

# Controls to Tasmanide epithermal and porphyry Au-Cu mineralisation – Exploration implications

Greg Corbett  
Mines and Wines Conf.  
Sept 2017

[www.corbettgeology.com](http://www.corbettgeology.com)

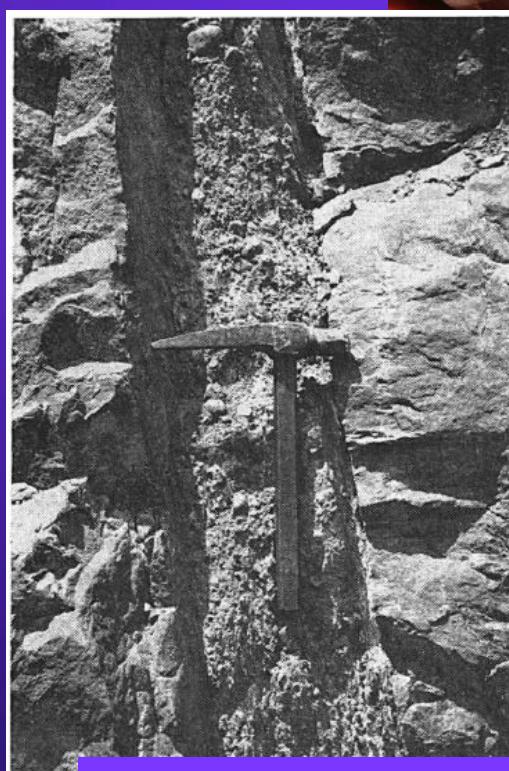
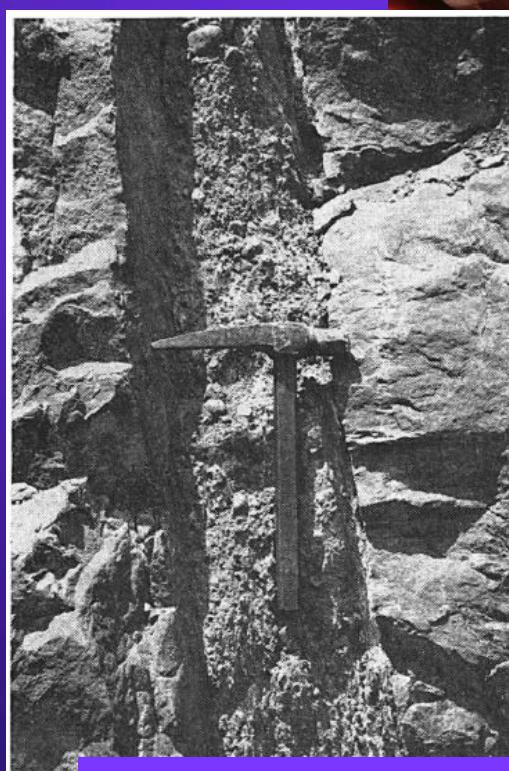
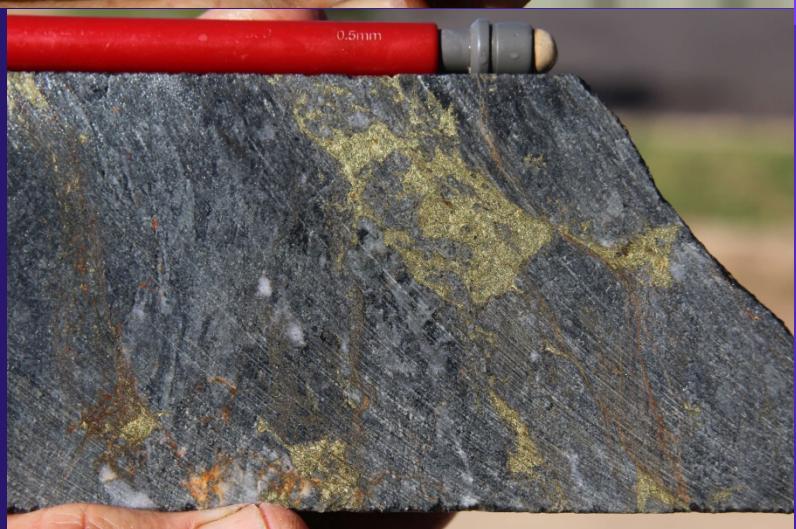
# Controls to Tasmanide epithermal-porphyry Au-Cu mineralisation - including ore shoots in epithermal veins

- ◆ Styles of mineralisation (including repetition)
- ◆ Structure
- ◆ Host rocks
- ◆ Mechanisms of Au deposition
- ◆ Supergene effects
- ◆ Triggers to ore formation (veins give kinematic)

.... and mention a couple of exploration pitfalls

# Styles of mineralisation

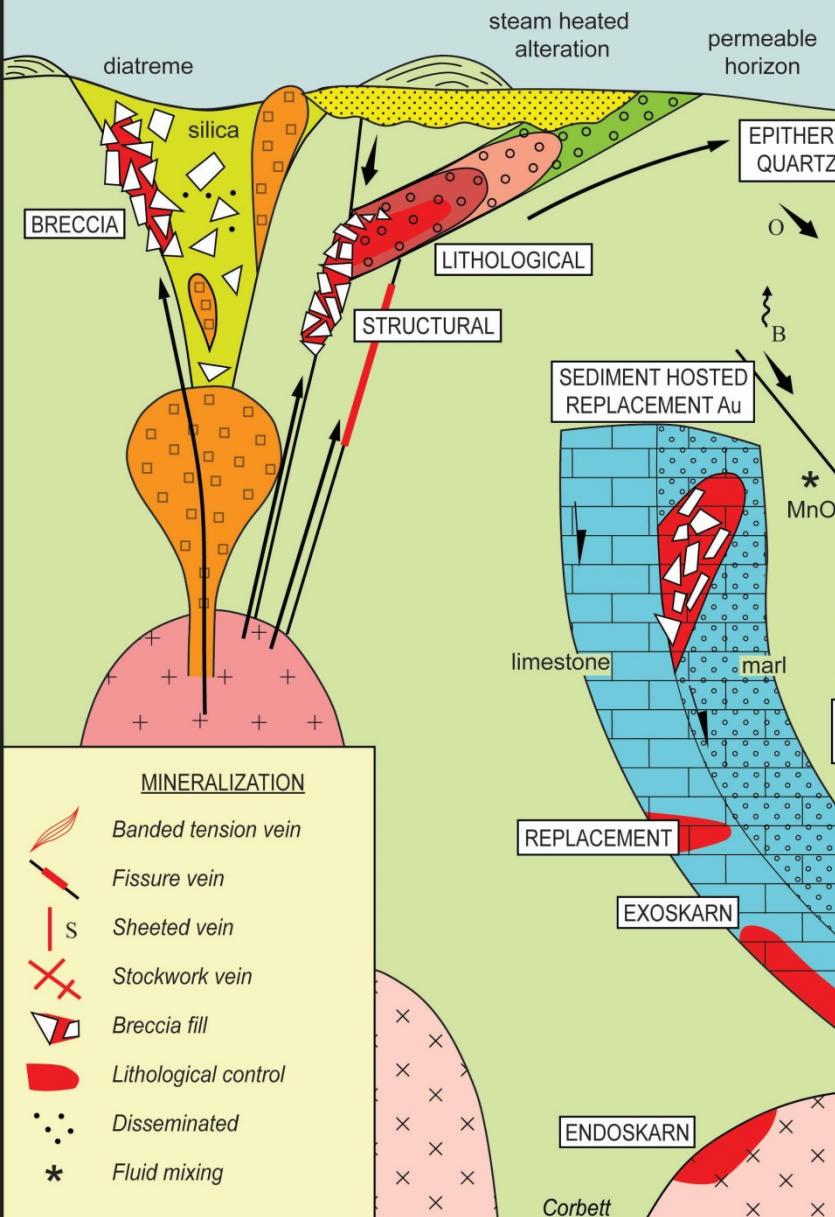
Burraga  
Commonwealth  
Mineral Hill  
Mt Morgan



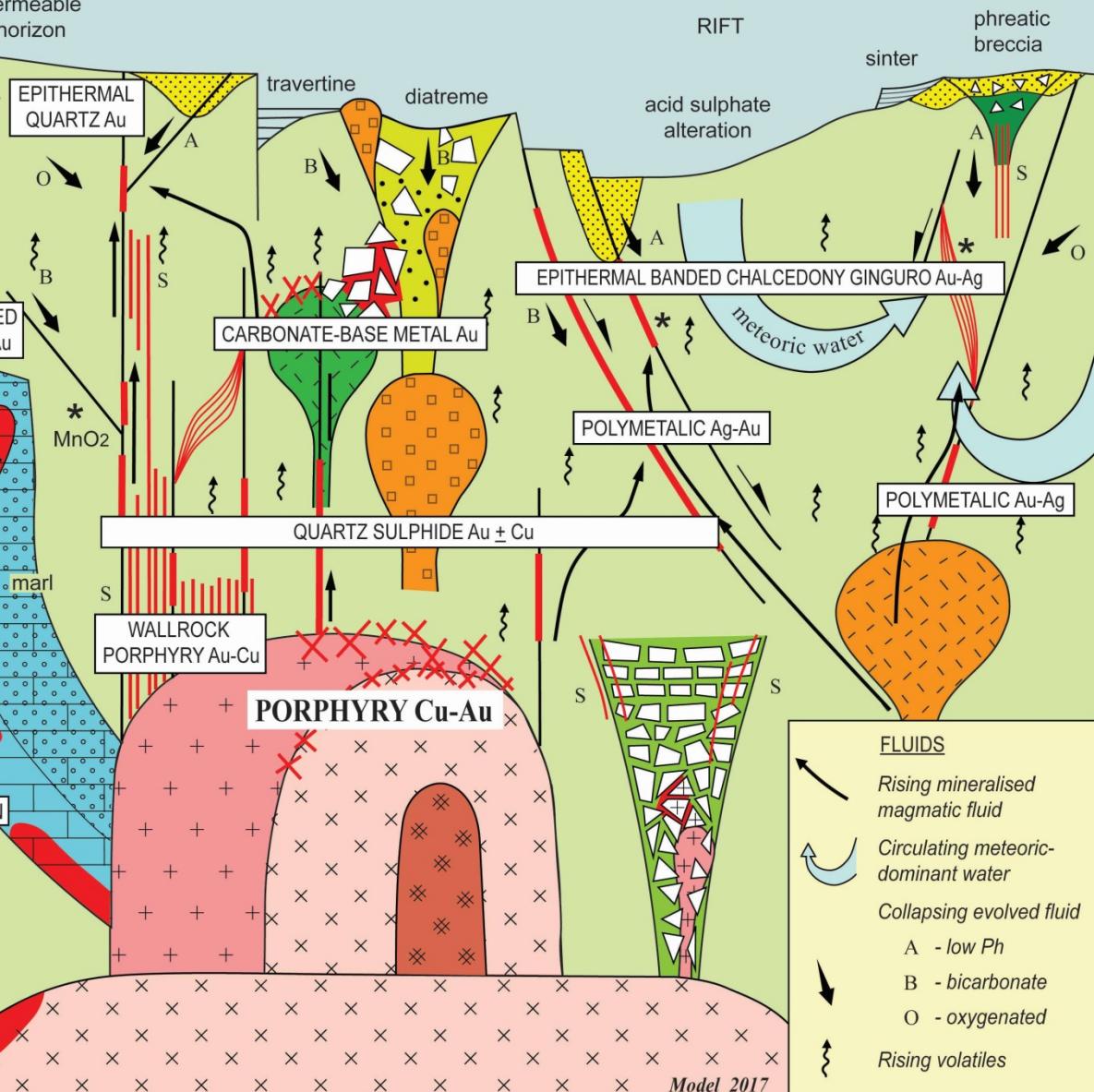
Cornelius 1967, 1968

2% Cu & 3 g/t Au

## HIGH SULPHIDATION EPITHERMAL Au



## LOW SULPHIDATION EPITHERMAL Au-Ag



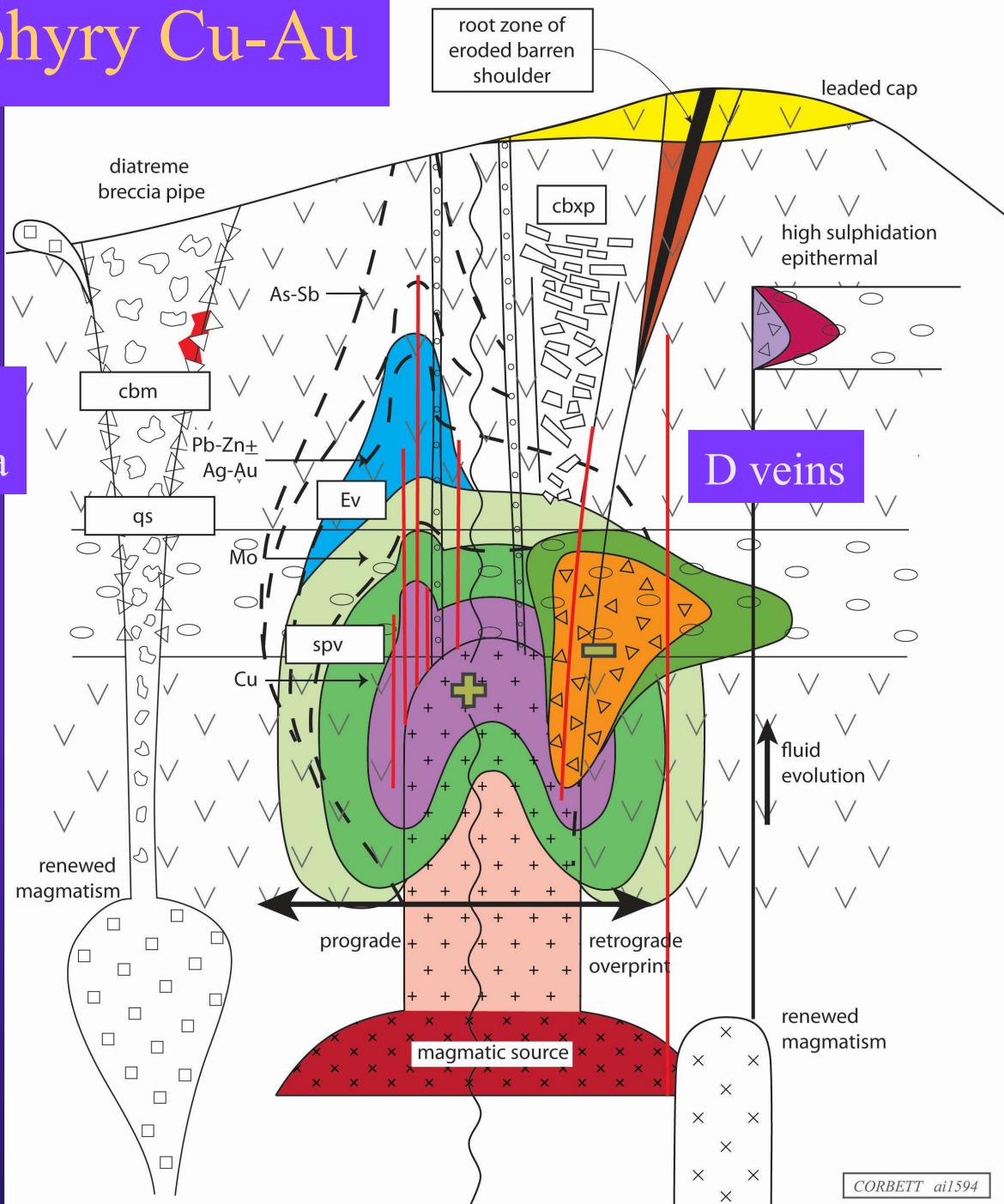
# D veins outside porphyry Cu-Au



Stavely  
Victoria



Serbia



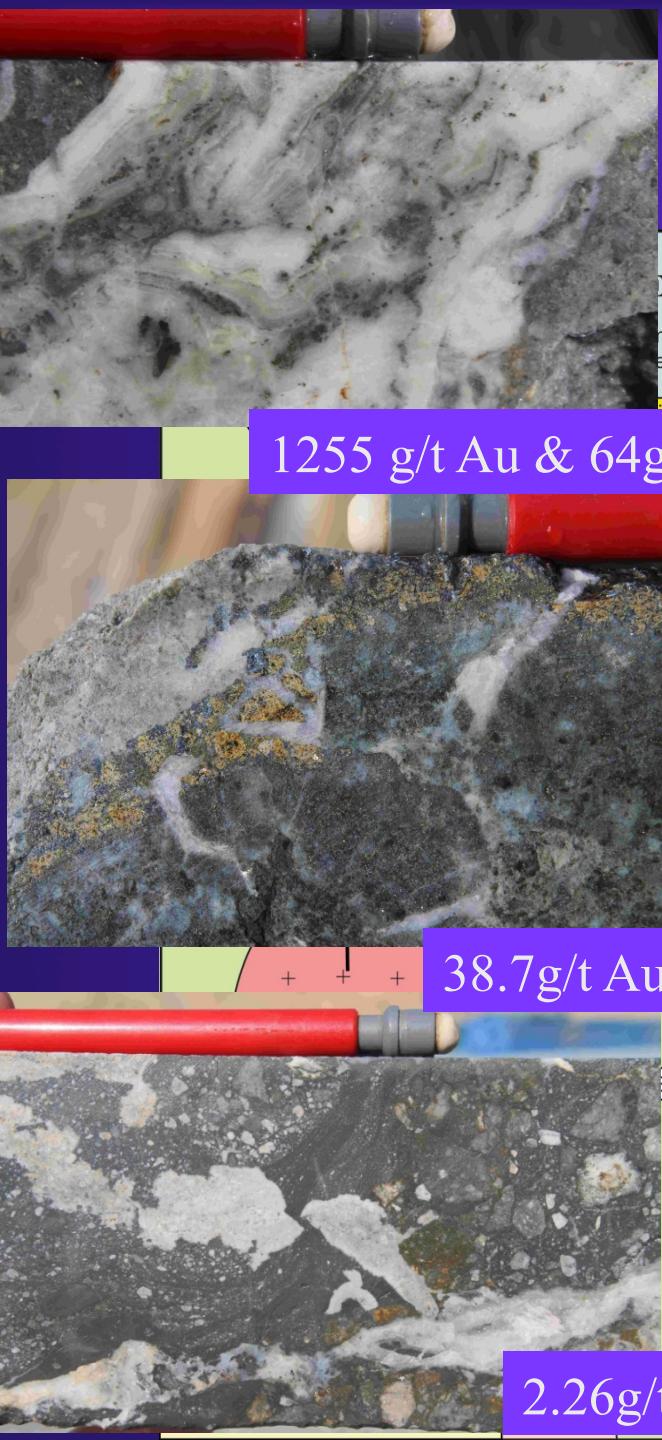


# Bingham Canyon

## July 2017



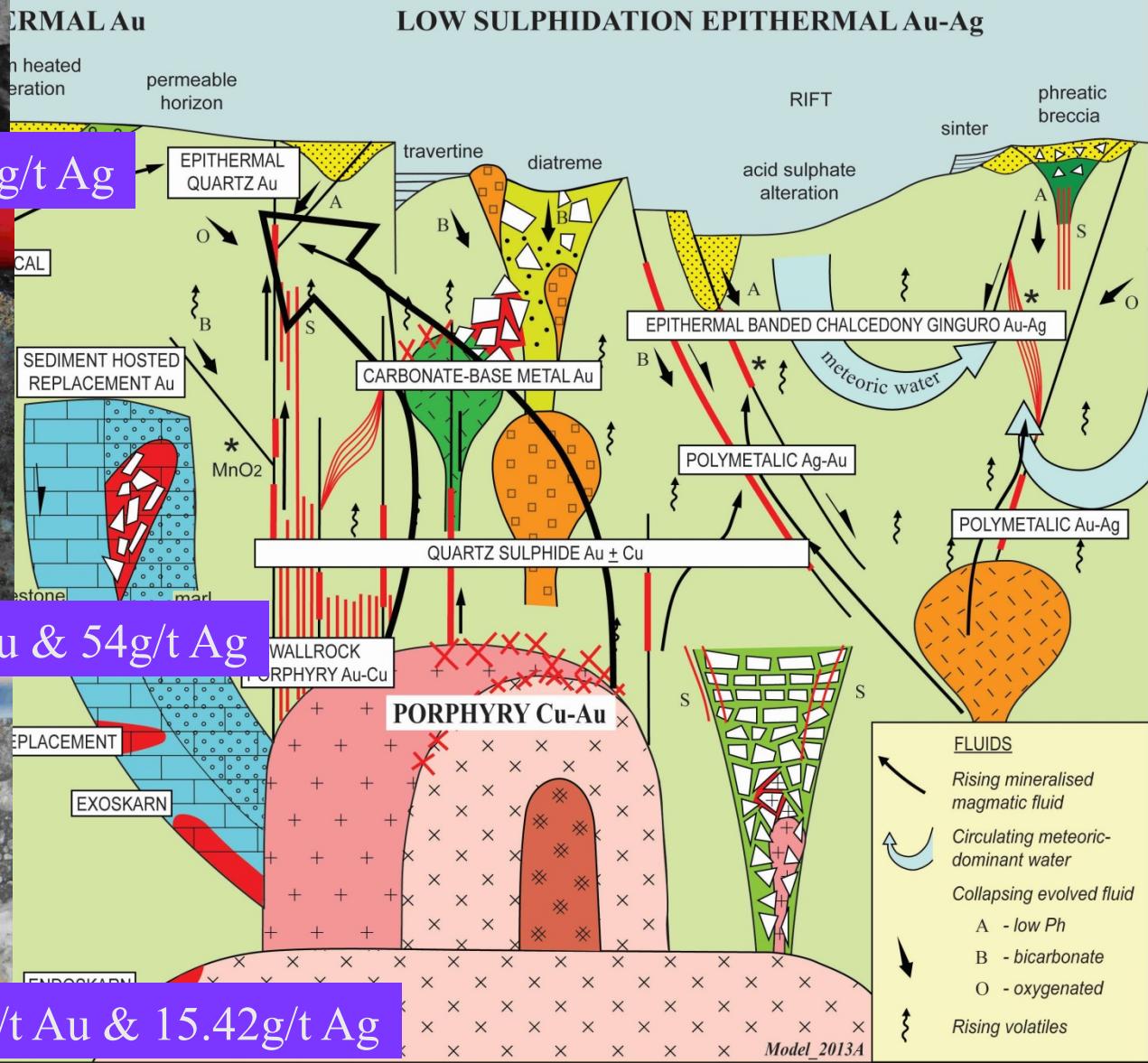
# Intrusion-related low sulph. epi. fluid flow - Mastra, Turkey



1255 g/t Au & 64g/t Ag

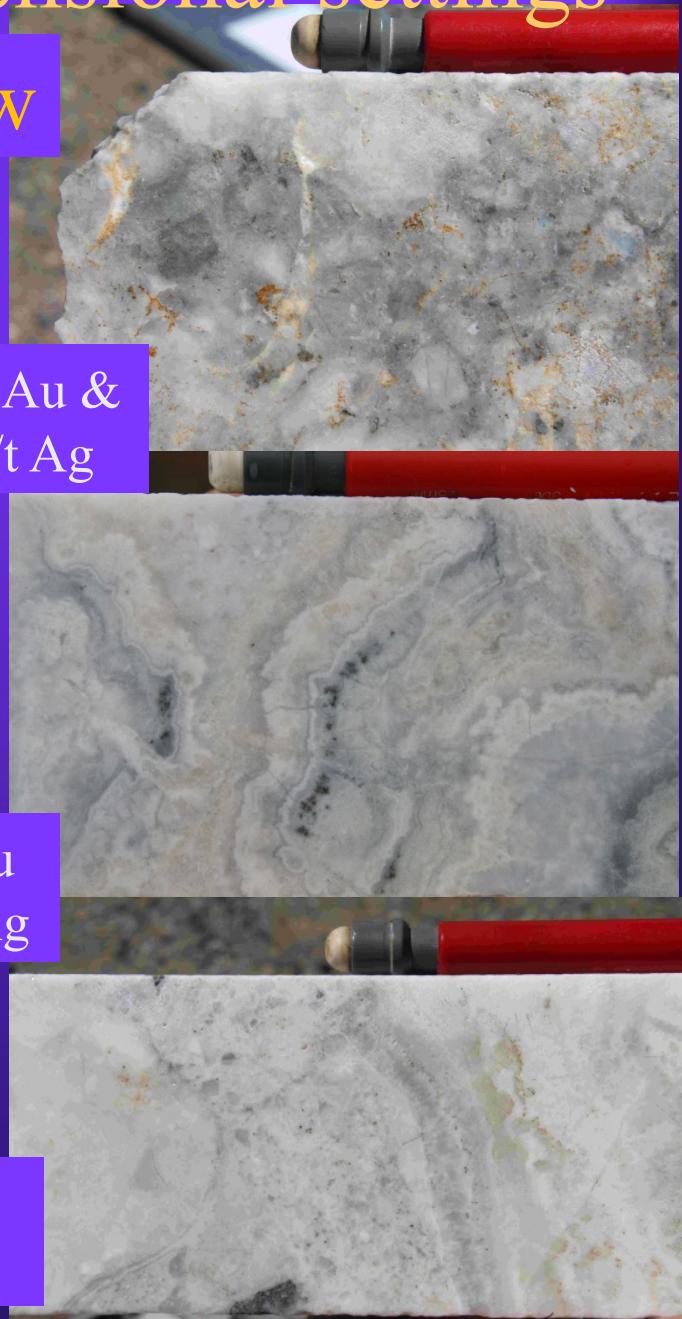
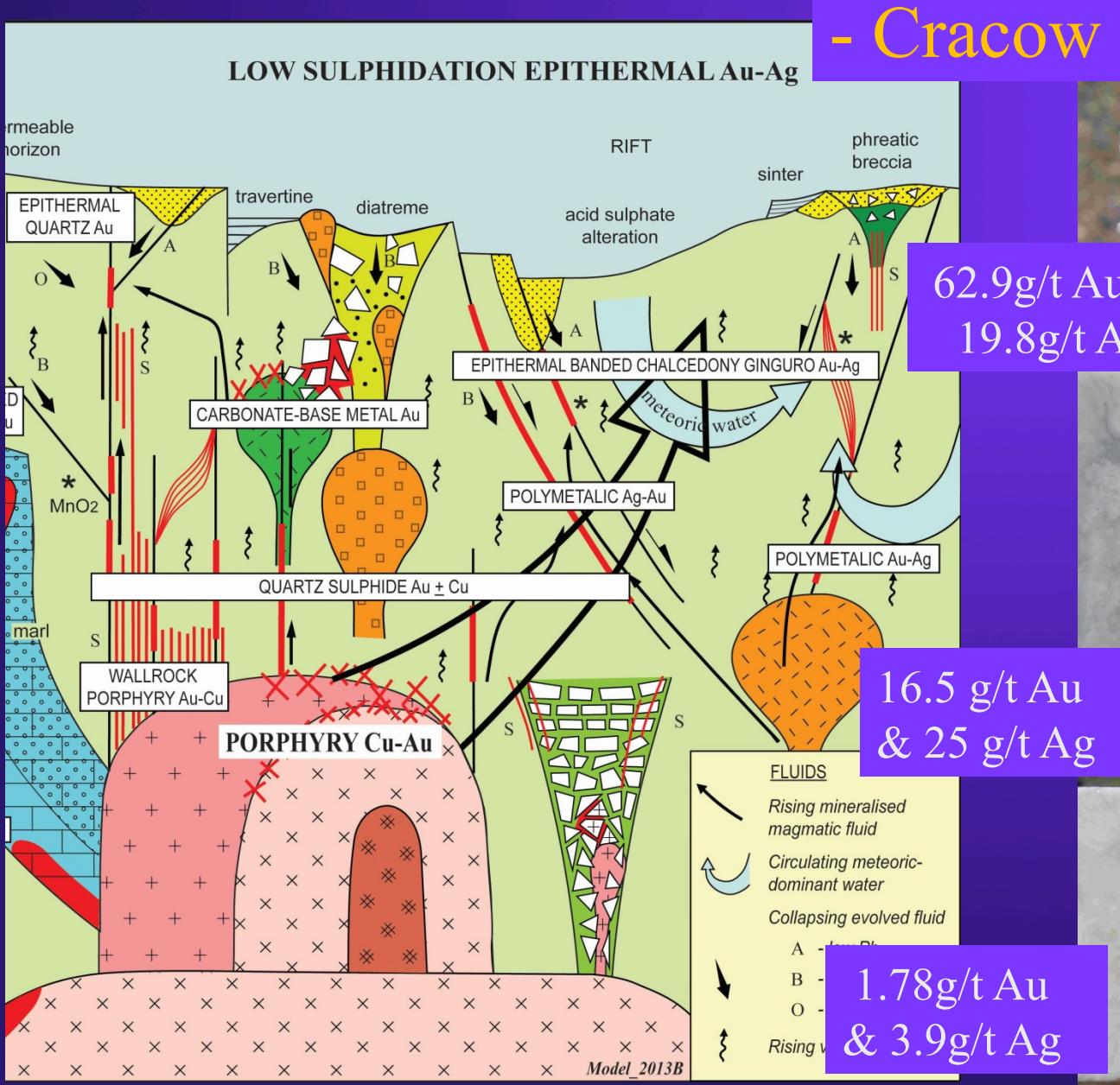
38.7g/t Au & 54g/t Ag

2.26g/t Au & 15.42g/t Ag



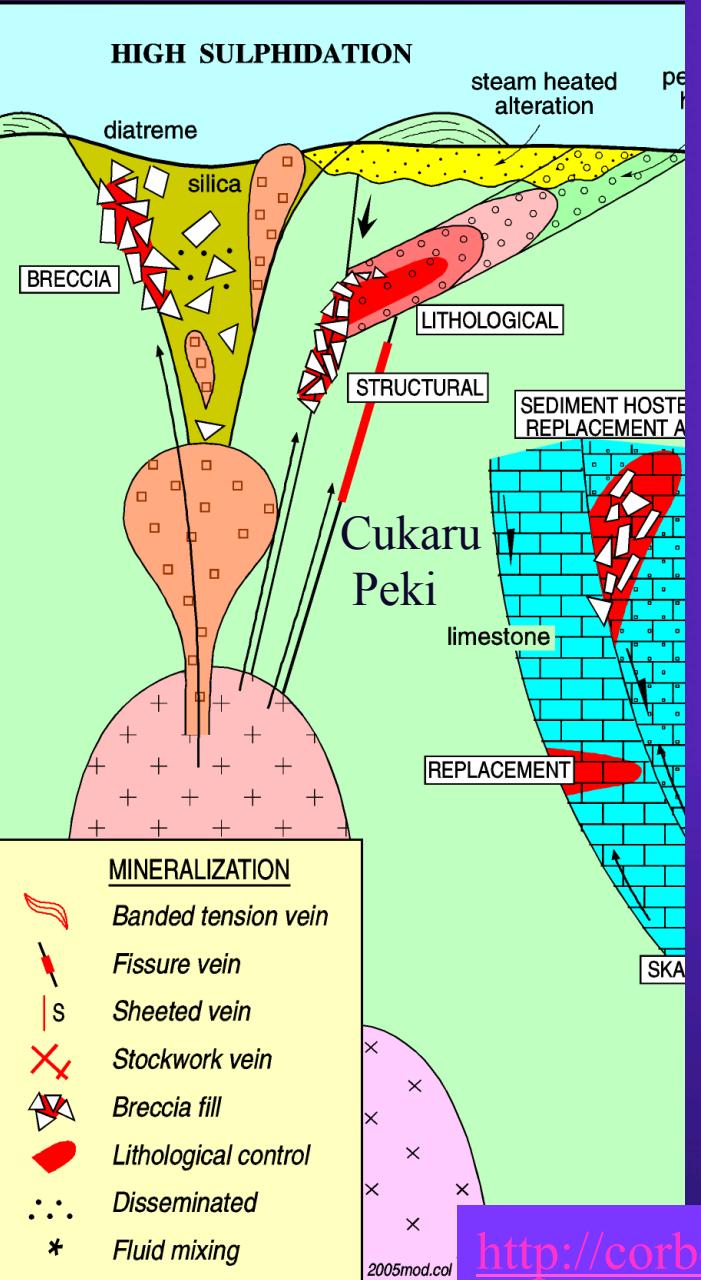
# Banded quartz veins in extensional settings

- Cracow

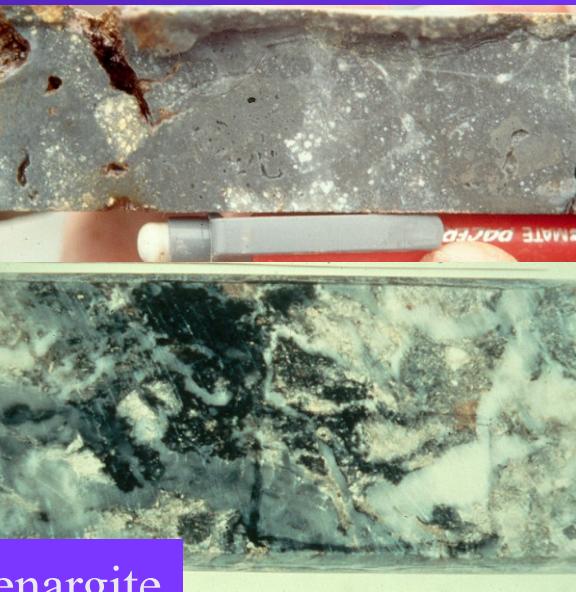


# High Sulphidation epithermal Au

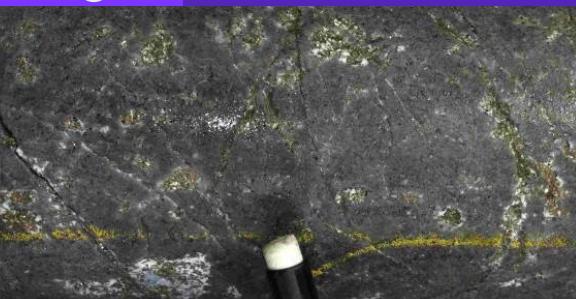
## HIGH SULPHIDATION



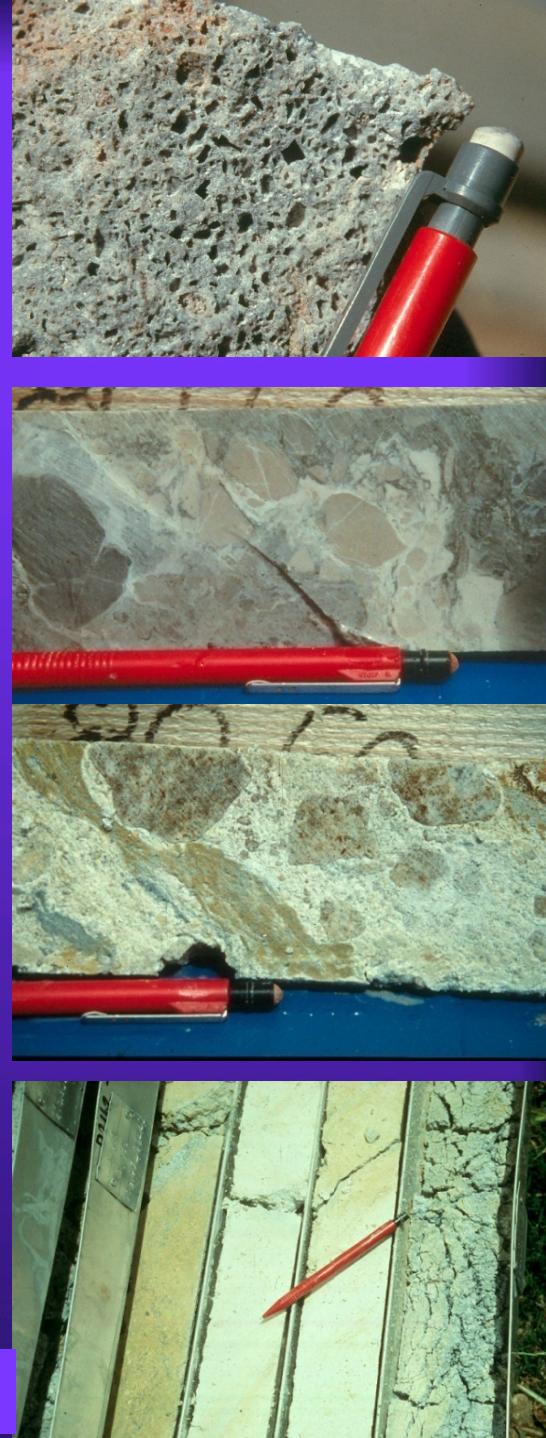
## MOST HOT ACID



enargite

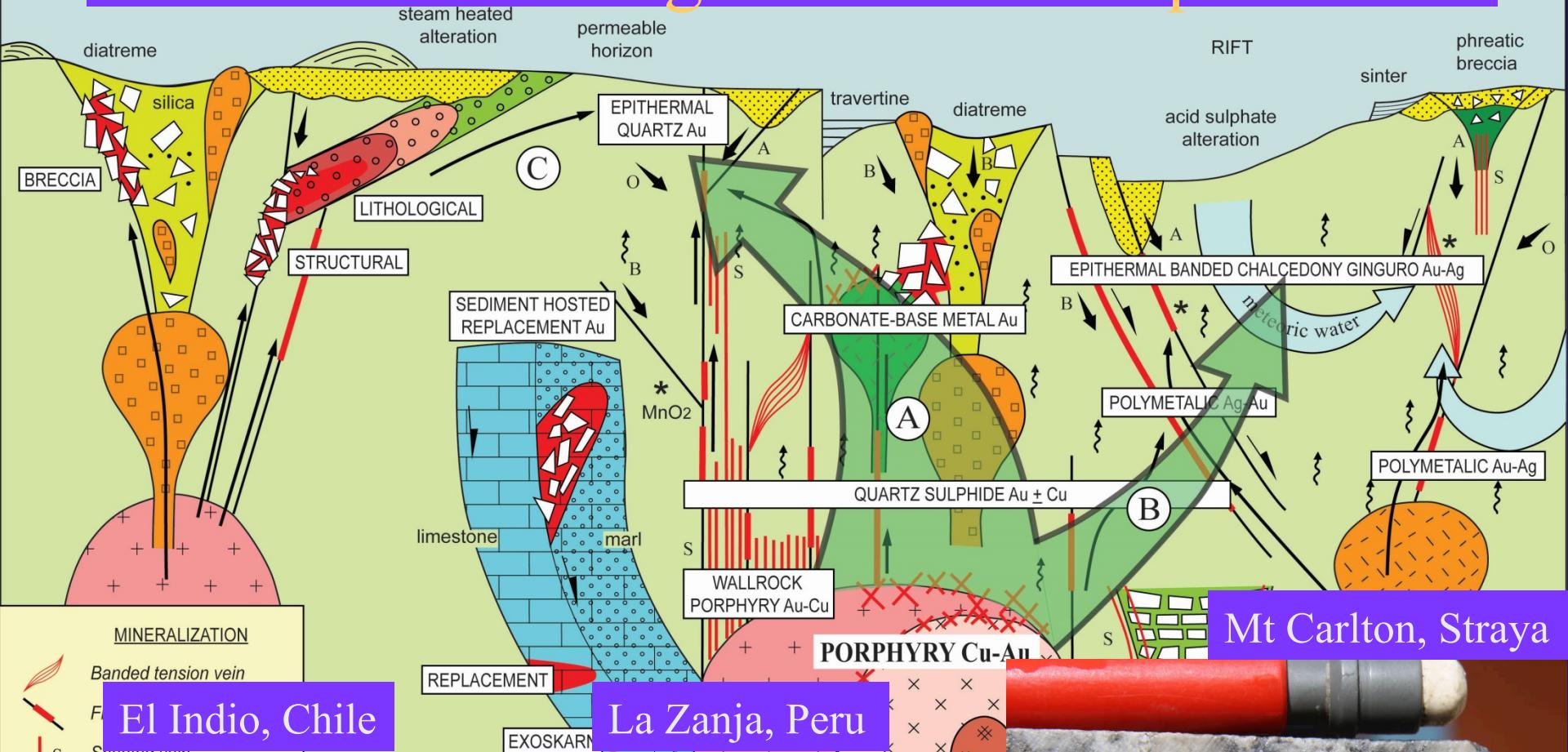


covellite-chalcocite  
LESSER HOT ACID



HIGH

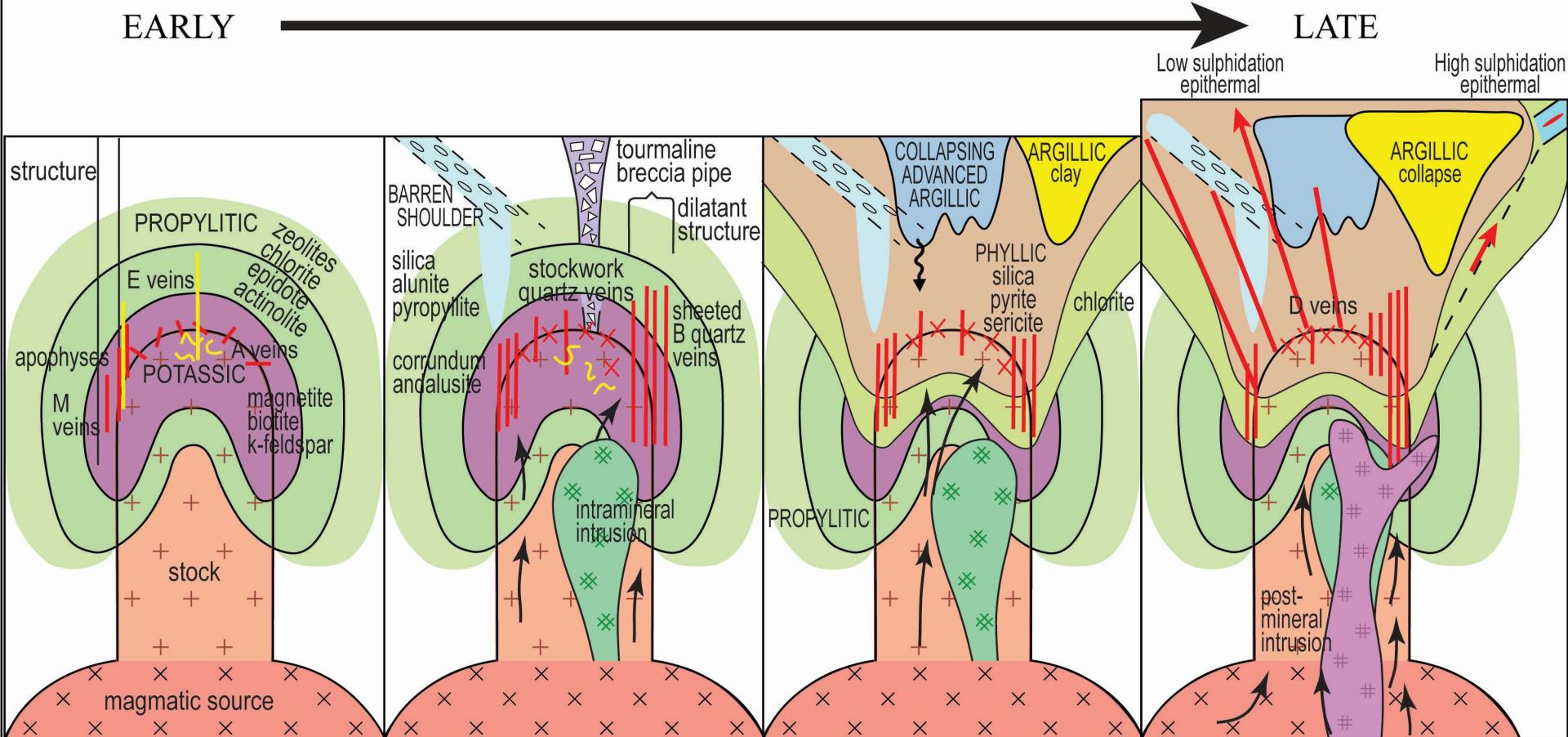
# Evolution from high to lower sulphidation



# STAGED PORPHYRY Cu-Au EVOLUTION

EARLY

LATE



Intrusion emplacement and heat transfer with prograde alteration. E veins.

Initiation of A & M quartz vein formation and early mineralization.

B quartz vein formation.

Exsolution of magmatic volatiles and formation of barren shoulder.

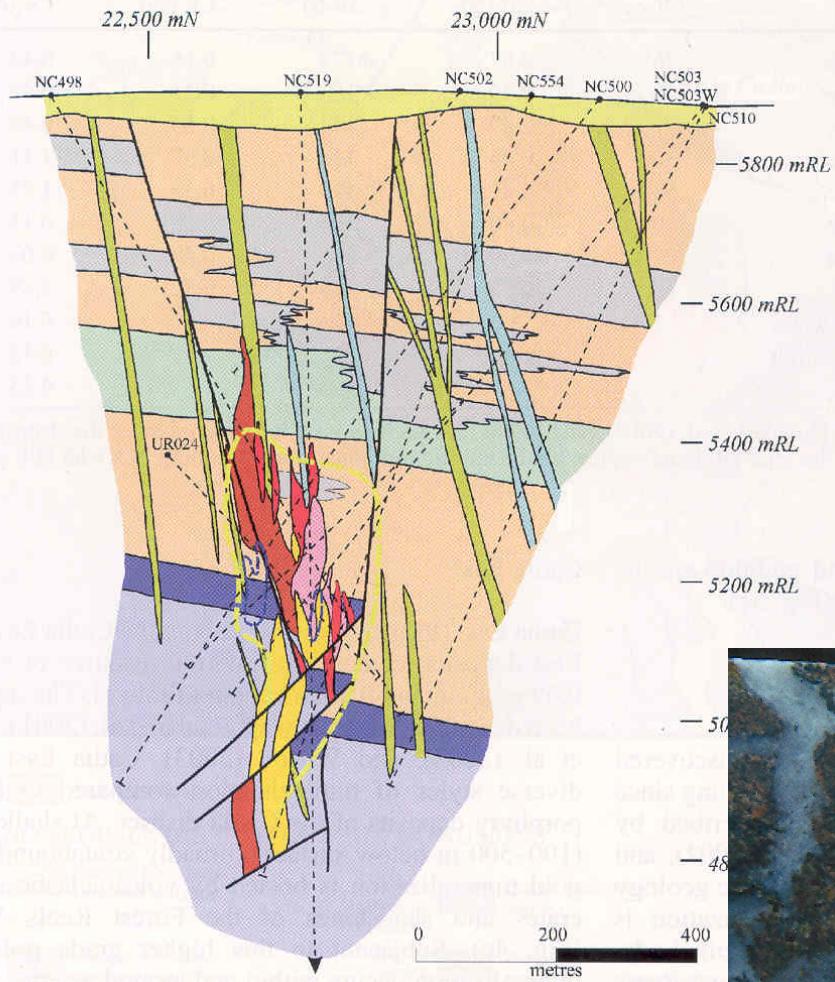
Cooling and collapsing of retrograde phyllitic and argillic alteration and overprinting collapsing advanced argillic alteration..

Local retrograde alteration selvages to B veins.

Continued retrograde collapse. D vein mineralization, & post-mineral features.

# Polyphasal porphyry intrusions

a Ridgeway, Section 11,050mE

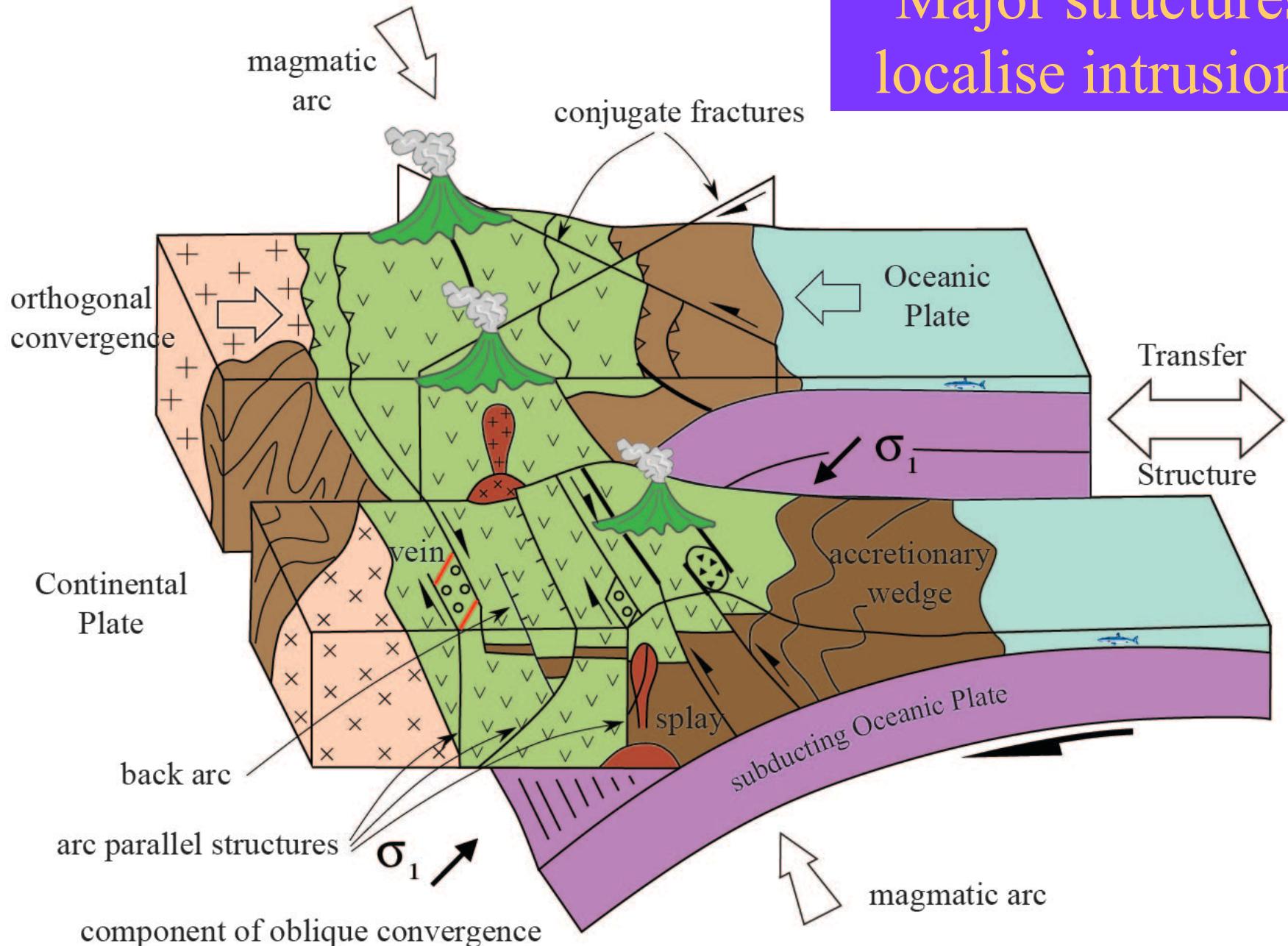


Magnetite: Bornite vs chalcopyrite



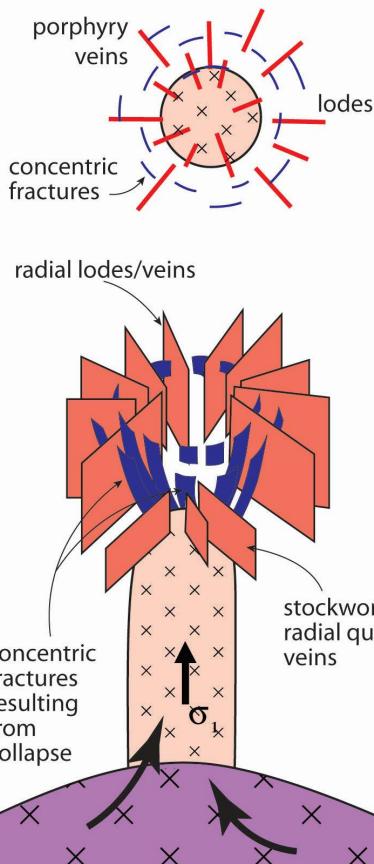
From ,Wilson et al., 2003

# Major structures localise intrusions

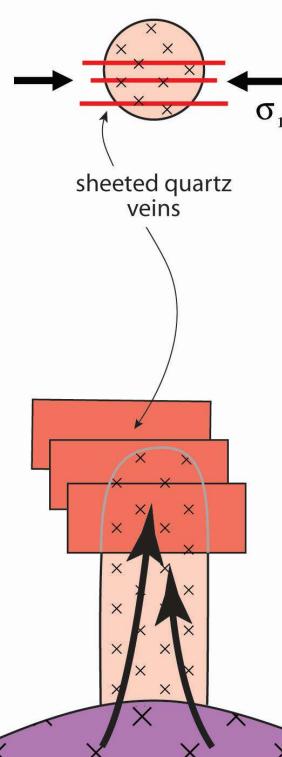


# Prospect scale structure - porphyry

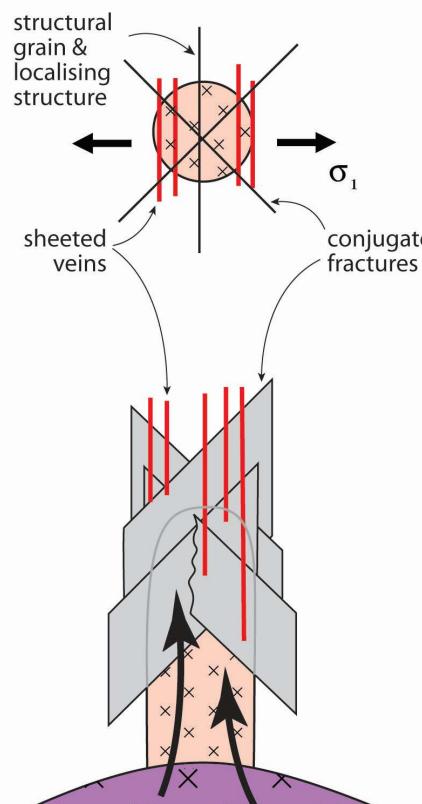
VERTICAL COMPRESSION



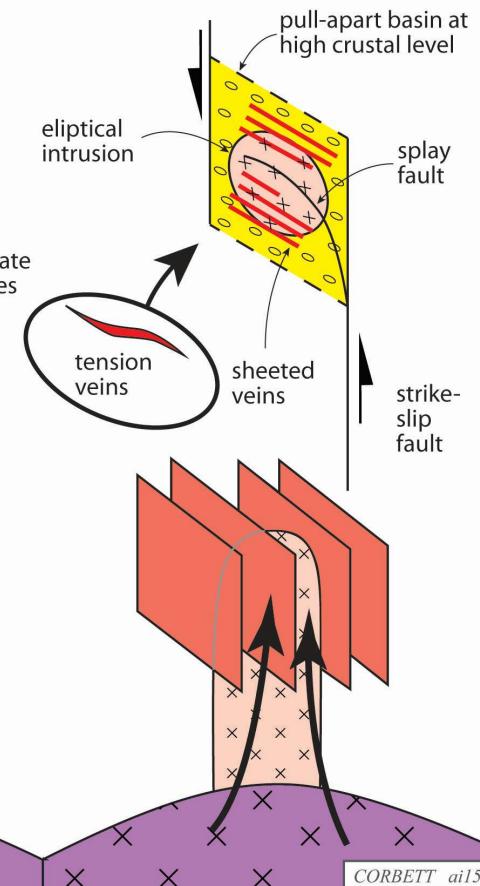
ORTHOGONAL COMPRESSION



ORTHOGONAL EXTENSION



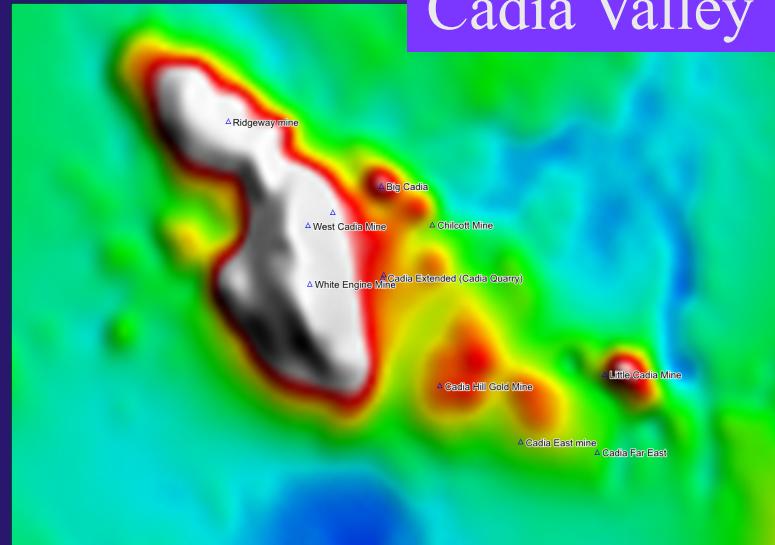
TRANSPRESSION



CORBETT ai1577a

# Structure and intrusion architecture & - Exploration implications

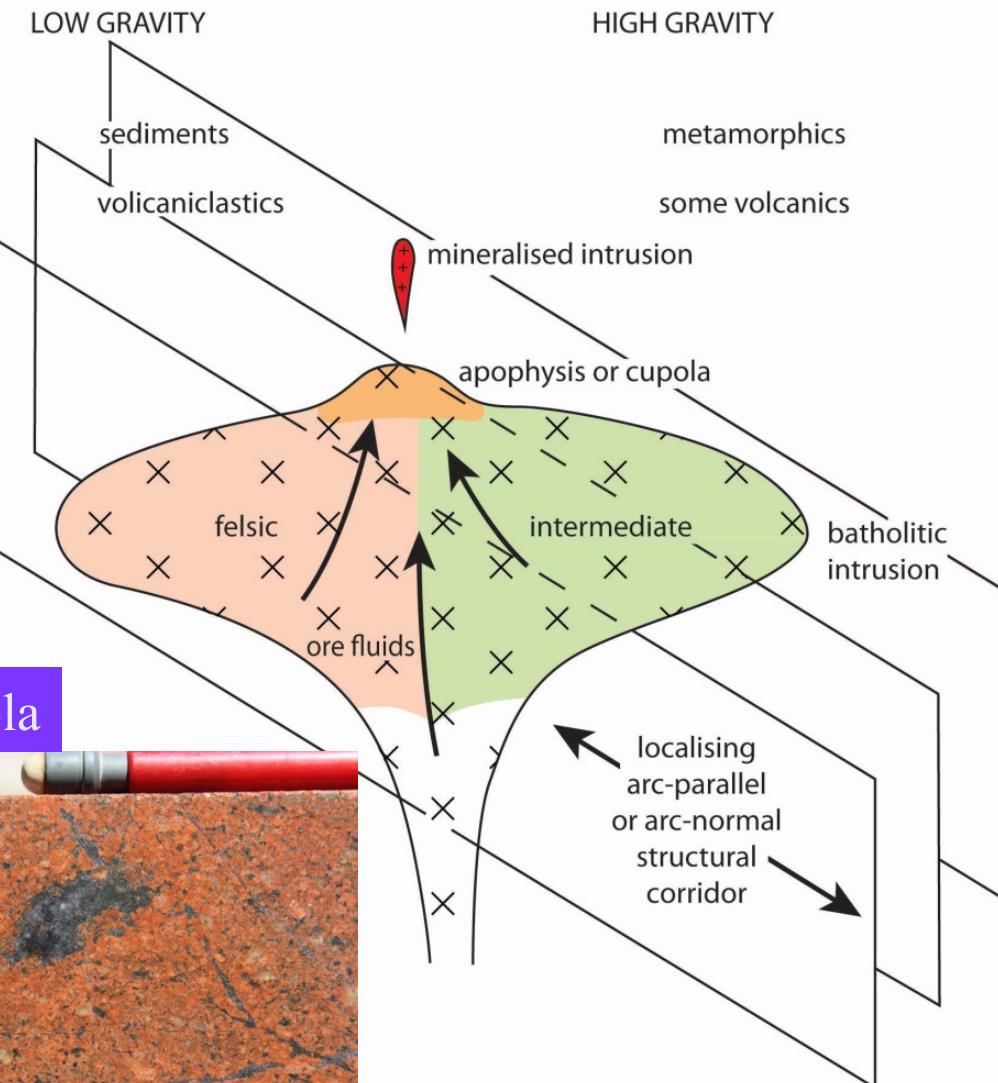
Cadia Valley



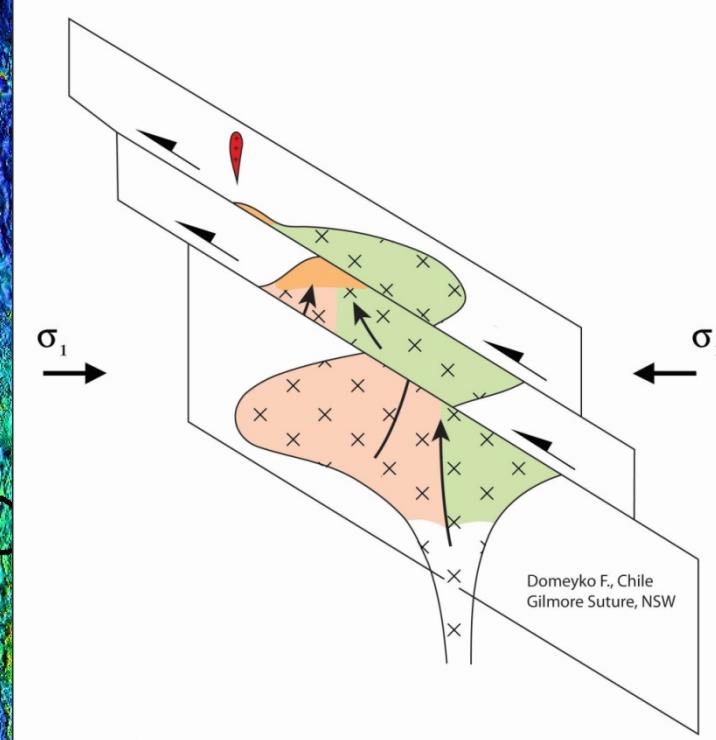
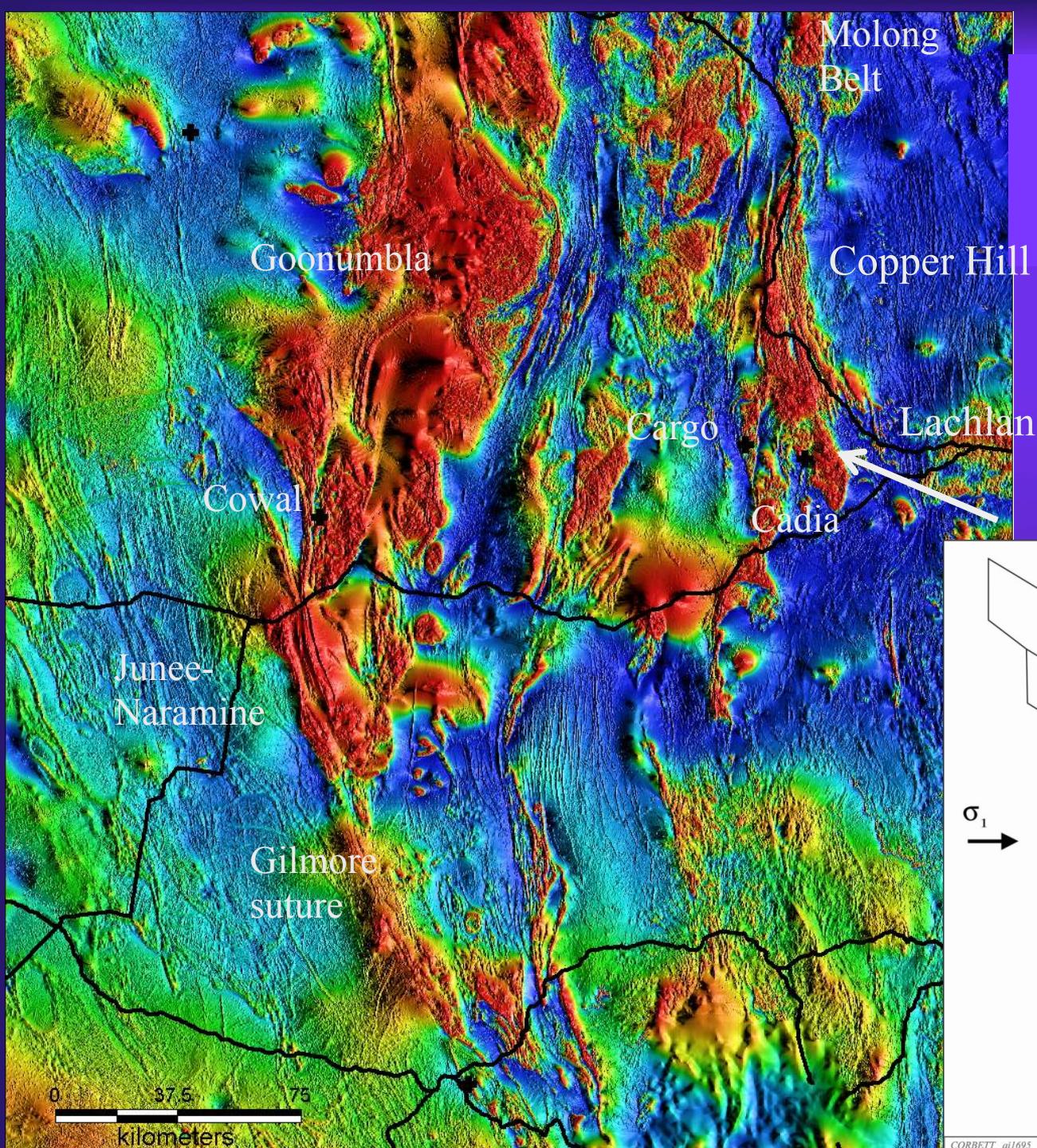
Yeoval



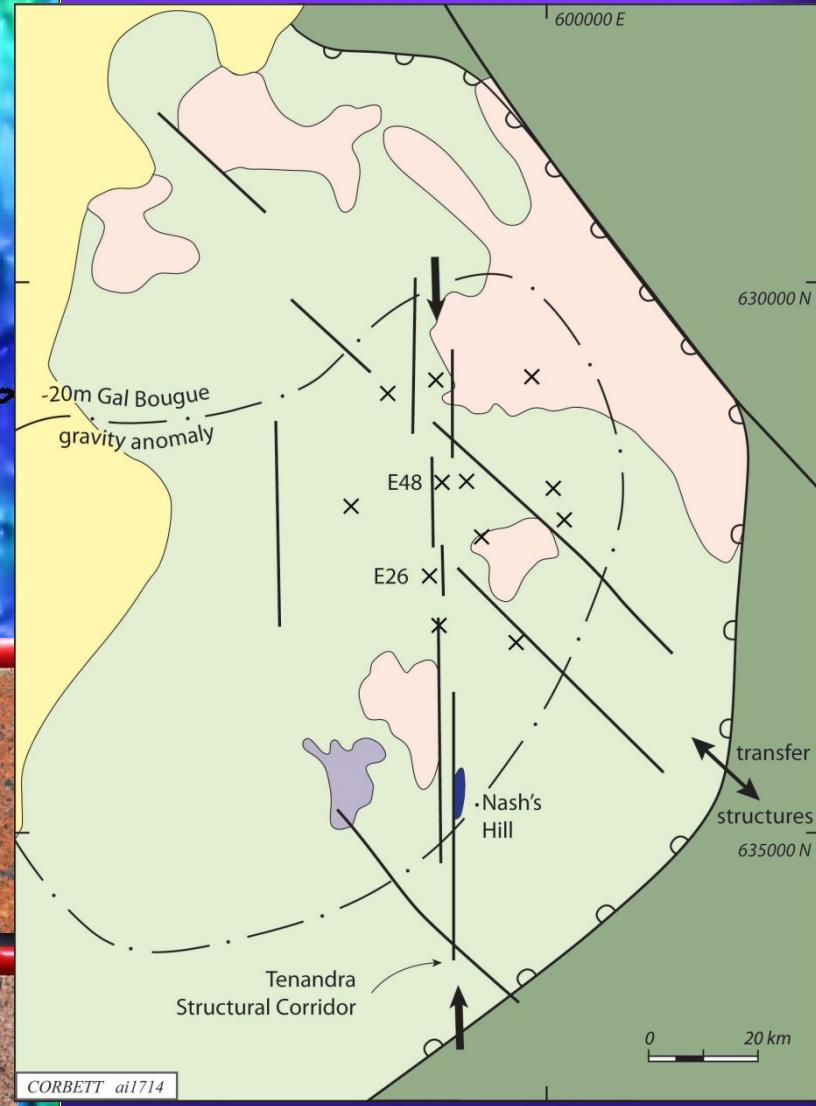
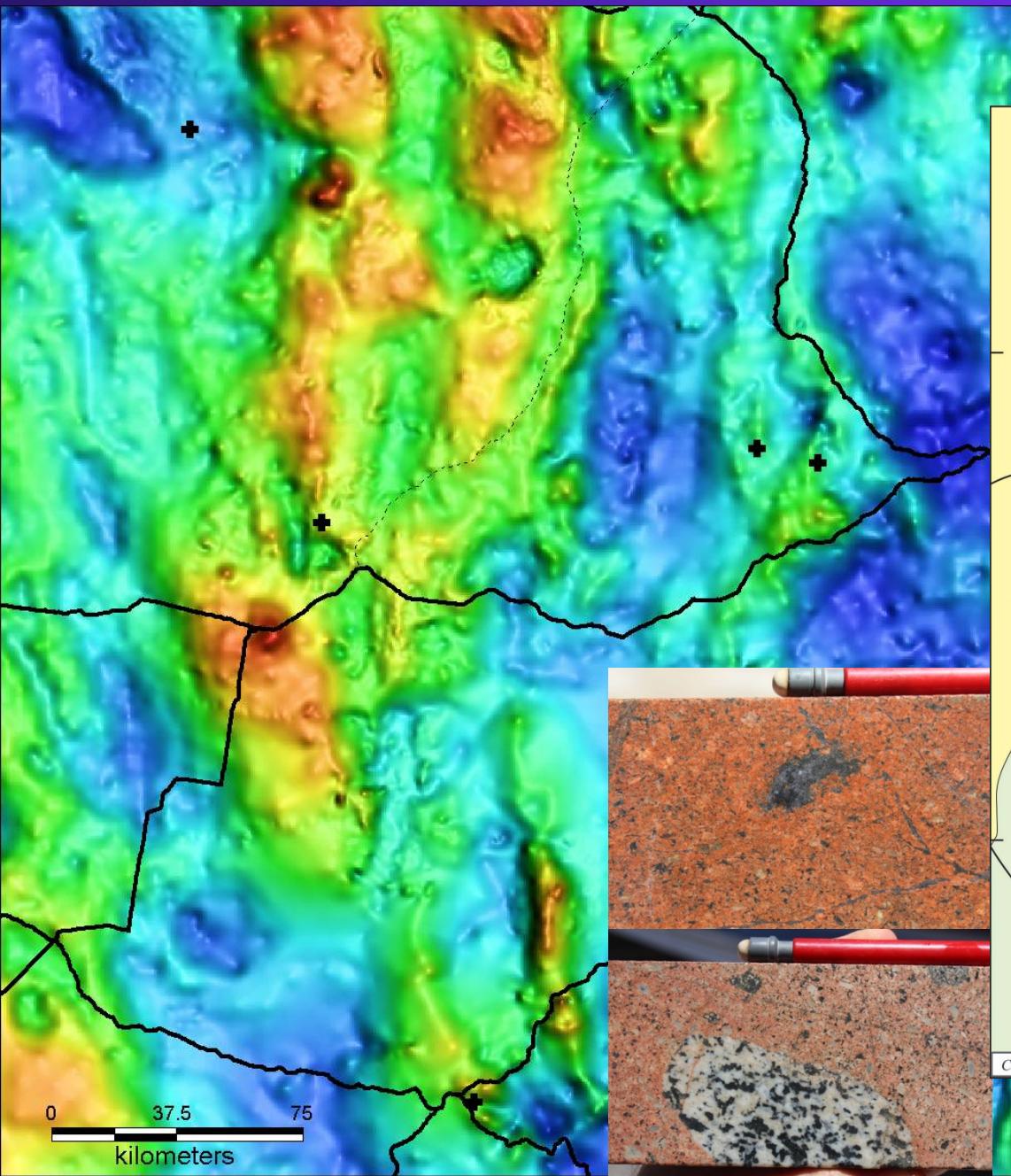
Goonumbla



# NSW Tasmanides - magnetics



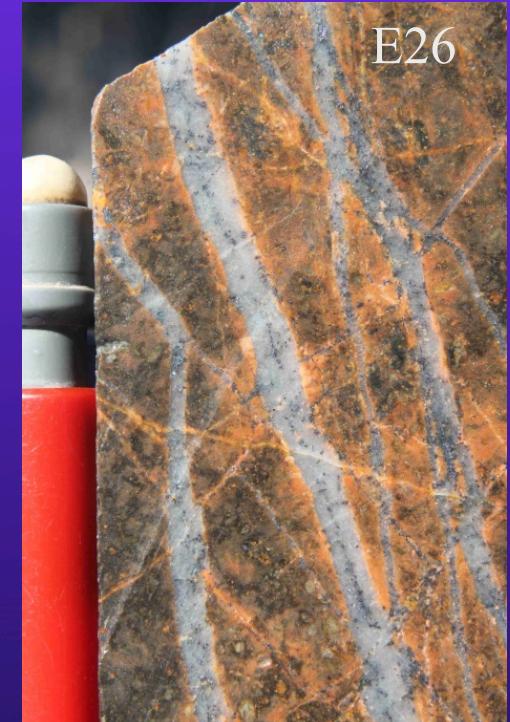
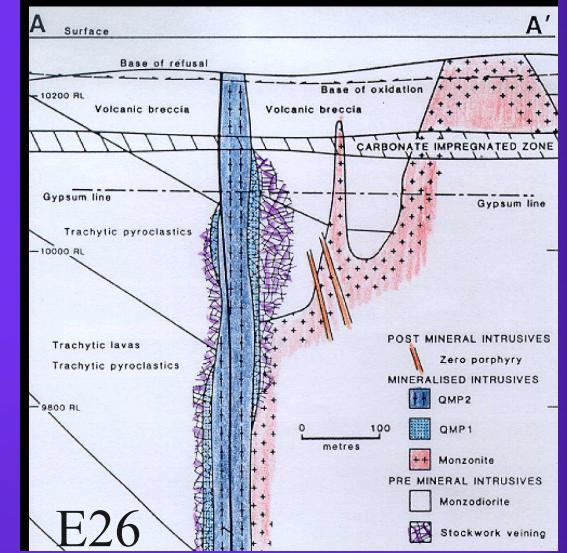
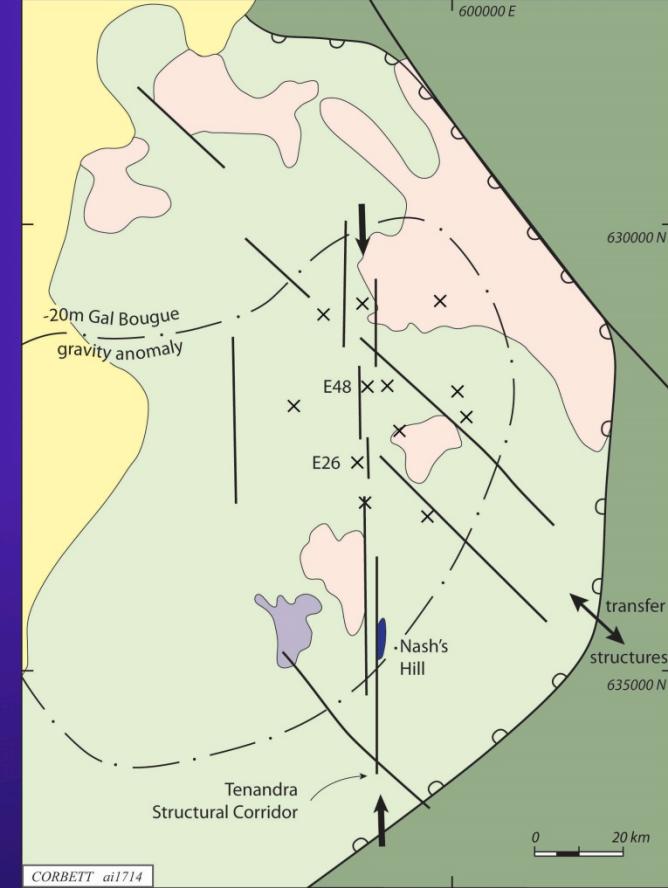
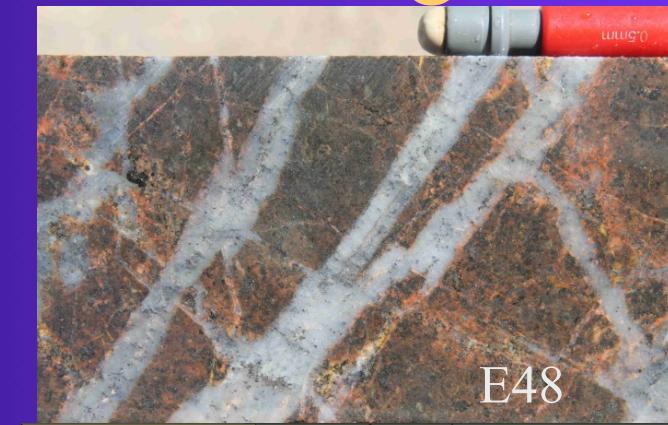
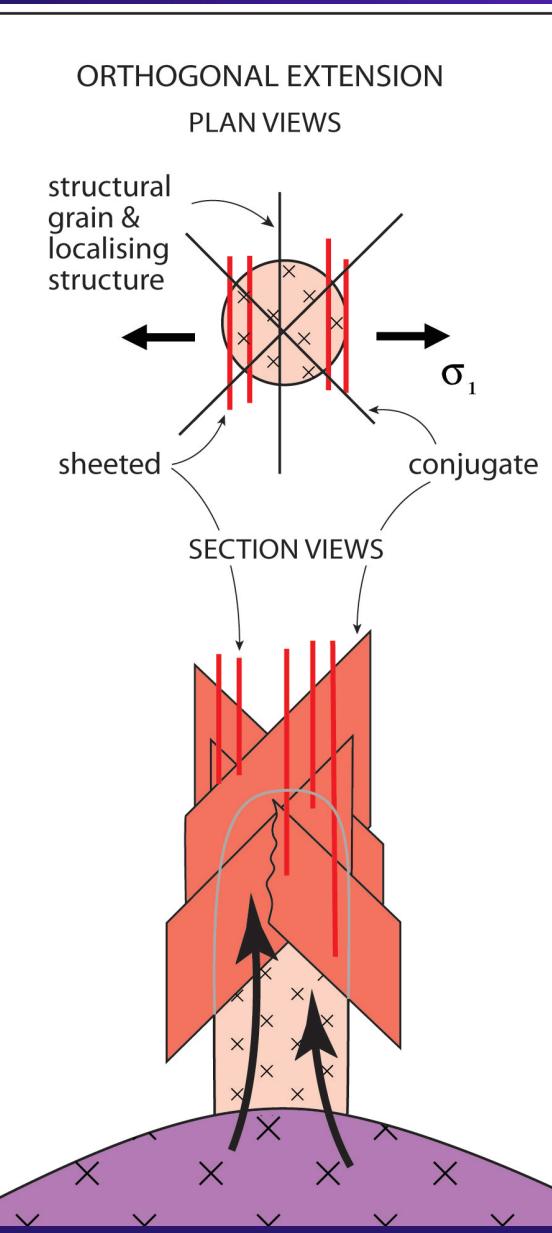
# Goonumbla



CORBETT ai1714

Modified from Owens et al., in press

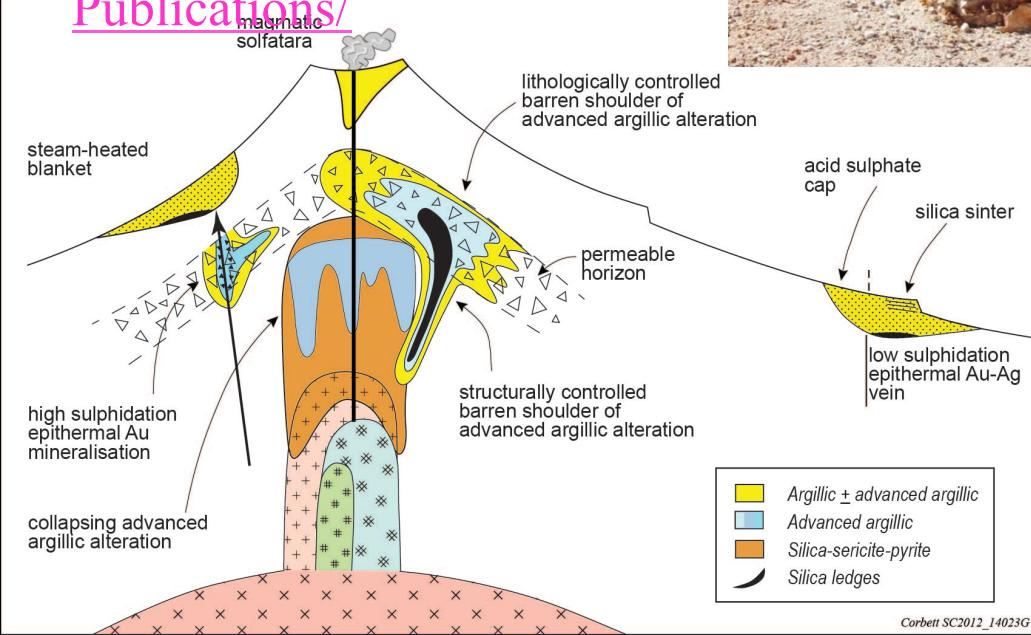
# Relaxation in convergence – Goomumbla



# Barren shoulder - Nash's Hill, Goonumbla

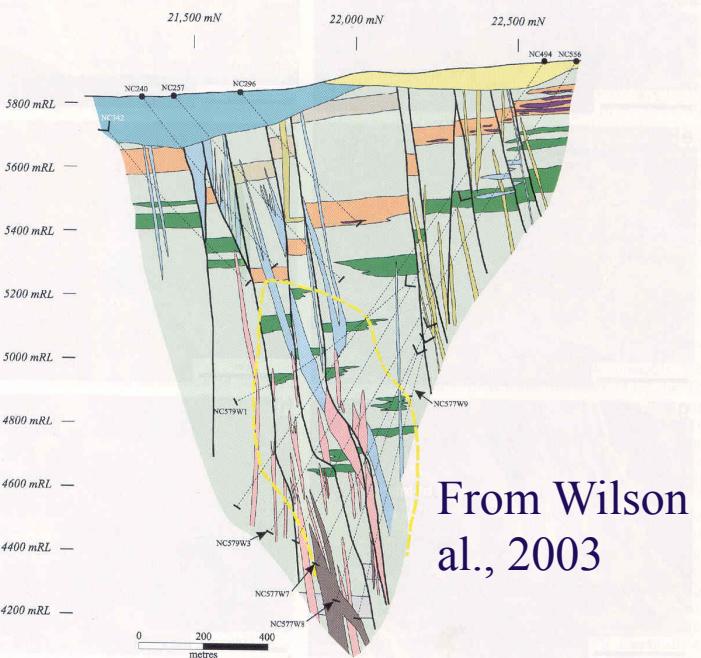


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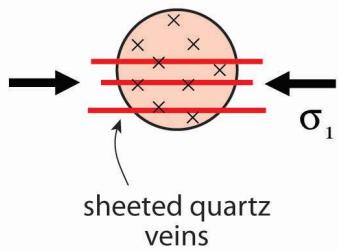
# Dilatant sheeted veins

Cadia East, Section 15,820 mE



From Wilson et al., 2003

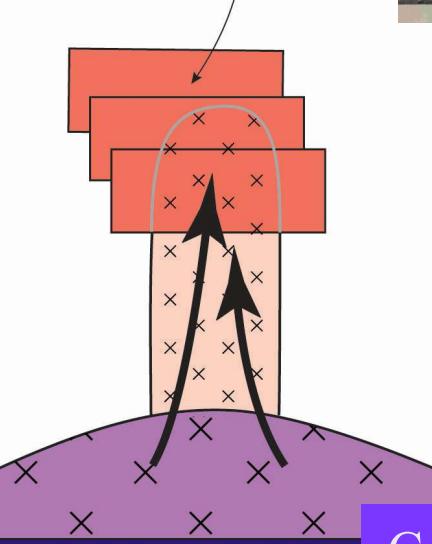
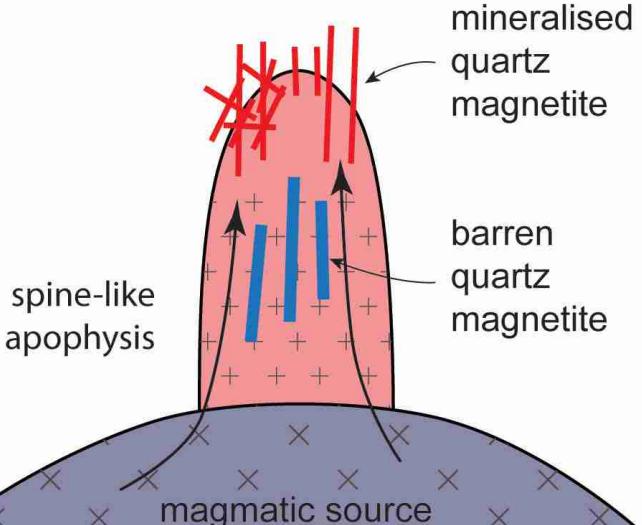
ORTHOGONAL COMPRESSION



sheeted quartz veins



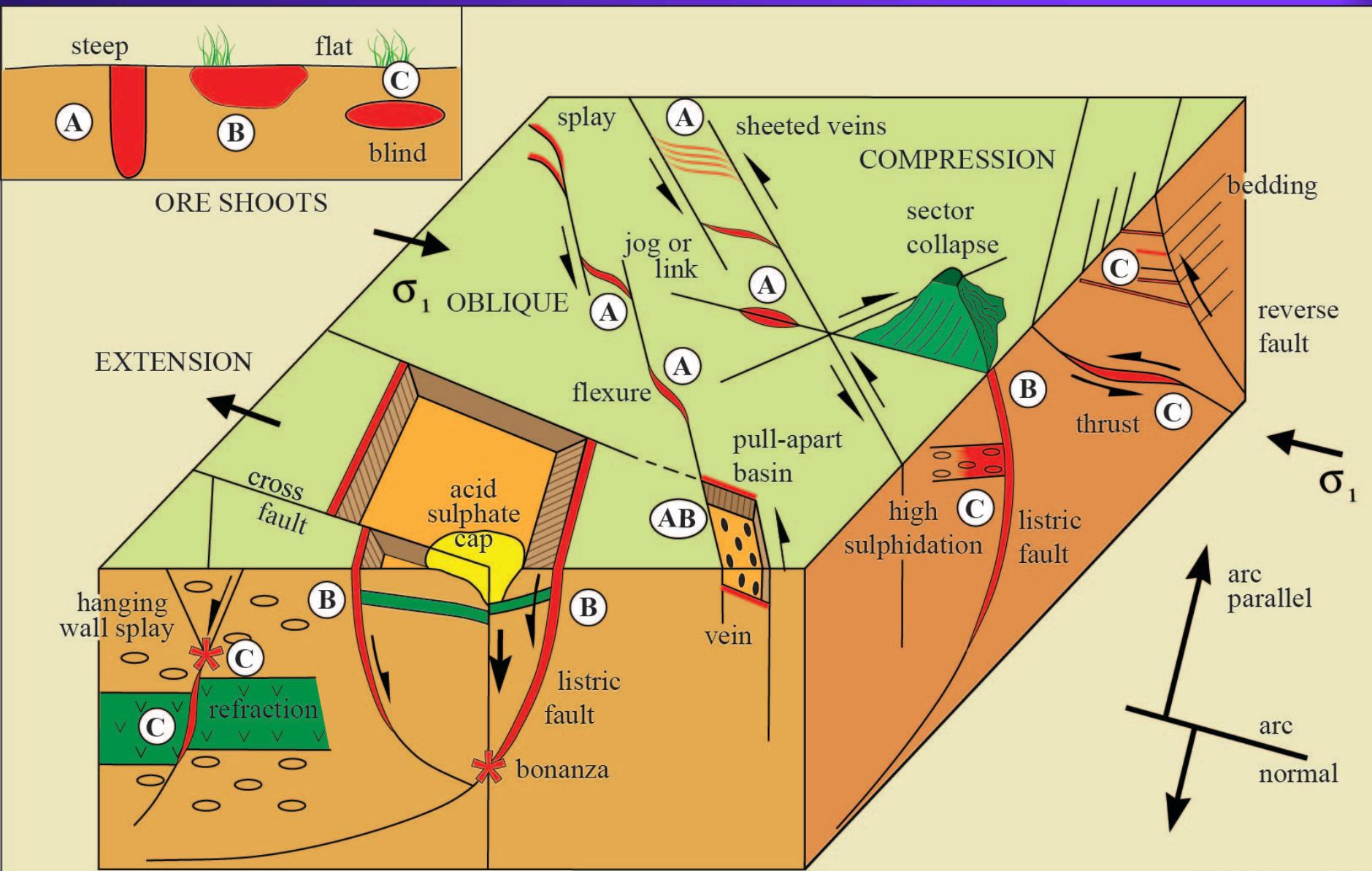
Cadia East



Copper Hill 15.2 g/t Au & 0.3% Cu



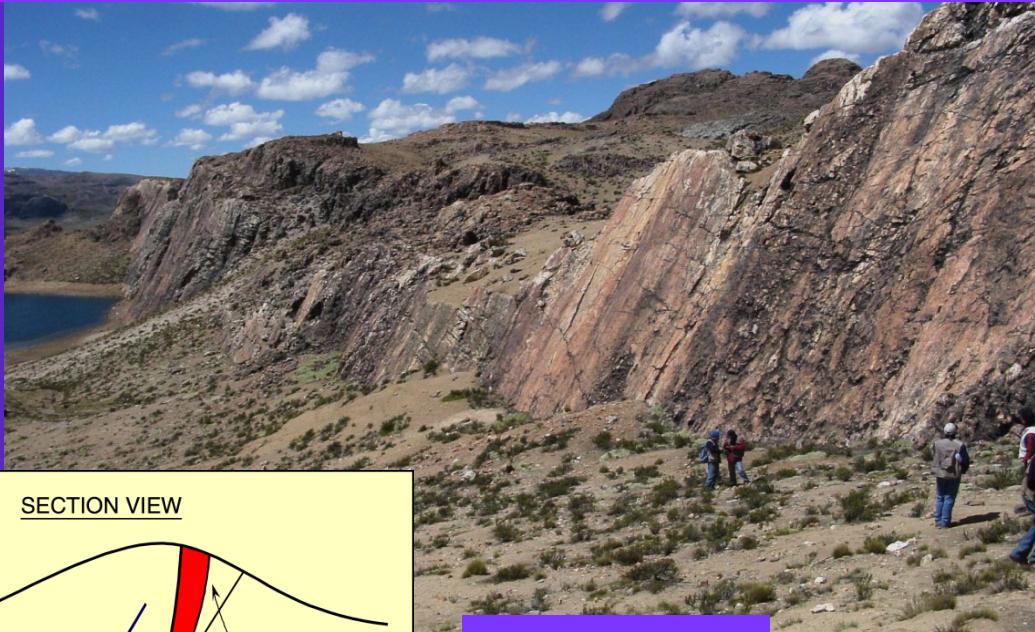
# Prospect scale structure – epithermal veins



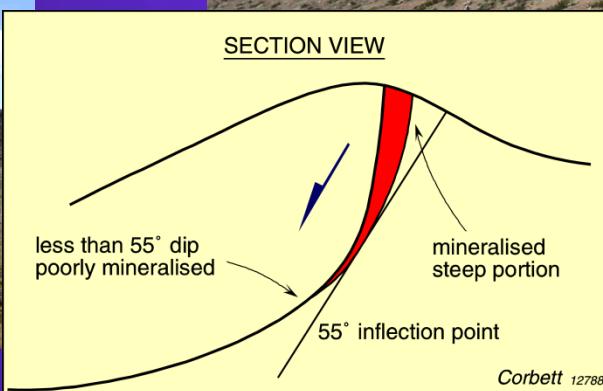
# Ore shoots in steep dipping listric fault portions



Corani, Peru

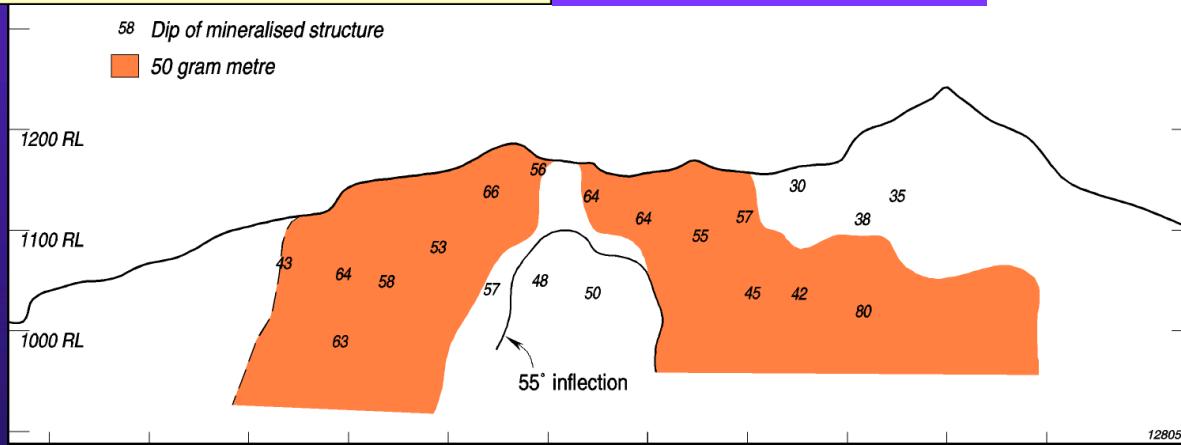


Arcata, Peru

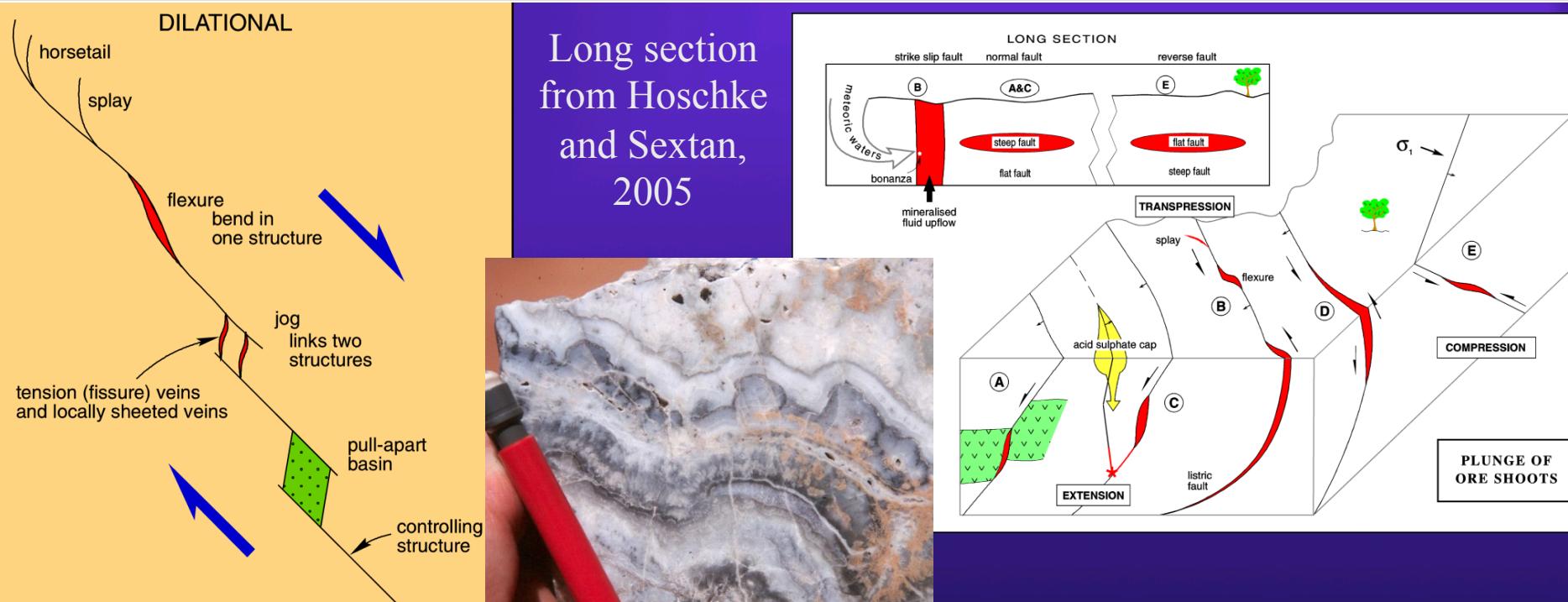
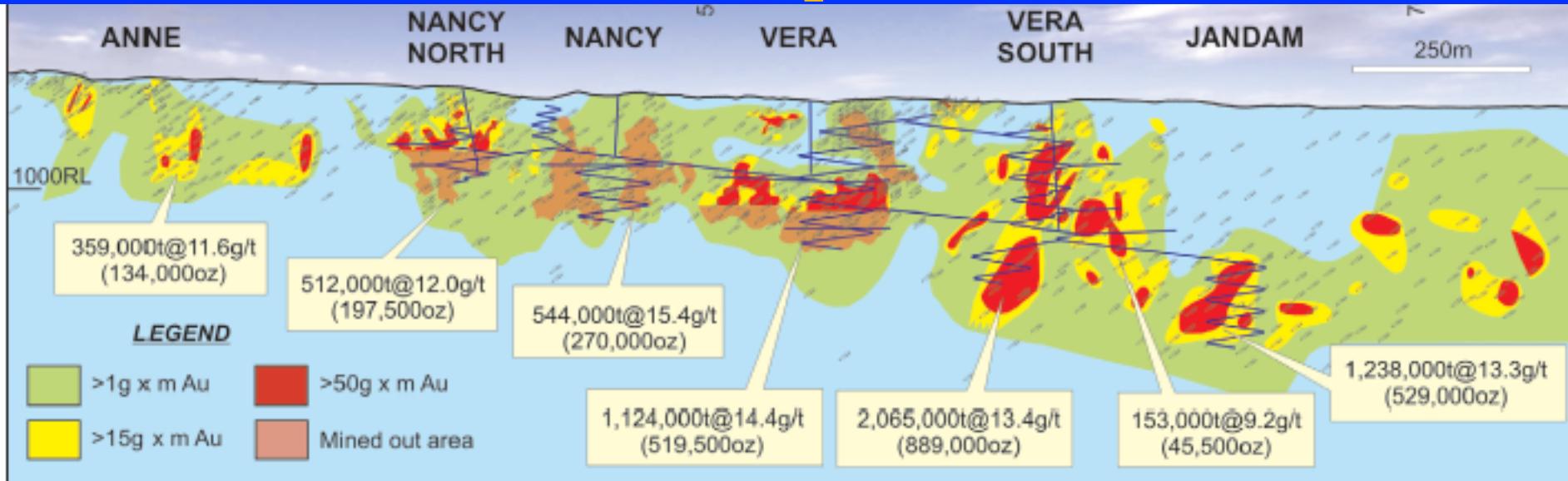


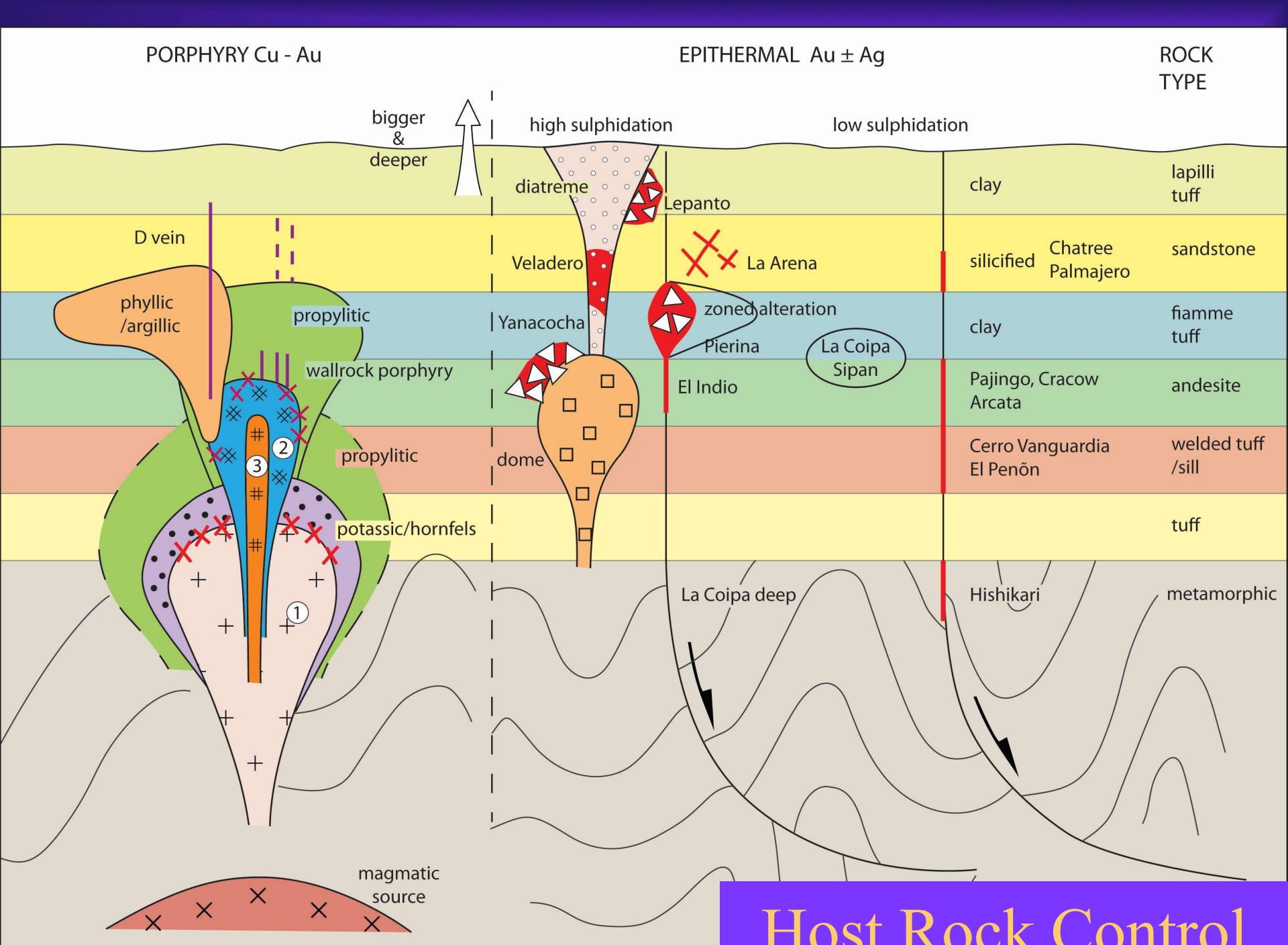
Palmarejo Mexico

757000E

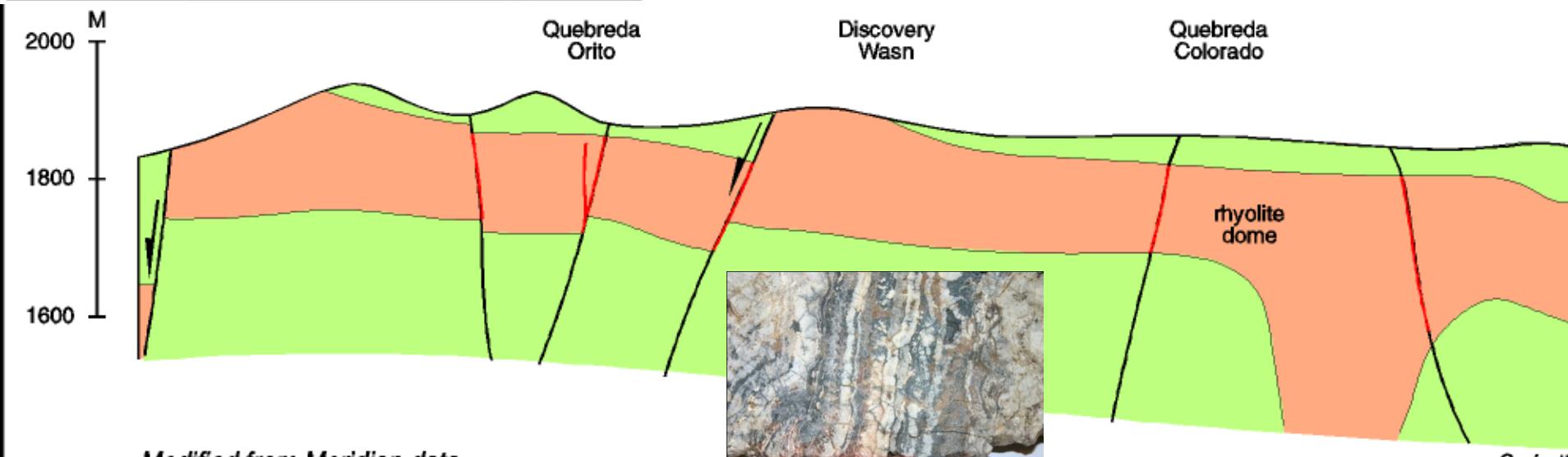
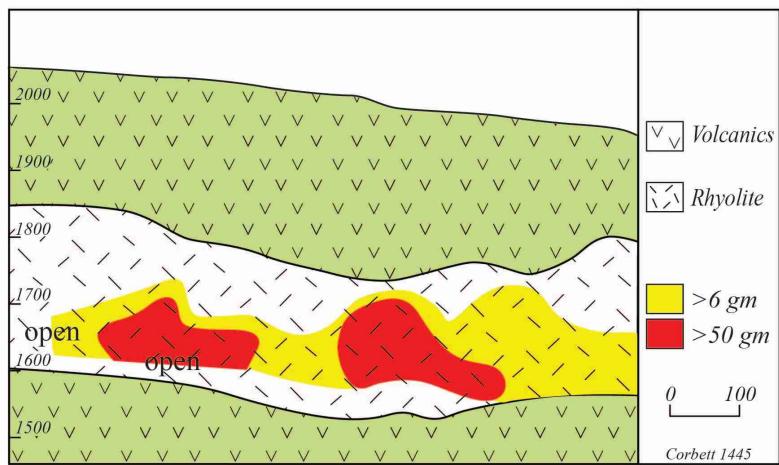


# Ore shoots within steep flexures – Vera Nancy





# Host rock vein control - El Peñón



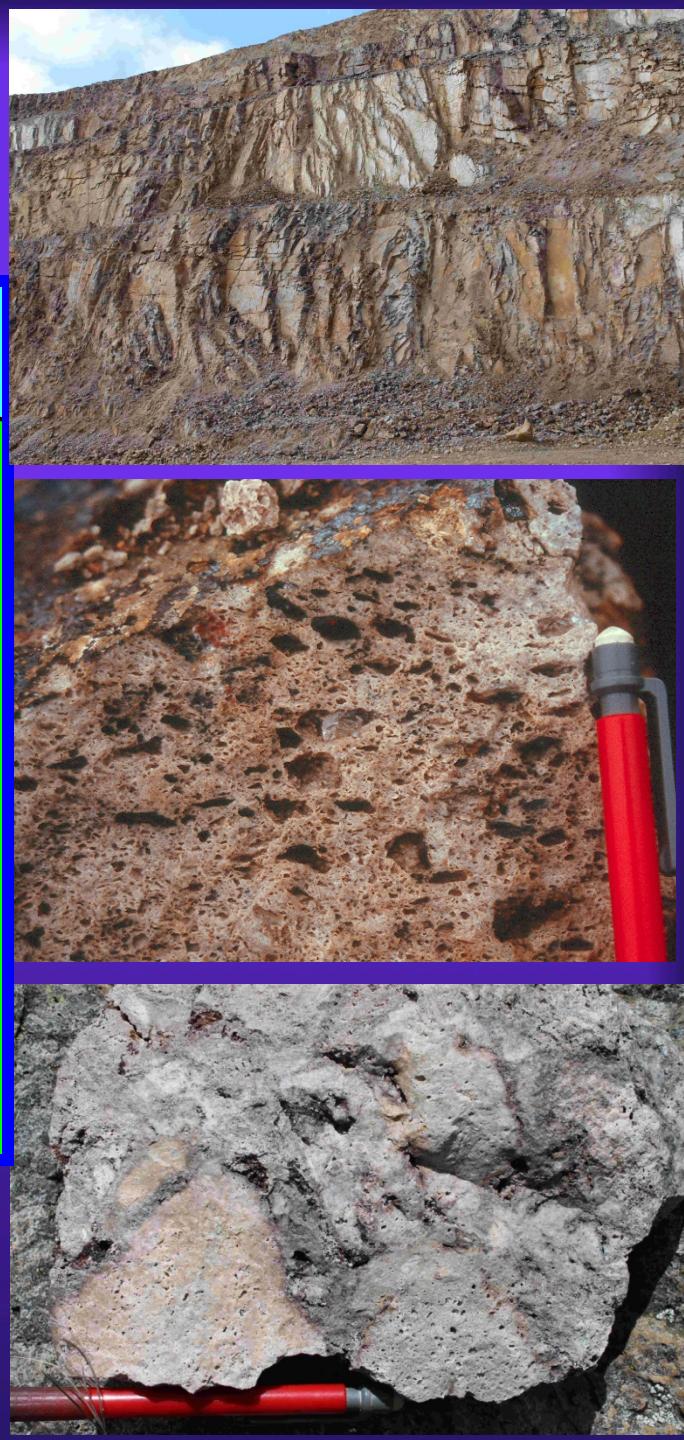
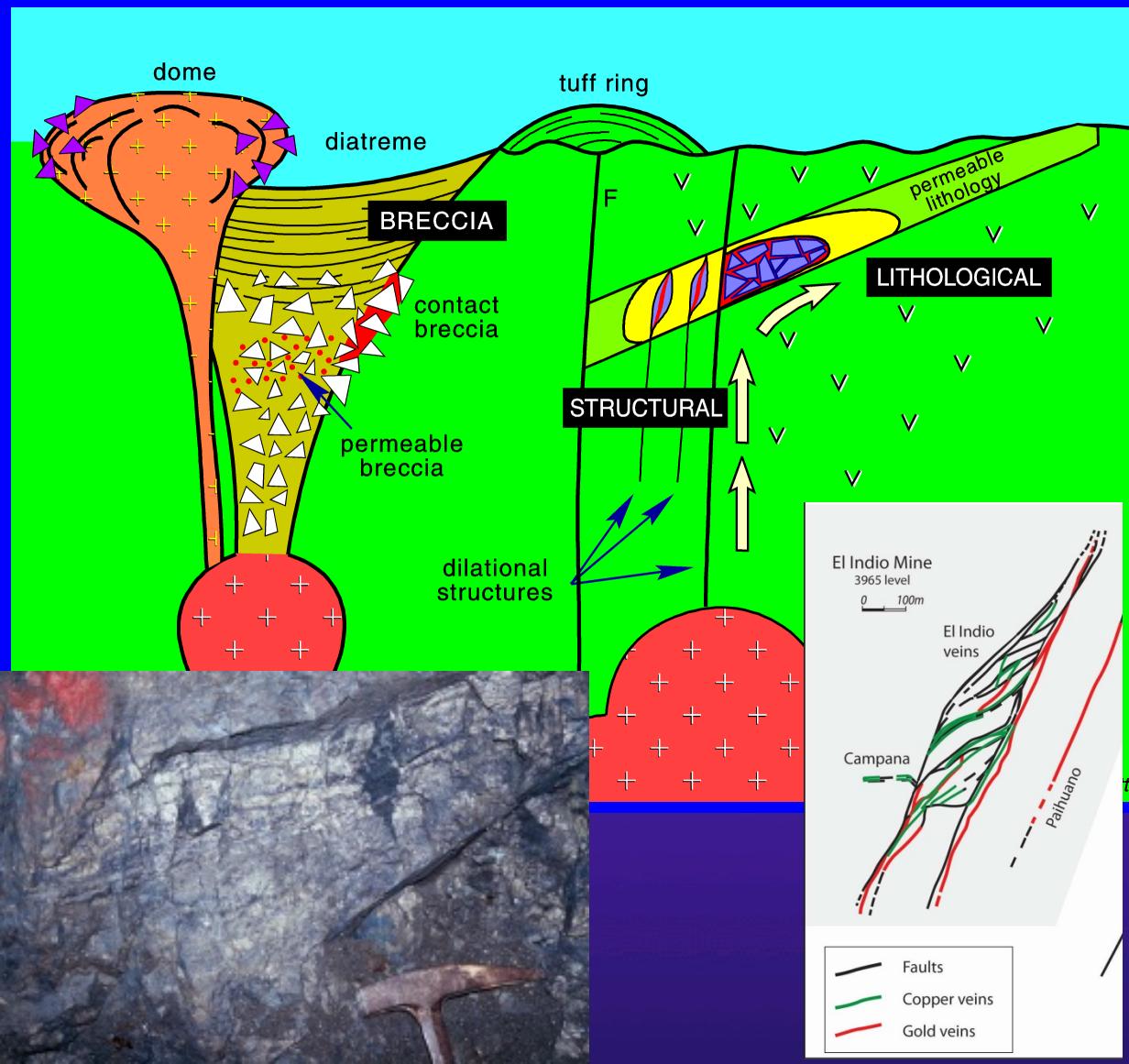
Modified from Meridian data

12971 Corbett

# Host rock control - Chatree Thailand



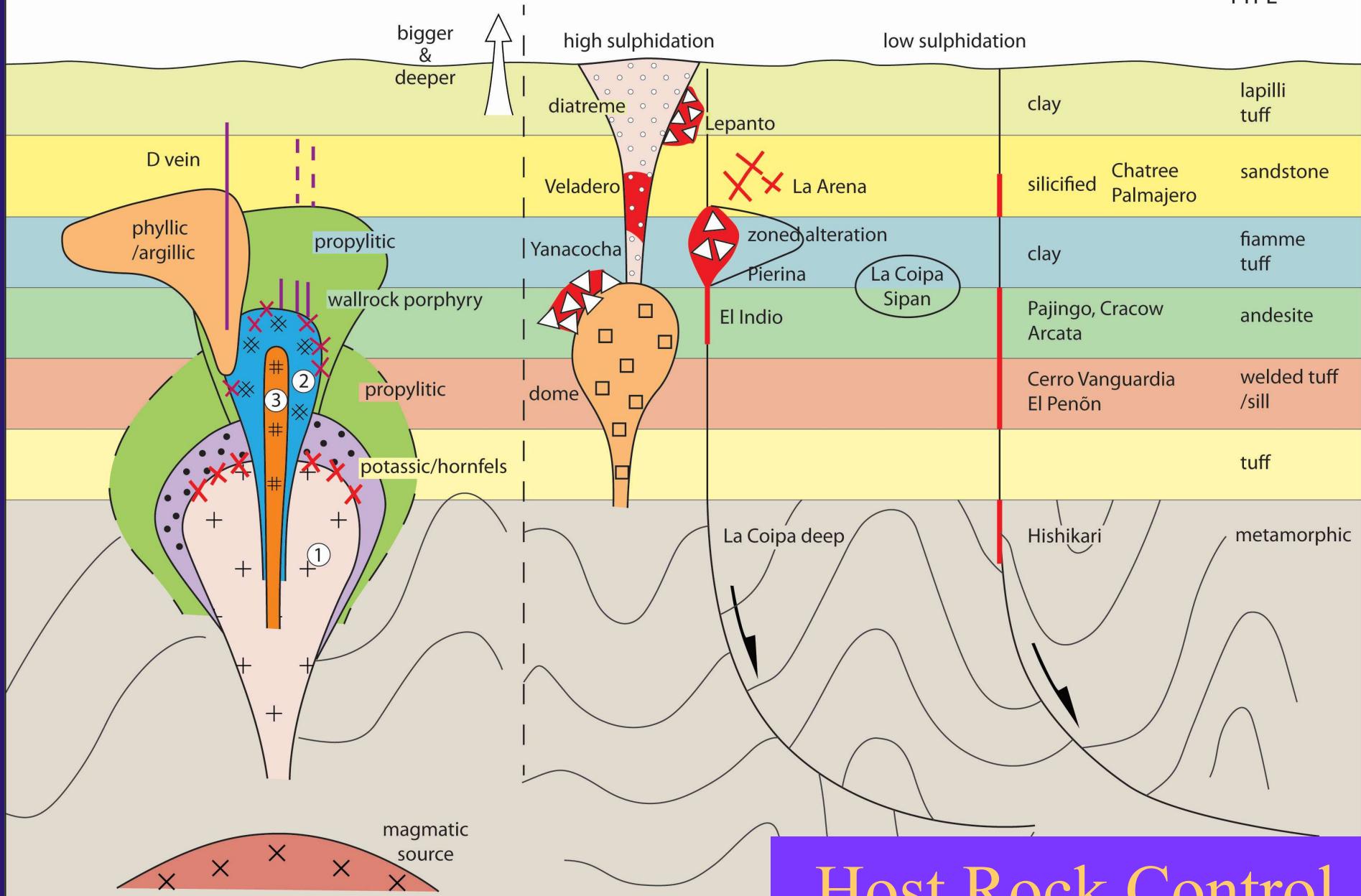
# Host rock control in high sulphidation epithermal



## PORPHYRY Cu - Au

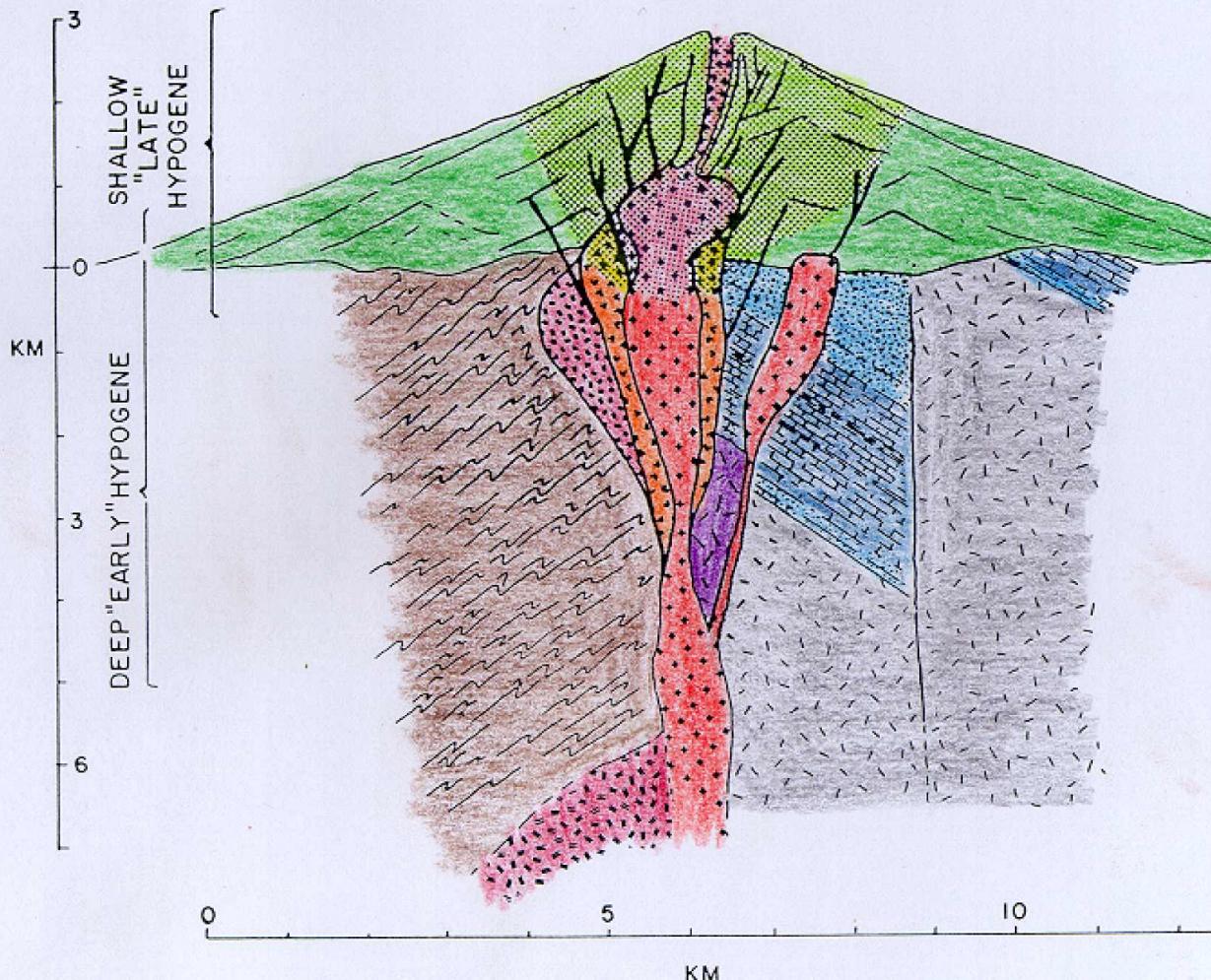
## EPITHERMAL Au ± Ag

ROCK TYPE



Host Rock Control

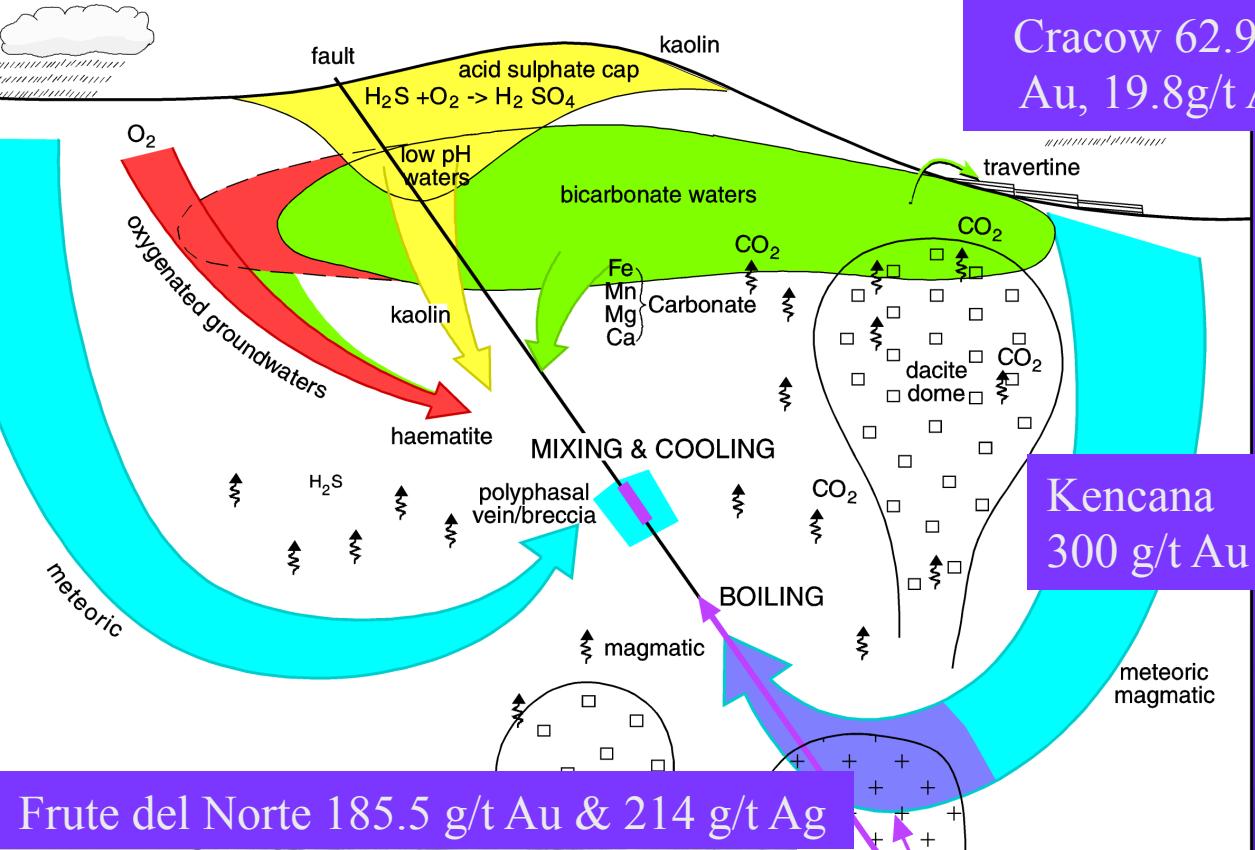
# Porphyry Cu-Au and host rocks



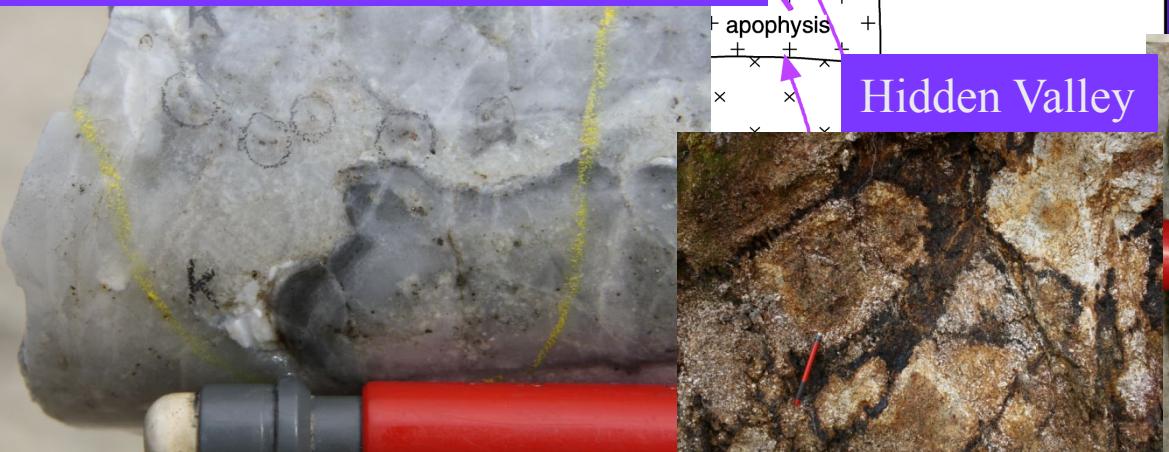
Spencer Titley 1980



# Mechanisms of Au deposition



Chatree  
69 g/t Au  
42 g/t Ag

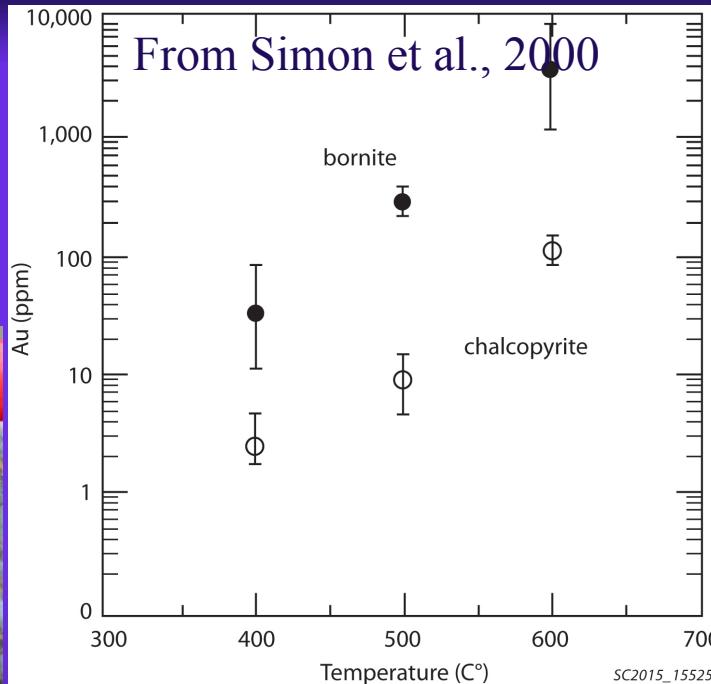
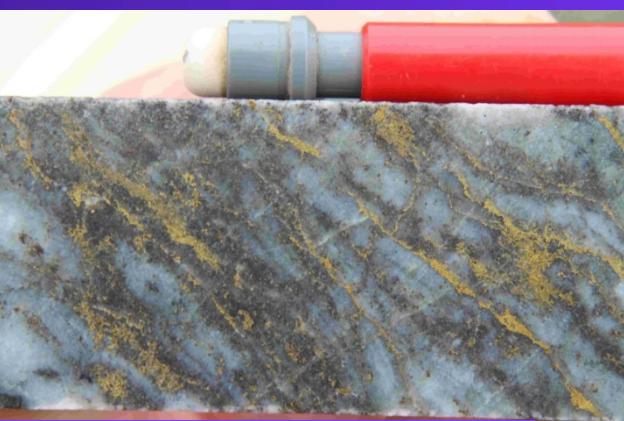
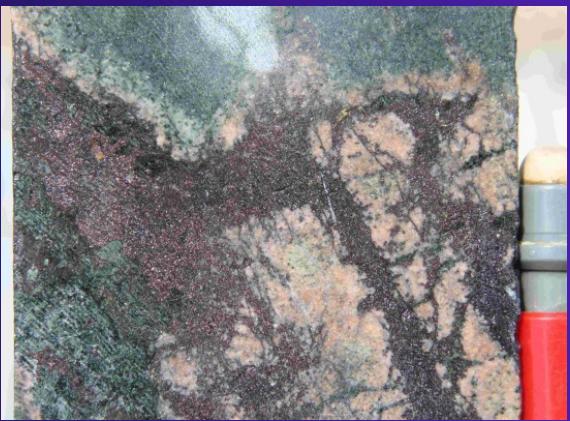


# Gualdalupe, Palmaréjo Mexico



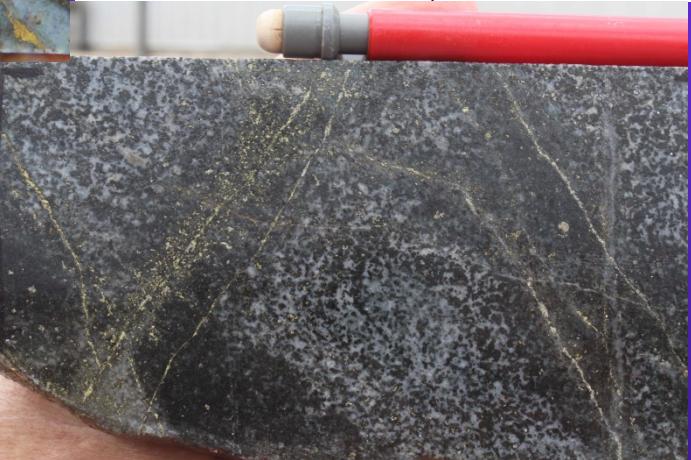
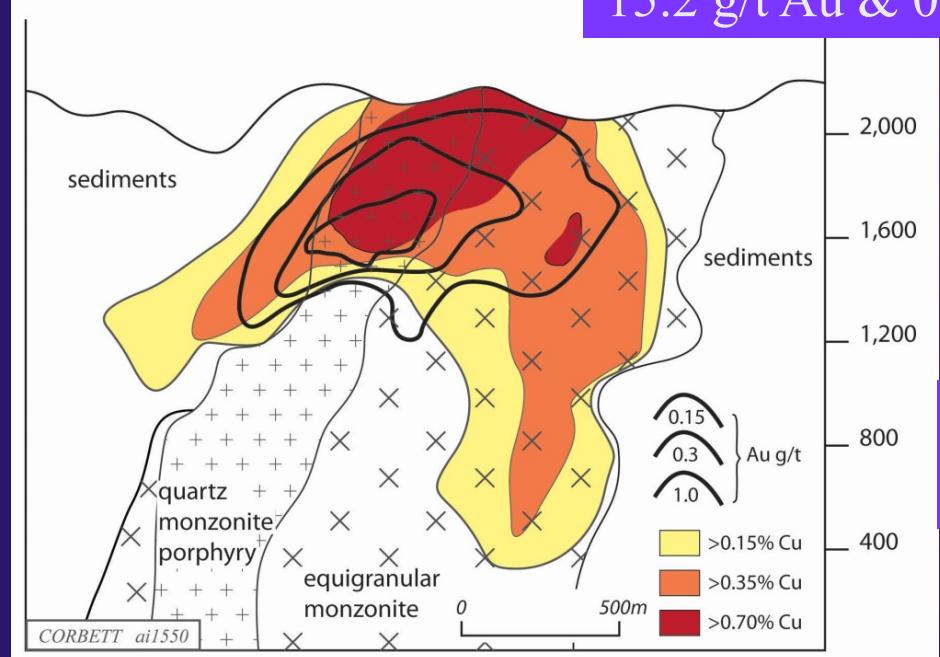
# Au in bornite

– Bingham Canyon, Ridgeway & Copper Hill



SC2015\_15525

15.2 g/t Au & 0.3% Cu

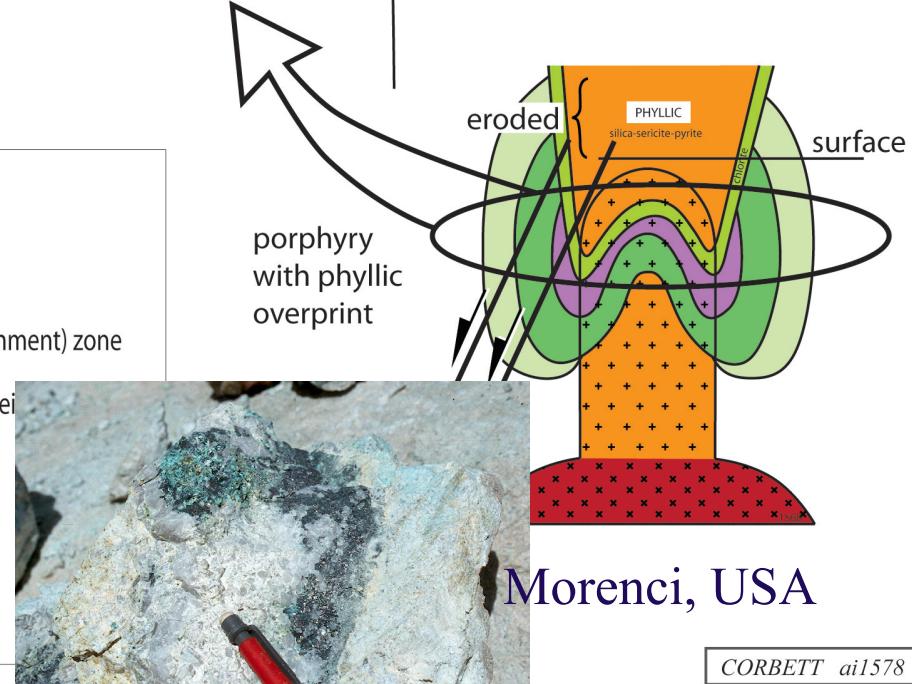
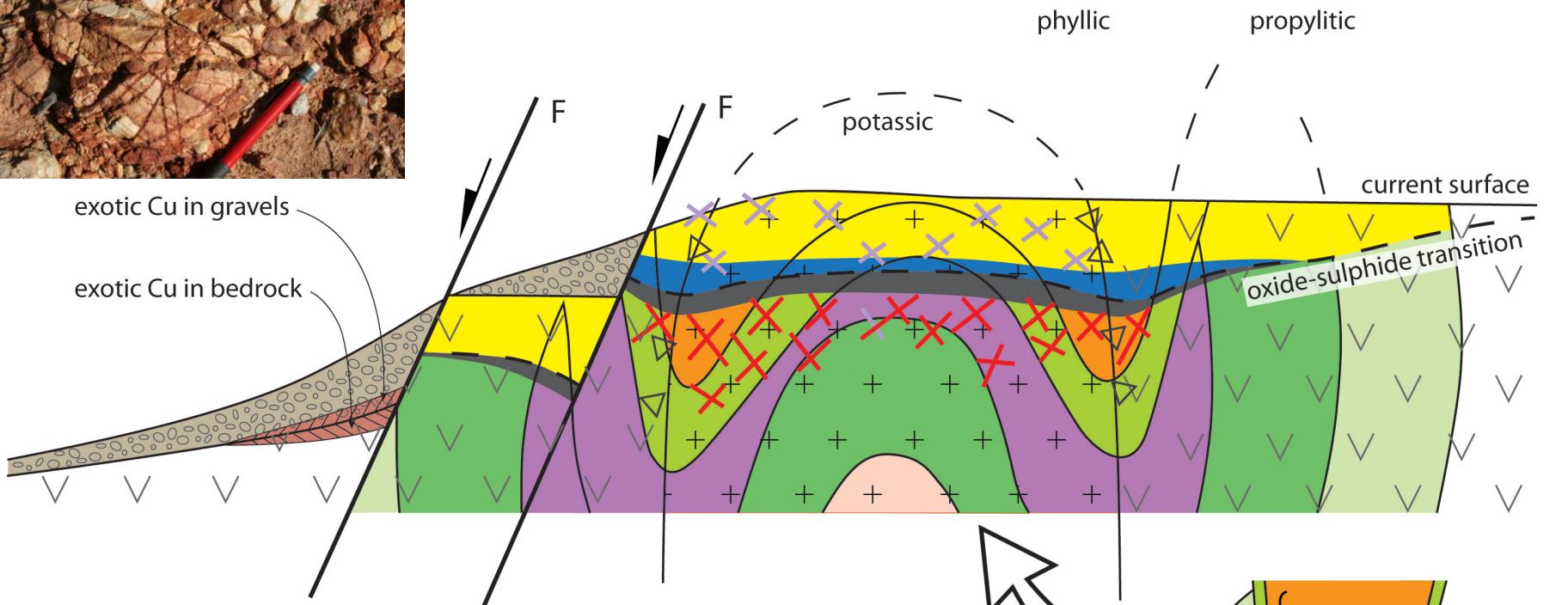


Bingham Canyon - potassic alteration with bornite overprints propylitic alteration  
modified from Landtwig et al. (2010) and Gruen et al. (2010)

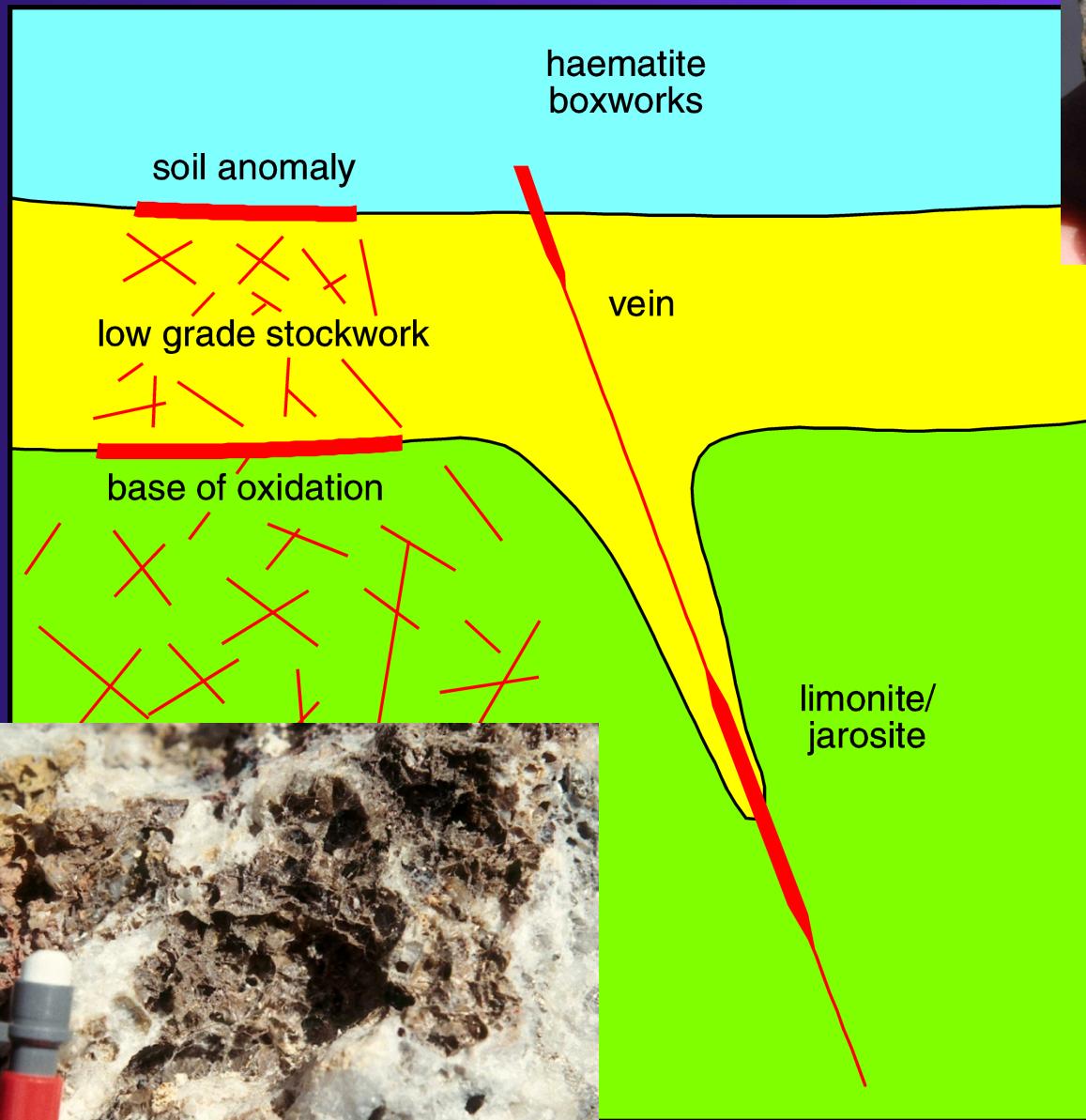


Anthony Mo

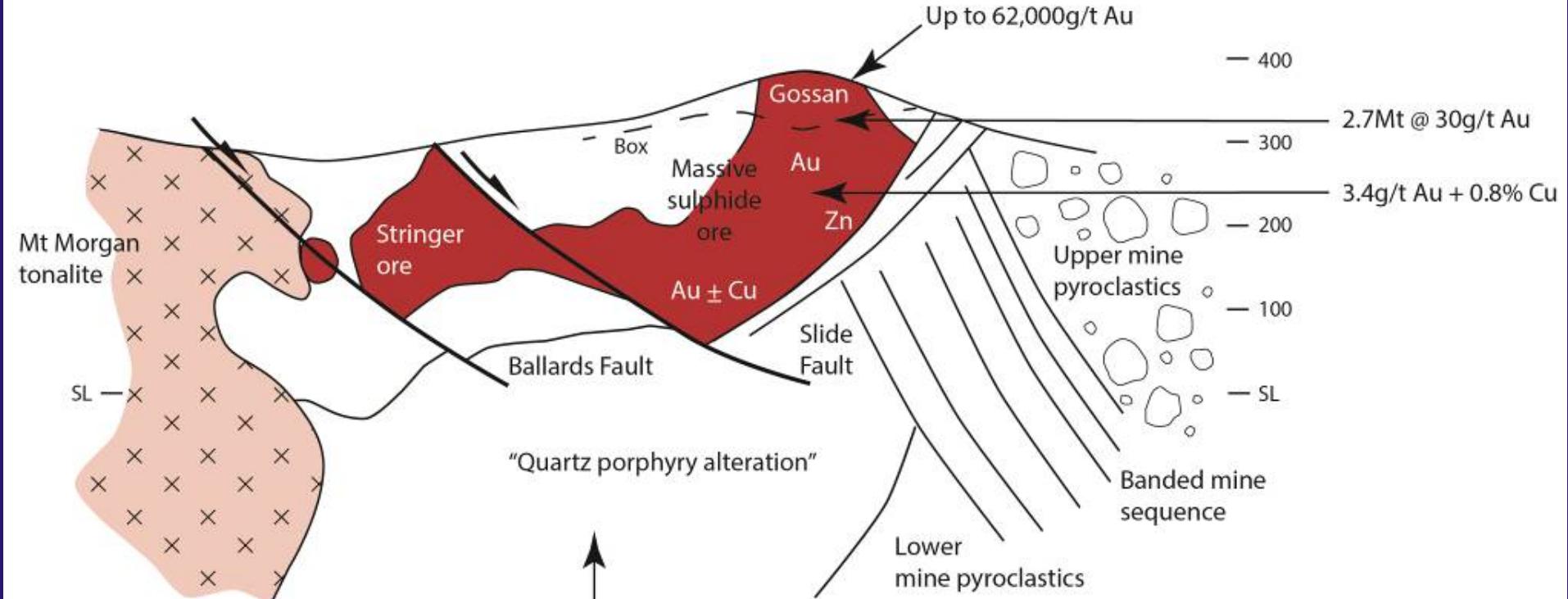
# Supergene Cu



# Supergene Au enrichment

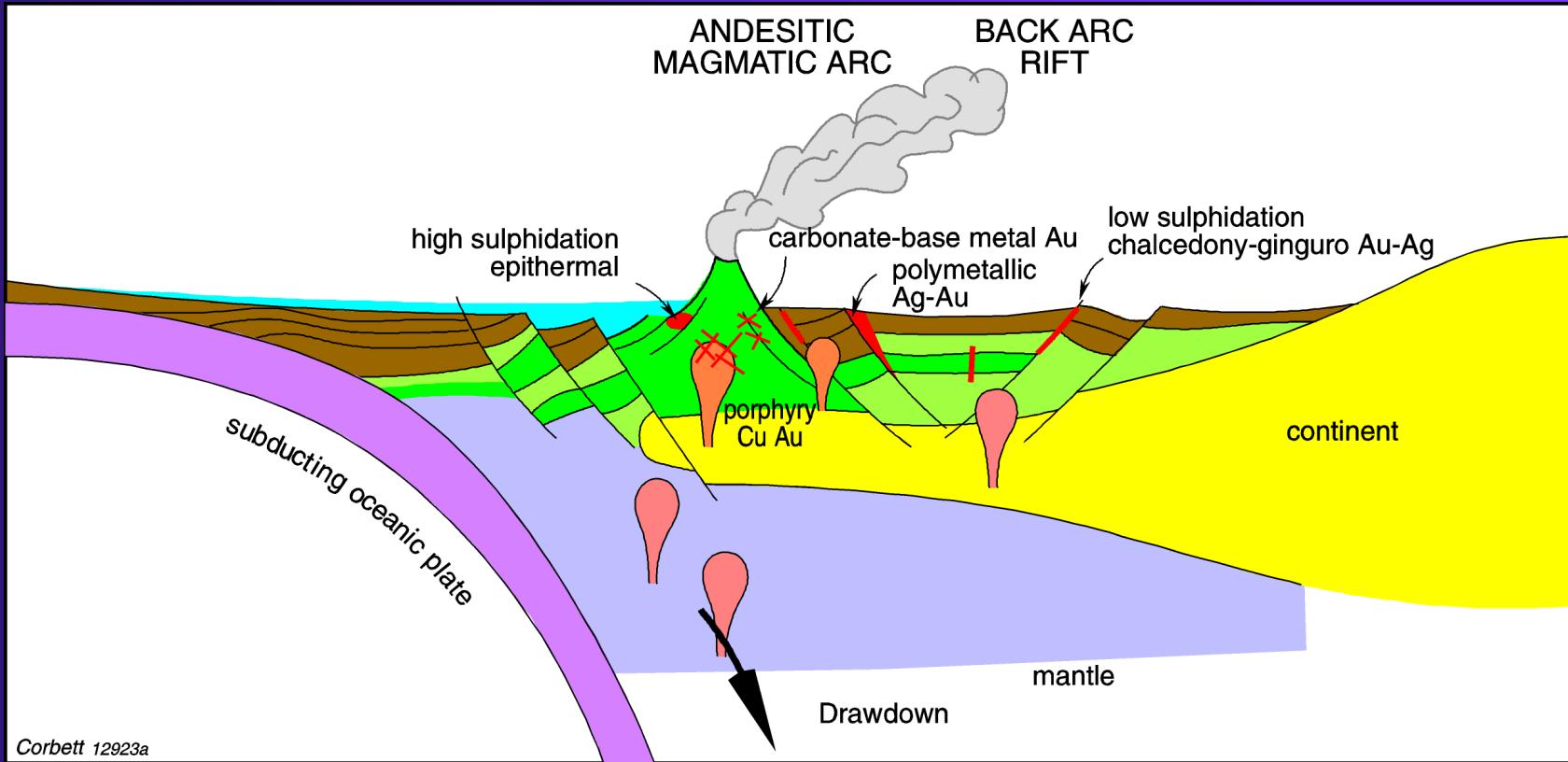


# Supergene Au - Mt Morgan



Modified from Balde (1976) in Taupe (1986)

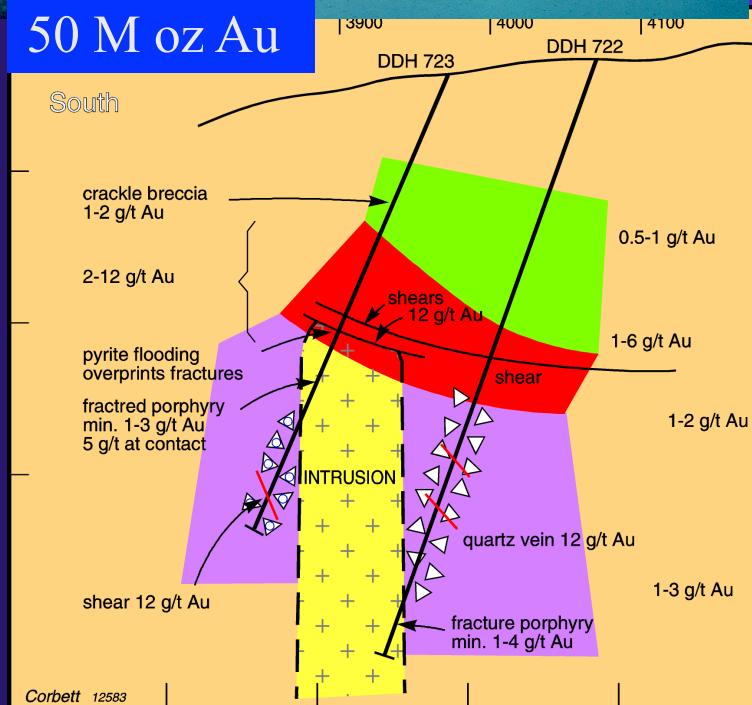
# Triggers for the onset of mineralisation



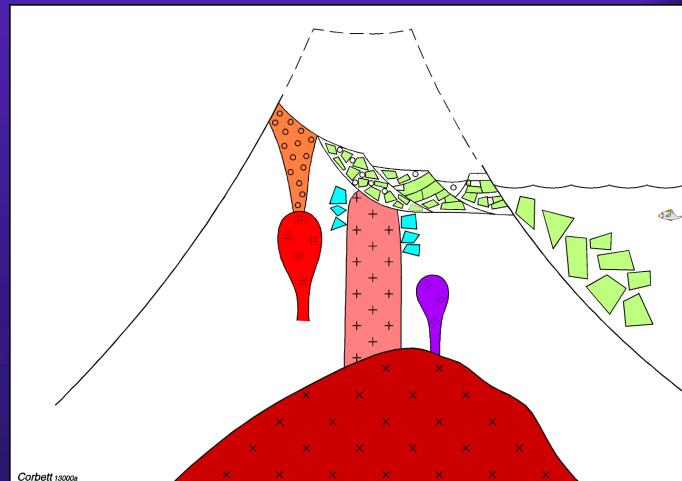
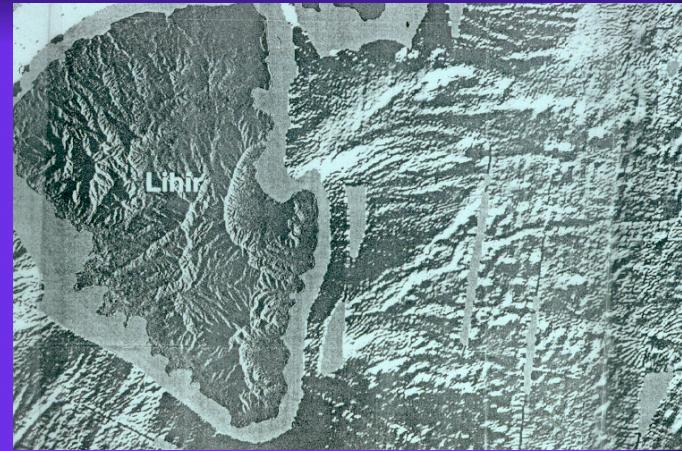
- ◆ Vein kinematics provide conditions of formation
  - Changes orthogonal to oblique convergence
  - Relaxation of compression
  - Unroofing by rapid uplift & erosion, thrust erosion, sector collapse

# Triggers, Sector collapse

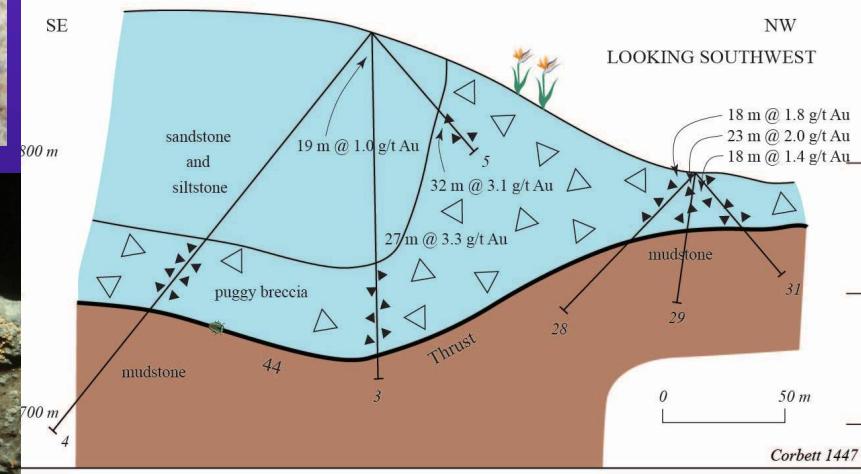
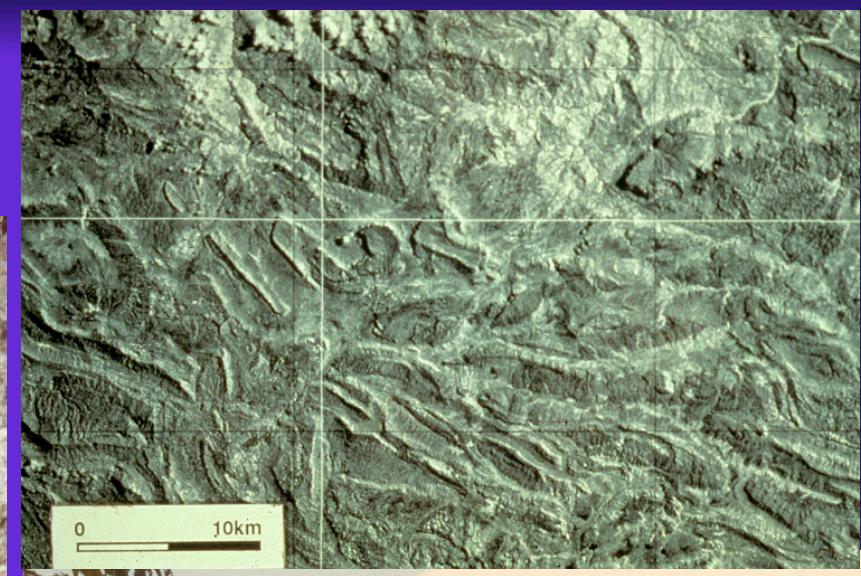
## - Lihir Island, Papua New Guinea



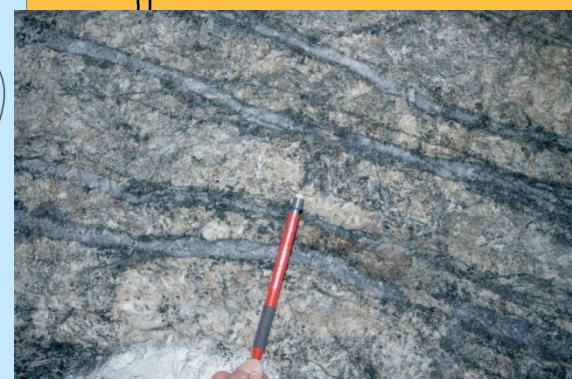
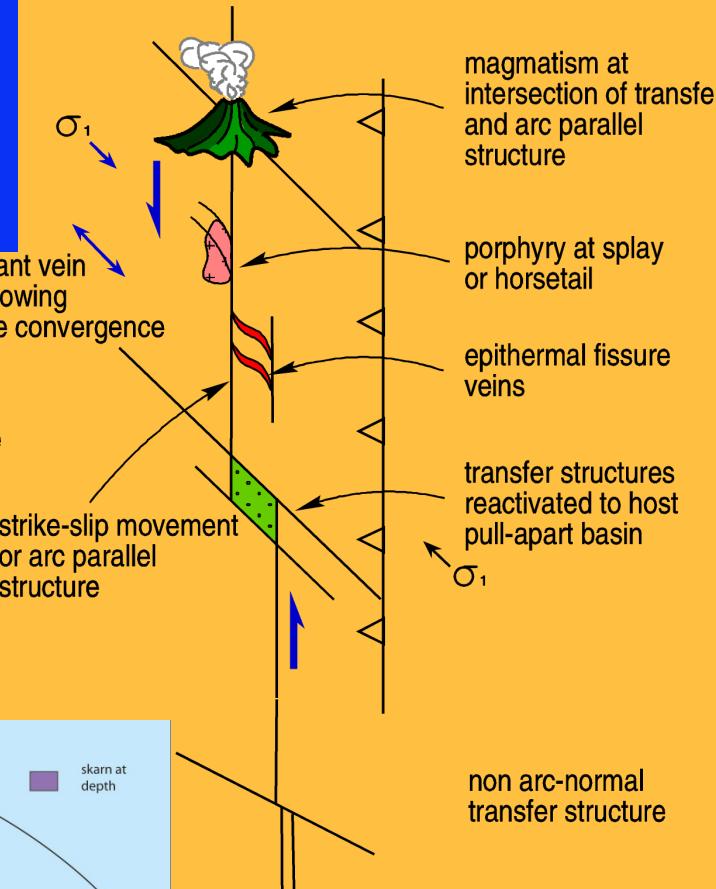
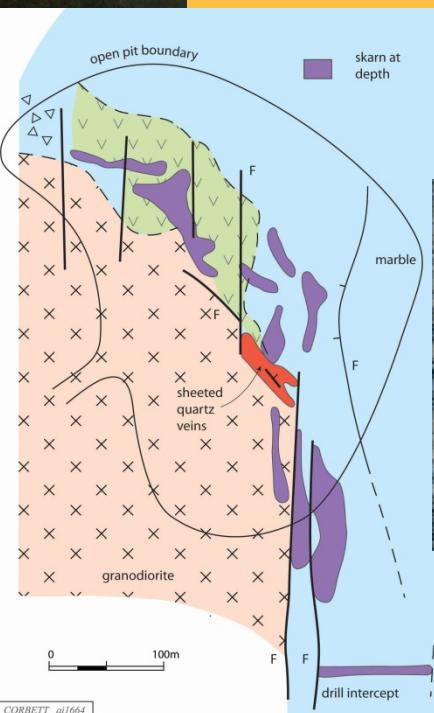
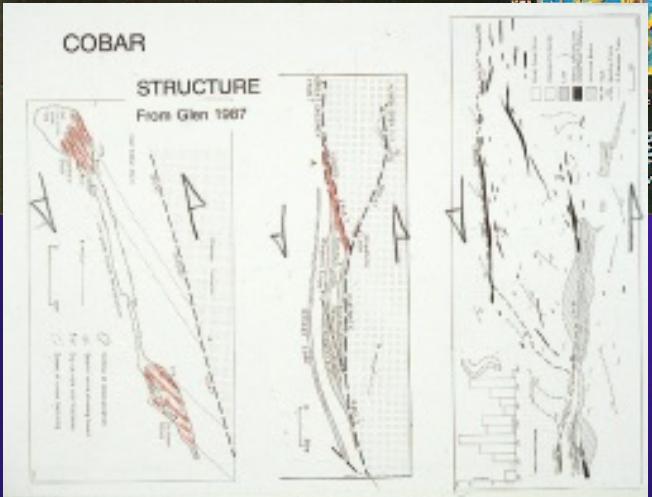
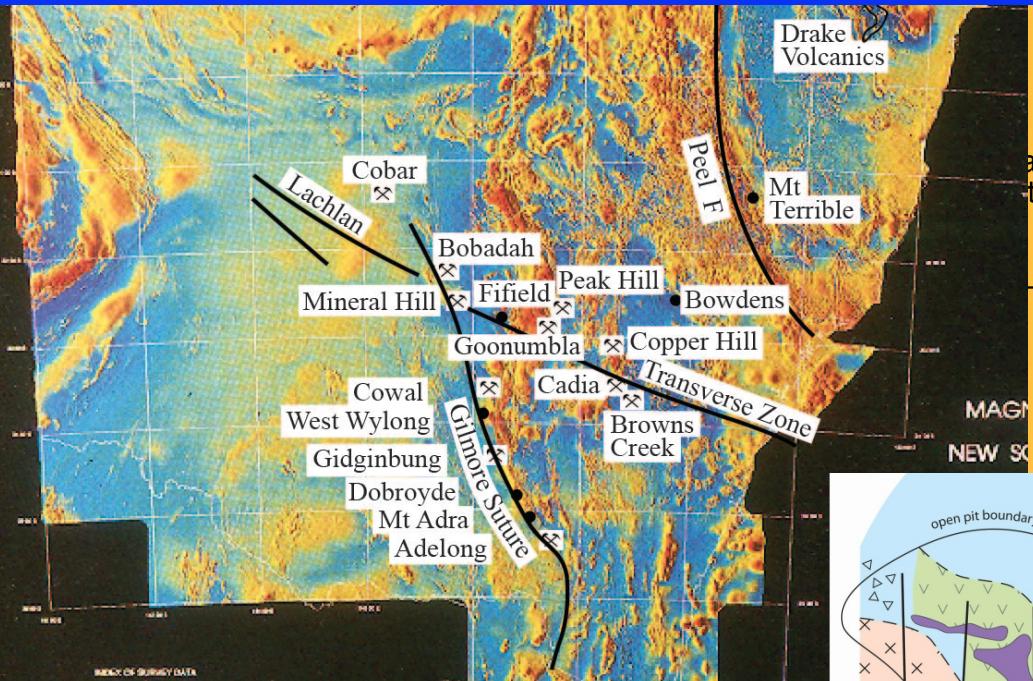
14 g/t Au



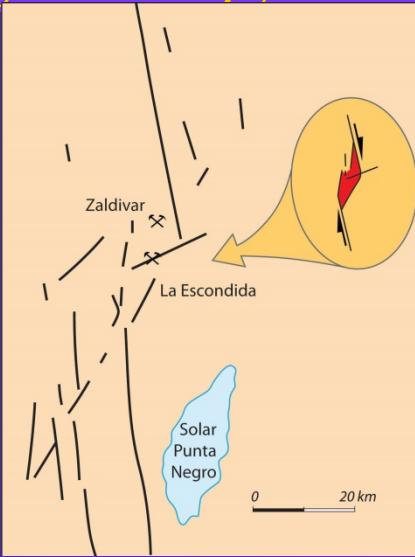
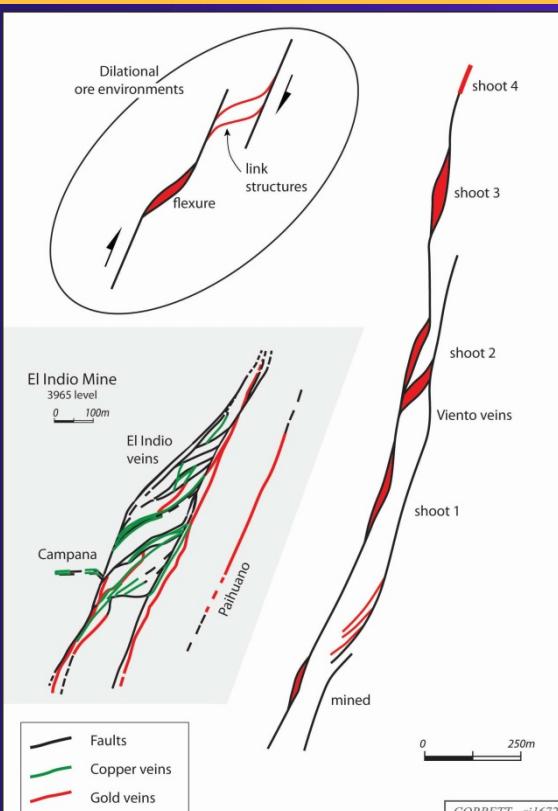
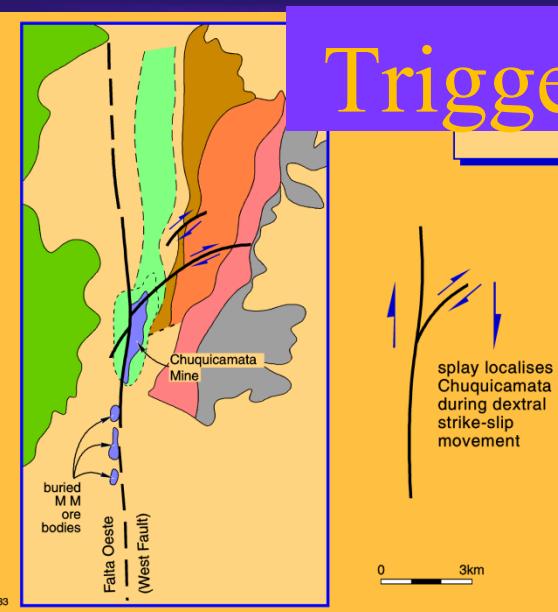
# Triggers, thrust erosion - Porgera, Papua New Guinea



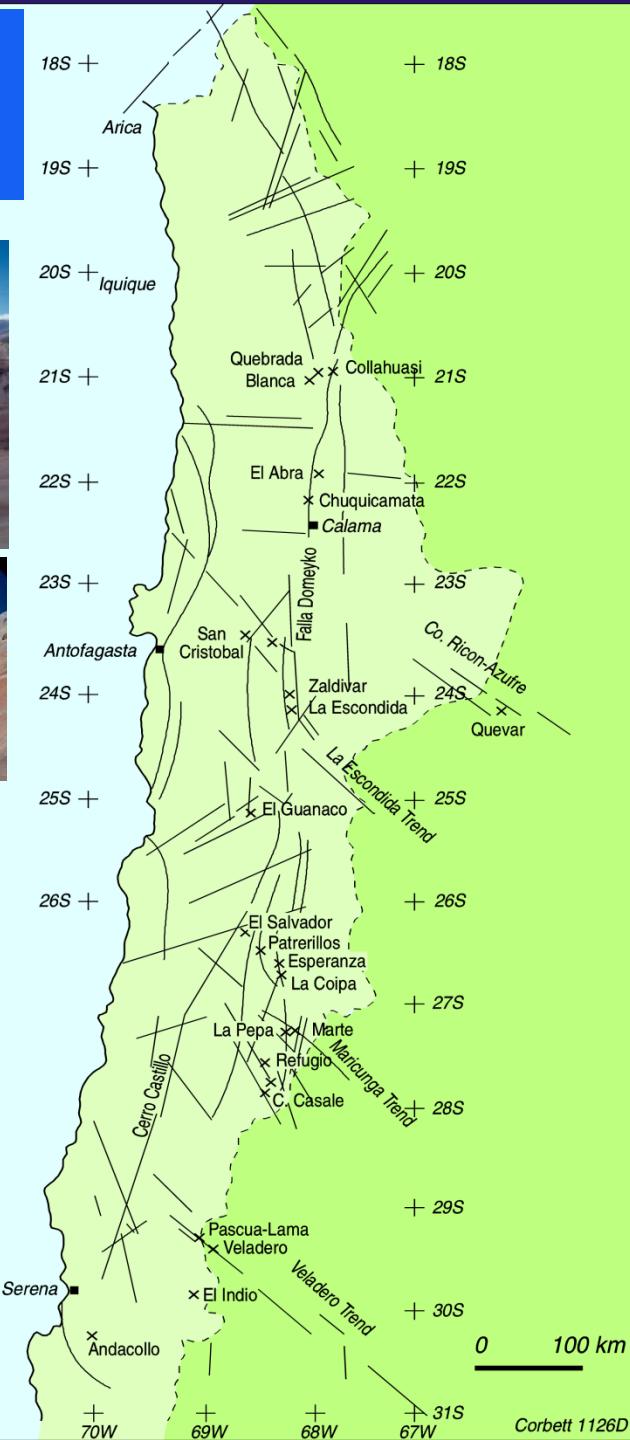
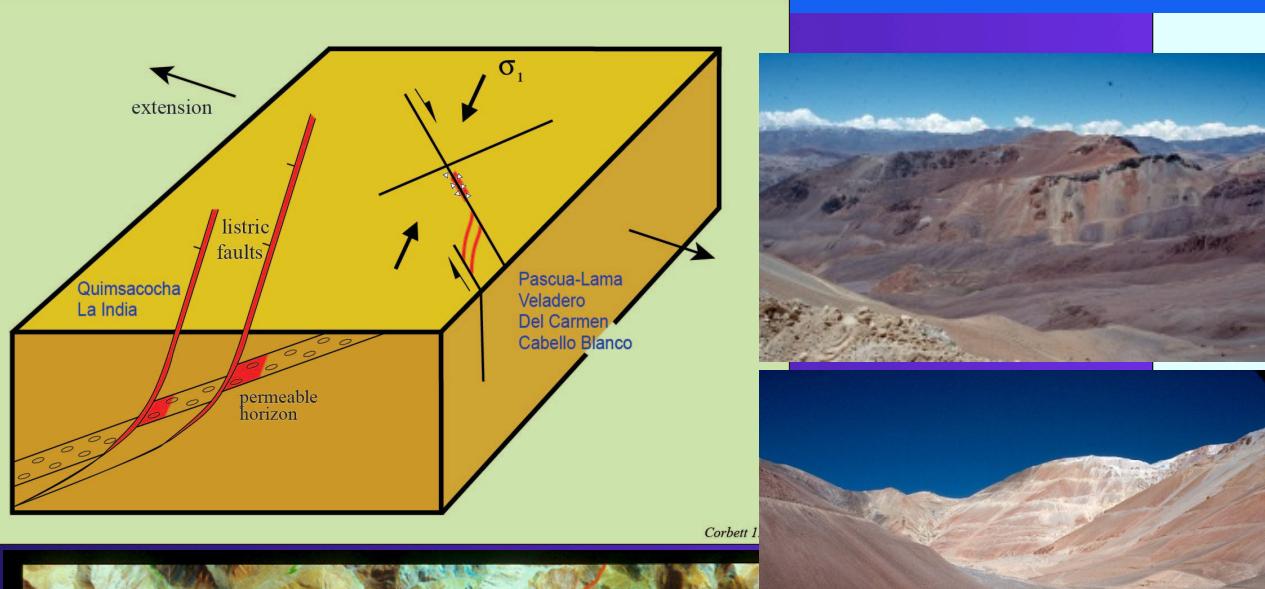
# Triggers, change to oblique convergence - Tasmanides

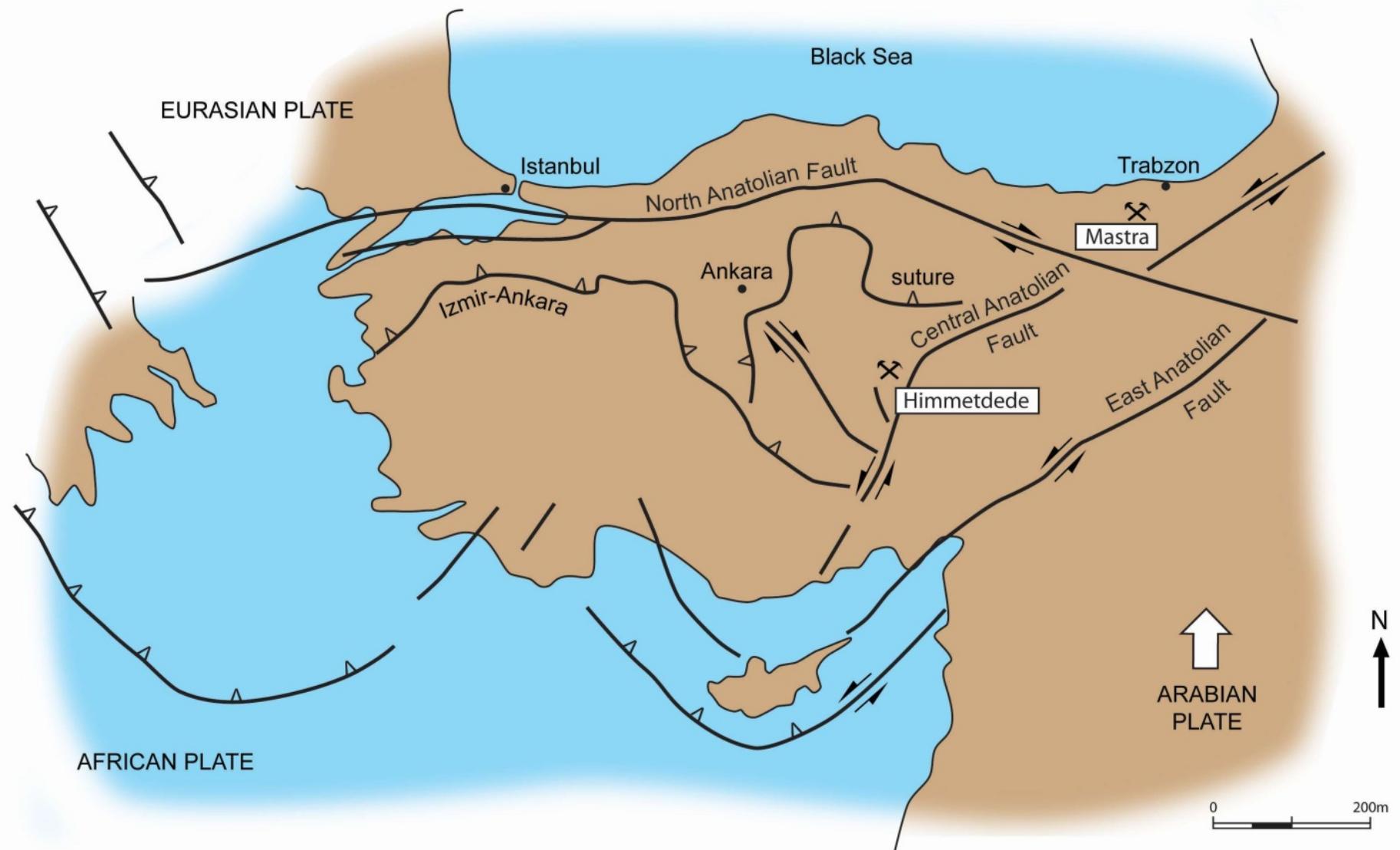


# Triggers, change to oblique convergence - Northern Chile



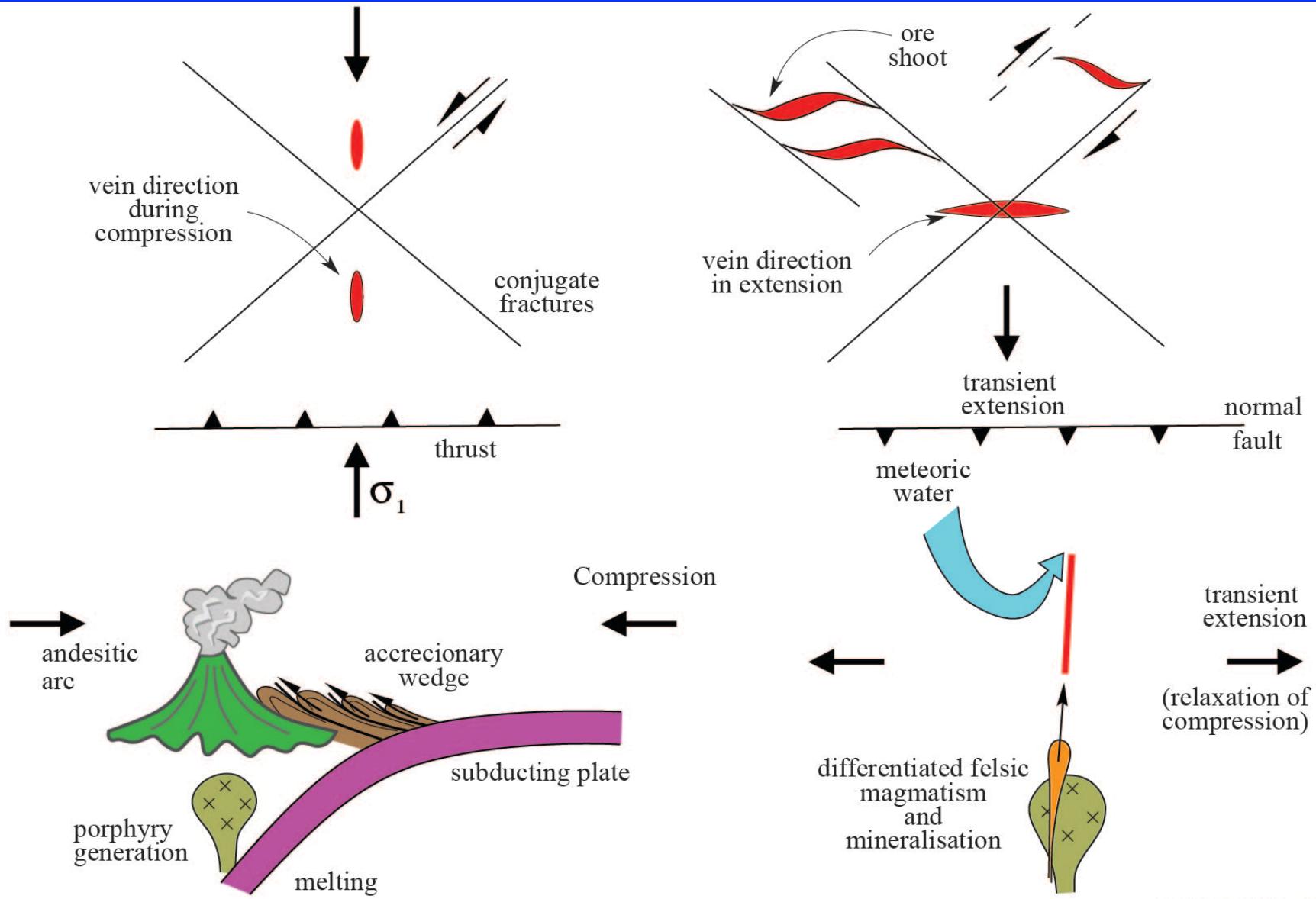
# Extension within a magmatic arc





## TURKEY TECTONIC SETTING

# Triggers, relaxation - Turkey



# Conclusion

- ◆ Quality mineralisation including ore shoots form at the coincident with as many as possible of the controls:
  - Styles of mineralisation
  - Structure
  - Host rocks
  - Mechanisms of Au deposition
  - Supergene effects
- ◆ Triggers to ore formation

# Thanks



Gümüşhane, Turkey