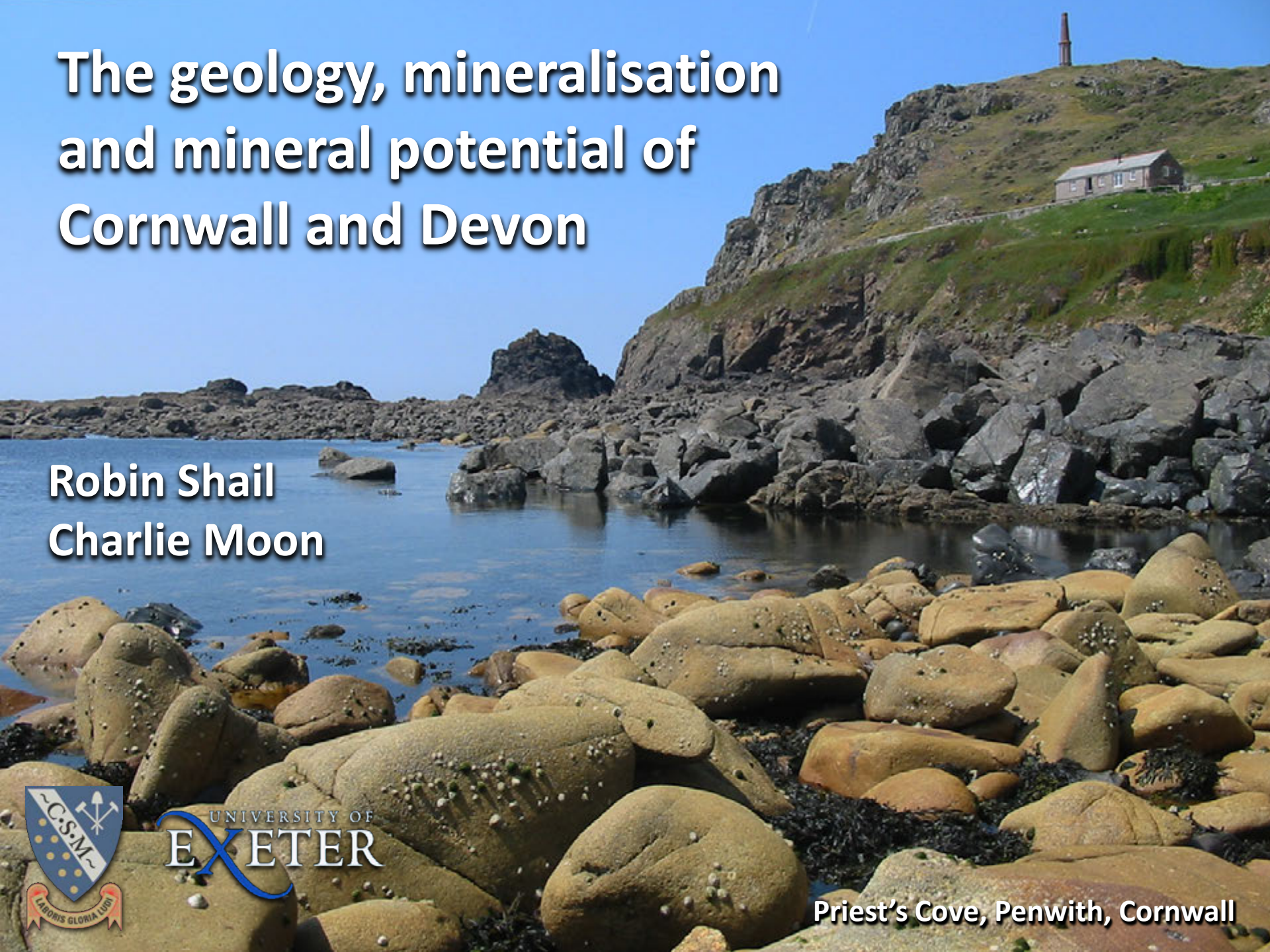
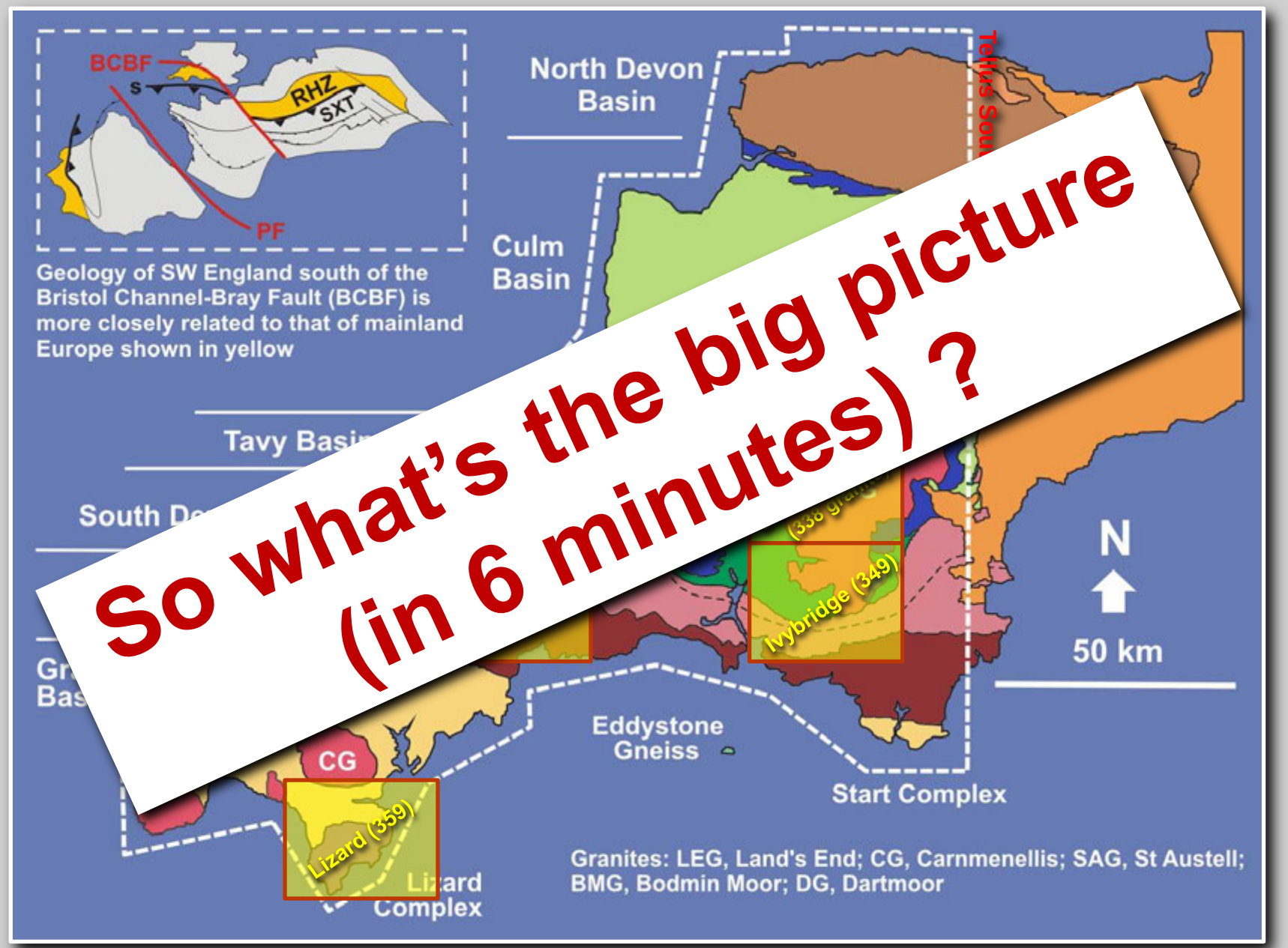
The geology, mineralisation and mineral potential of Cornwall and Devon

Robin Shail
Charlie Moon



Priest's Cove, Penwith, Cornwall

Simplified bedrock geology

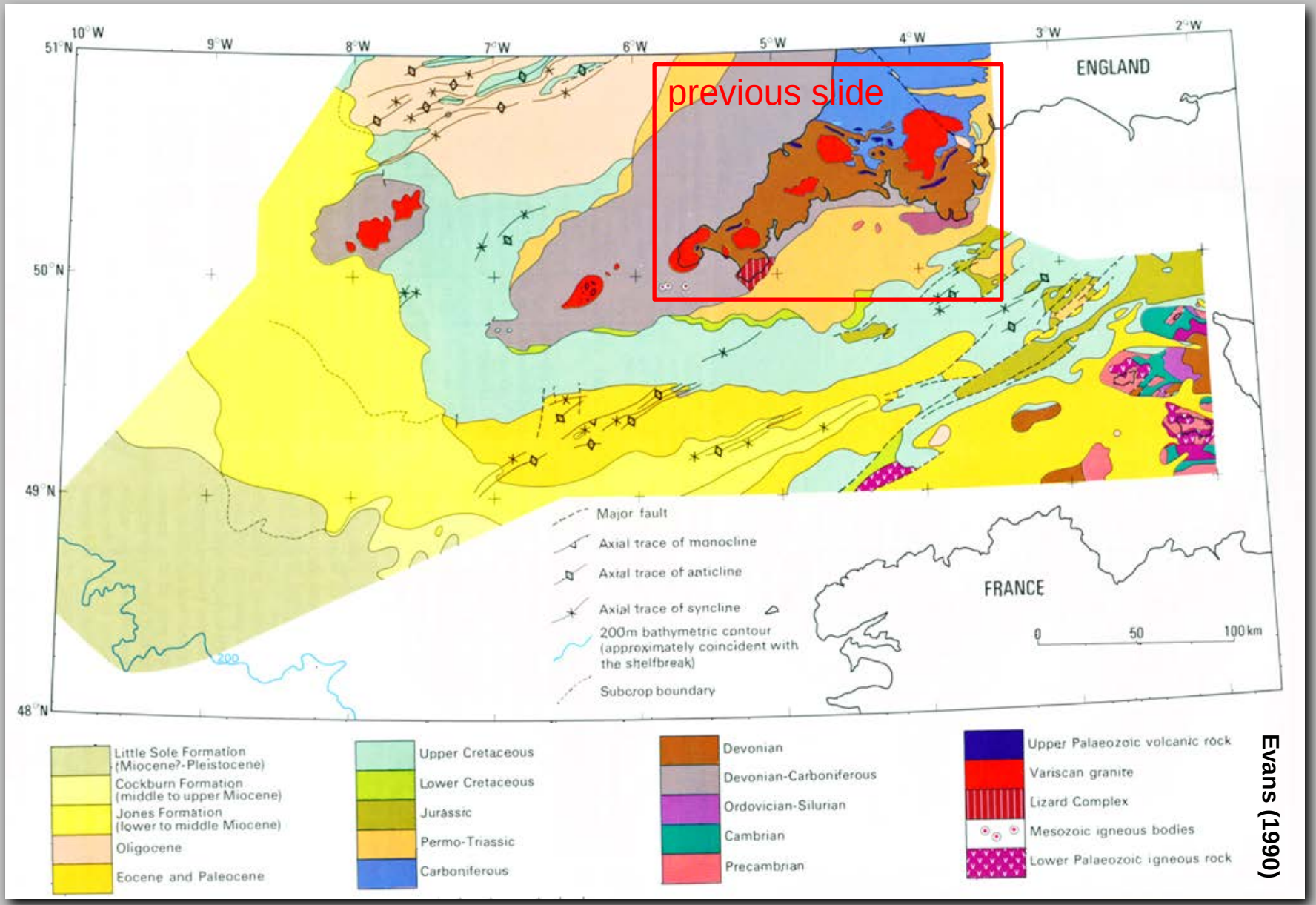


So what's the big picture (in 6 minutes) ?

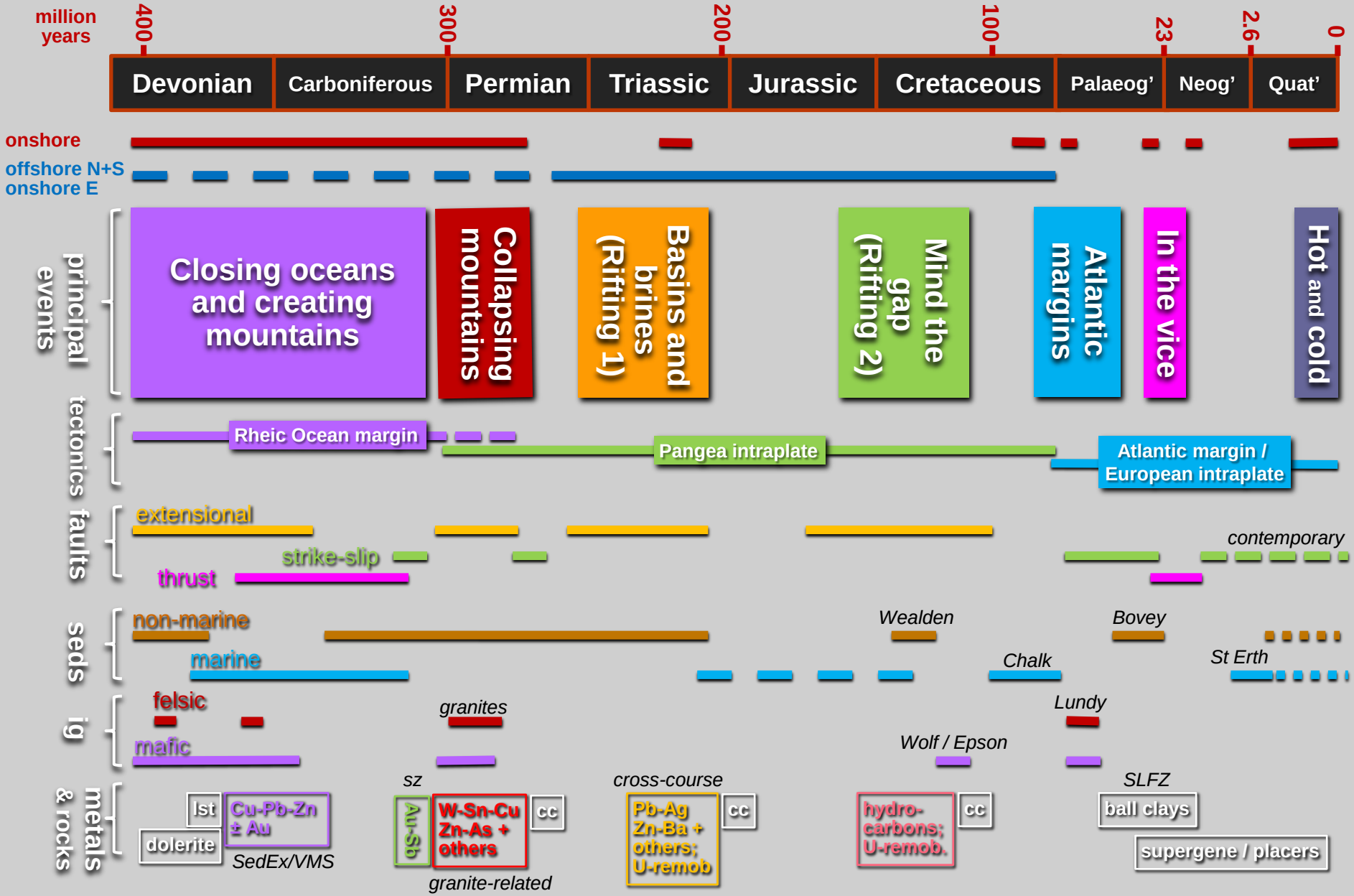
Shail and Leveridge (2009), Leveridge and Hartley (2006): based upon BGS mapping

Published 1:50,000 geological maps of highlighted areas not based on 'recent' resurvey

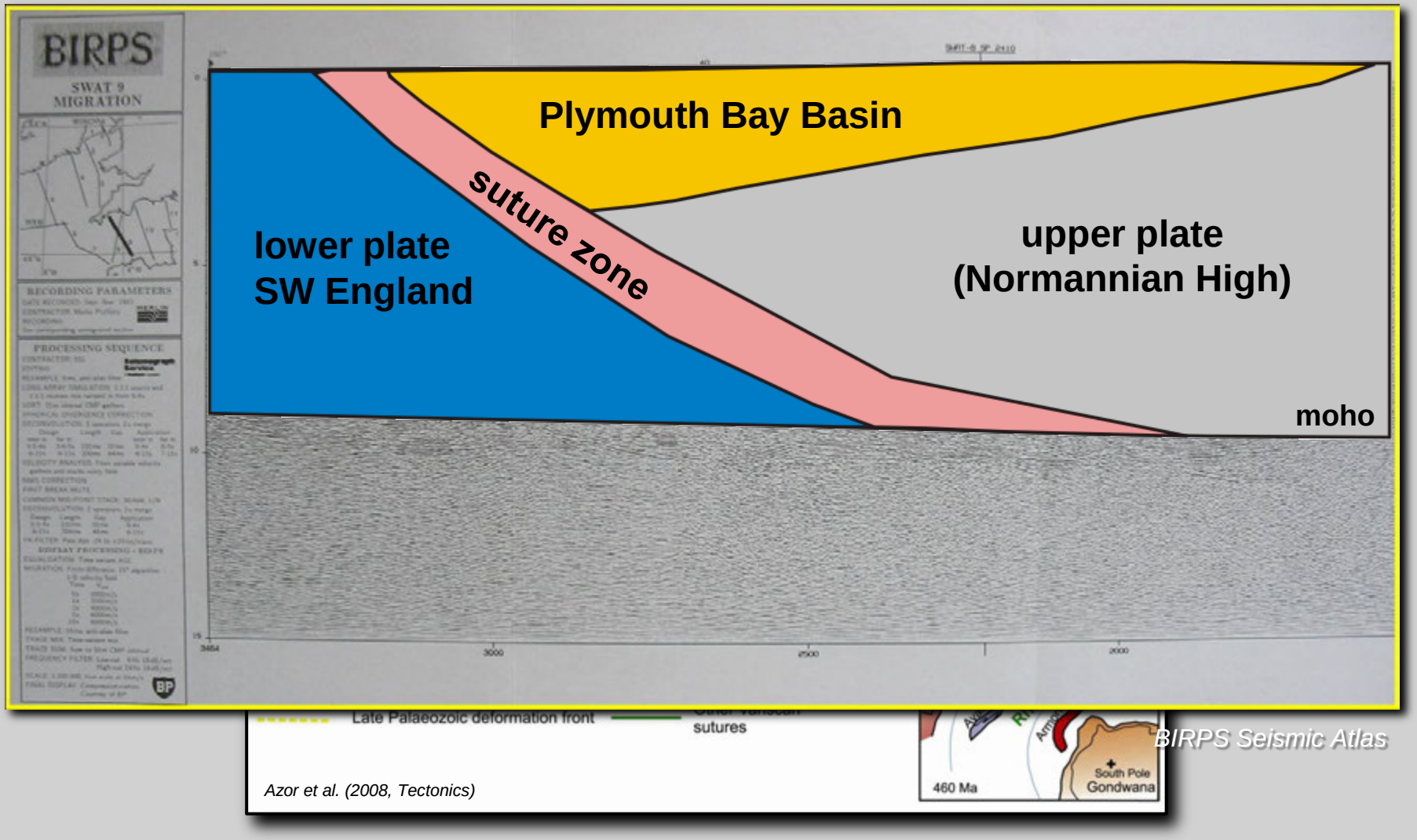
Contrasting onshore and offshore geology



SW England principal geological events



(1) Closing oceans / creating mountains

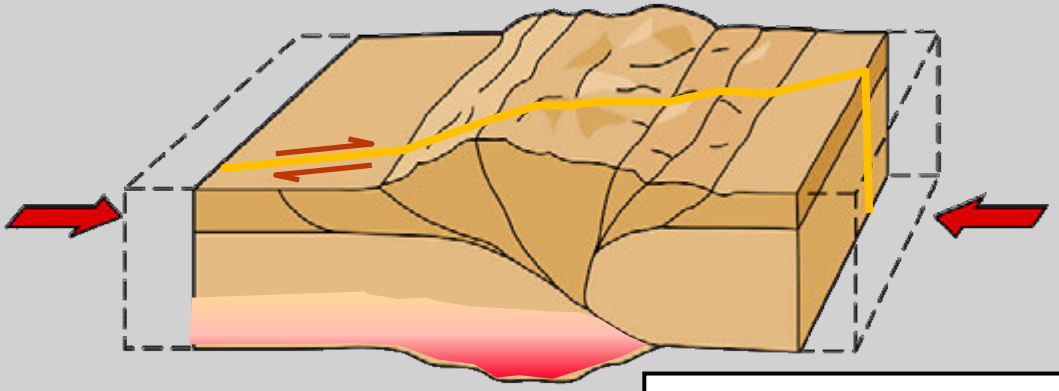


Azor et al. (2008, Tectonics)

BIRPS Seismic Atlas

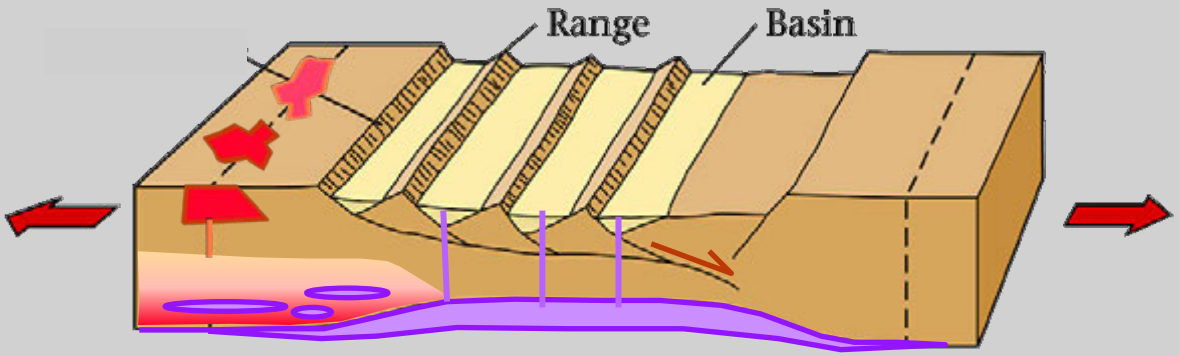
(2) Collapsing mountains

Prograde metamorphism of lower crust during / following Variscan convergence. High T metamorphic fluids along NW-SE strike-slip fault zones



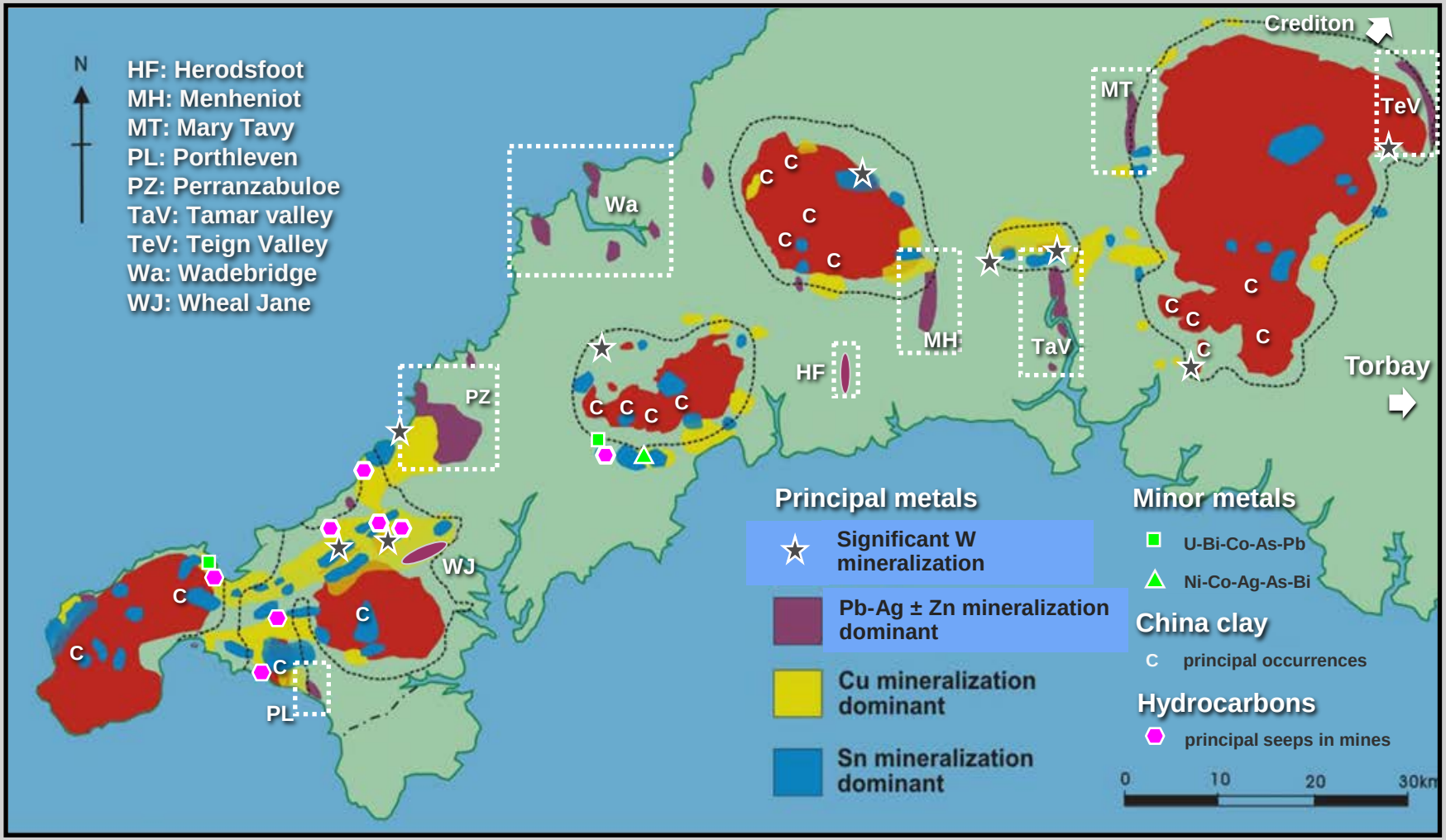
Variscan convergence

Lithospheric extension brings about mantle partial melting and injection of melts into already hot lower crust



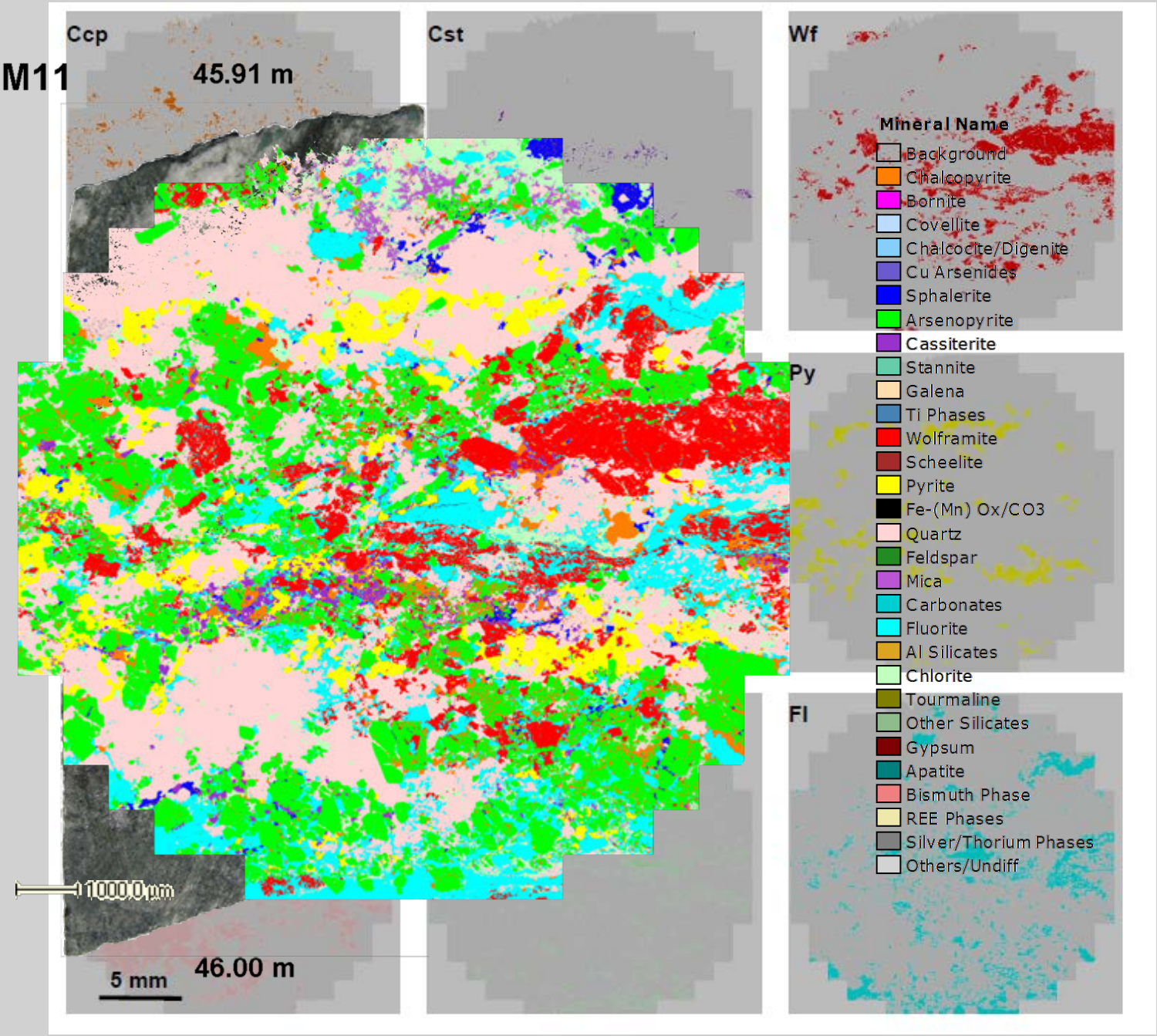
Post-Variscan extension

Post-Variscan mineralisation, china clay and hydrocarbon occurrences

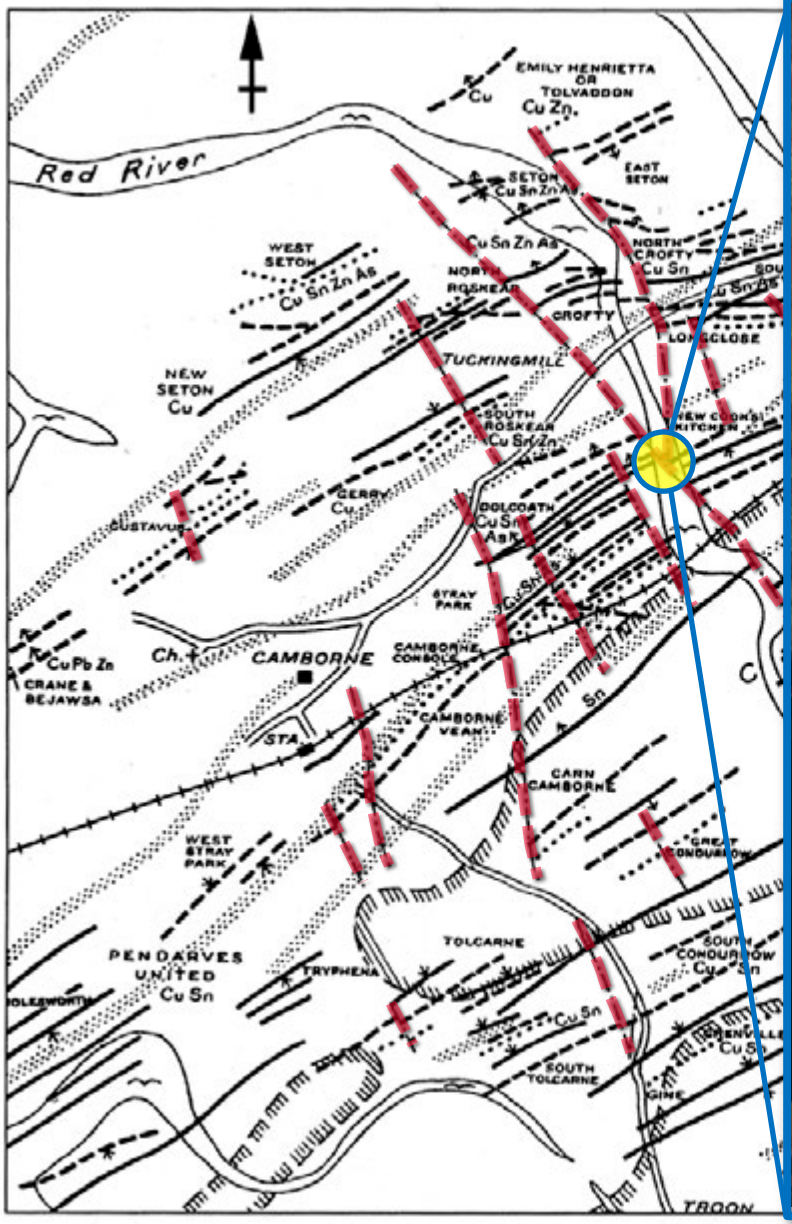


Sources: Dines (1956); Parnell (1988), Jackson et al. (1989)

QEMSCAN® fieldscan image of Dolcoath polymetallic vein

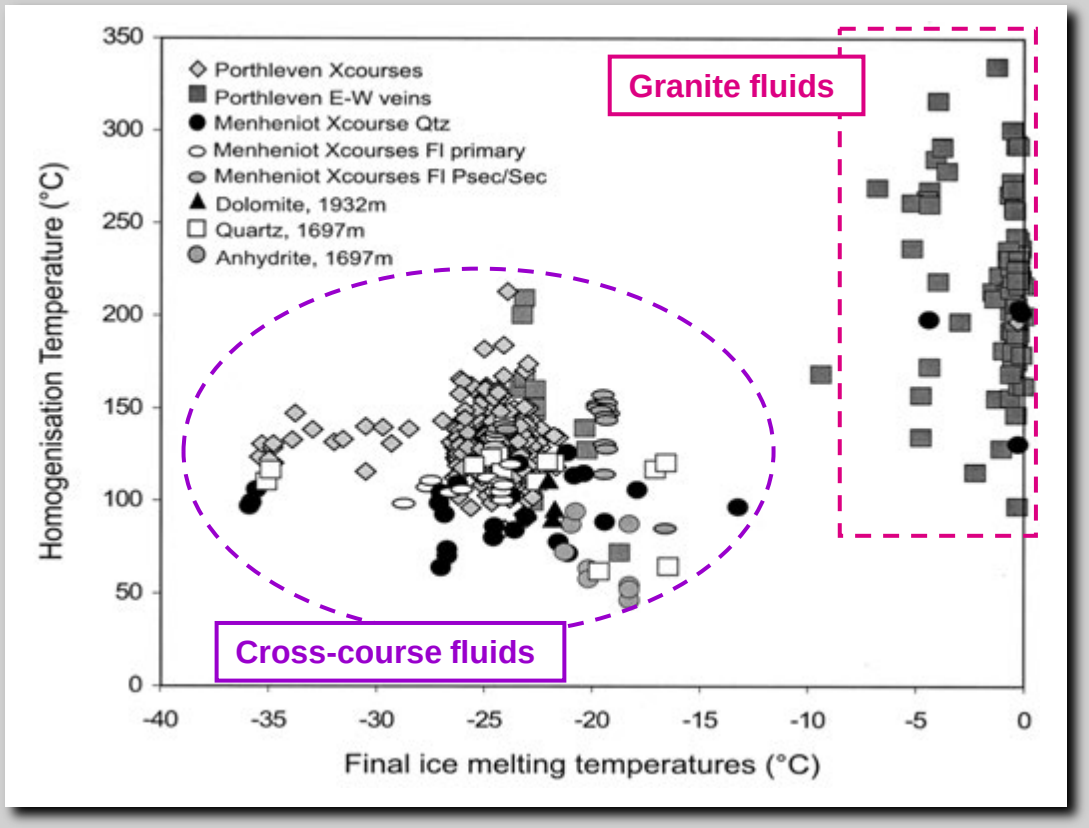


Camborne-Redruth mining district lodes & cross-courses

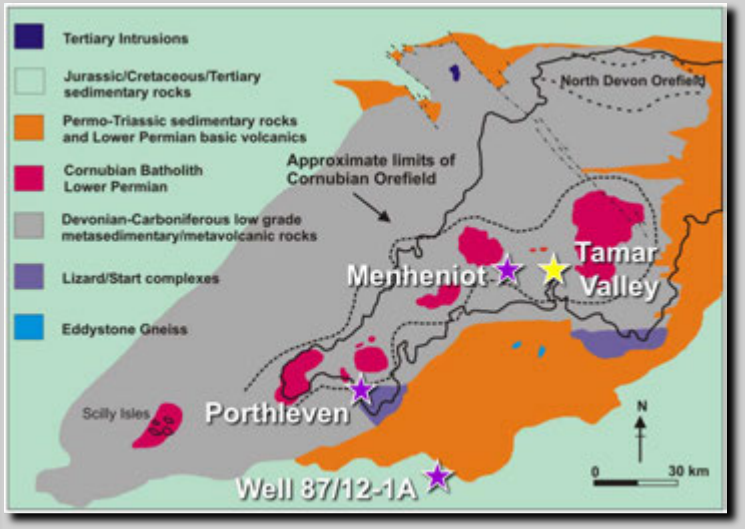


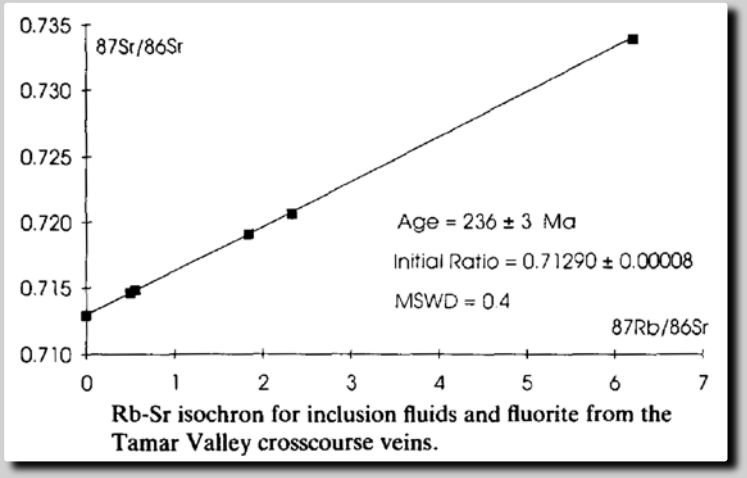
Margin of Great Cross-course fault zone, deep adit level, South Crofty Mine

(4) Basins and brines (rifting 1)



Source: Gleeson *et al.* (2001, GCA)

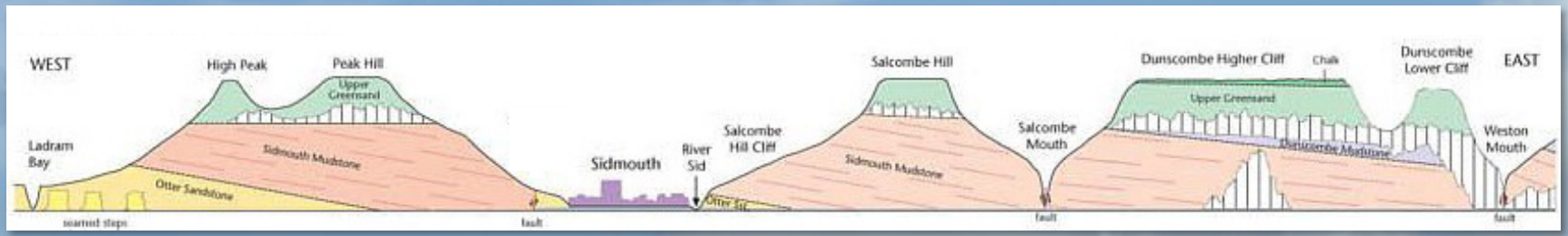




Source: Scrivener et al. (1994) JGSL

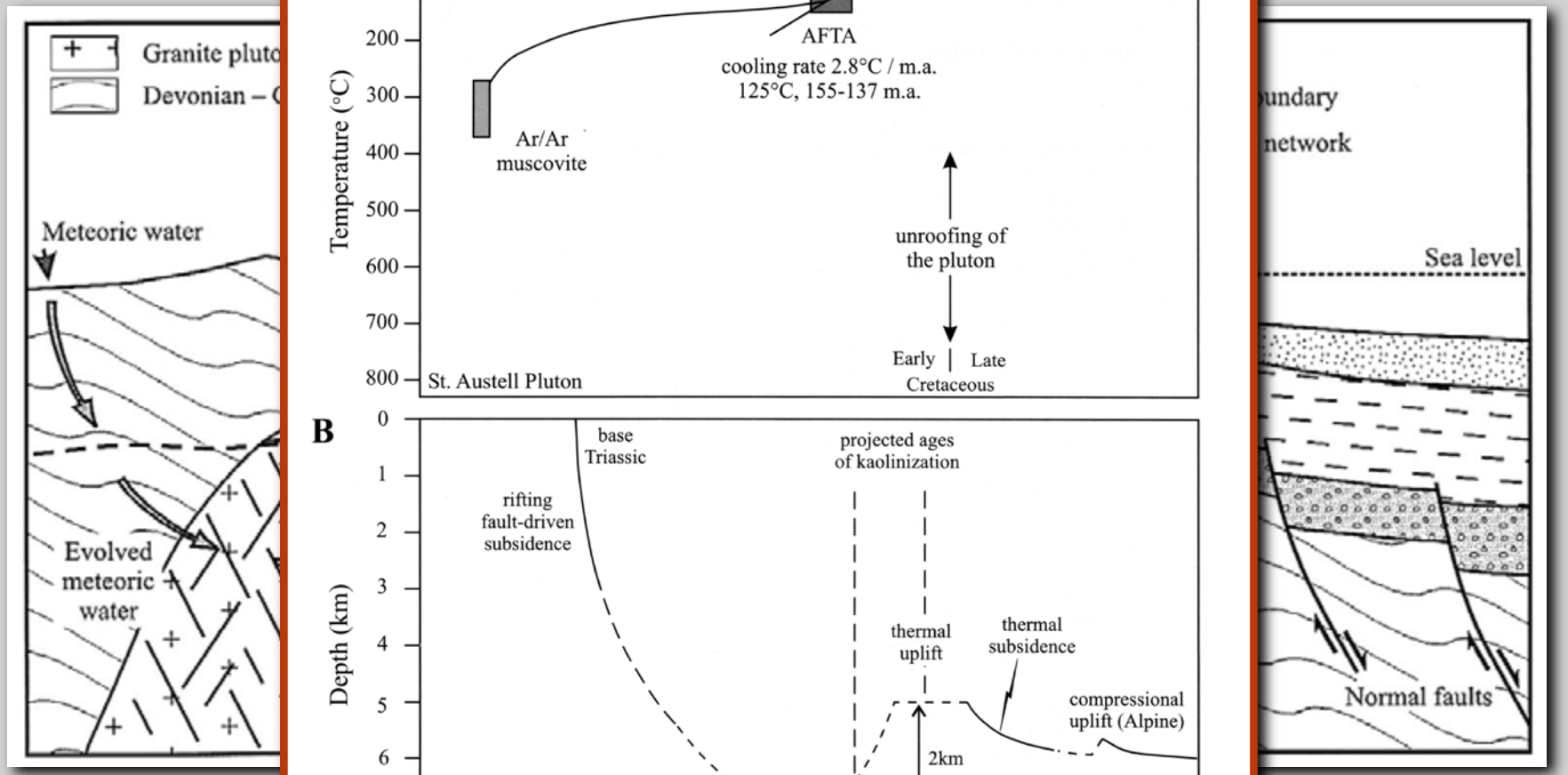
- Fluids in P-T hosted veins in offshore similar to cross-course
- Some cross-course fluids in E-W veins with earlier granite fluids
- Some cross-course quartz (Menheniot) has granite-type fluids

(4) Mind the gap - where's the Jurassic?



Cretaceous Upper Greensand unconformably overlying Triassic Mercia Mudstone Group east of Sidmouth (viewed from Chit Rocks)

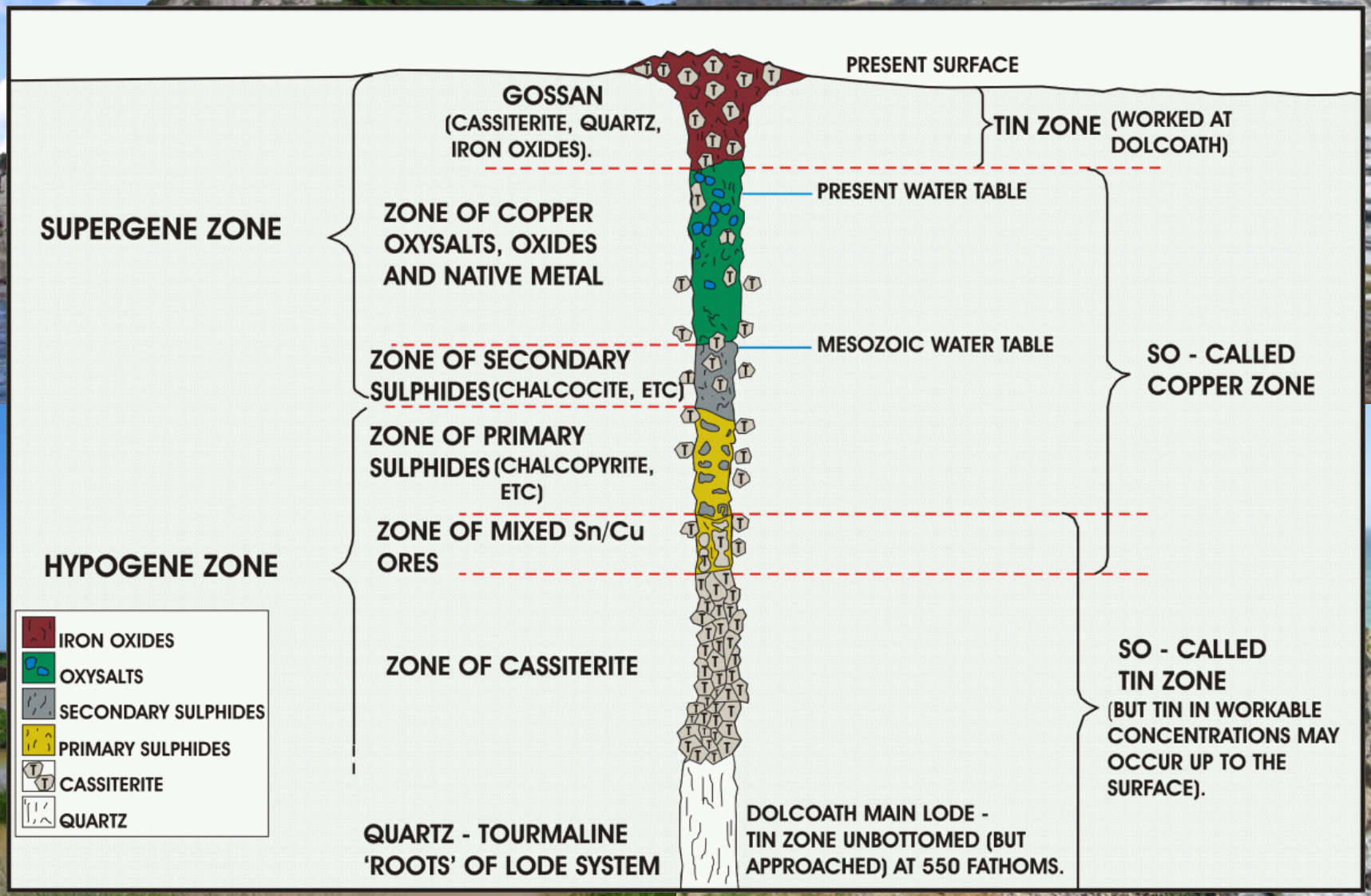
Potent ion ?



Source: PSYRILLOS
and high: kaolinizatio
Crystalline Rocks. Ed

uid evolution of a basin
: *Hydrocarbons in*
214, 175-195

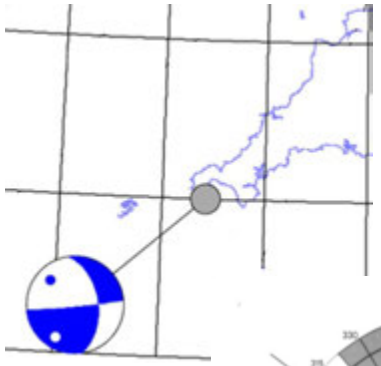
(5/6) Atlantic margin / In the vice

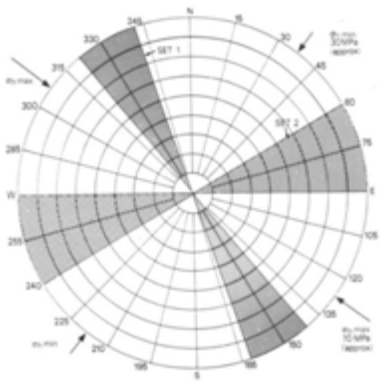


St Agnes Formation, Cornwall
Neogene (Miocene)

(7) Cold and hot

Camm and Hosking (1985)





Commodities in SW England

- Metallics- Sn, W, (Cu, Zn, U, Au?)
- China Clay (By-products Li, Nb, Ta)
- Ball Clay
- Aggregates
- Building Stone
- Holes (Waste Disposal)

Fracture-controlled mineralization

Triassic 240-220 Ma

Type	Metals	Gangue	Fluids
Cross-course veins	Pb, Zn, Ag, Fe, Sb, U	qtz, bar, dol, cal, fluor	Fluids from sedimentary basins

Mid-Triassic rifting

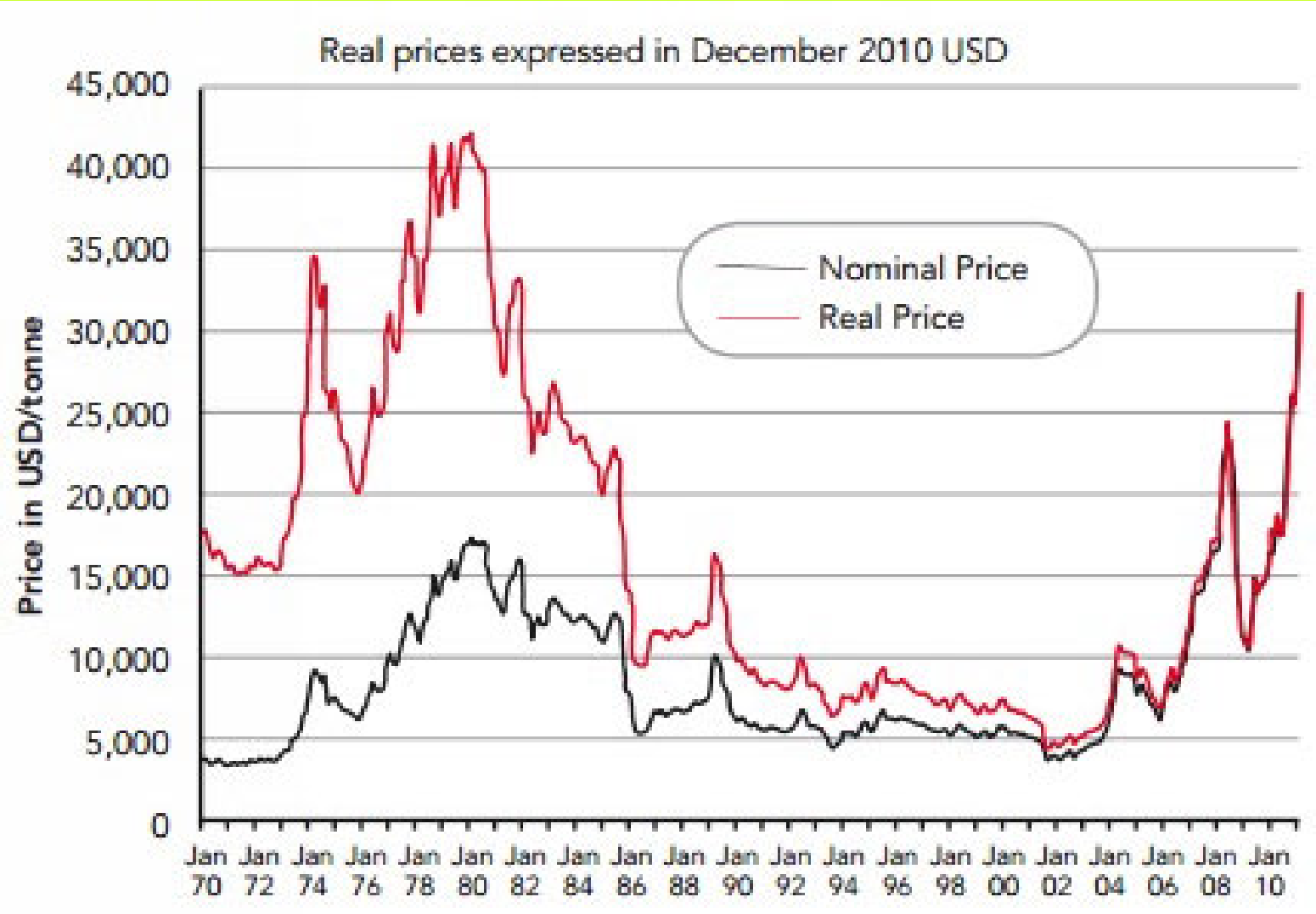
Lower- Middle Permian 290 – 255 Ma

Chlorite-tourmaline veins	Sn, Cu, Pb, Zn, As, Fe	qtz, kspar, chl, tour, hem, fluor	Variable mixing of granite and country rock fluids
Tourmaline-quartz (breccia) veins	Sn	tour, qtz	
Skarn/ replacement	Sn		
Greisen-bordered sheeted veins	W, As, Sn	qtz, musc, tour	Granite-derived fluids dominate
Pegmatites	W, As, Bi, Mo, Sn	qtz, kspar, musc, tour	

Lower Permian granite emplacement

After Chesley *et al.* (1993)

Tin Price

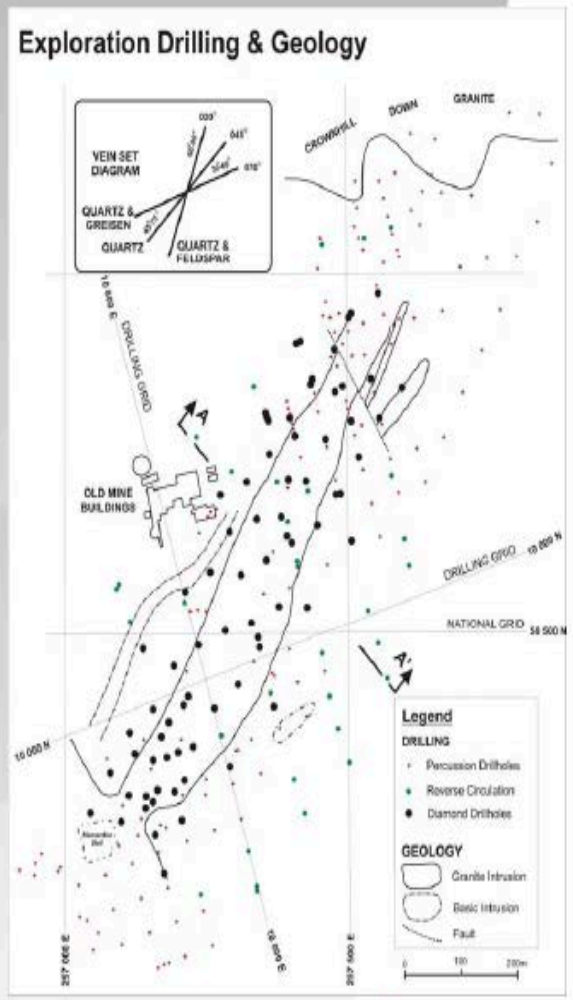


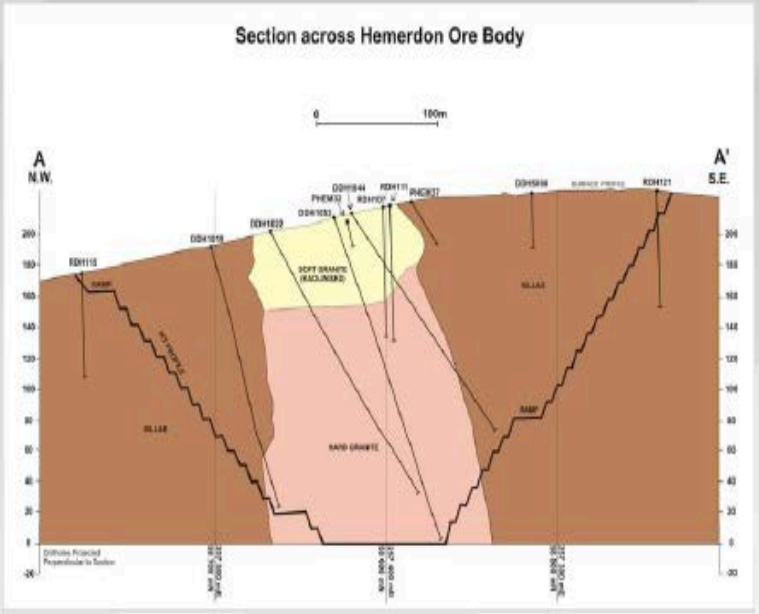
Source: MSC's annual report 2010

Underground Mining

Hemerdon project – Well drilled and geological simple

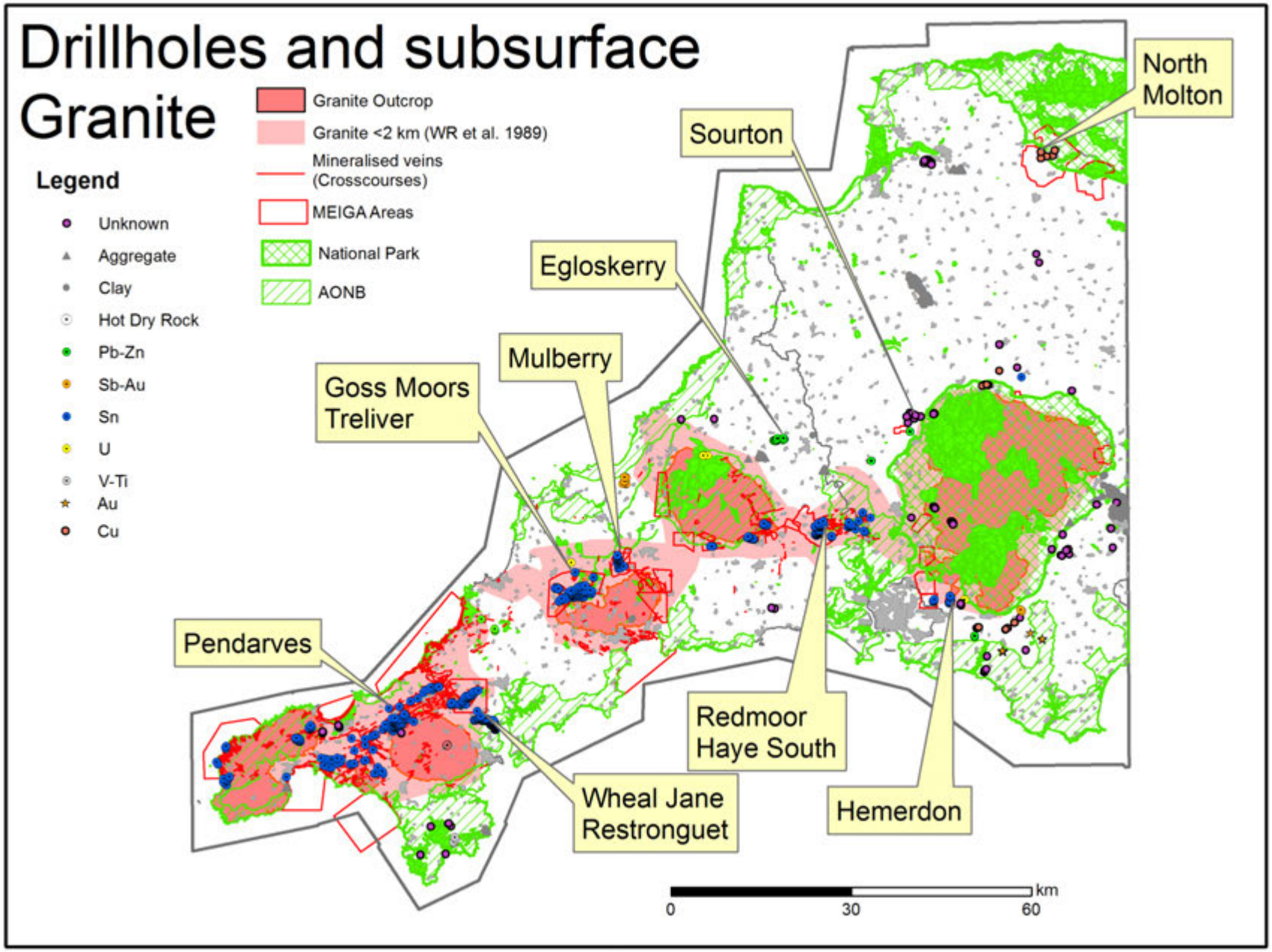
- Drill location plan
- Section showing Geology
- Potential to yield Long mine life
- Amax pilot plant recovery ~70% Heavy Media Separation, gravity.





WOLF Minerals Limited

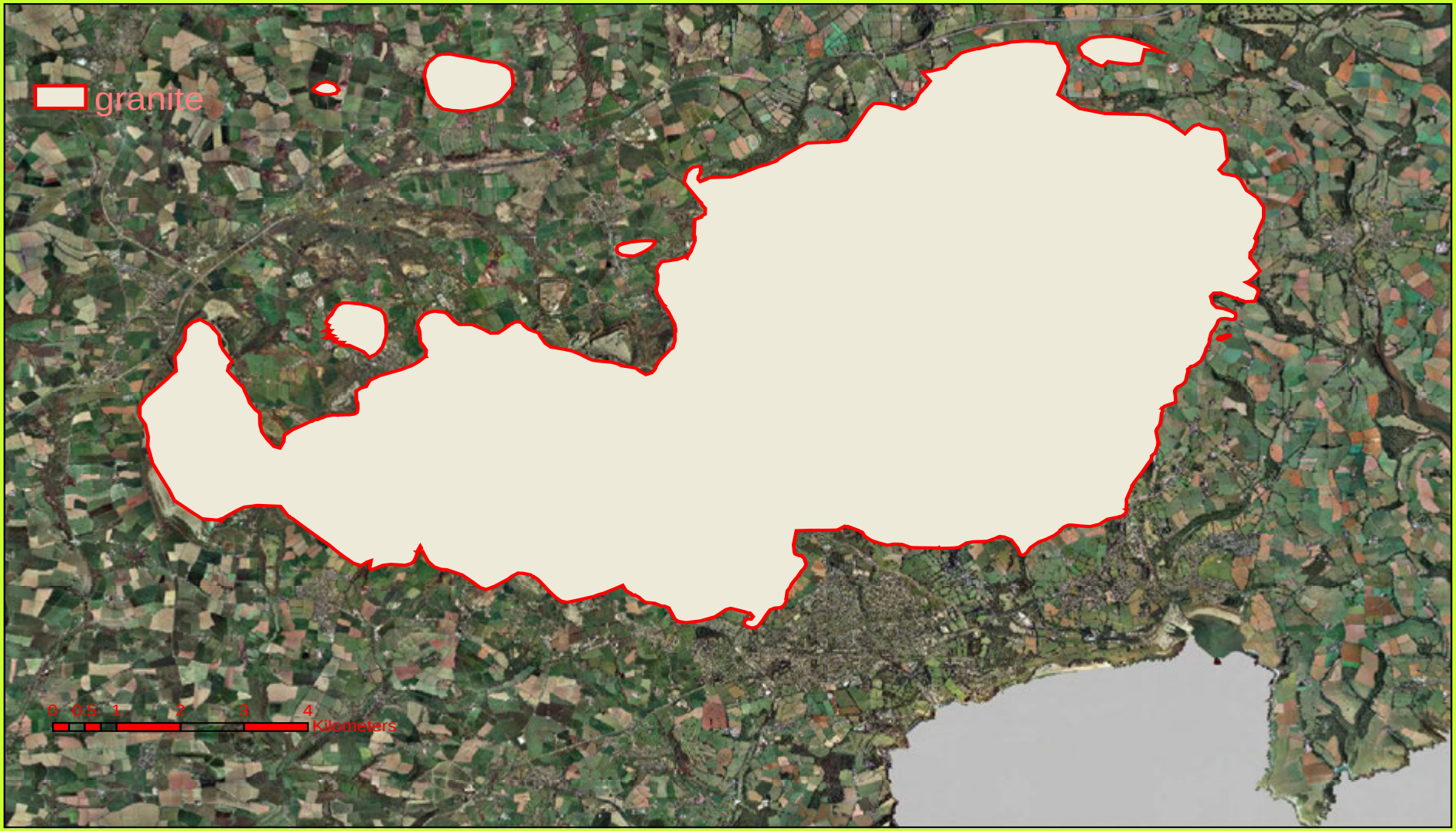
Environmental Constraints



Mineral Rights Issues

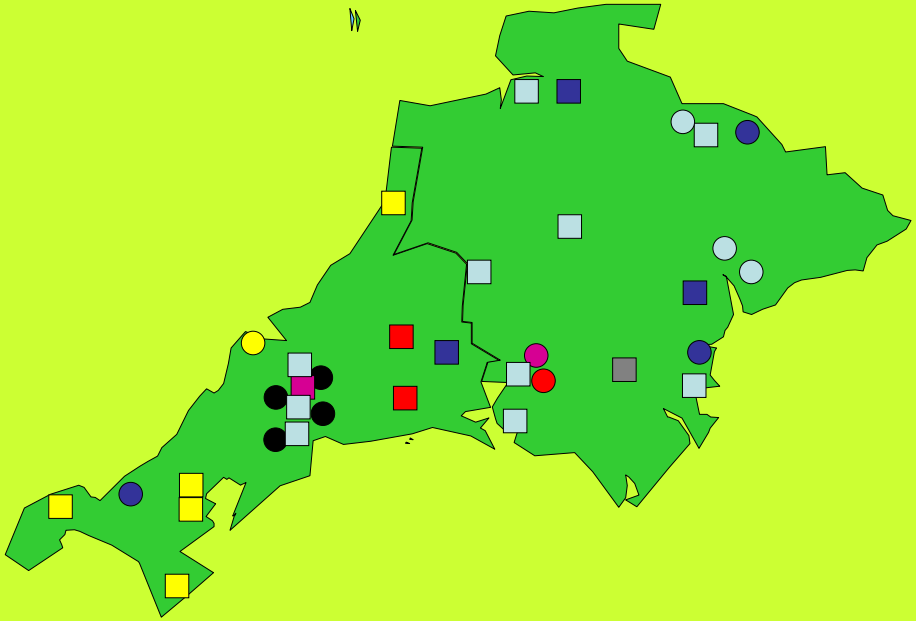
- Locating owners
- Owner’s liabilities
- Owner’s reputation
- Dues
- Length
- LEGAL COSTS

St Austell China Clay Area



South West “local” Market

Source: Bardon Aggregates



Crushed Rock	Sand & Gravel
Agg Ind Uk	Agg Ind Uk
Hanson	Hanson
Tarmac	Tarmac
Glendinning	Goonvean
Atlantic	Atlantic
Others	Others

TellusSW Data for Minerals an explorer's view

- **Magnetics**

Better delineation of lithologies and feeder or major faults at surface and depth

Detection of magnetite and pyrrhotite rich units

- **Radiometrics**

Direct detection of uranium (^{214}Bi) anomalies and mapping granites or sediments (ternary plots)

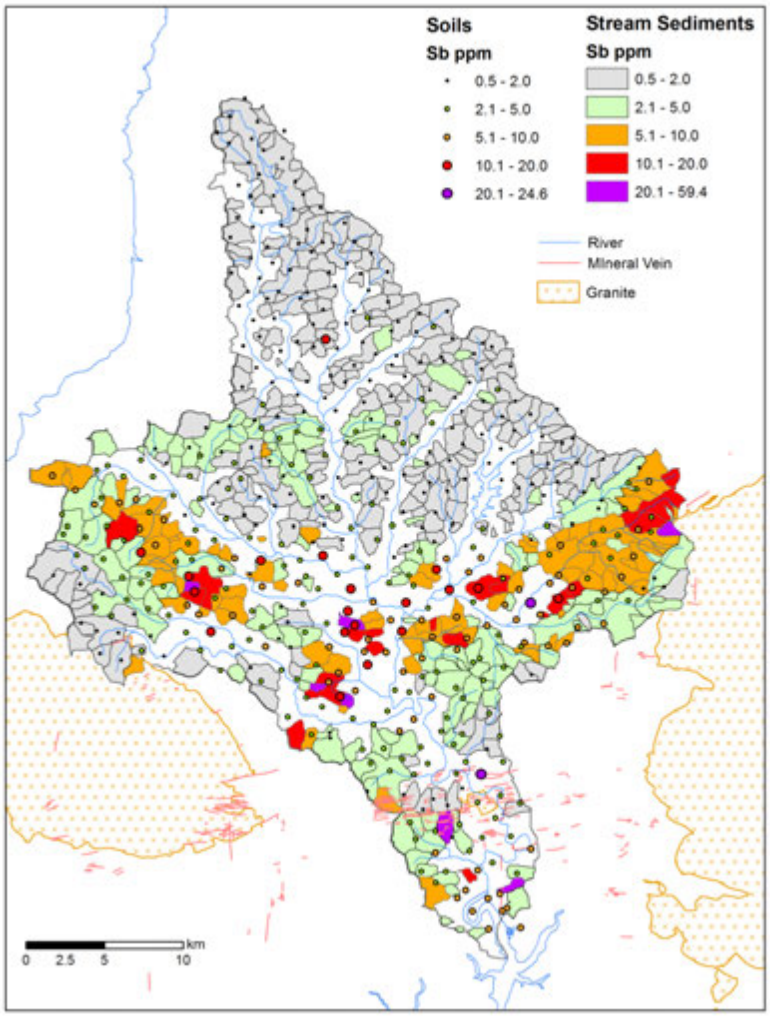
- **Lidar**

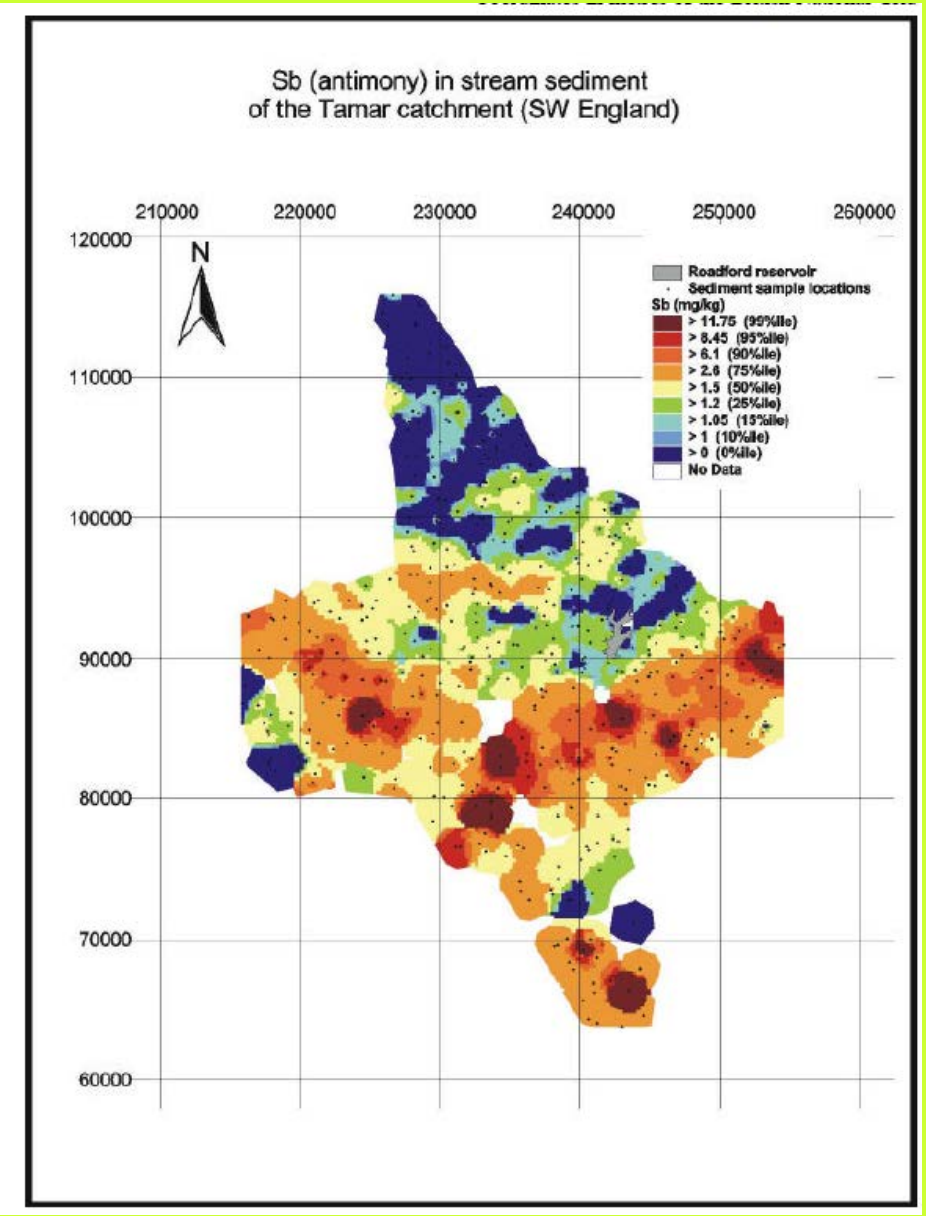
Mapping topography for detection of old workings and lithology

- **Hyperspectral**

Mineral mapping

Antimony Spatial Context
Tamar Catchment





Rawlins, O'Donnell,
& Ingham, 2003.