The Architecture A1 Project

In search of an lithosphere-scale suture at Mt Isa

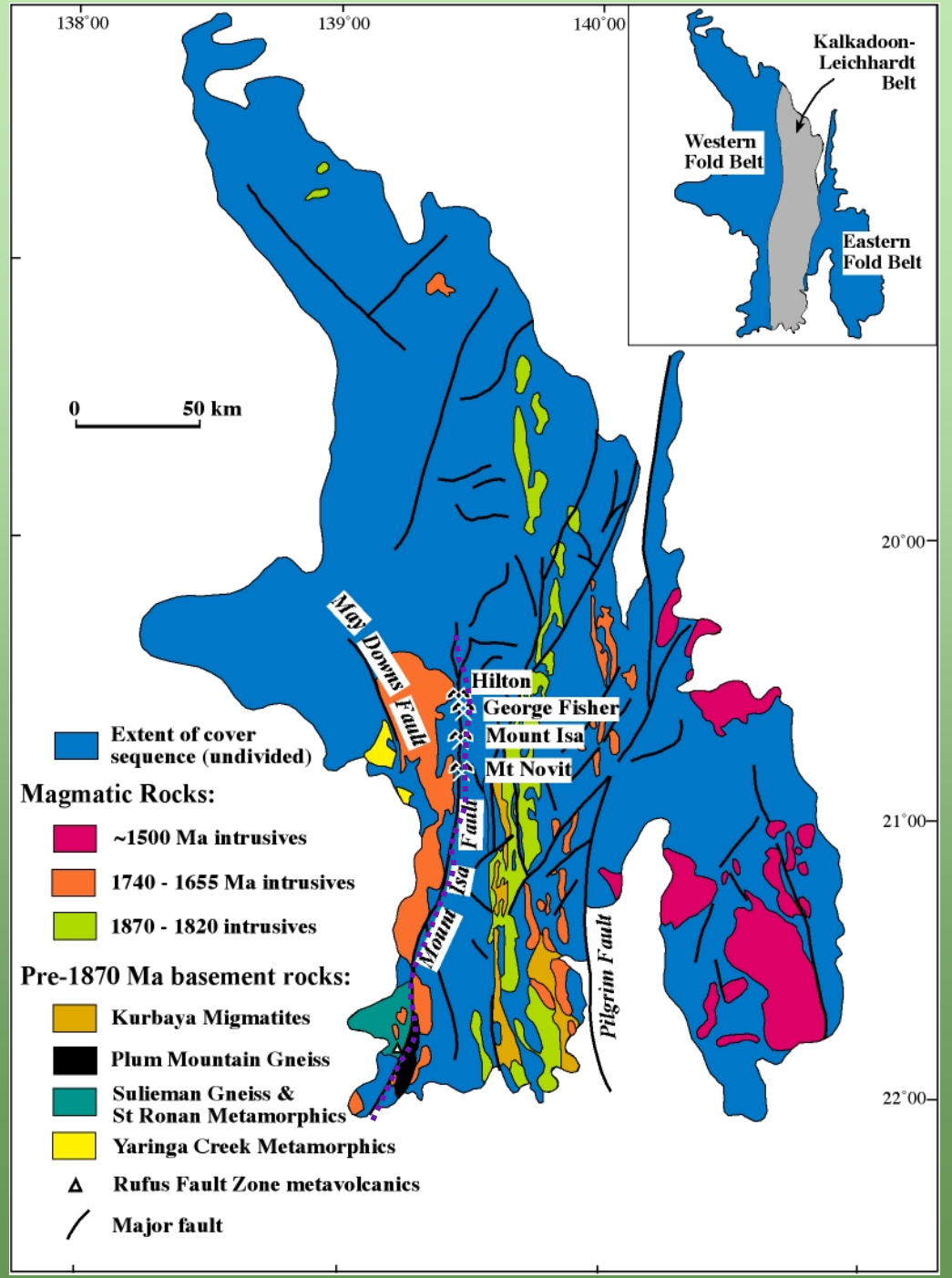
Frank Bierlein, Lance Black, Peter Betts

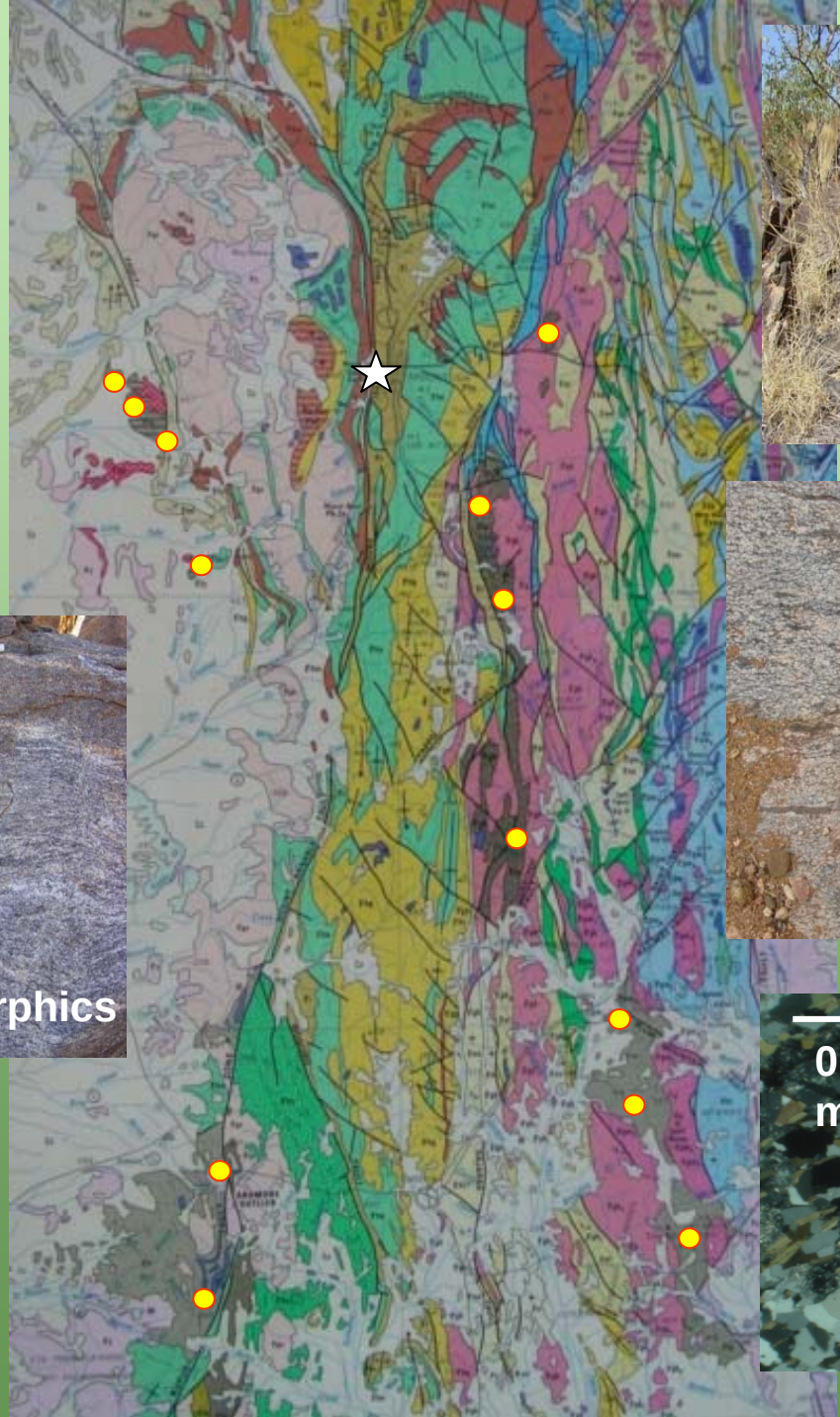
Mount Isa PDT Workshop; Mt Isa, March 10 - 11, 2005

MIFZ basement study

A1: trans-lithospheric, mantle-tapping faults = world-class deposits?

Mt Isa Fault ideal test case (mineralised; HDD terrain)

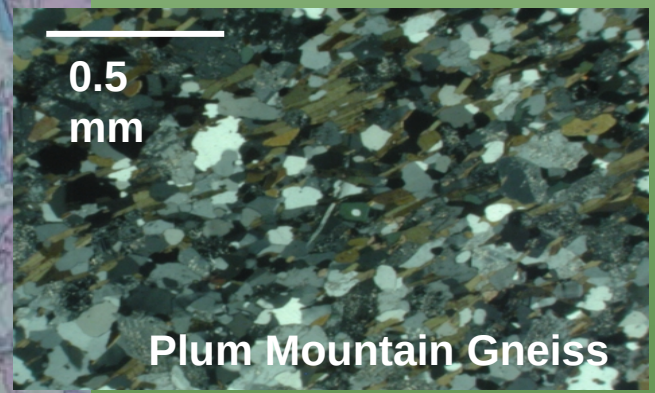





Kurbaya Migmatites

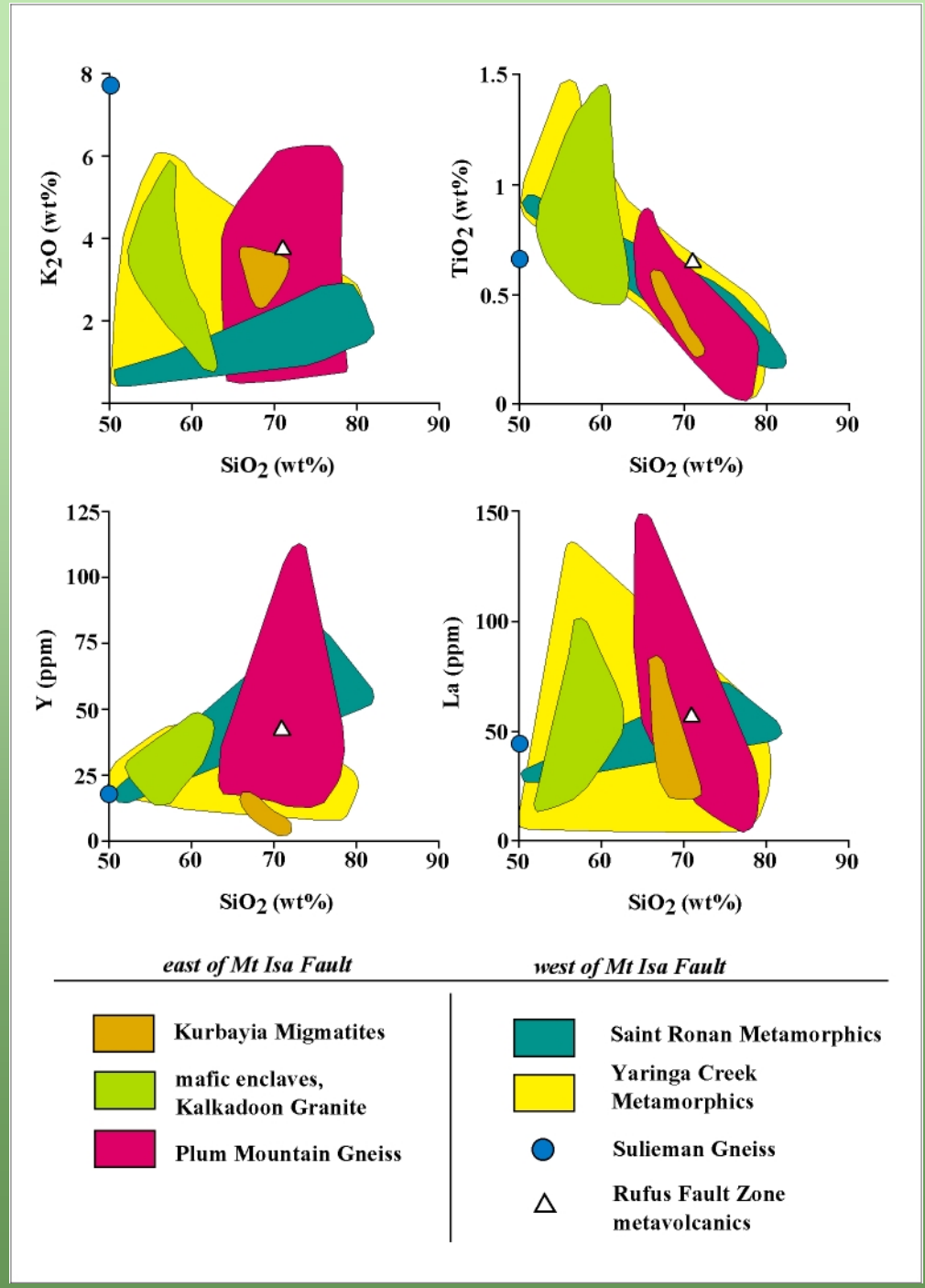

Kalkadoon Granite mafic enclave

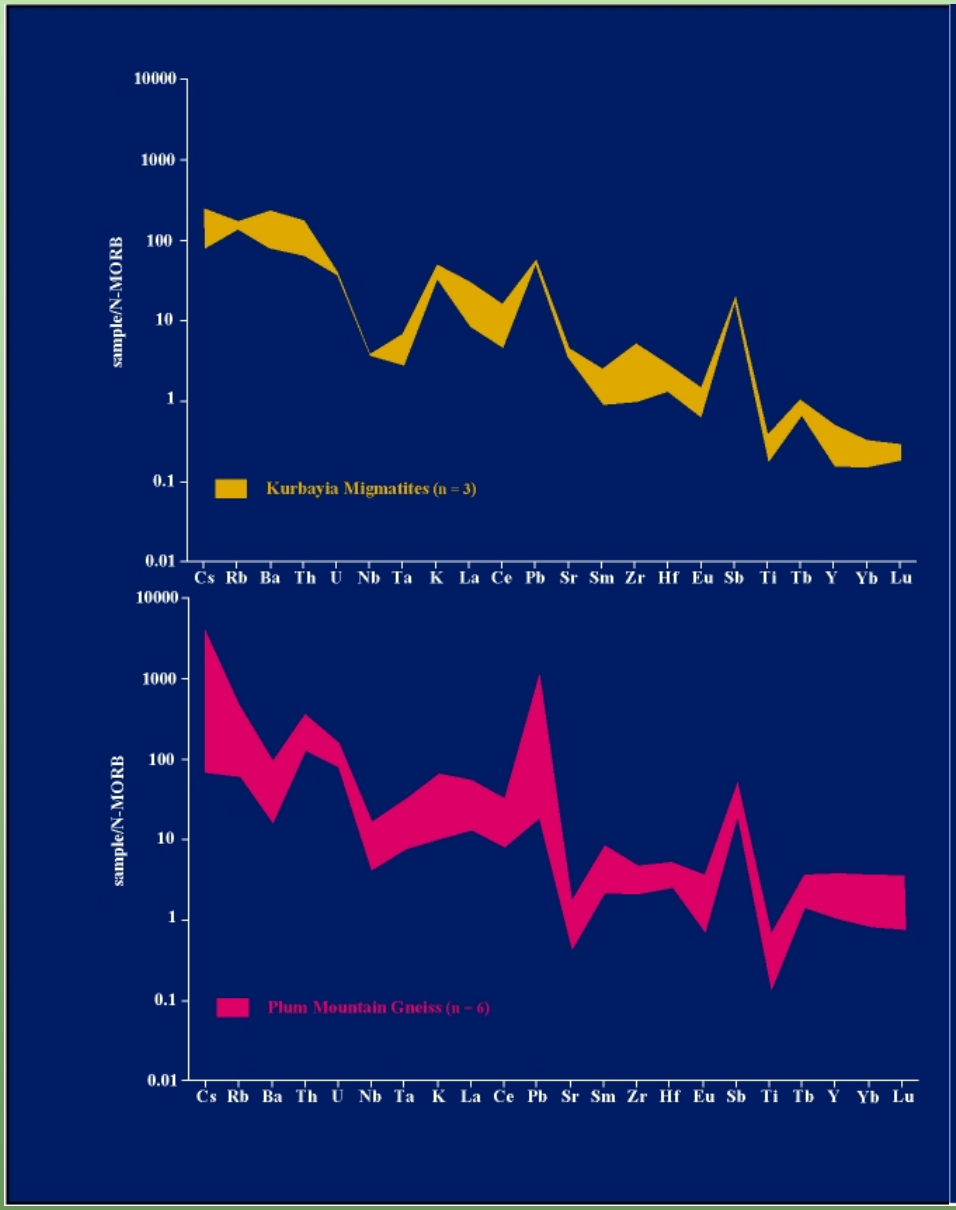

Yaringa Creek Metamorphics



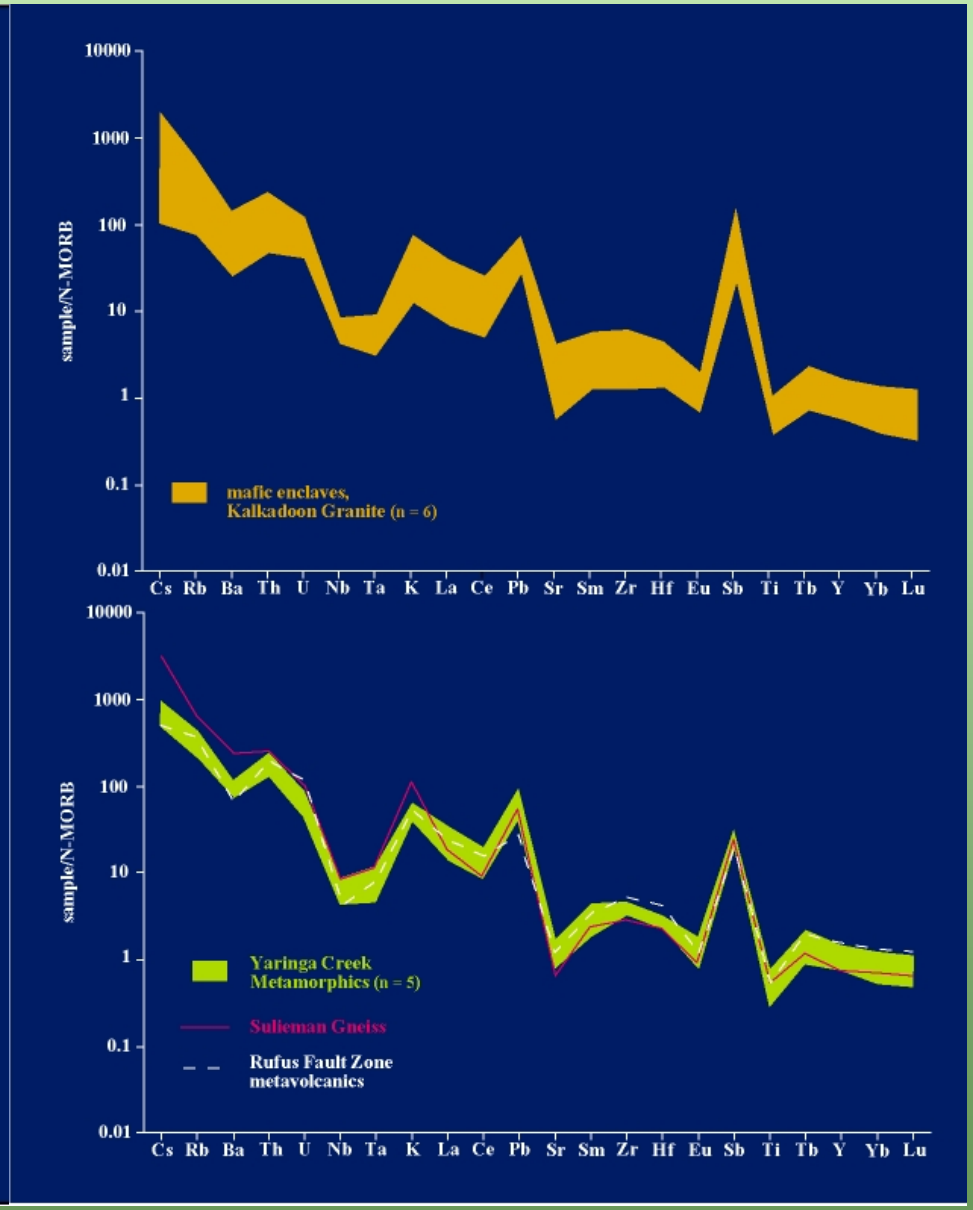
Plum Mountain Gneiss

(includes data from OzChem db)

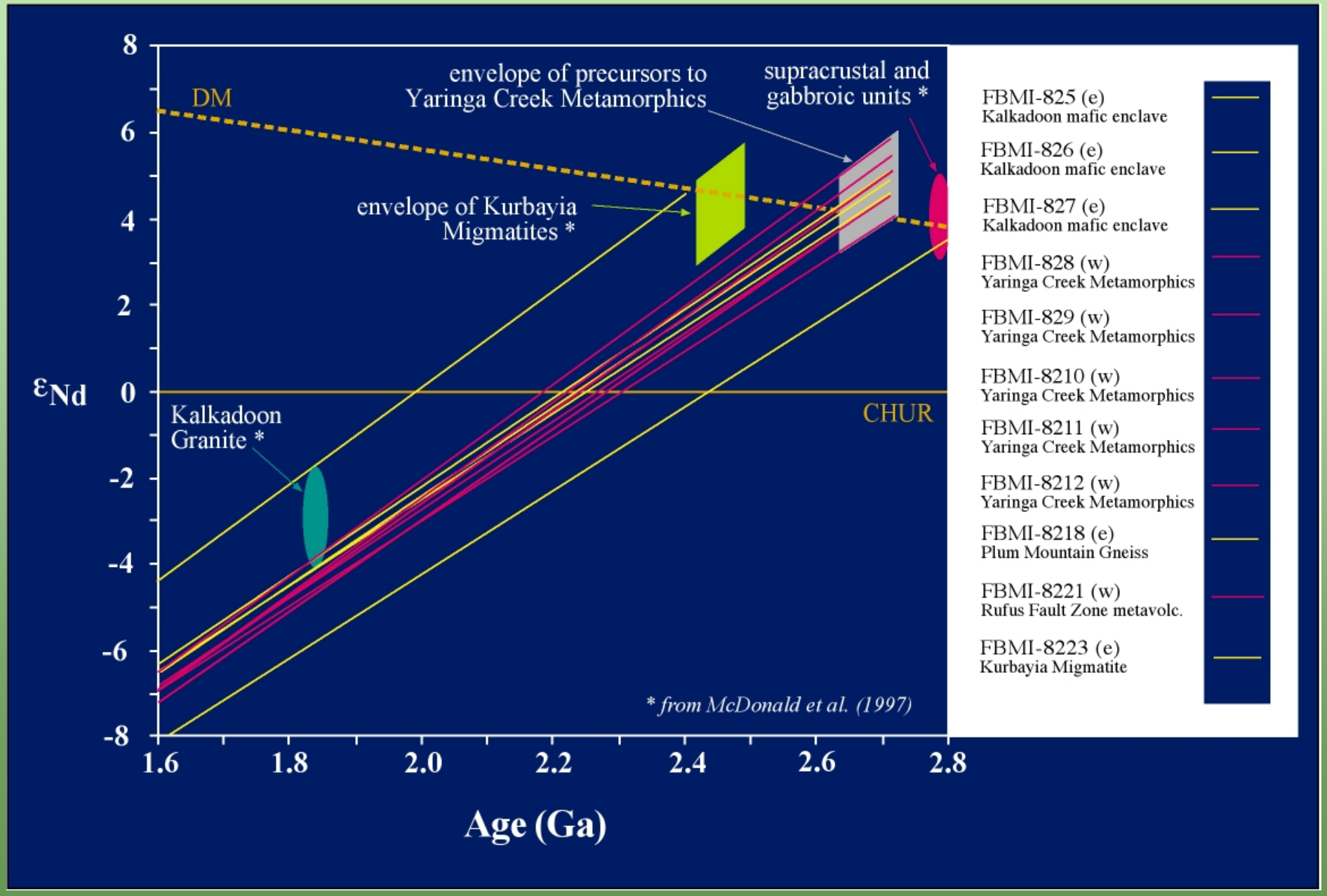




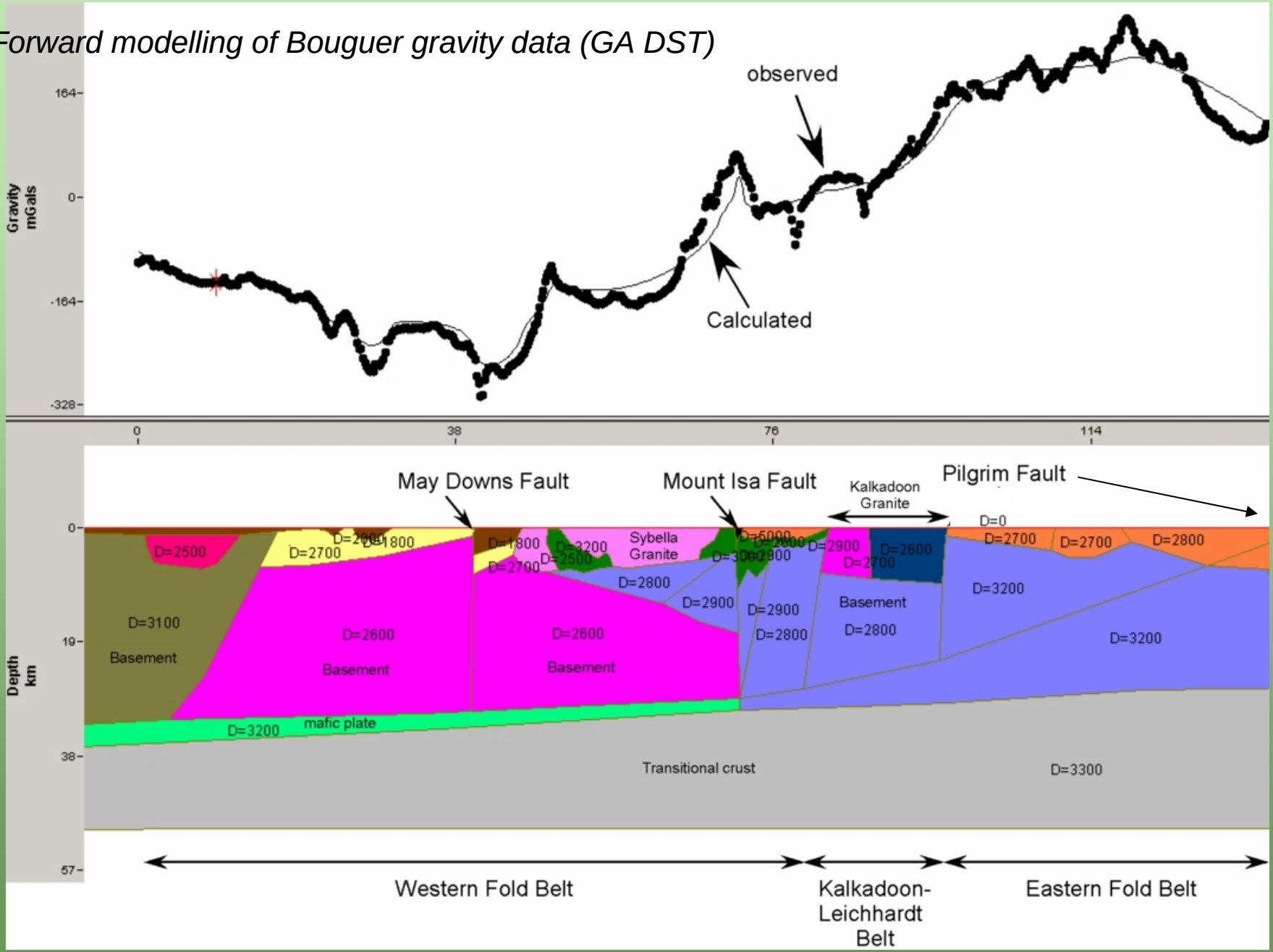
East of Mt Isa Fault

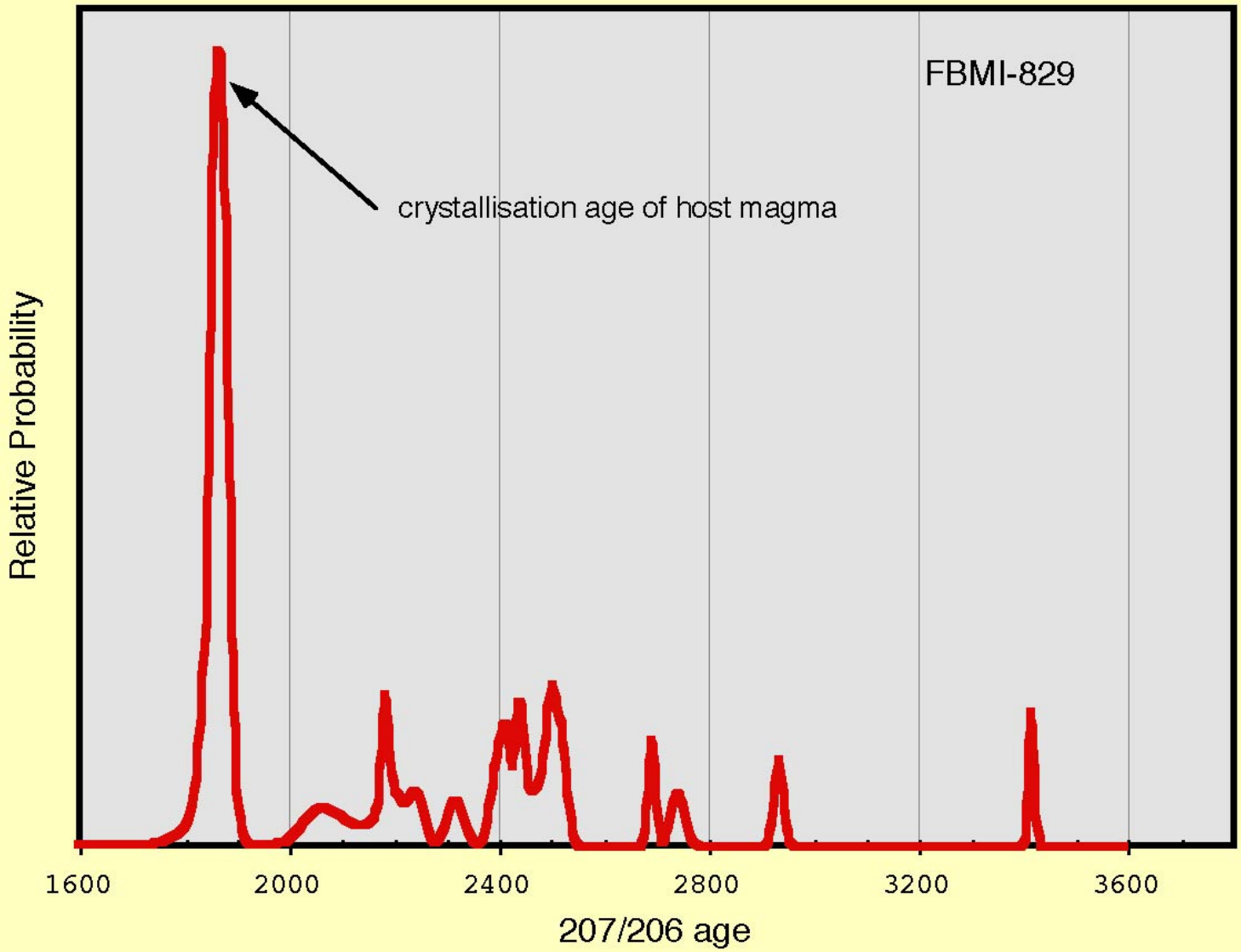


West of Mt Isa Fault

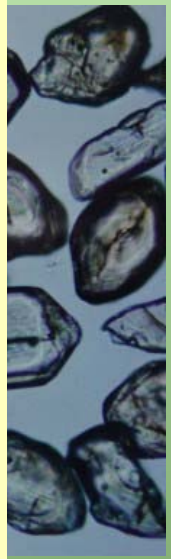

8
6
4
2
0
-2
-4
-6
-8
εNd
1.6
1.8
2.0
2.2
2.4
2.6
2.8
Age (Ga)
DM
envelope of precursors to Yaringa Creek Metamorphics
supracrustal and gabbroic units *
envelope of Kurbayia Migmatites *
Kalkadoon Granite *
CHUR
* from McDonald et al. (1997)
FBMI-825 (e) Kalkadoon mafic enclave
FBMI-826 (e) Kalkadoon mafic enclave
FBMI-827 (e) Kalkadoon mafic enclave
FBMI-828 (w) Yaringa Creek Metamorphics
FBMI-829 (w) Yaringa Creek Metamorphics
FBMI-8210 (w) Yaringa Creek Metamorphics
FBMI-8211 (w) Yaringa Creek Metamorphics
FBMI-8212 (w) Yaringa Creek Metamorphics
FBMI-8218 (e) Plum Mountain Gneiss
FBMI-8221 (w) Rufus Fault Zone metavolc.
FBMI-8223 (e) Kurbayia Migmatite

Forward modelling of Bouguer gravity data (GA DST)

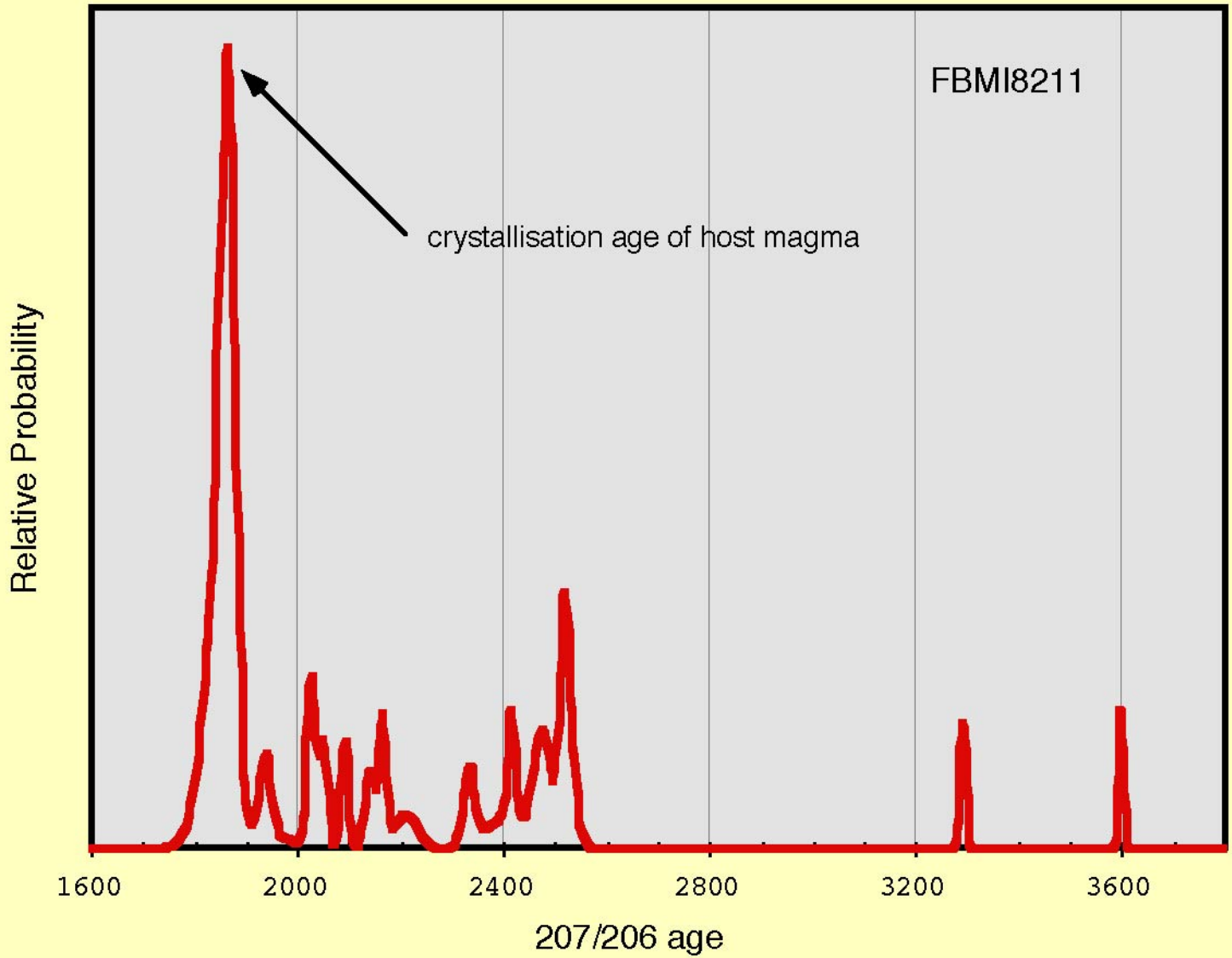




$^{206}Pb/^{23}$



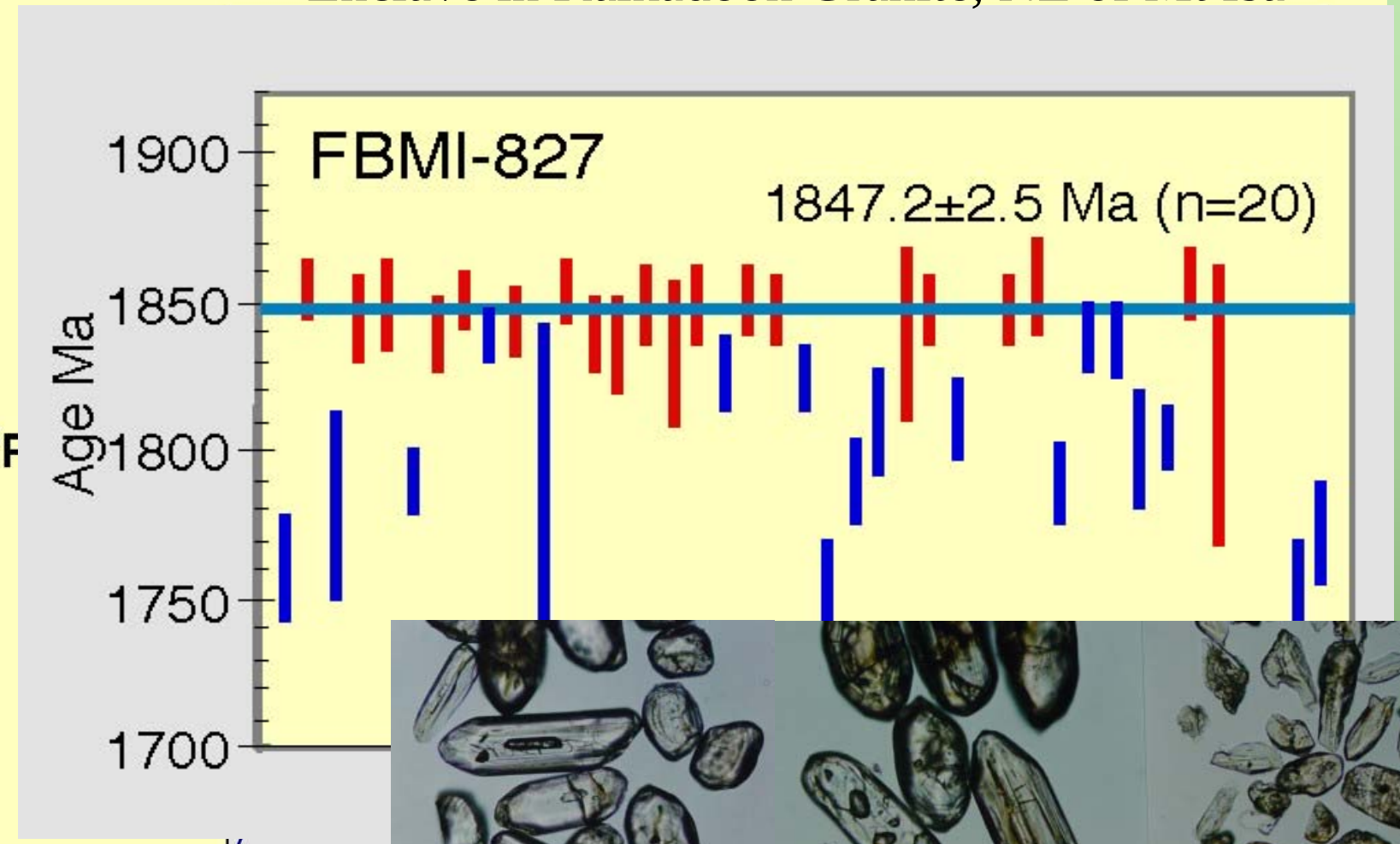
Yaringa Metamorphics (west of Mt Isa Fault); 1858 ± 4 Ma (n = 17)

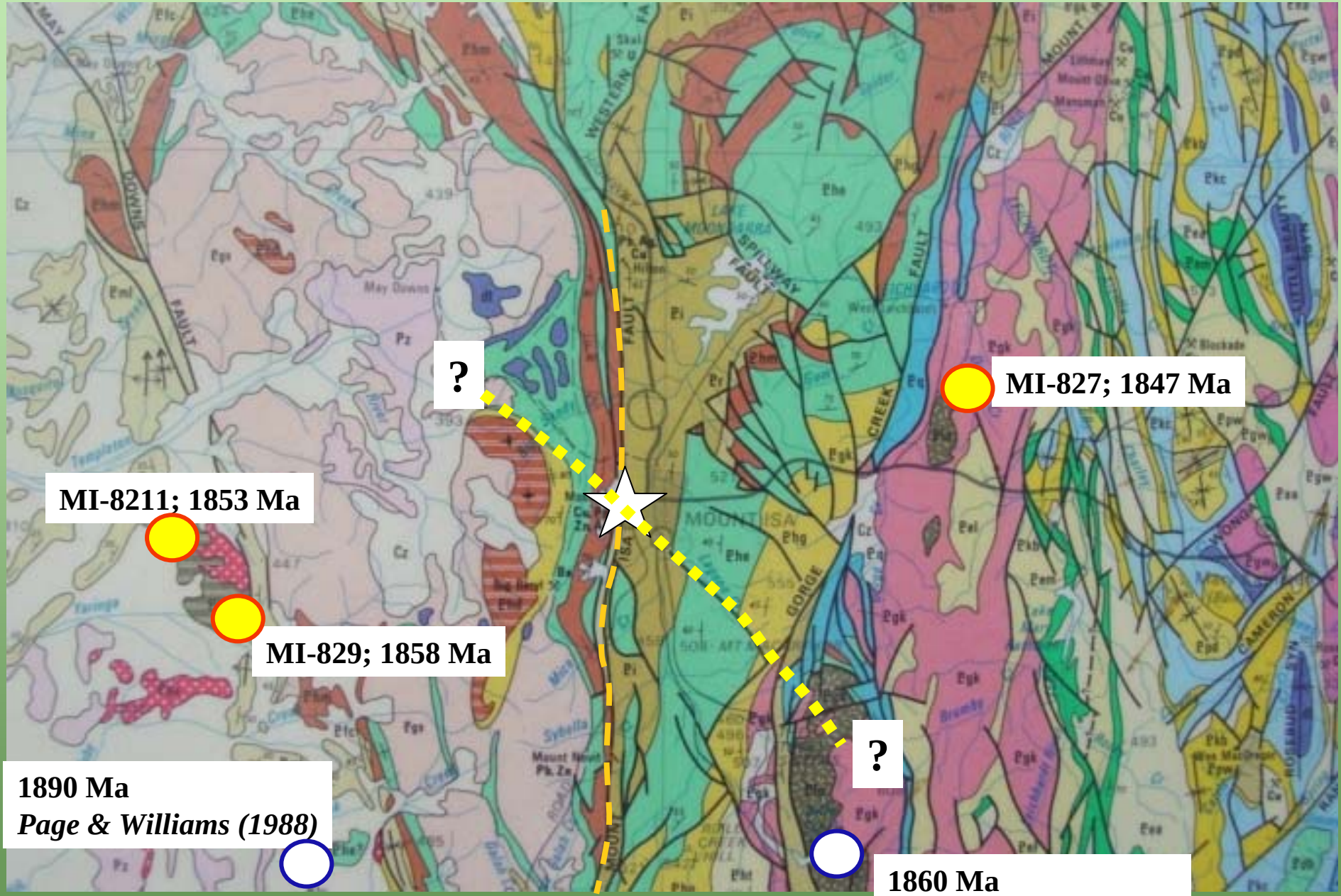


$^{206}Pb/^{2}$

Yaringa Metamorphics (west of Mt Isa Fault); 1853 ± 5 Ma (n = 17)

Enclave in Kalkadoon Granite, NE of Mt Isa




?
MI-827; 1847 Ma
MI-8211; 1853 Ma
MI-829; 1858 Ma
?
1890 Ma
Page & Williams (1988)
1860 Ma
McDonald et al. (1997)

Summary

- MIF no lithospheric-scale break
  (inverted growth fault or late-orogenic?)

- Western fold belt part of NAC before Barramundi Orogeny?

- Mantle-tapping conduits not required for world-class
  MI-style Pb-Zn-Ag-Cu deposits (?)

- Major breaks along NW-trends (i.e., Lagoon Creek Fault)??

Proposed future work to test hypothesis:

- SHRIMP U-Pb of zircons from +1.8 Ga basement rocks NE of Lagoon Creek Fault
- (targeted) field mapping & geophysical constraints
- Lu-Hf (whole-rock & in-situ LA of zircons) to resolve mantle evolution + crustal contamination
- Integration with basement studies in Eastern Succession and KLB (I-New; G.M.)