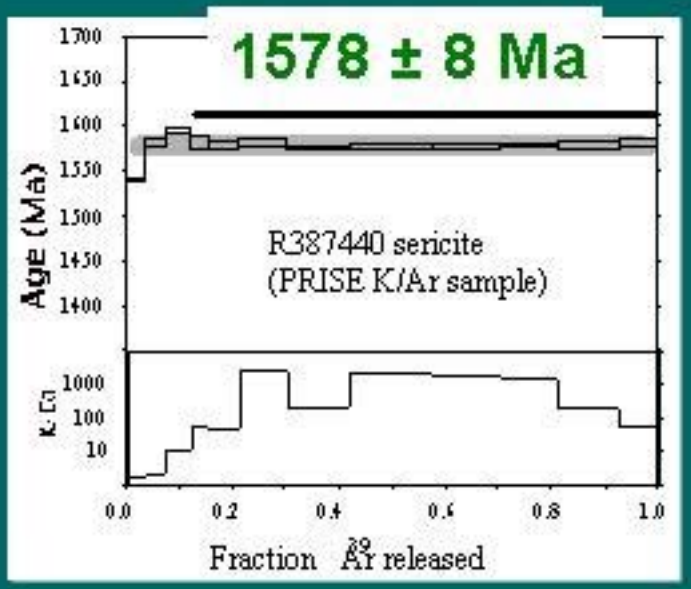
0.5 mm

2003369001

Geoscience Australia


1567 ± 8 Ma
2003369001 sericite
Age (Ma)
K/Ca
Fraction 39Ar released
1583 ± 9 Ma
2003369002 sericite
Age (Ma)
K/Ca
Fraction 39Ar released
Tunkillia
1583 ± 8 Ma
2003369003 sericite
Age (Ma)
K/Ca
Fraction 39Ar released
1582 ± 8 Ma
2003369004 sericite
Age (Ma)
K/Ca
Fraction 39Ar released

Tunkillia



K/Ar age 1609 ± 12 Ma (PRISE)

Five sericite ages in range;

1567 ± 8 Ma to 1583 ± 9 Ma

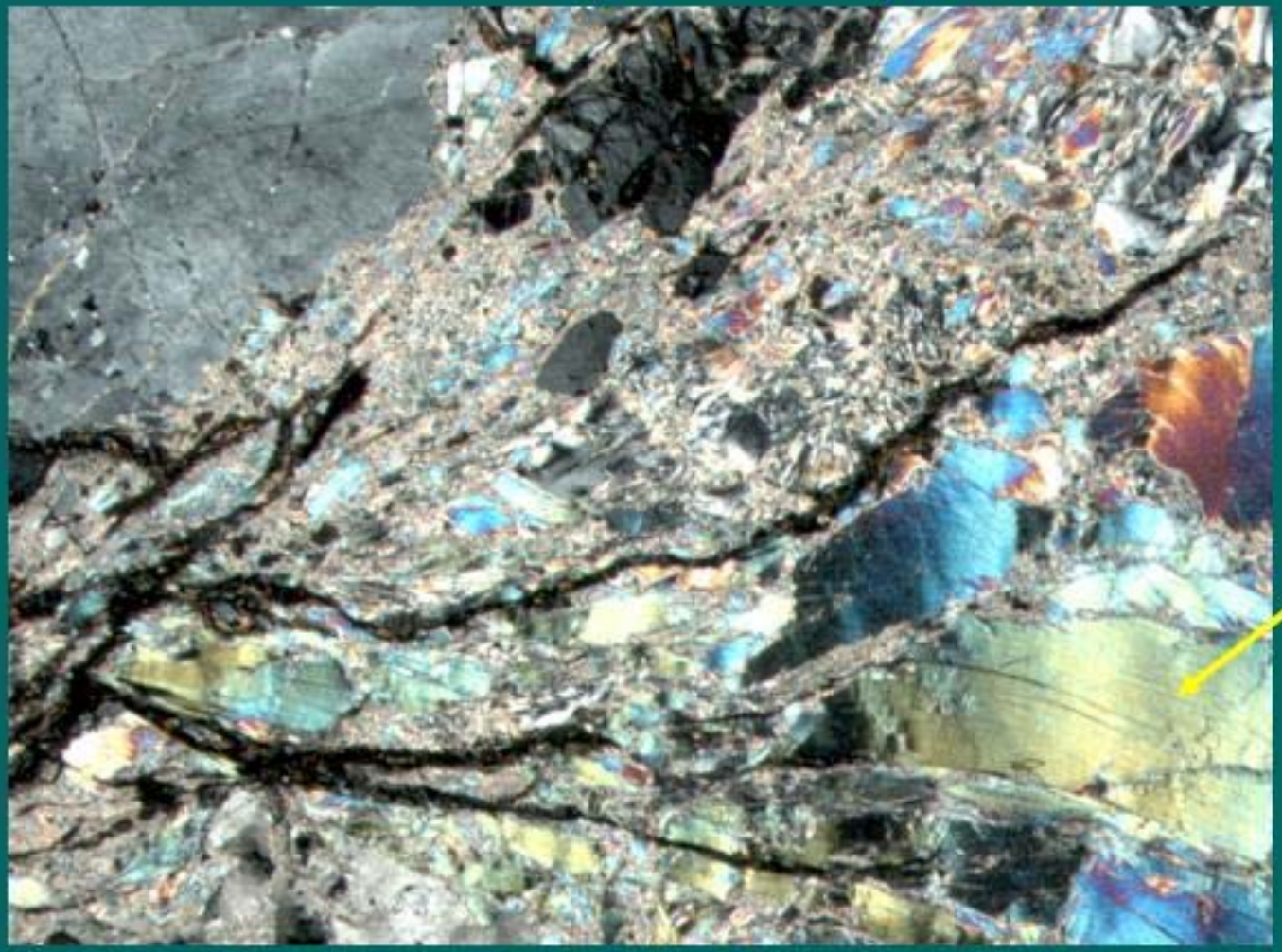
Consistency of ages:

- Geologically meaningful
- Interpreted as alteration ages

Nuckulla Hill

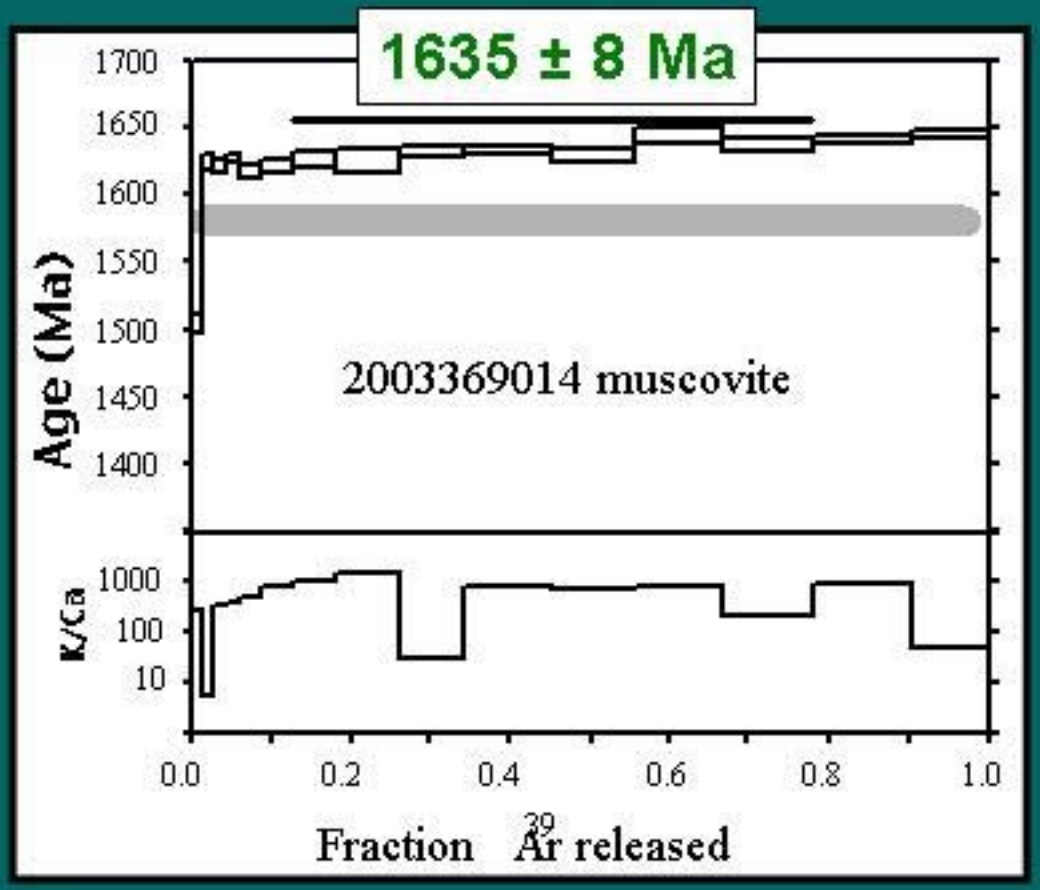
Yarlbrinda Shear Zone

Tunkillia Suite (~1680 Ma)

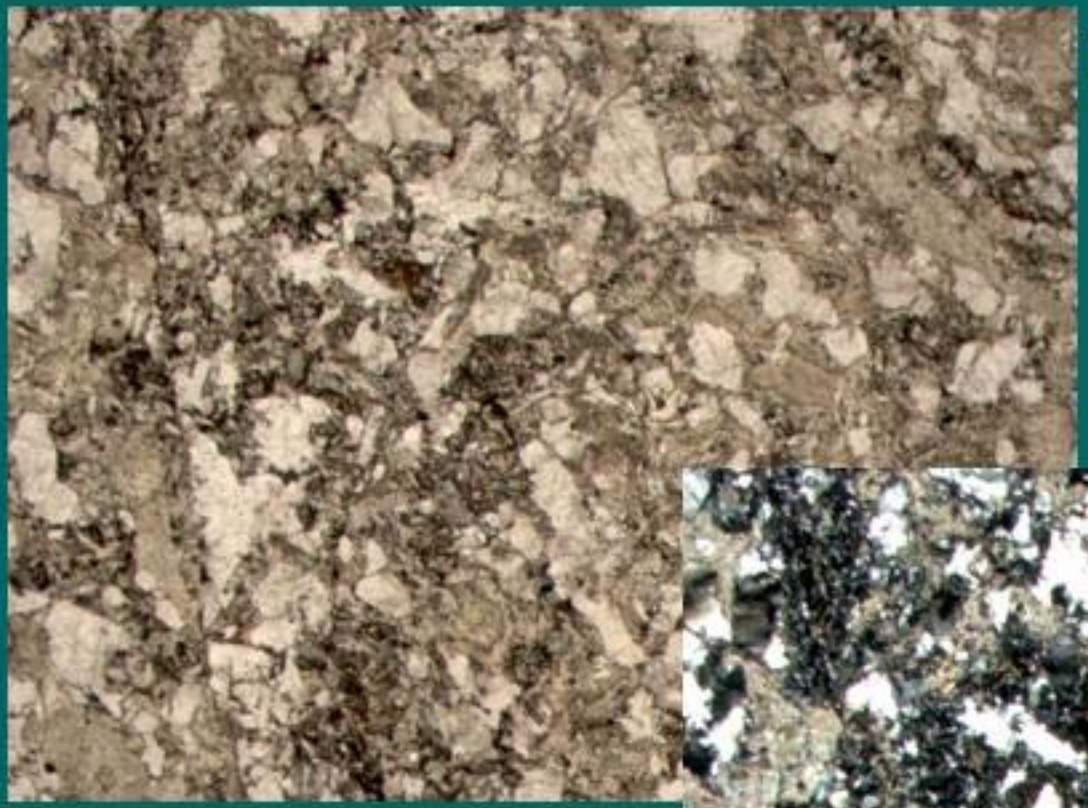


2003369014

Nuckulla Hill



- Yarlbrinda S.Z. active at ~1635 Ma
- Relationship with Au-mineralisation unknown

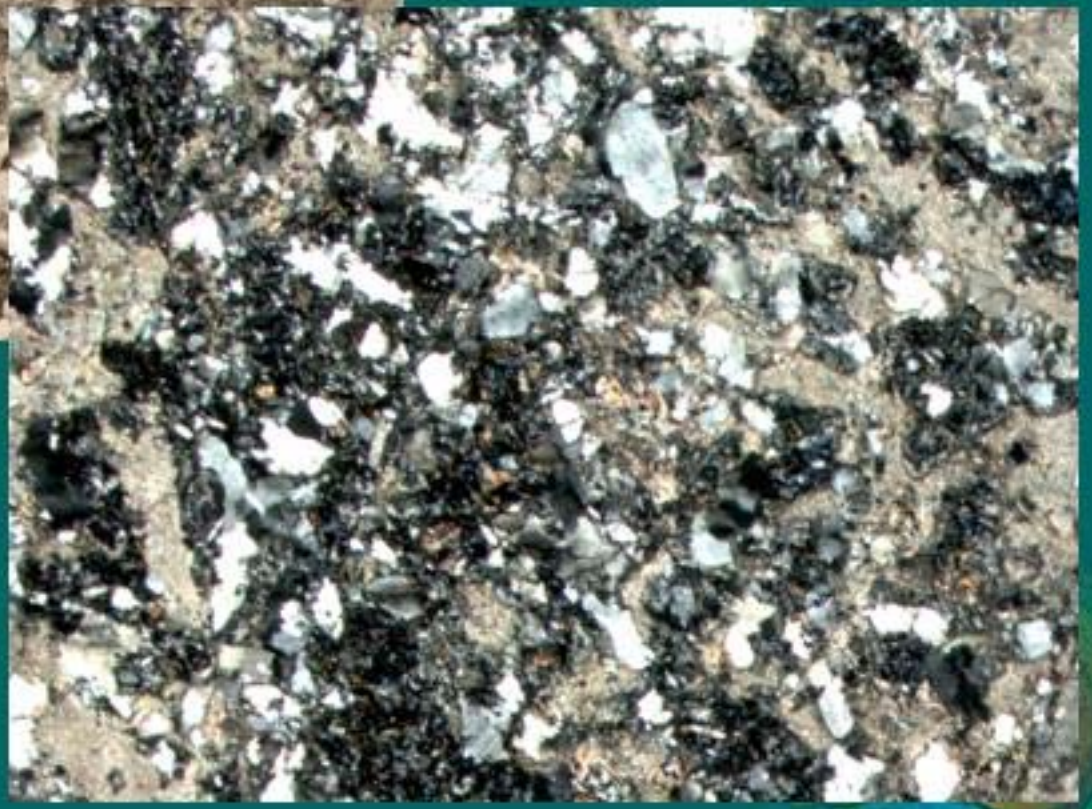


PPL

Nuckulla Hill

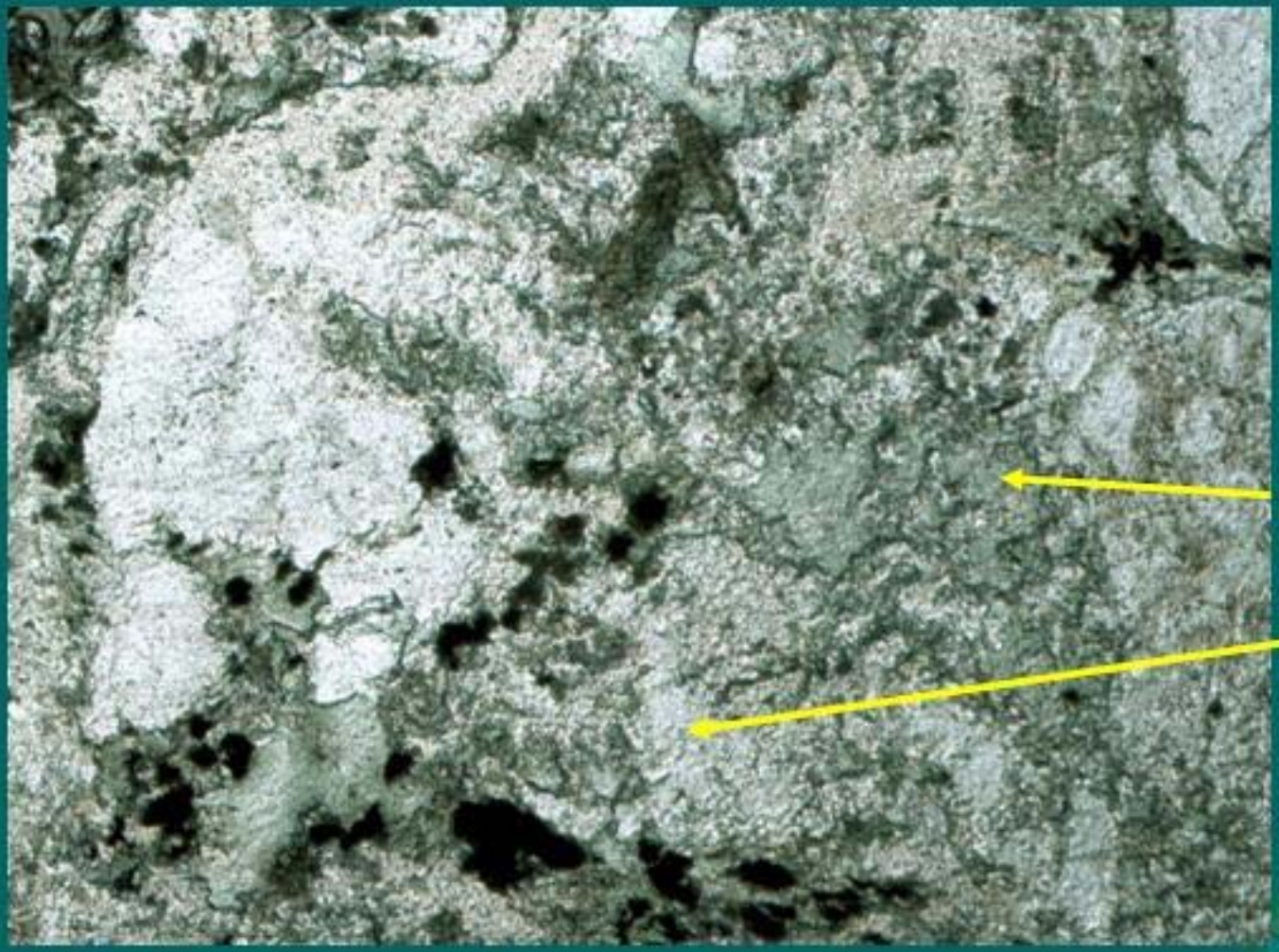
2003369015

XPL



2 mm

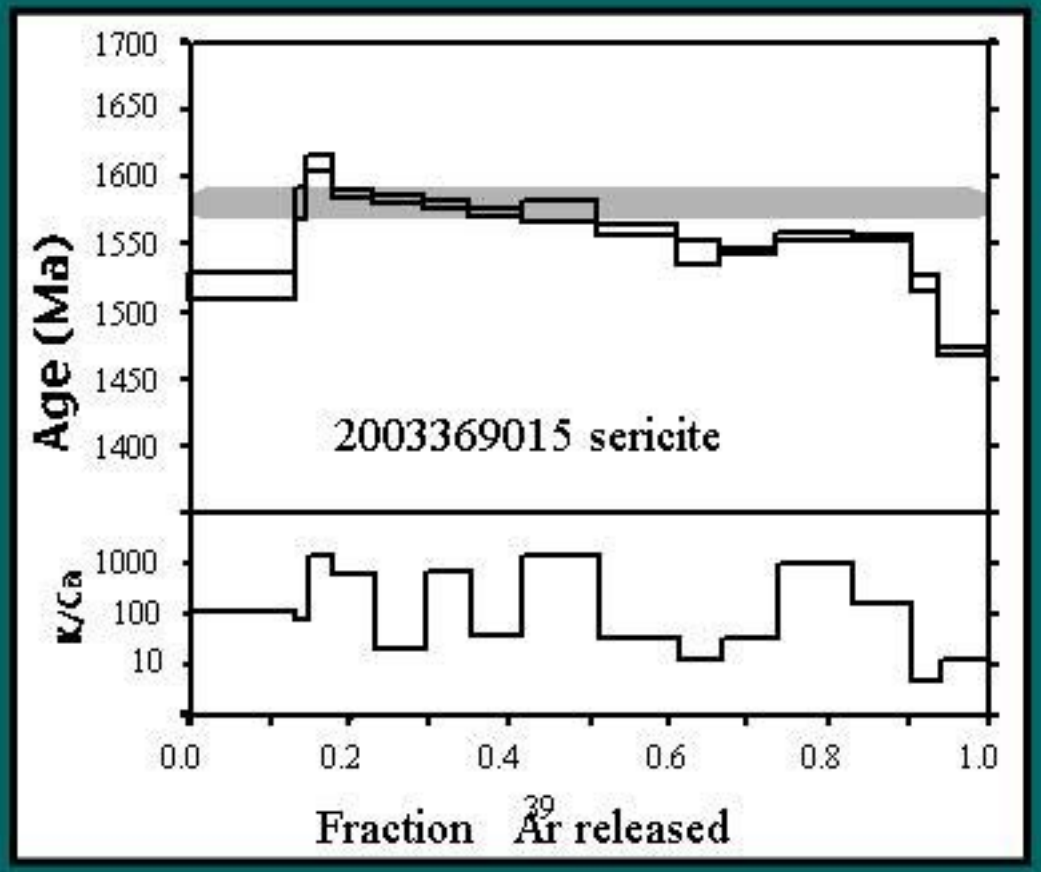
Nuckulla Hill



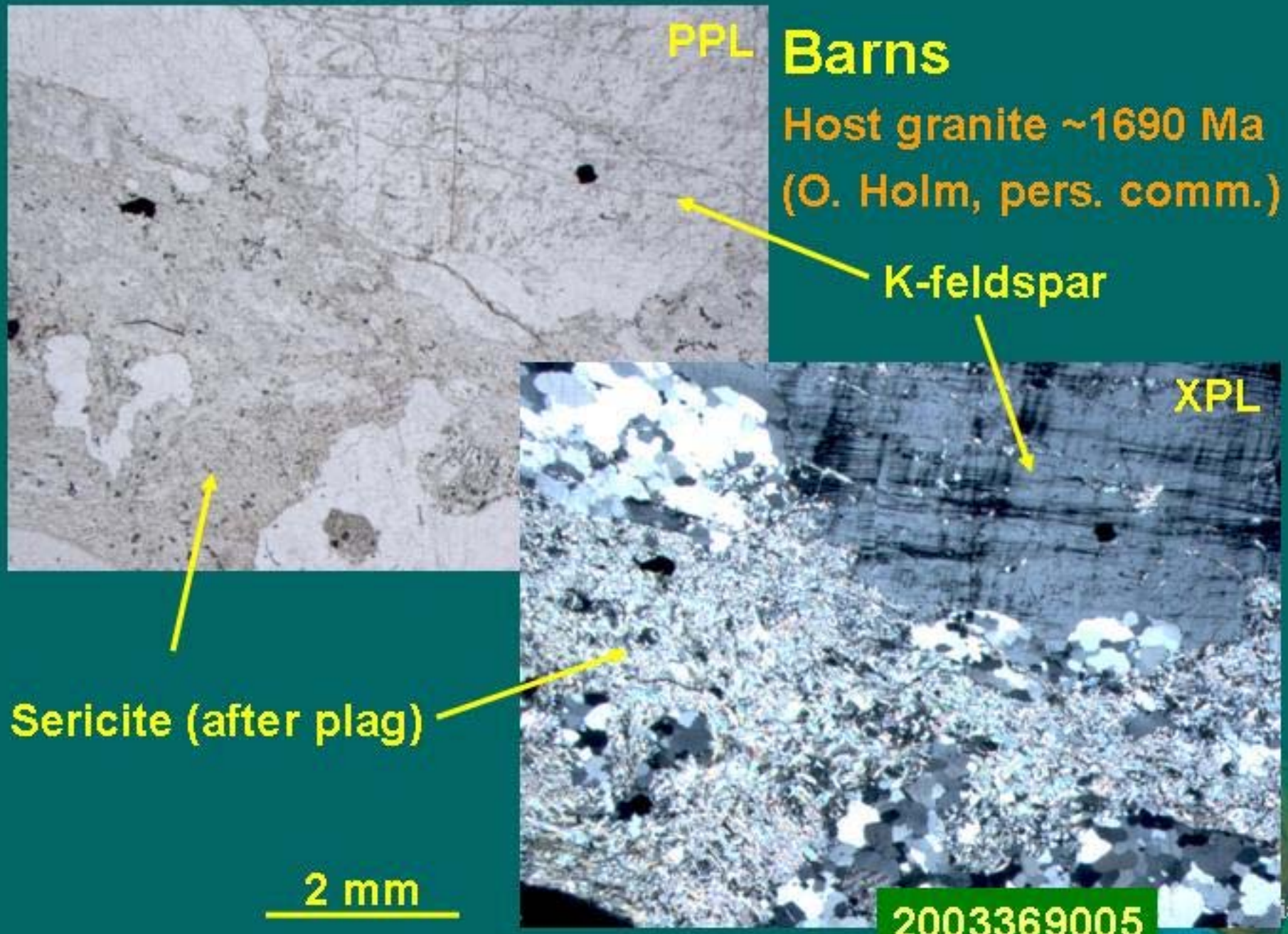
0.5 mm

2003369015

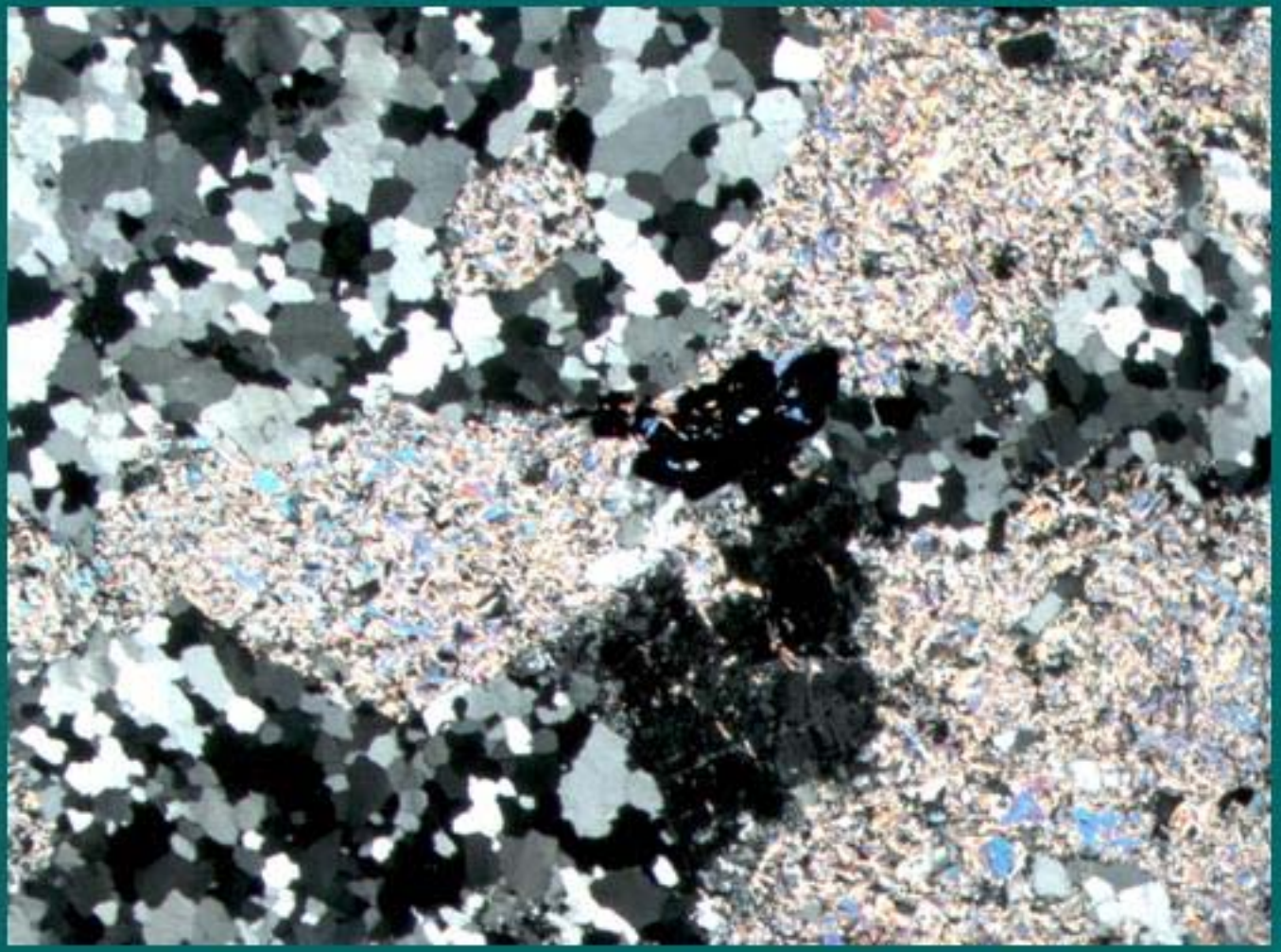
Nuckulla Hill



Impure mineral separate
Problem with chlorite alteration

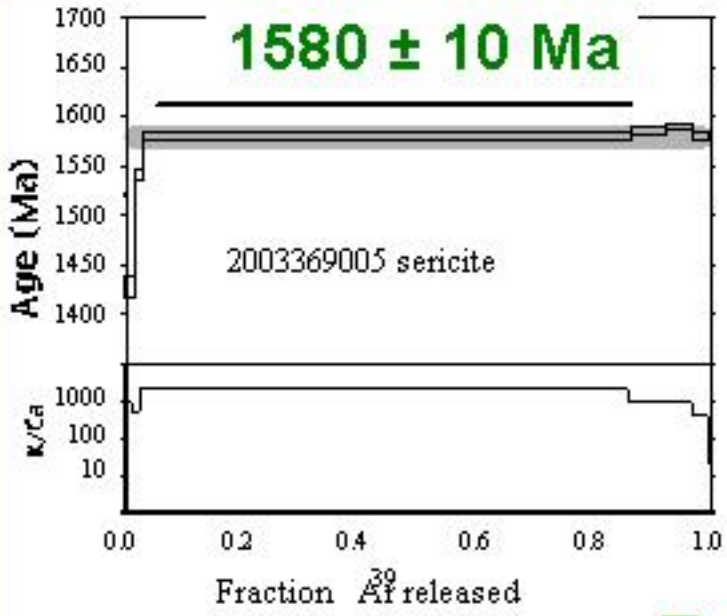

PPL
Barns
Host granite ~1690 Ma
(O. Holm, pers. comm.)
K-feldspar
XPL
Sericite (after plag)
2 mm
2003369005

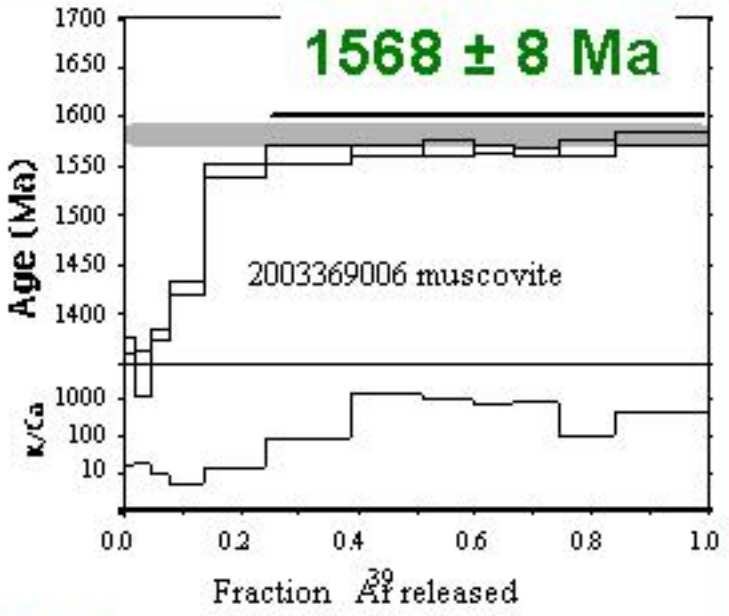
Barns



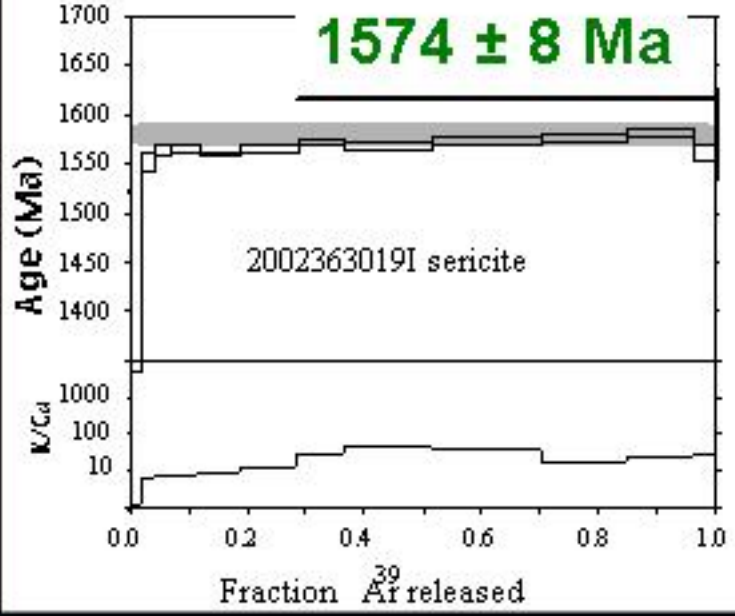
2 mm

2003369005

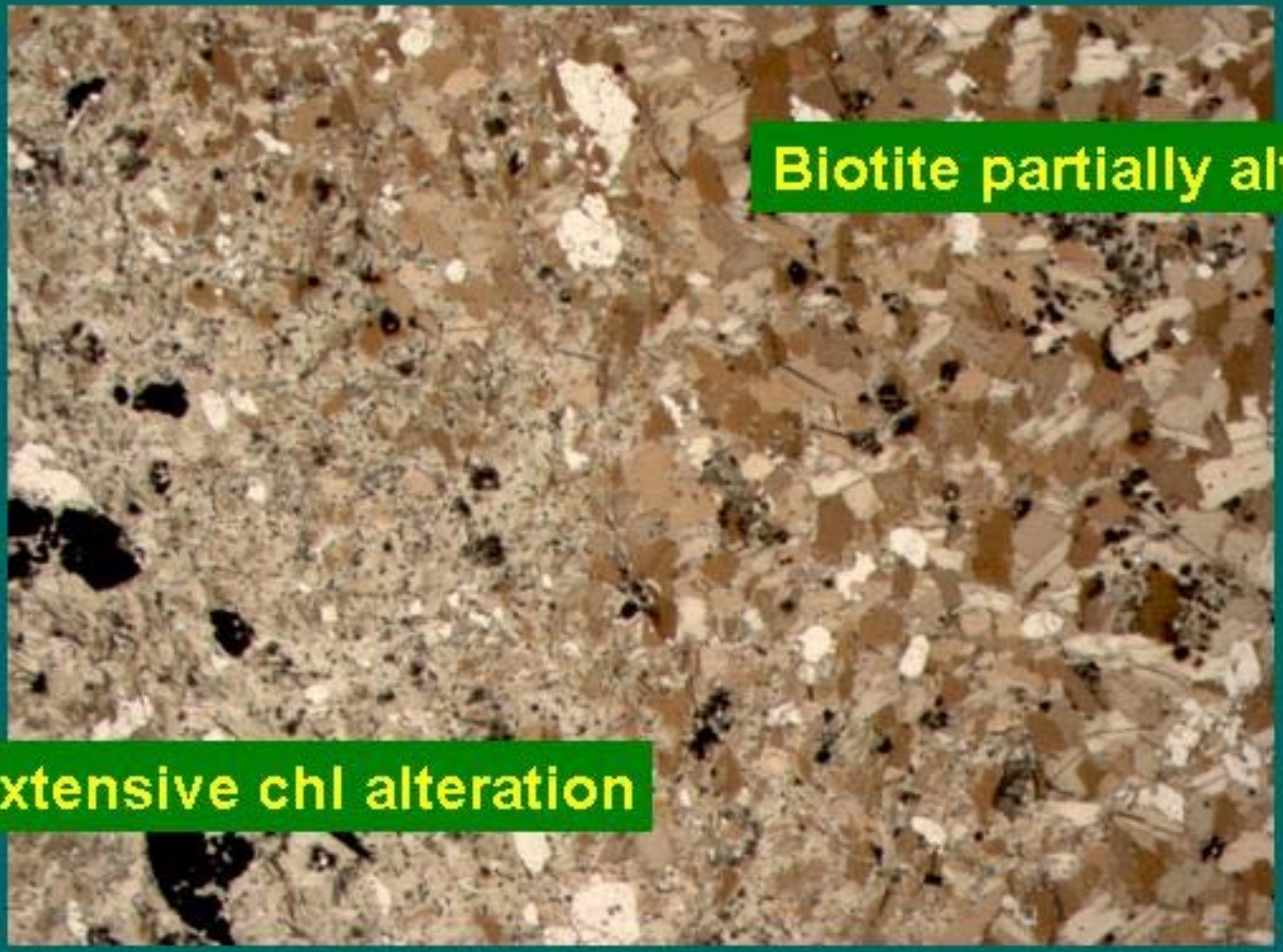




Barns



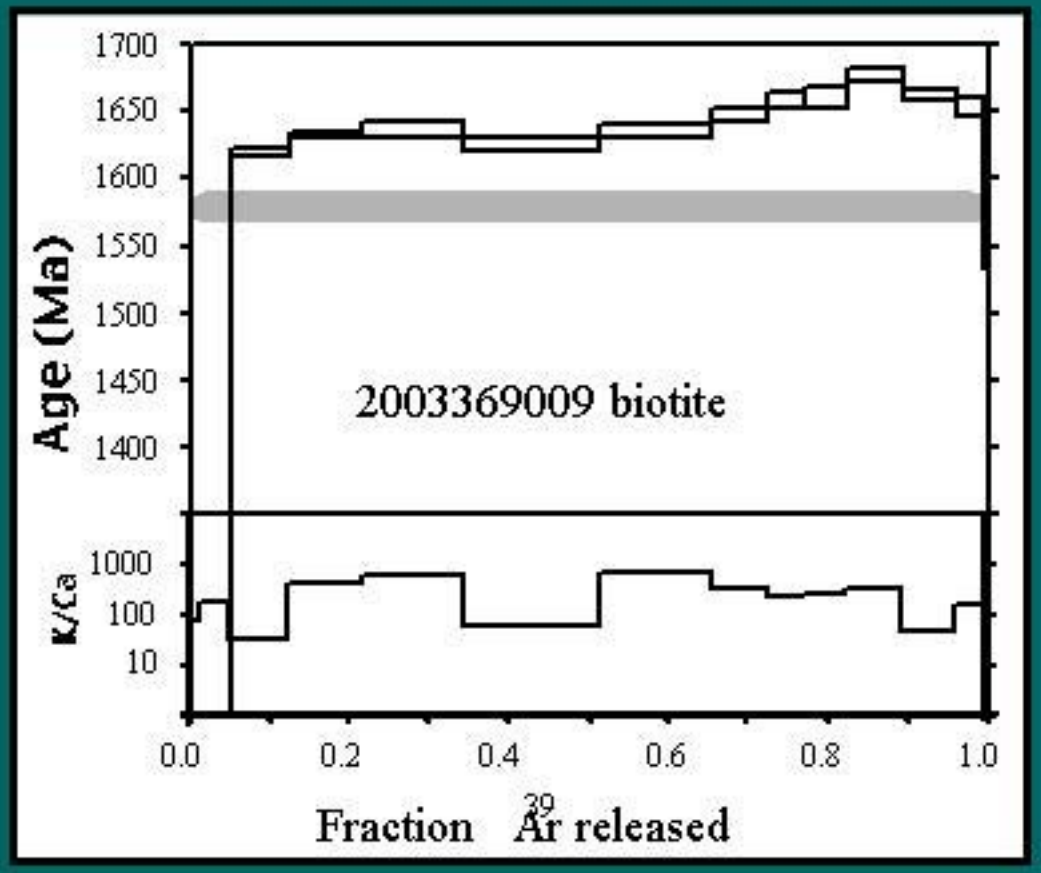
Weednanna - variety of hosts, extensively altered



2 mm

2003369010

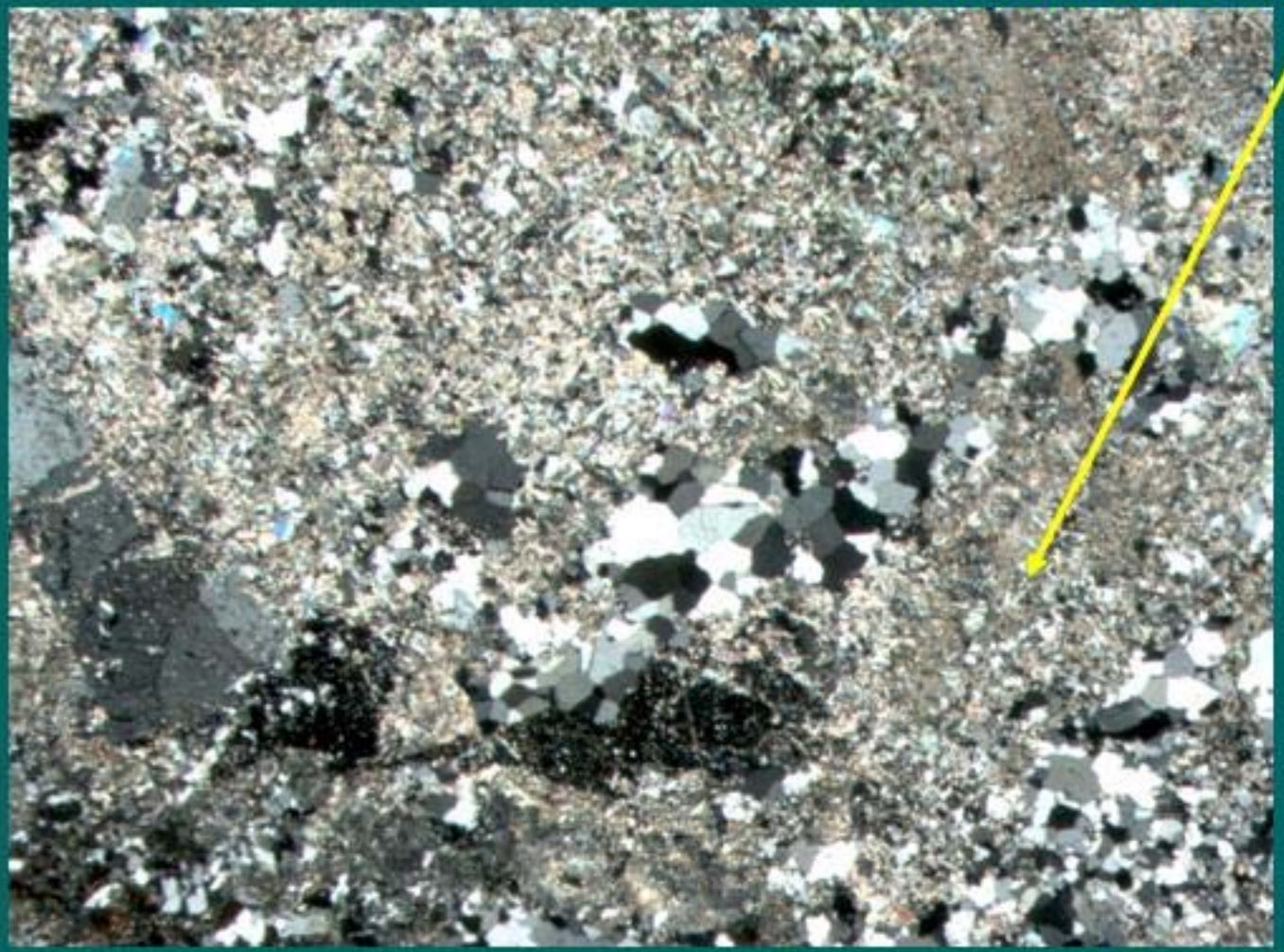
Weednanna



biotite texturally predates chl+musc alteration

Weednanna

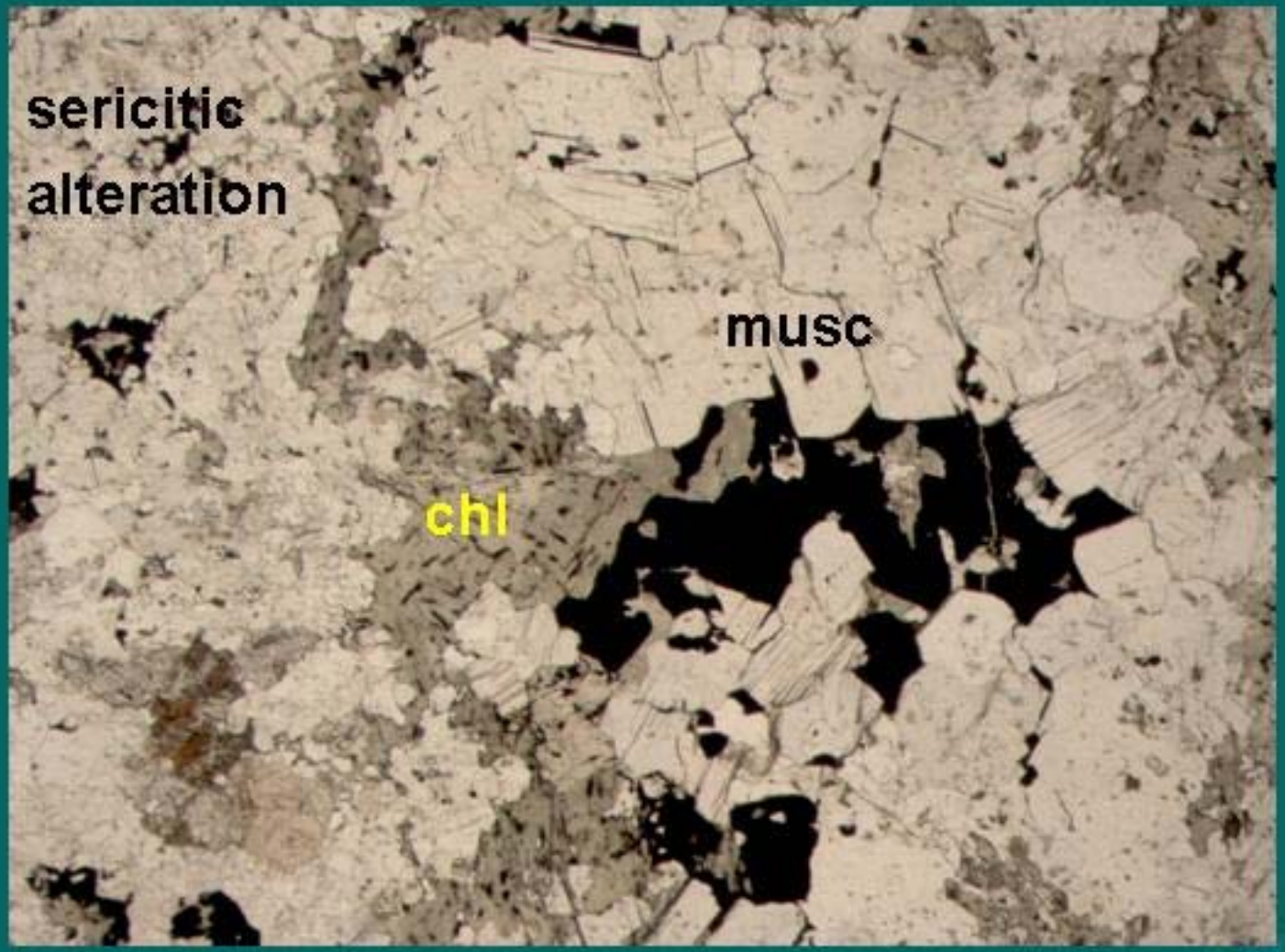
Partial sericitic alteration + chlorite



2 mm

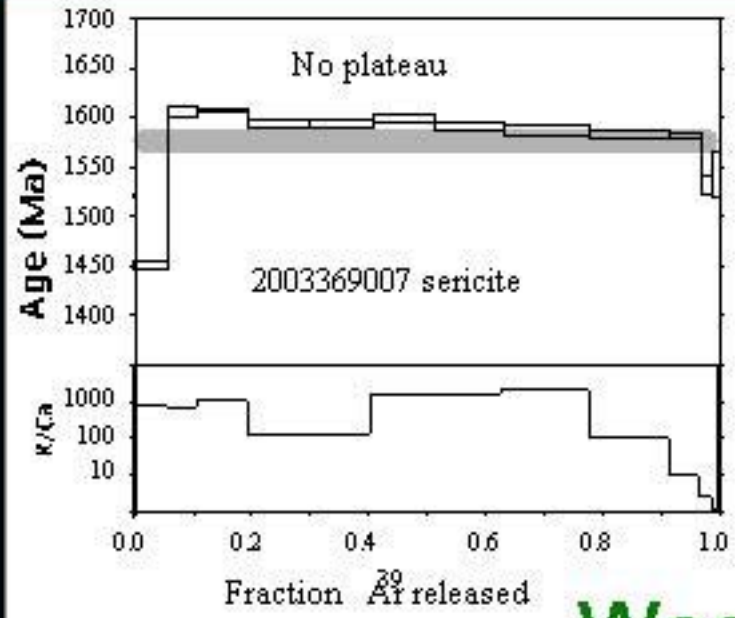
2003369007

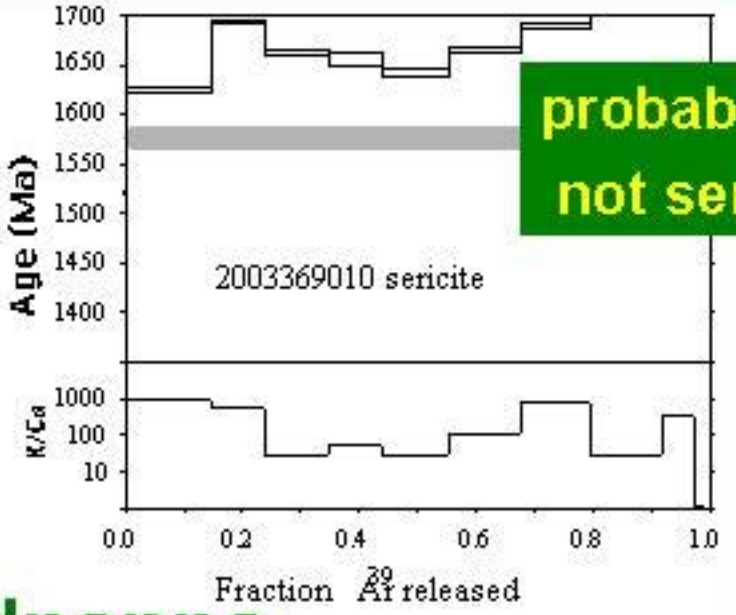
Geoscience Australia



2 mm

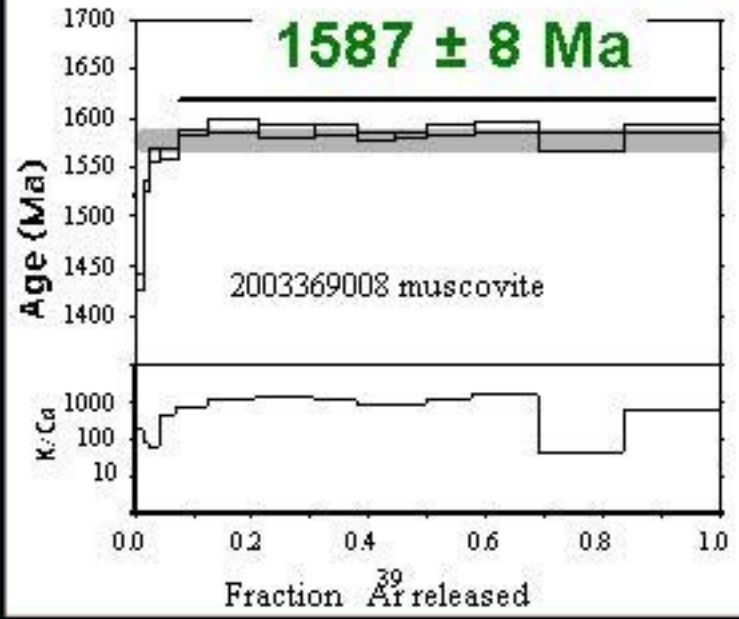
2003369008 Weednanna

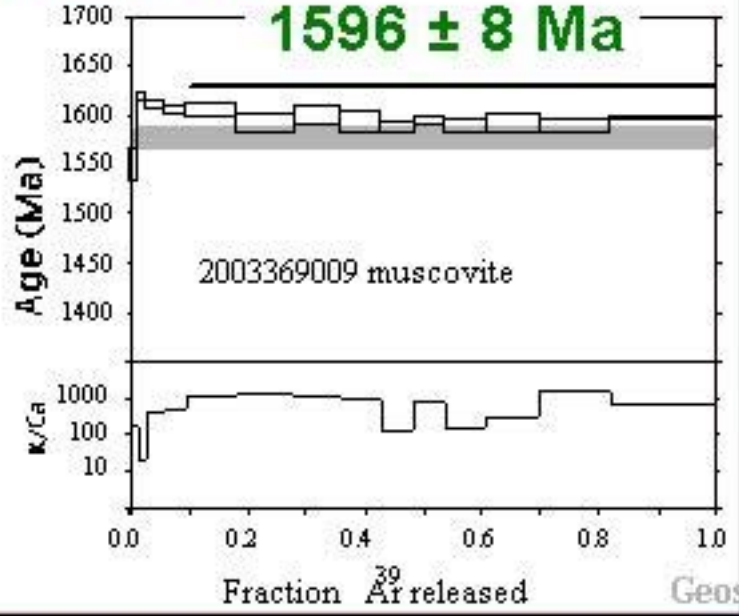




probably chlorite
not sericite

Weednanna





Summary of age data

$^{40}Ar/^{39}Ar$ dating of sericitic alteration successful where quality, pure separates can be obtained

Consistency of sericite ages from Tarcoola, Tunkillia, Barns, strongly suggests an episode of alteration at ~1580 ± 10 Ma.

Sericitic alteration spatially associated with gold mineralisation, and broadly coeval with GRV/Hiltaba magmatism.

Weednanna & Nuckulla Hill - require better petrological understanding of alteration history and mineralisation

Uncertainties - comparison with U-Pb ages

e.g. 2003369002 sericite: Tunkillia 1583 ± 9 Ma

Uncertainty source	± 2σ
Analytical only	± 5 Ma
+ Irradiation parameter	± 9 Ma
+ Age of standard	± 15 Ma
+ *Decay constants*	± *30 Ma*

Conclusion

So:

Are all the CGGP prospects the same age?

- Tarcoola, Tunkillia, Barns

Yes, all ~1580 ± 10 Ma

- Nuckulla Hill, Weednanna

Maybe, or maybe not