Geodynamic evolution of the Mount Isa Inlier and its influence on the formation, timing and localisation of fluid flow

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Questions addressed:

- Geodynamic evolution of Isa Inlier?
- Tectonic setting?
- BHT & Isa deposits – legacy of intracontinental rift environment?
- Analogues?
- Implications for metal sources & fluid flow?

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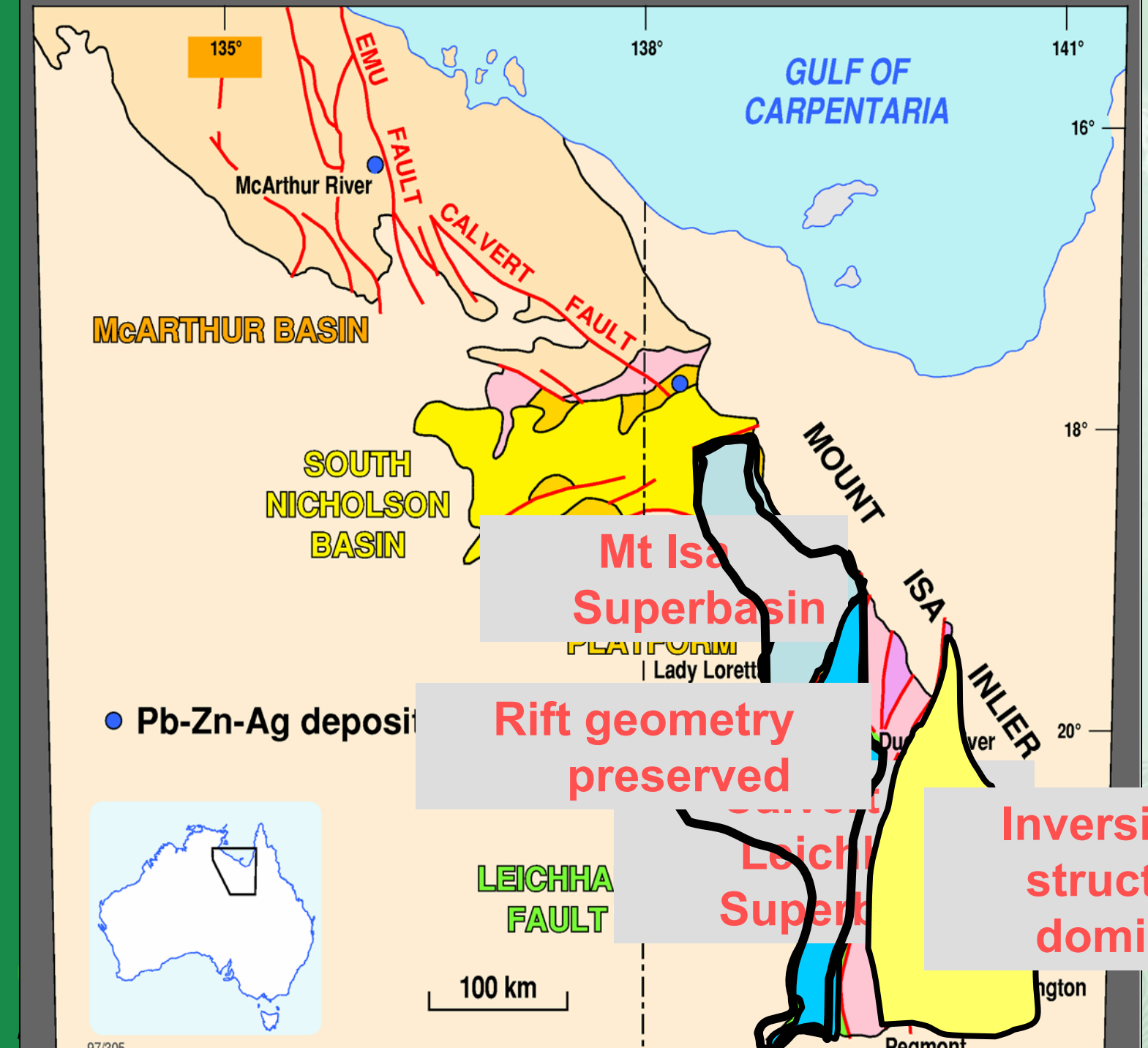
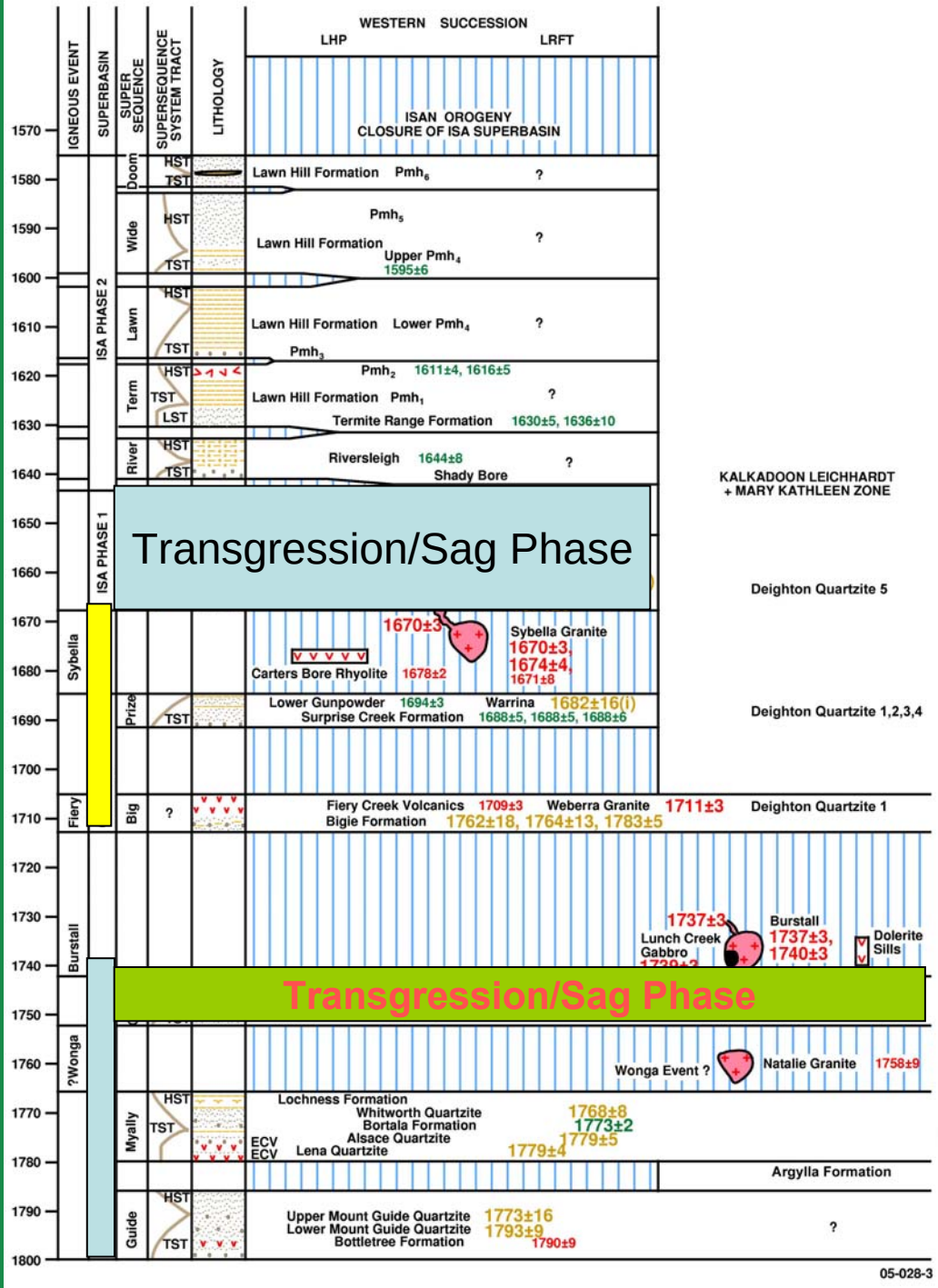

135°
138°
141°
16°
18°
20°
GULF OF CARPENTARIA
EMU FAULT
McArthur River
CALVERT FAULT
McARTHUR BASIN
SOUTH NICHOLSON BASIN
MOUNT ISA INLIER
Mt Isa Superbasin
Rift geometry preserved
Inversion structures dominant
LEICHHA FAULT
Pb-Zn-Ag deposit
100 km



Calvert Superbasin
1730 -1670 Ma

Rift -
Drift

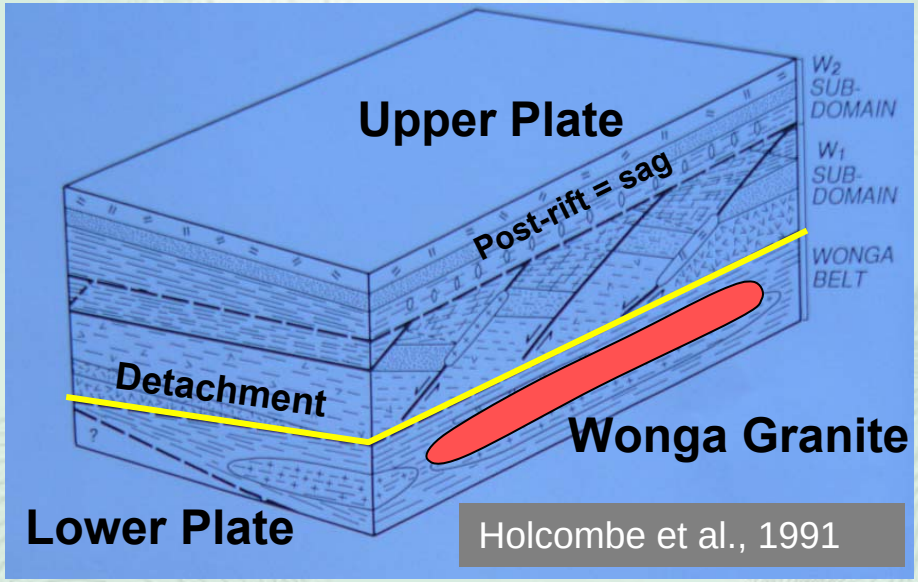
Leichhardt Superbasin
(1800-1740 Ma)

Rift

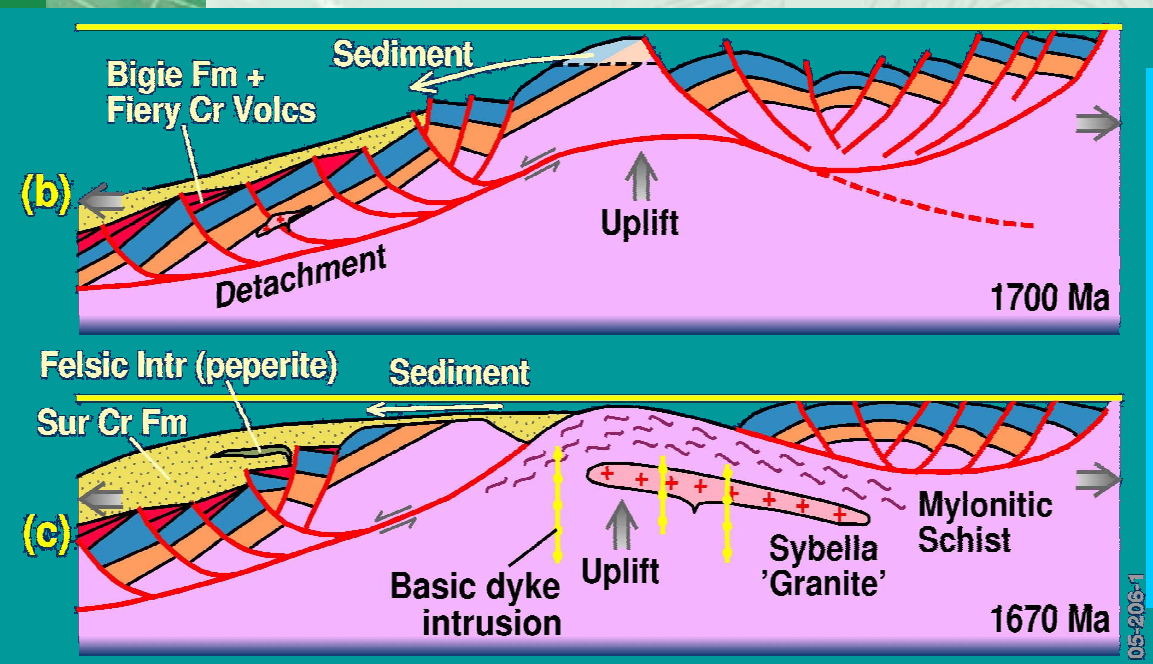
Superbasin formation accompanied by:

Leichhardt Superbasin:

- **Bimodal magmatism (including flood basalts)**
- **Half-graben formation**
- **Mid-crustal detachment faulting (Eastern Succession)**



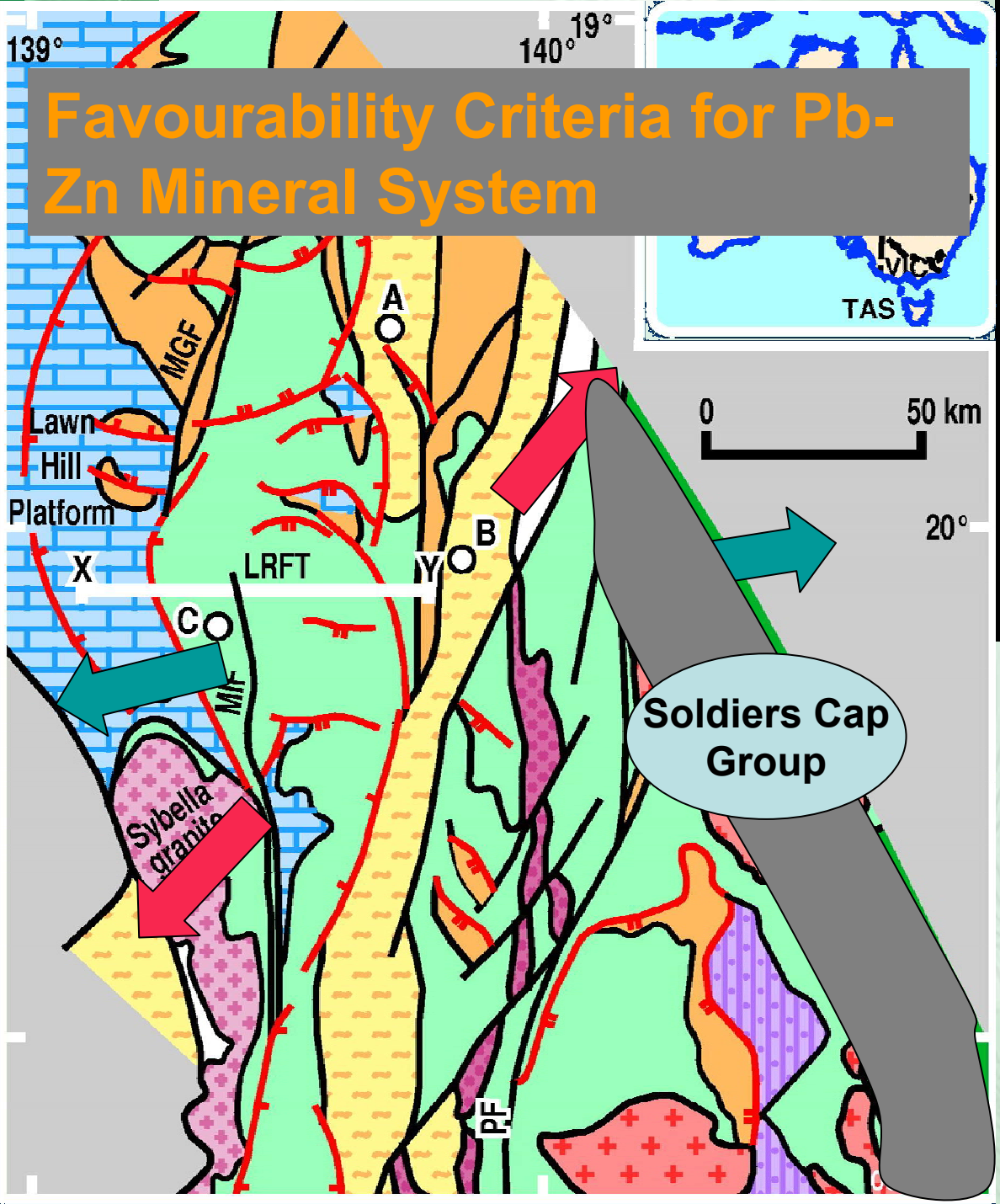
Holcombe et al., 1991

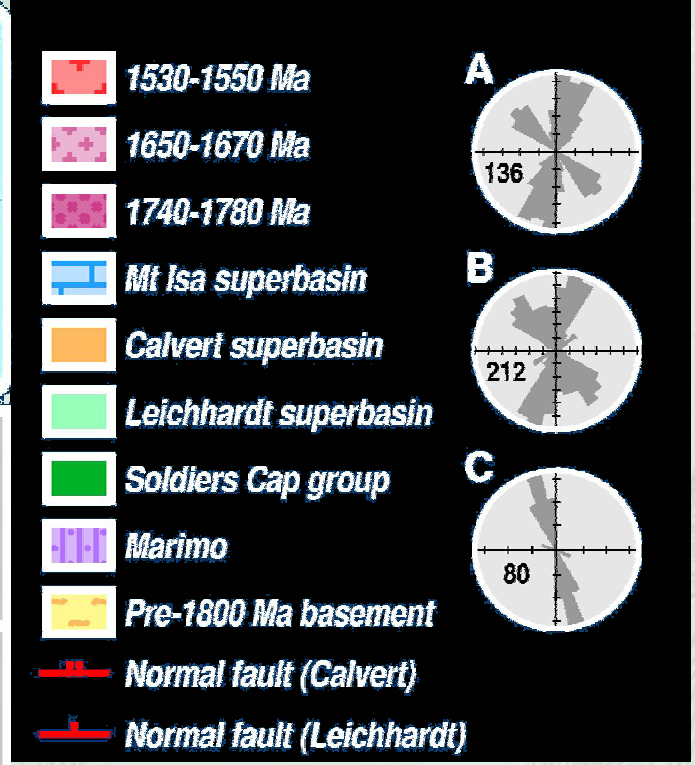


Calvert Superbasin:

- **Bimodal magmatism (including oceanic tholeiites)**
- **Magmatic inflation & doming**
- **Uplift & erosion**
- **Extensional unroofing of mid-crustal rocks & 1670 Ma granite**

Favourability Criteria for Pb-Zn Mineral System

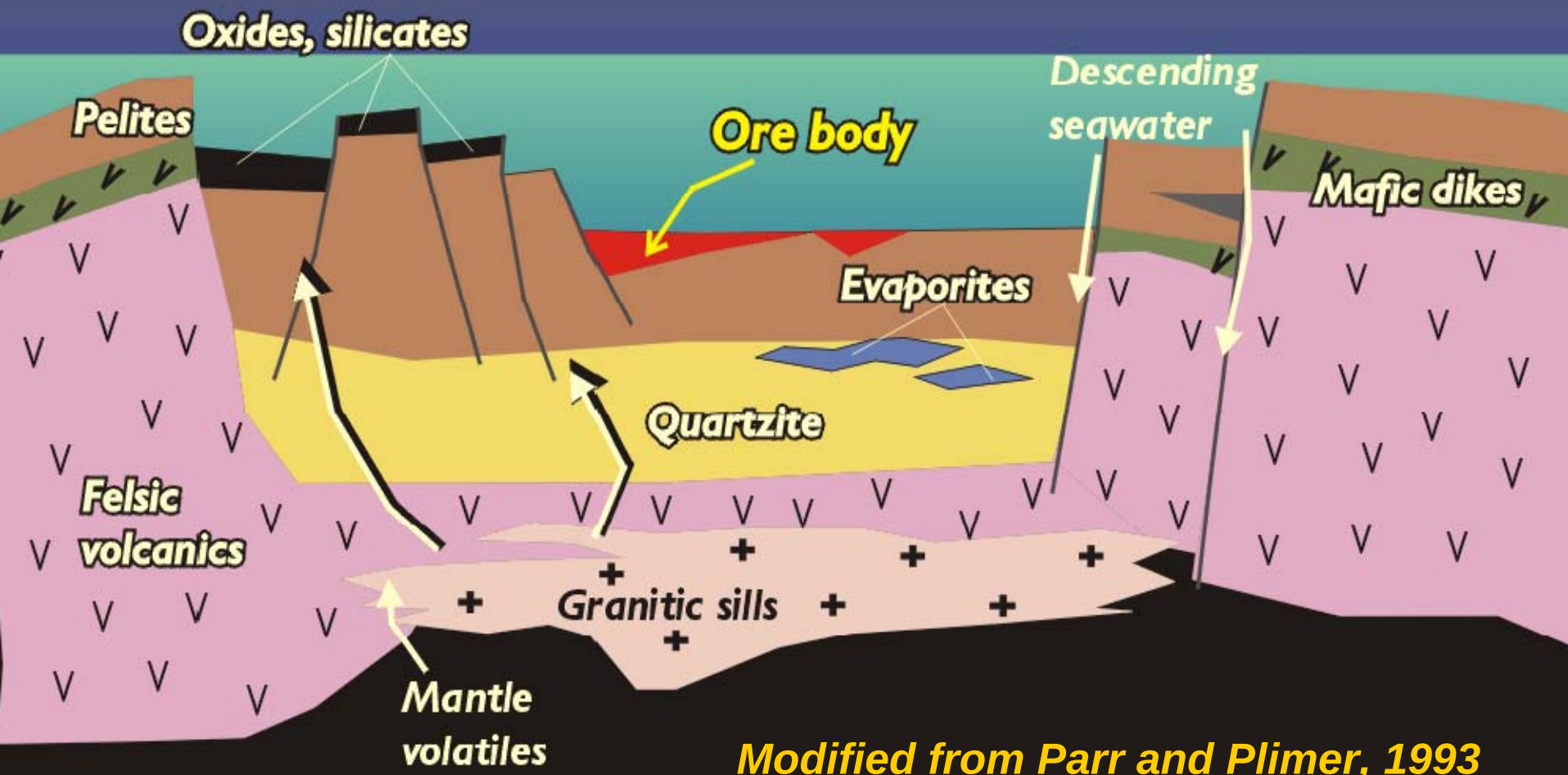




- Extension/rifting
- Growth faults
- Basal clastic aquifer
- Reduced shales
- Deep tapping fluid conduits (detach.)

Broken Hill (Cannington), Australia

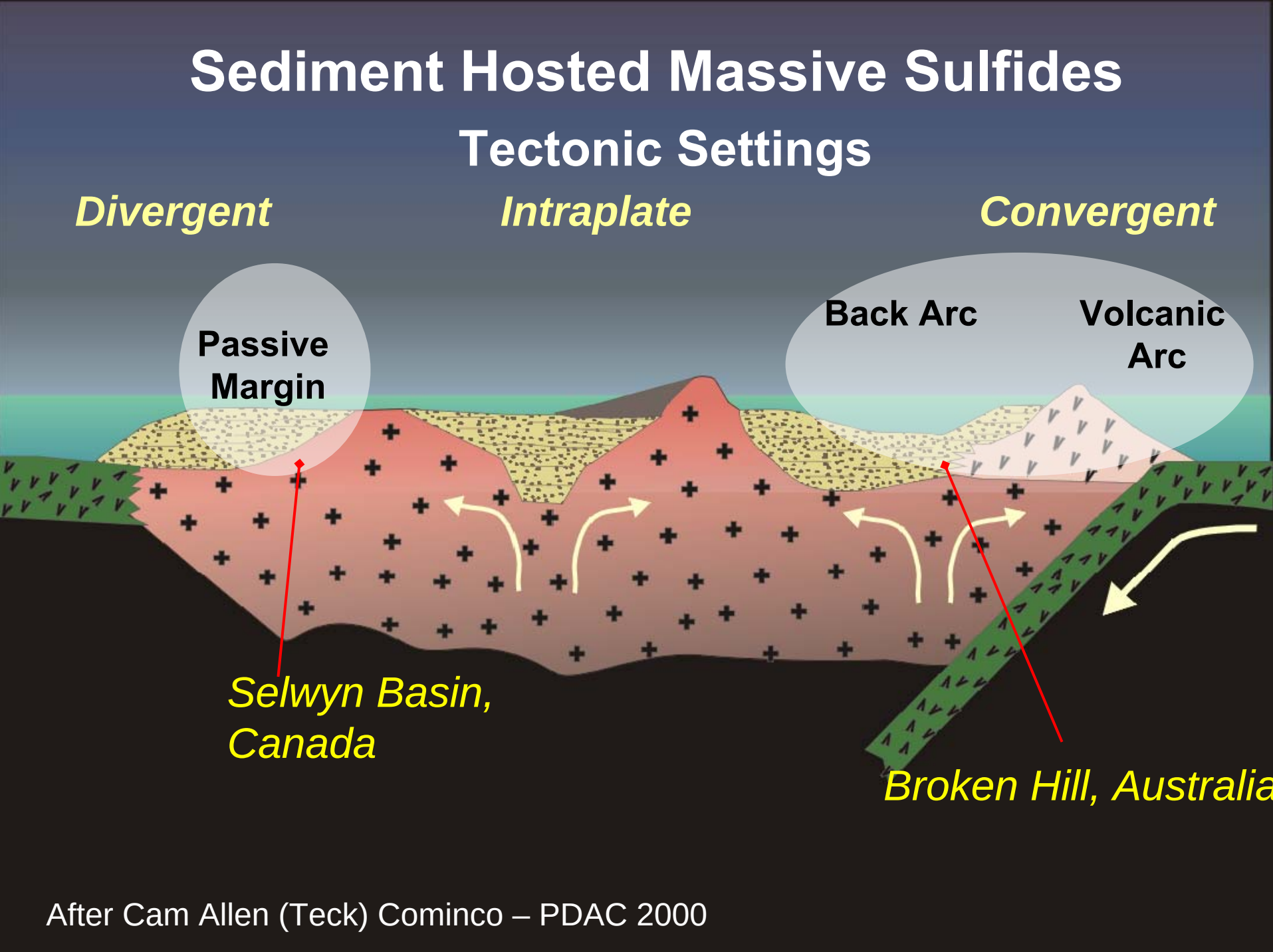
- *Contains all Favourability Criteria*
- *Genetic Model – intracontinental setting*



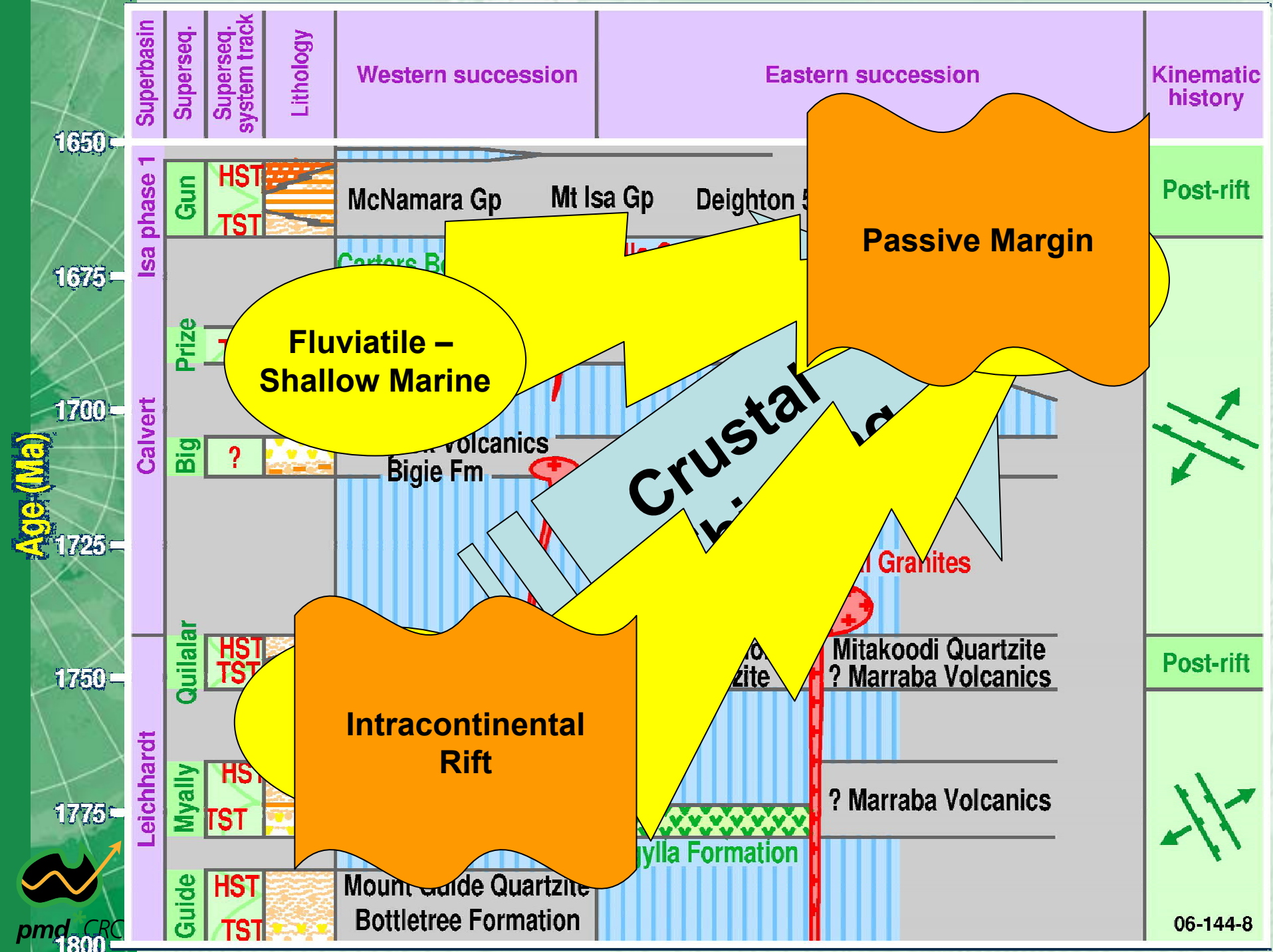
Modified from Parr and Plimer, 1993

Sediment Hosted Massive Sulfides

Tectonic Settings



After Cam Allen (Teck) Cominco – PDAC 2000


Superbasin
Superseq.
Superseq. system track
Lithology
Western succession
Eastern succession
Kinematic history
Age (Ma)
1650
1675
1700
1725
1750
1775
1800
Isa phase 1
Calvert
Leichhardt
Gun
Prize
Big
Quilalar
Myally
Guide
HST
TST
McNamara Gp
Mt Isa Gp
Deighton 5
Bigie Fm
Granites
Mitakoodi Quartzite
? Marraba Volcanics
Mount Guide Quartzite
Bottletree Formation
Post-rift
Passive Margin
Fluviatile – Shallow Marine
Crustal
Intracontinental Rift
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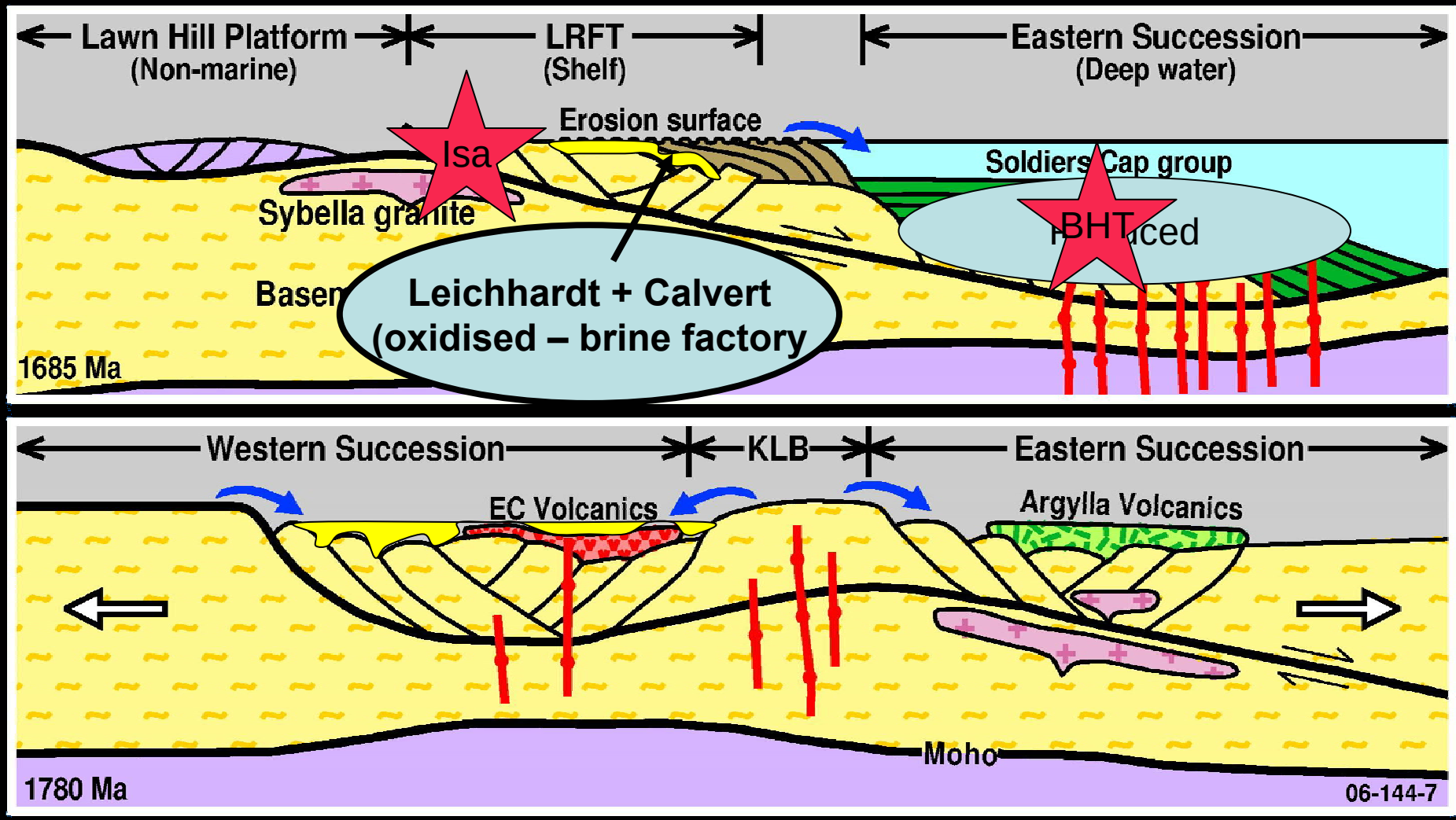
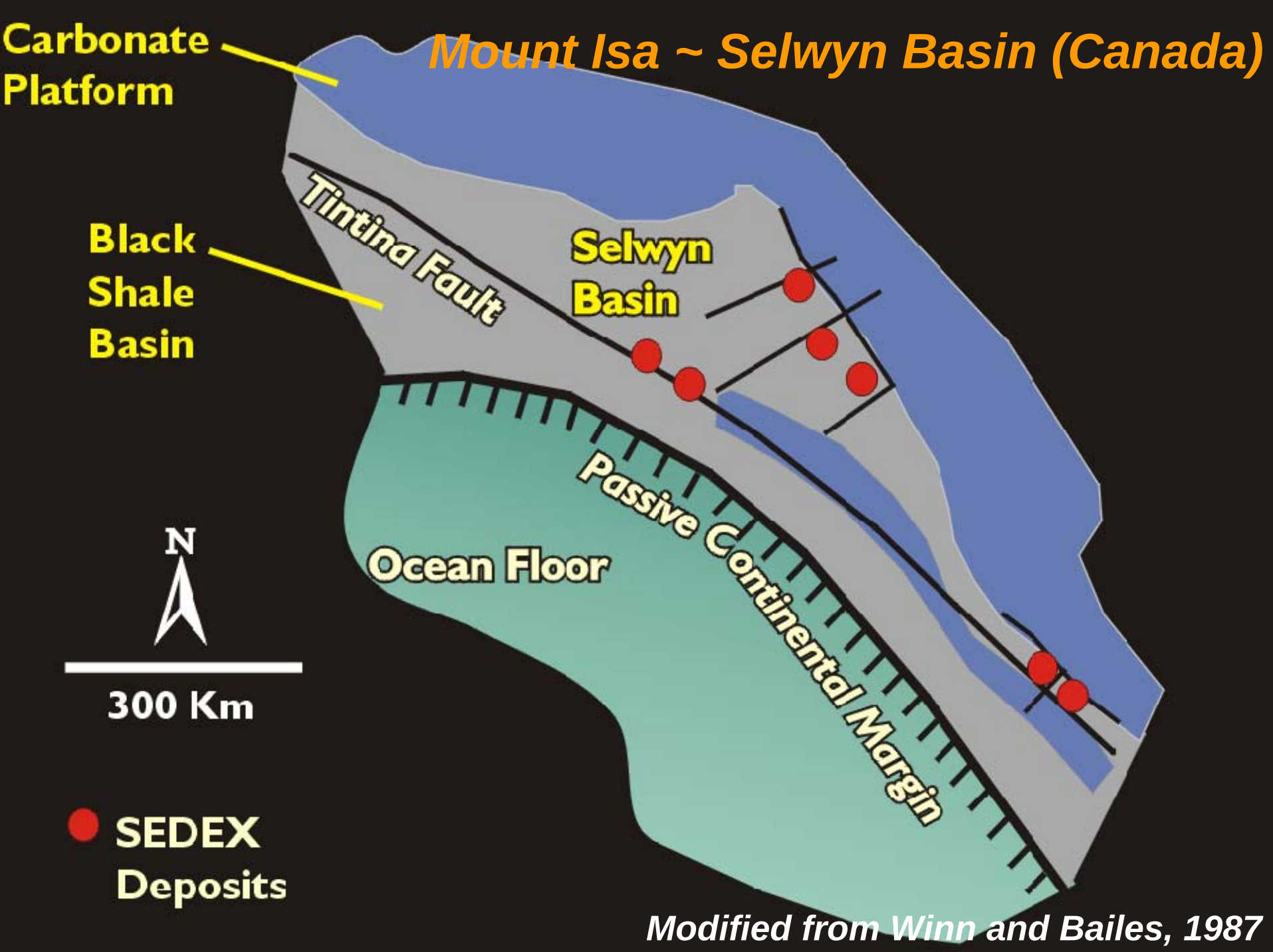
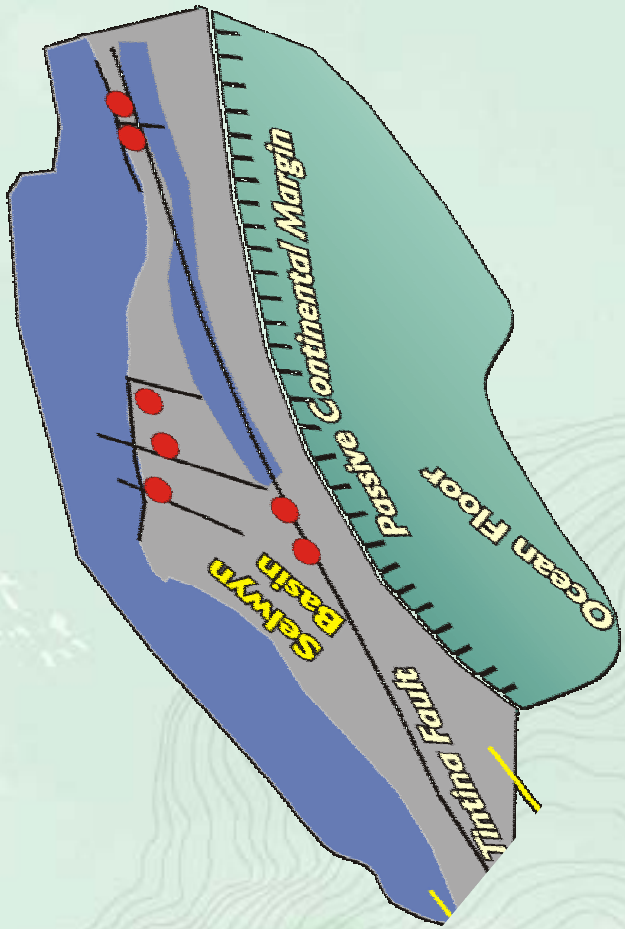
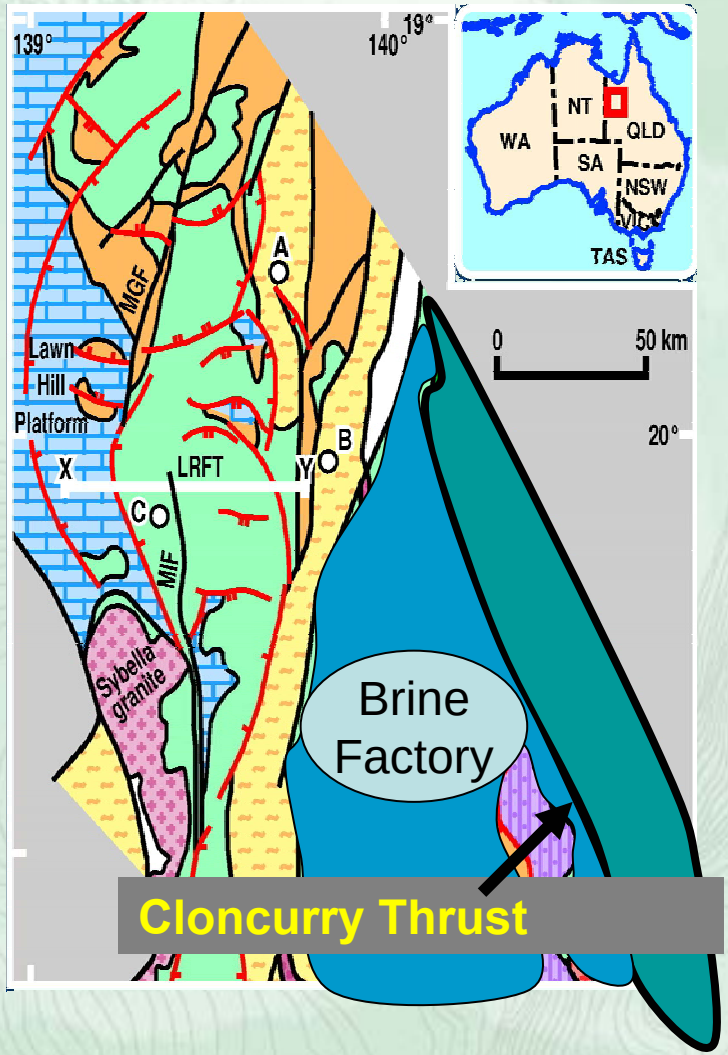
Syn-rift Depositional Environment through time




Mount Isa ~ Selwyn Basin (Canada)
Carbonate Platform
Black Shale Basin
Tintina Fault
Selwyn Basin
Passive Continental Margin
Ocean Floor
N
300 Km
SEDEX Deposits
Modified from Winn and Bailes, 1987

Regional Redox boundary





- **Fluid Cell 1 - Oxidised = Shallow marine (Corella Formation)**
- **Fluid Cell 2 – Reduced = Deep Water turbidites (Soldiers Cap)**

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Conclusions

- Geodynamic evolution of Isa Inlier?
- Tectonic setting?
  - Initially intracontinental rift
  - Progression towards passive margin
- Analogues?
  - Selwyn Basin (Canada) (Passive margin)
- Implications for metal sources & fluid flow?
  - Oxidised vs Reduced fluid cells
  - Redox boundary

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