New U-Pb and Re-Os ages from Victoria and their implications for the link between granitoid magmatism and mineralisation.

AIG Victoria Minerals Round-up

26 June 2025

steven.boger@deeca.vic.gov.au

Senior Economic Geologist

RESOURCES VICTORIA

RECENT GSV GEOCHRONOLOGY – what we have done

EXISTING DATA

U-Pb Zircon:

150 ages – GSV and other sources

U-Pb Apatite

Nil

U-Pb Cassiterite – Scheelite – Wolframite:

Nil

Re-Os Molybdenite – Arsenopyrite – Pyrite

12 ages – GA, industry and academic sources

NEW DATA (2022-2025)

U-Pb Zircon:

108 ages – GSV

U-Pb Apatite

6 ages collected by GSV
8 ages collected by CSIRO
17 ages collected by University of Adelaide

MinEx CRC

U-Pb Cassiterite – Scheelite – Wolframite:

5 ages collected by GSV (**4** samples with no result)

Re-Os Molybdenite – Arsenopyrite – Pyrite

8 ages – GSV (**68** to little Re to analyse, **10** No result)

RECENT GSV GEOCHRONOLOGY – who are we working with

U-Pb Zircon:

- National Collaborative Framework (NCF), Geoscience Australia
- Exploring for the Future (EFTF), Geoscience Australia

U-Pb Apatite

- Critical Minerals Initiative, Curtin University
- MinEx CRC, The University of Adelaide, CSIRO

U-Pb Cassiterite - Scheelite - Wolframite:

- Critical Minerals Initiative, The United States Geological Survey

Re-Os Molybdenite – Arsenopyrite – Pyrite

- Critical Minerals Initiative, The University of Alberta

RECENT GSV GEOCHRONOLOGY – why do more?

U-Pb zircon

Granitoids and volcanics - better precision and accuracy

U-Pb Apatite

Present in rocks that do not contain zircon, occurs in hydrothermal veins

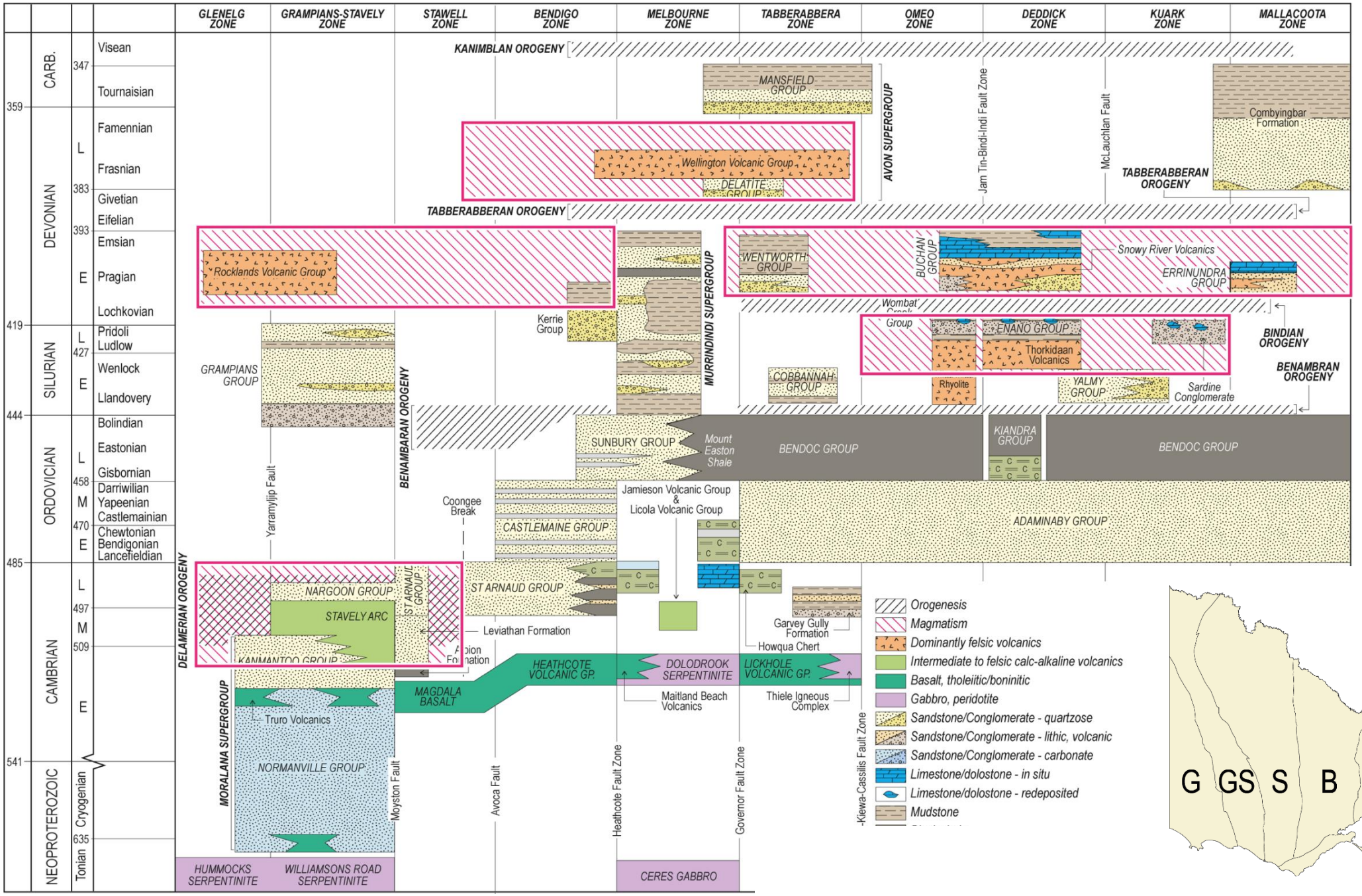
U-Pb Cassiterite – Scheelite – Wolframite:

Dates Sn-W ore minerals

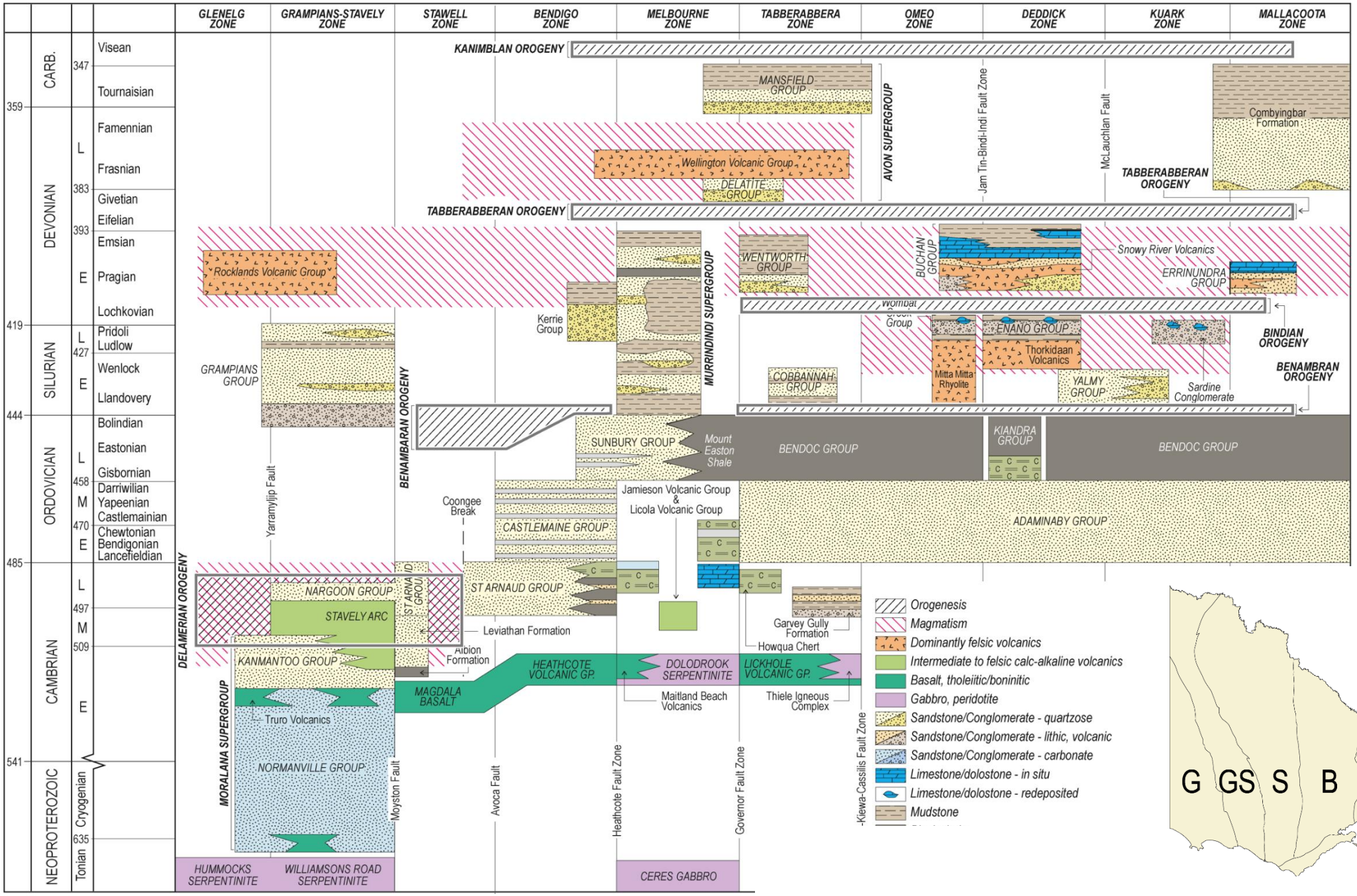
Re-Os Molybdenite – Arsenopyrite – Pyrite

Dates sulphide minerals associated with Au, Sb, Cu etc

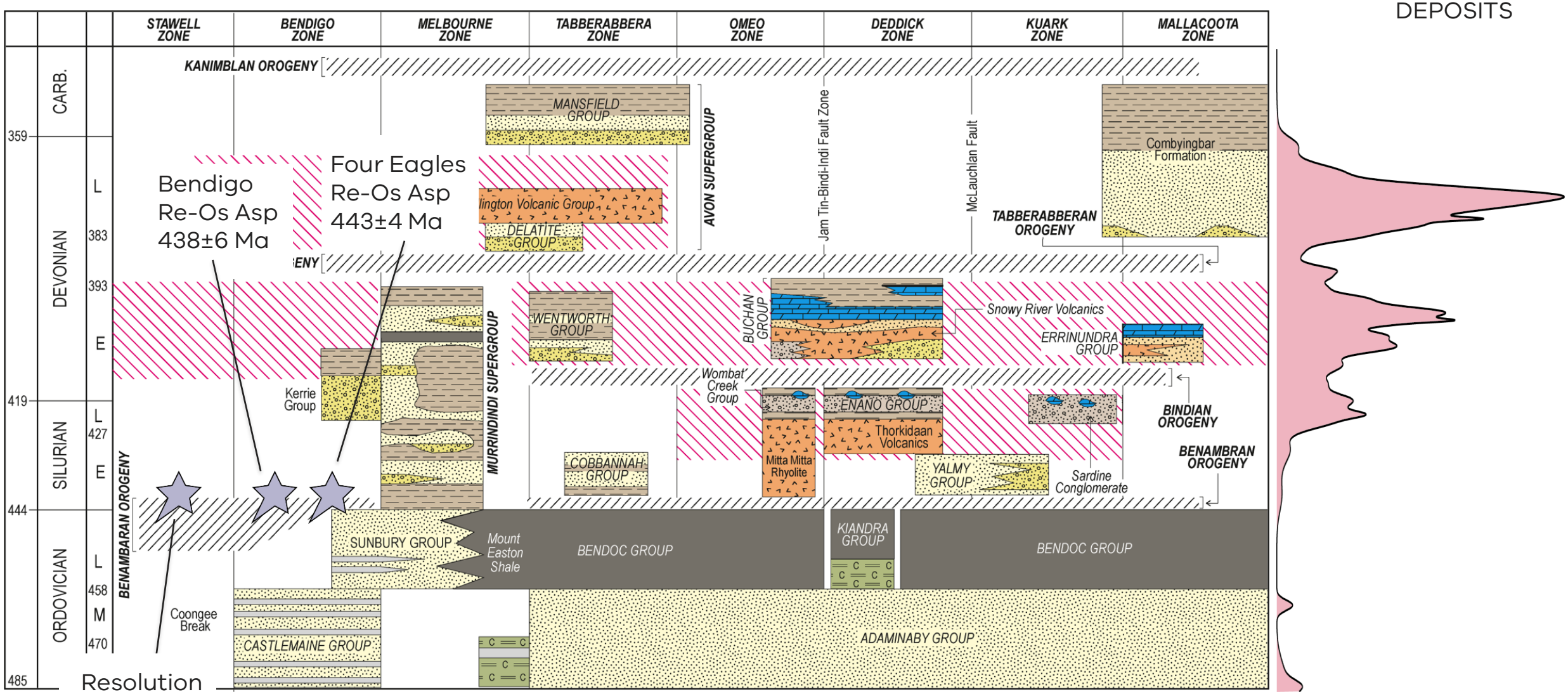
MAGMATISM


GLENELG ZONE
GRAMPIANS-STAVELY ZONE
STAWELL ZONE
BENDIGO ZONE
MELBOURNE ZONE
TABBERABBERA ZONE
OMEO ZONE
DEDDICK ZONE
KUARK ZONE
MALLACOOTA ZONE
CARB.
DEVONIAN
SILURIAN
ORDOVICIAN
CAMBRIAN
NEOPROTEROZOIC
Visean
Tournaisian
Famennian
Frasnian
Givetian
Eifelian
Emsian
Pragian
Lochkovian
Pridoli
Ludlow
Wenlock
Llandovery
Bolindian
Eastonian
Gisbornian
Darriwilian
Yapeenian
Castlemainian
Chewtonian
Bendigonian
Lancefieldian
Cryogenian
Tonian
359
383
393
419
427
444
458
470
485
497
509
541
635
KANIMBLAN OROGENY
MANSFIELD GROUP
AVON SUPERGROUP
Jam Tin-Bindi-Indi Fault Zone
McLauchlan Fault
Combyingbar Formation
TABBERABBERAN OROGENY
Wellington Volcanic Group
DELATITE GROUP
TABBERABBERAN OROGENY
Rocklands Volcanic Group
Kerrie Group
MURRINDINDI SUPERGROUP
WENTWORTH GROUP
BUCHAN GROUP
Snowy River Volcanics
ERRINUNDRA GROUP
Wombat Group
ENANO GROUP
Thorkidaan Volcanics
BINDIAN OROGENY
BENAMBRAN OROGENY
GRAMPIANS GROUP
BENAMBARAN OROGENY
COBBANNAH GROUP
Rhyolite
YALMY GROUP
Sardine Conglomerate
SUNBURY GROUP
Mount Easton Shale
BENDOC GROUP
KIANDRA GROUP
BENDOC GROUP
Yarramyljip Fault
Coongee Break
Jamieson Volcanic Group & Licola Volcanic Group
CASTLEMAINE GROUP
ADAMINABY GROUP
DELAMERIAN OROGENY
NARGOON GROUP
STAVELY ARC
ST ARNAUD GROUP
ST ARNAUD GROUP
Leviathan Formation
Garvey Gully Formation
Howqua Chert
HEATHCOTE VOLCANIC GP.
DOLODROOK SERPENTINITE
LICKHOLE VOLCANIC GP.
MAGDALA BASALT
Maitland Beach Volcanics
Thiele Igneous Complex
MORALANA SUPERGROUP
Truro Volcanics
NORMANVILLE GROUP
Moyston Fault
Avoca Fault
Heathcote Fault Zone
Governor Fault Zone
Kiewa-Cassilis Fault Zone
HUMMOCKS SERPENTINITE
WILLIAMSONS ROAD SERPENTINITE
CERES GABBRO
Orogenesis
Magmatism
Dominantly felsic volcanics
Intermediate to felsic calc-alkaline volcanics
Basalt, tholeiitic/boninitic
Gabbro, peridotite
Sandstone/Conglomerate - quartzose
Sandstone/Conglomerate - lithic, volcanic
Sandstone/Conglomerate - carbonate
Limestone/dolostone - in situ
Limestone/dolostone - redeposited
Mudstone
G
GS
S
B
M
T
O
D
K
Ma

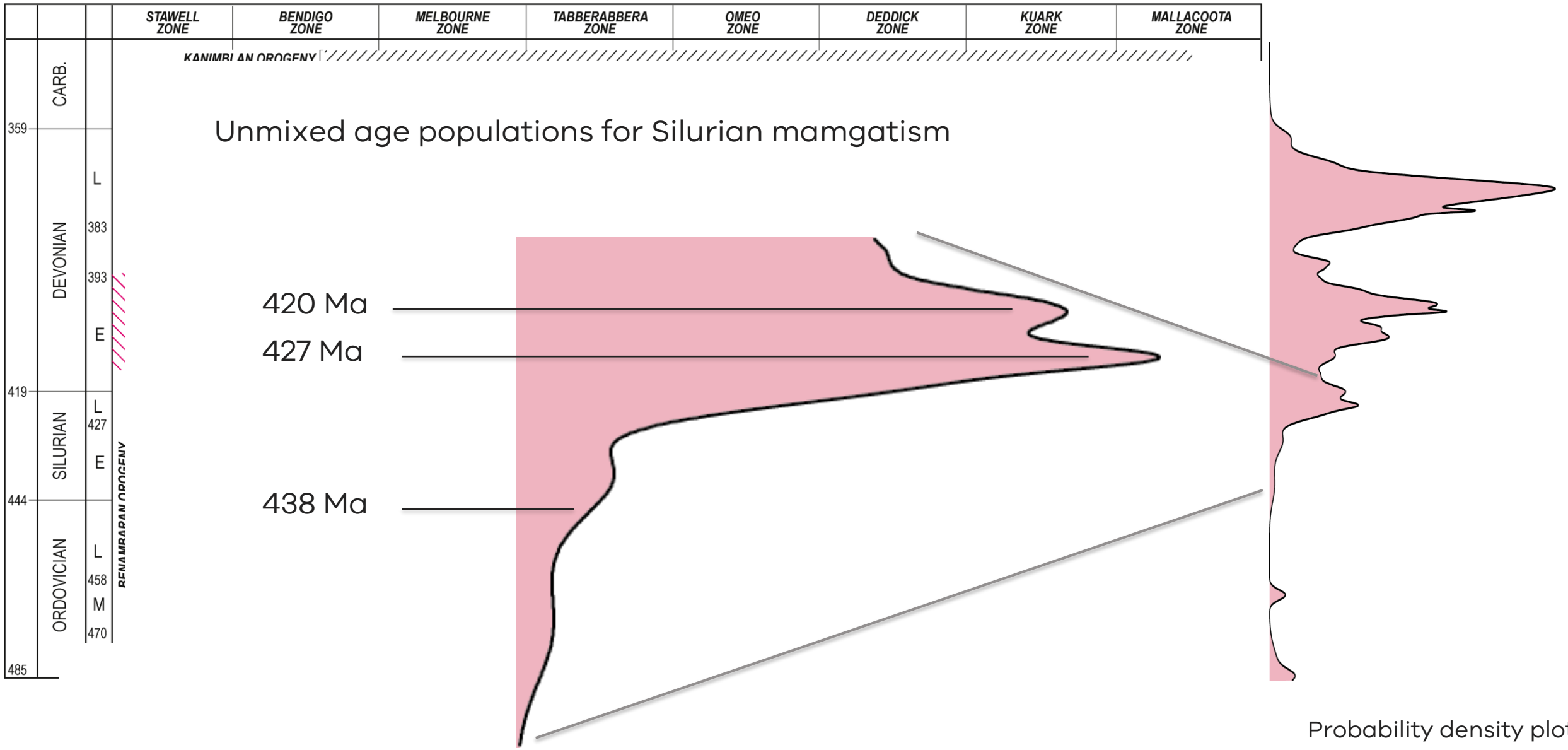
OROGENESIS & CRUSTAL SHORTENING



OROGENIC GOLD DEPOSITS

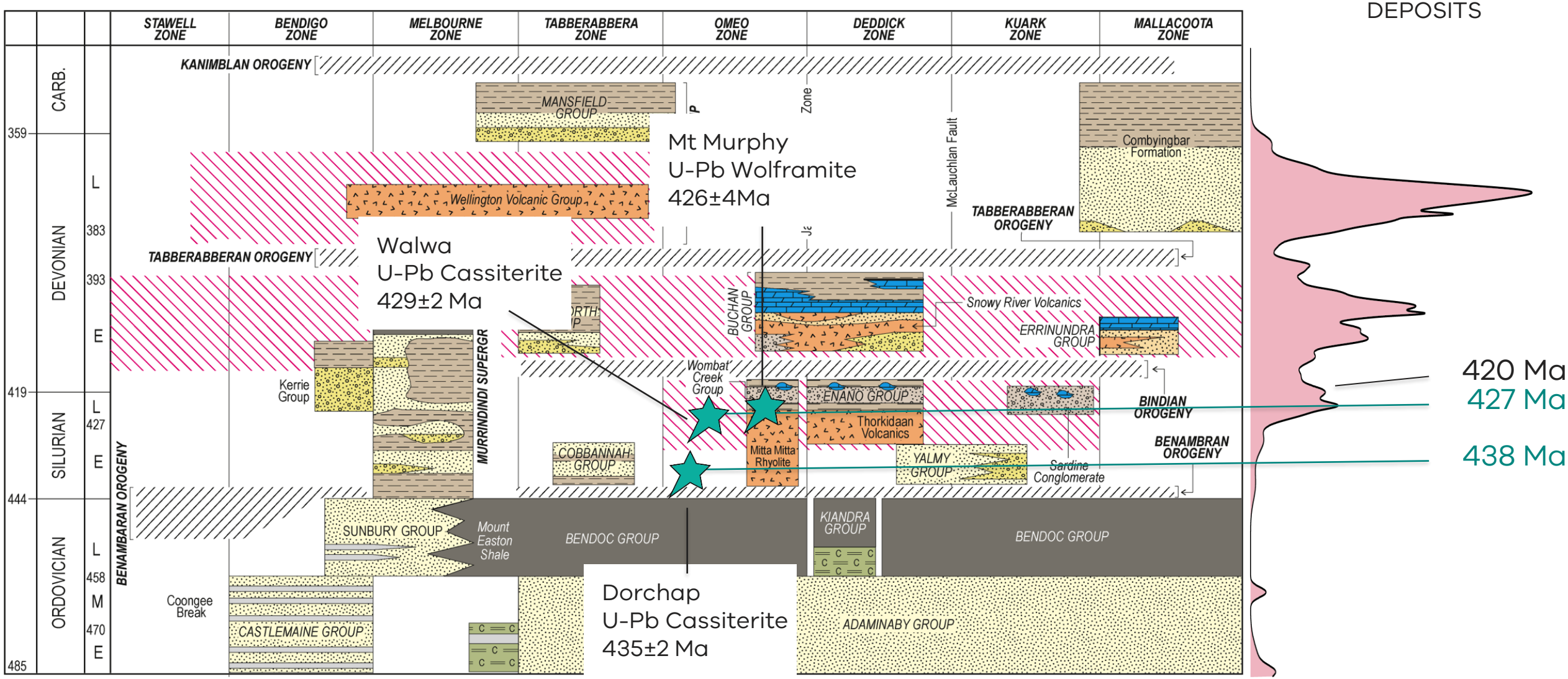


Probability density plot
U-Pb zircon ages

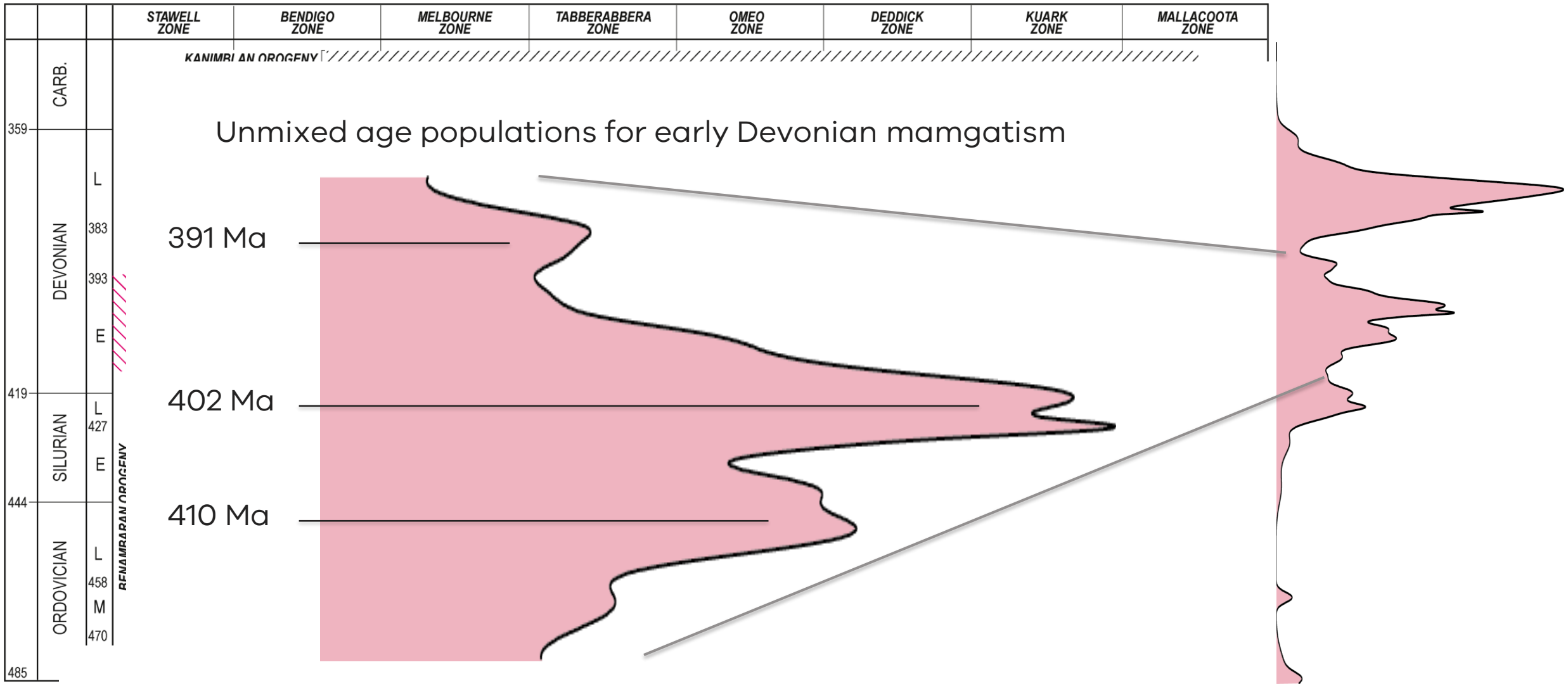


Probability density plot
U-Pb zircon ages

GRANITE Sn-W DEPOSITS

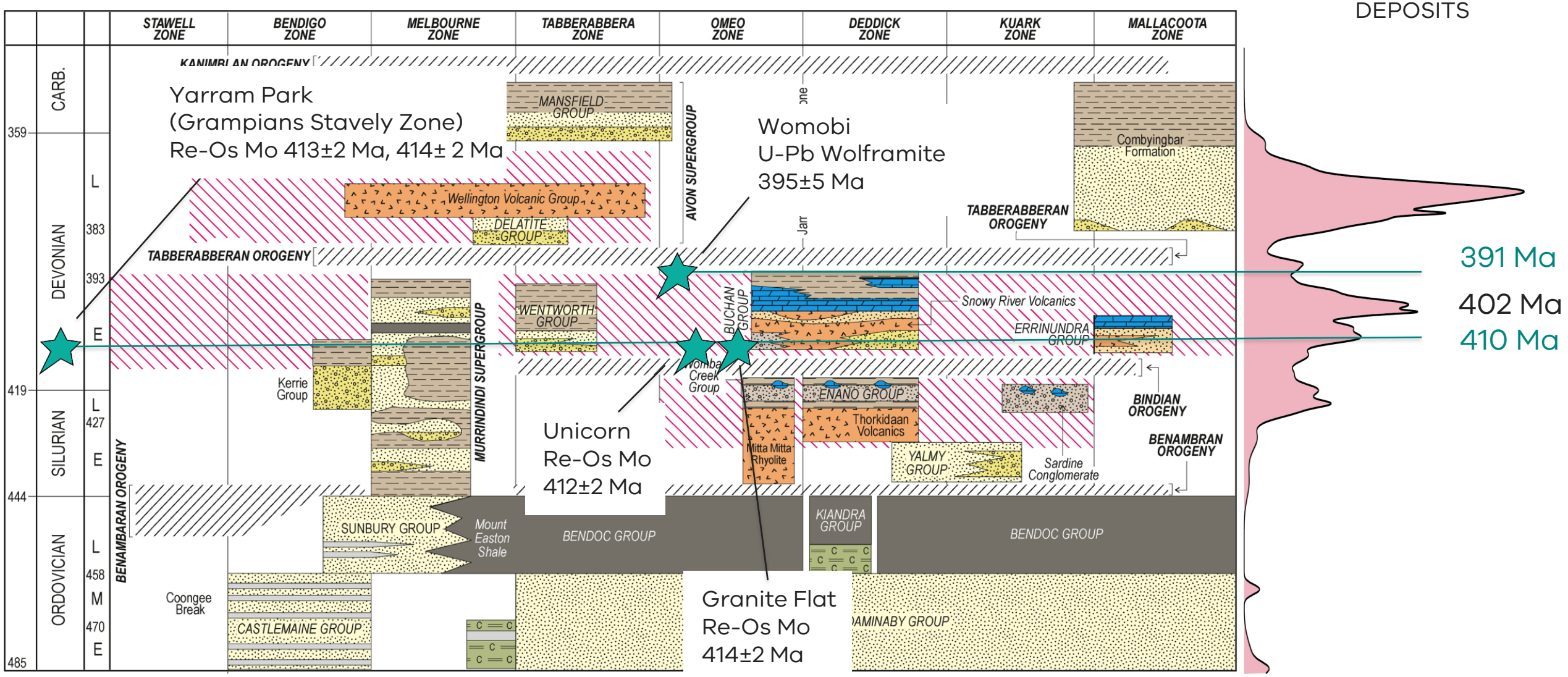


Probability density plot
U-Pb zircon ages

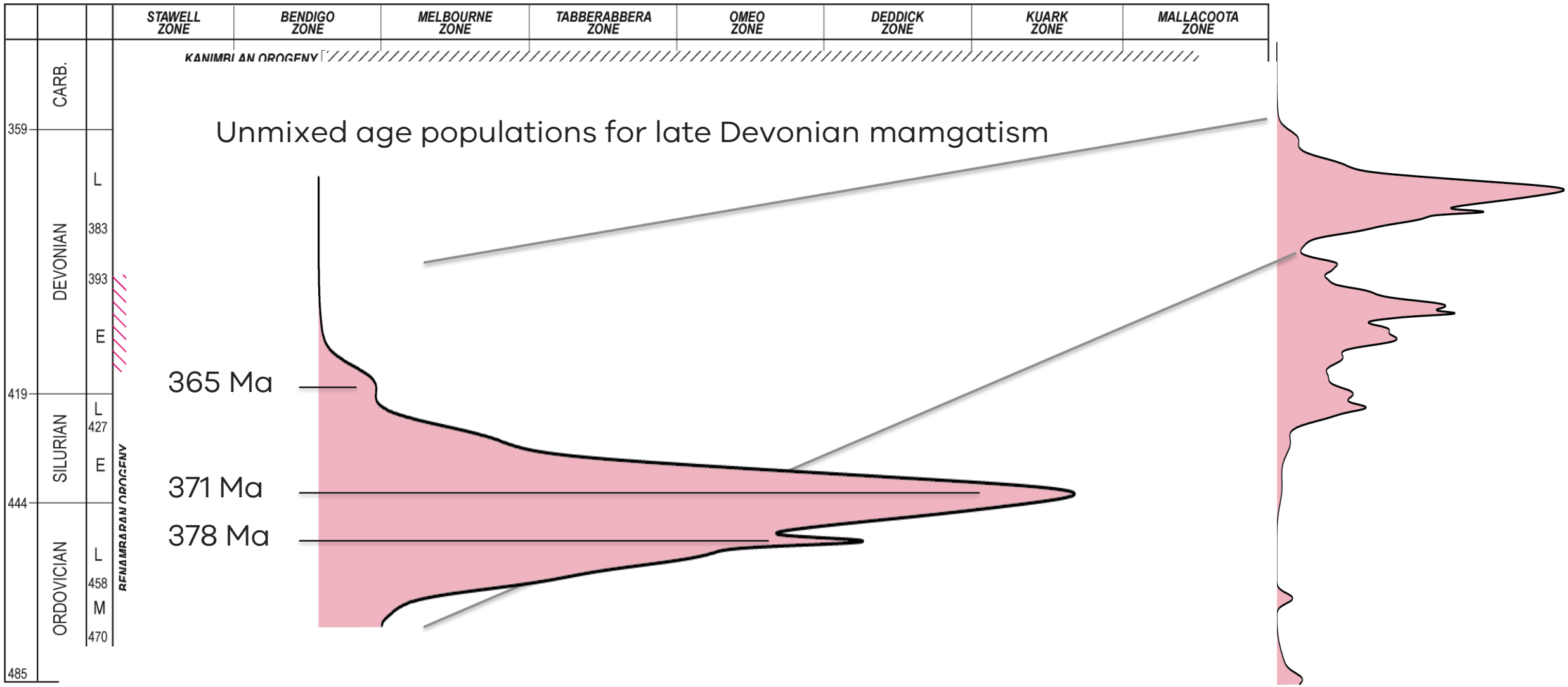


Probability density plot
U-Pb zircon ages

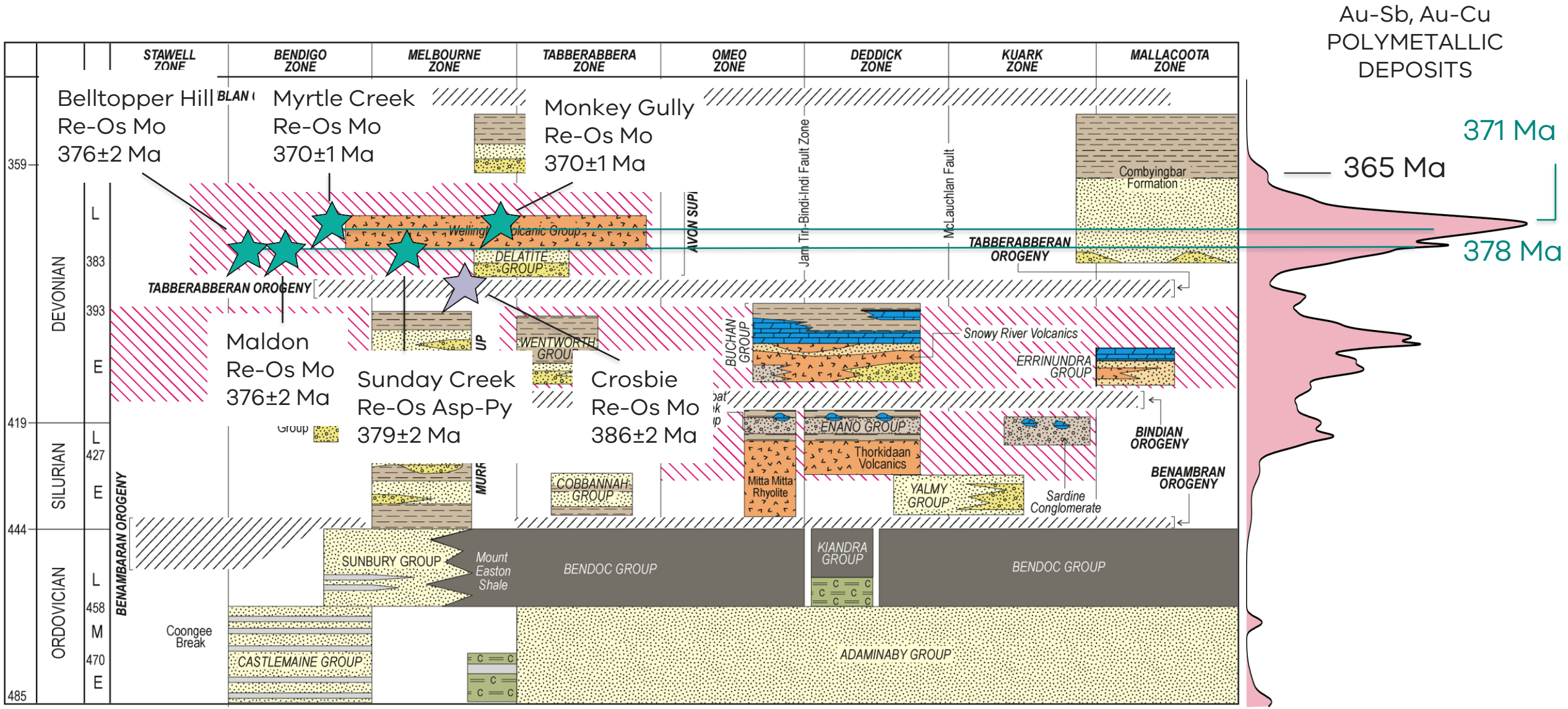
POLYMETALLIC Cu-Au DEPOSITS



Probability density plot
U-Pb zircon ages

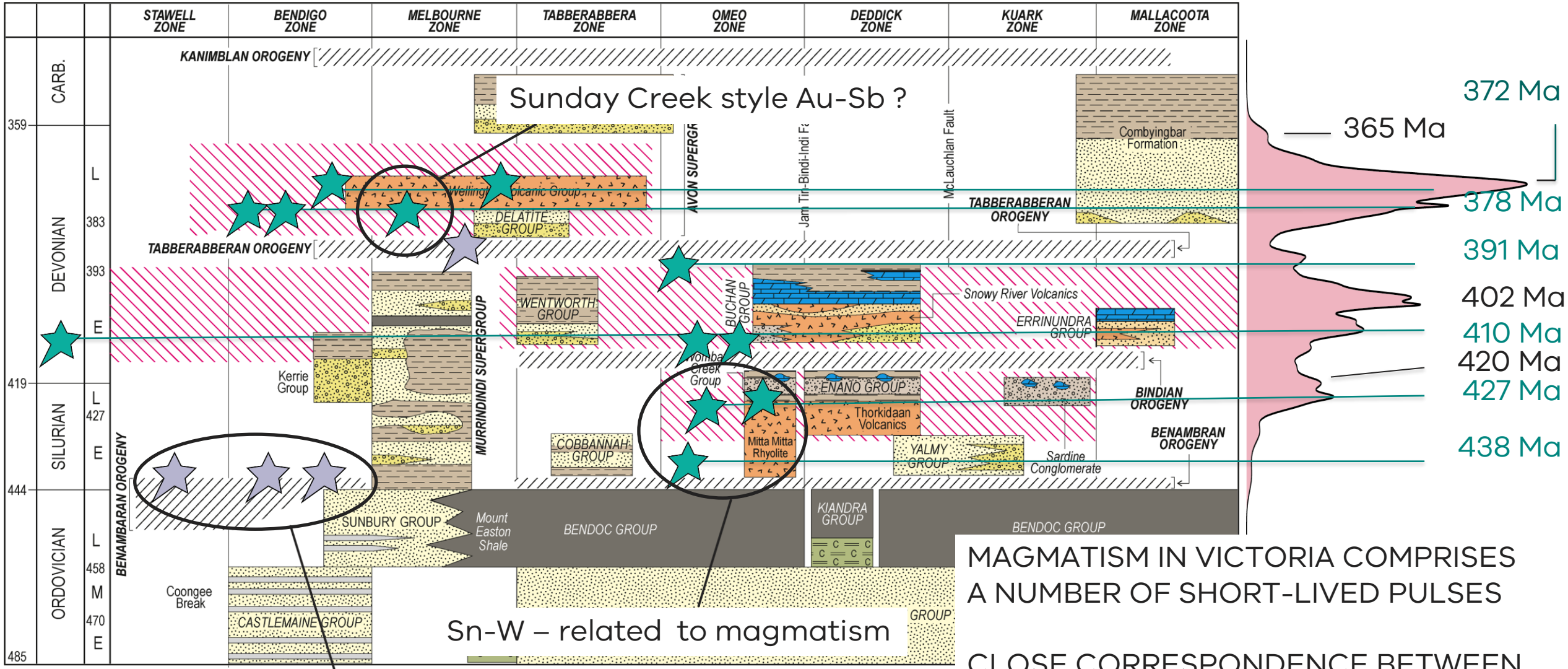


Probability density plot
U-Pb zircon ages



Probability density plot
U-Pb zircon ages

IS THERE A CAUSATIVE RELATIONSHIP BETWEEN MAGMATISM AND MINERALISATION ?



Sn-W – related to magmatism

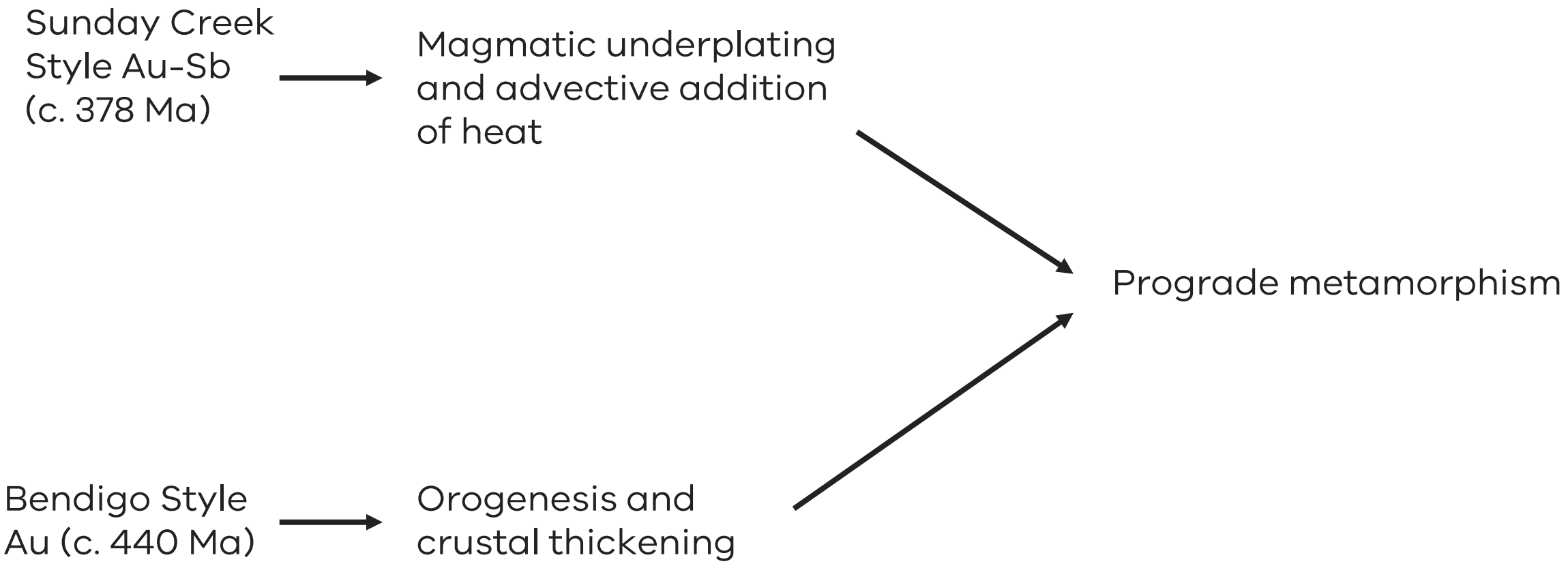
Bendigo style Au – unrelated to magmatism

MAGMATISM IN VICTORIA COMPRISES A NUMBER OF SHORT-LIVED PULSES

CLOSE CORRESPONDENCE BETWEEN THE AGE OF MANY OF THESE MAGMATIC PULSES AND MINERALISATION

MINERALISING EVENT

SOURCE OF MINERALISING FLUIDS



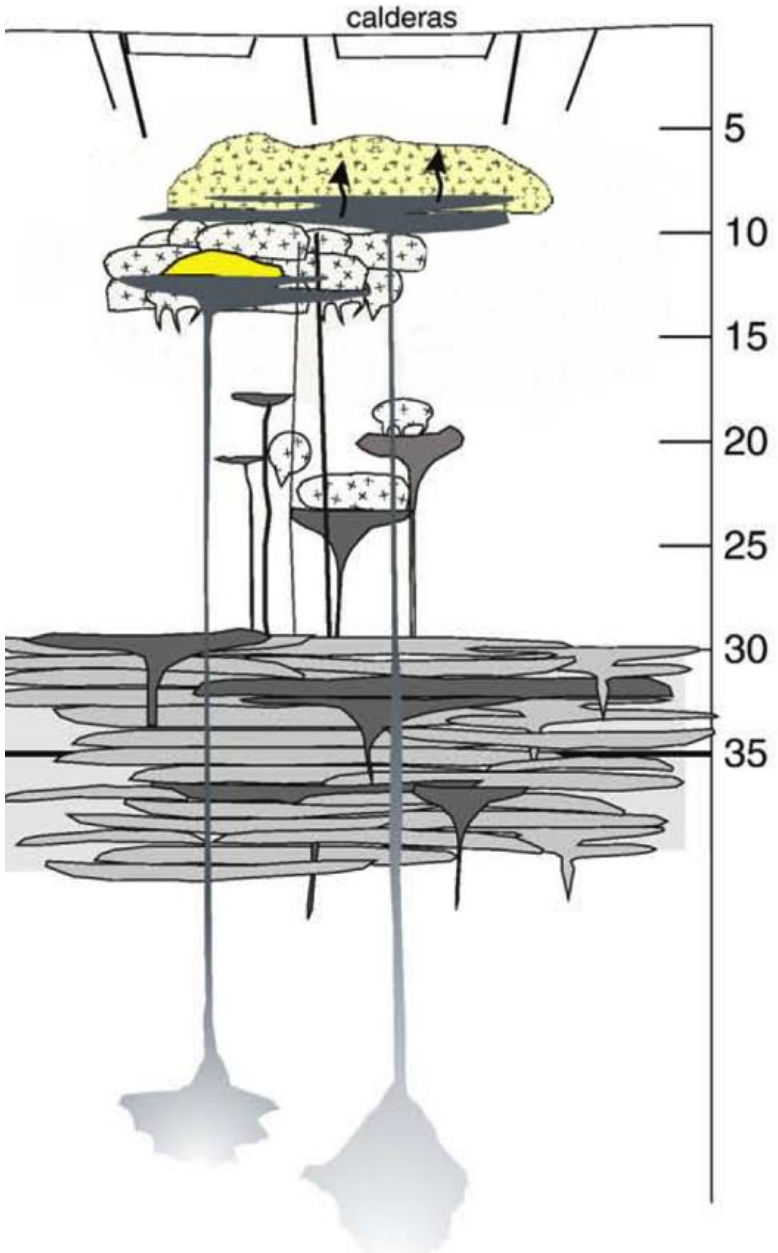
Sunday Creek Style Au-Sb (c. 378 Ma)

Upward migration of metalliferous fluids, deposition of Au, Au-Sb in upper crustal structures

Greenschist to amphibolite facies metamorphism and dehydration in the middle to lower crust

EVIDENCE FOR HIGH-DEGREE MANTLE PARTIAL MELTING AND UNDERPLATING

Cu-Ni-PGE mineralisation associated in the Woods Point Dyke Swarm



Extrusion of volcanics contemporaneous with sediment deposition on the surface

Granitoid emplacement in the upper crust

Upper amphibolite facies meta-morphism and partial melting in the lower crust

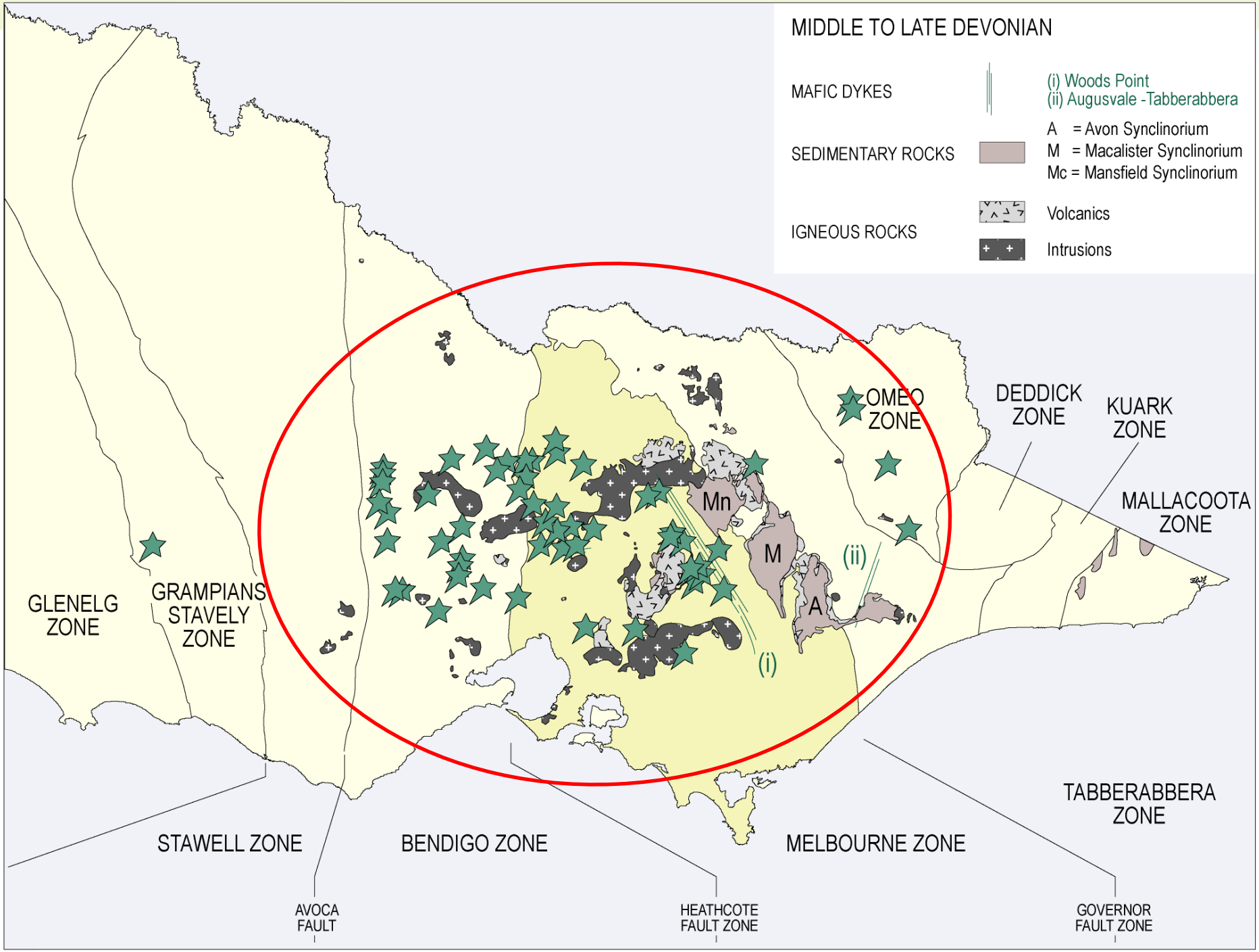
Widespread magmatic under-plating at the base of the crust

Upwelling of hot asthenosphere and high-degree mantle partial melting

Bryan et al. 2010, E-S Reviews, 102, 207-229.

There is a good spatial overlap between late Devonian granitoid magmatism and Au-Sb mineral occurrences

Au-Sb occurrences



Thank You

RECENT PUBLICATIONS:

U-Pb zircon: **A geochronological transect across the Tasmanides**
https://ecat.ga.gov.au/geonetwork/srv/eng/catalog.search#/metadata/149757

U-Pb Sn-W: **VCMSM Report 6 - U-Pb cassiterite, scheelite and wolframite ages from Victorian tin and tungsten occurrences.**
https://earthresources.efirst.com.au/product.asp?pID=1347&cID=70

Re-Os: **VCMSM Report 5 - Re-Os geochronology of Victorian mineral occurrences.**
https://earthresources.efirst.com.au/product.asp?pID=1346&cID=70

RESOURCES VICTORIA