

# Finding Gold and Geologists in the Tasman

## Ross Large



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HOBART Australia





# **Finding Gold.....**

## **....learning from Siberia**

# Location of Sukhoi Log



# Geological plan and Cross Section

Wood and Popov (2005)

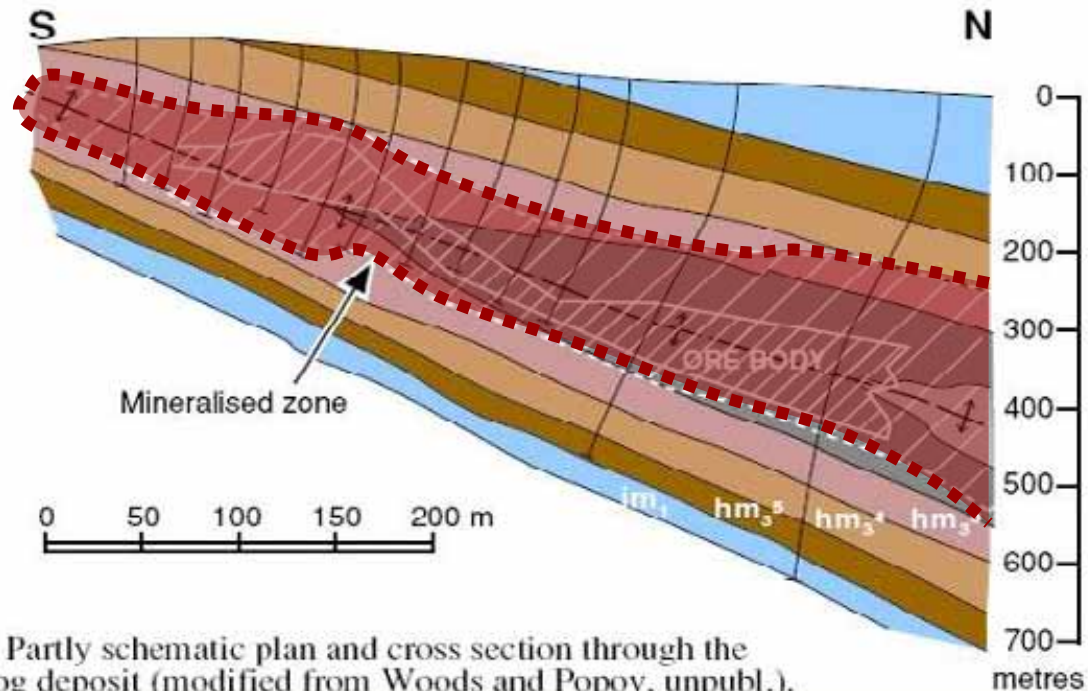
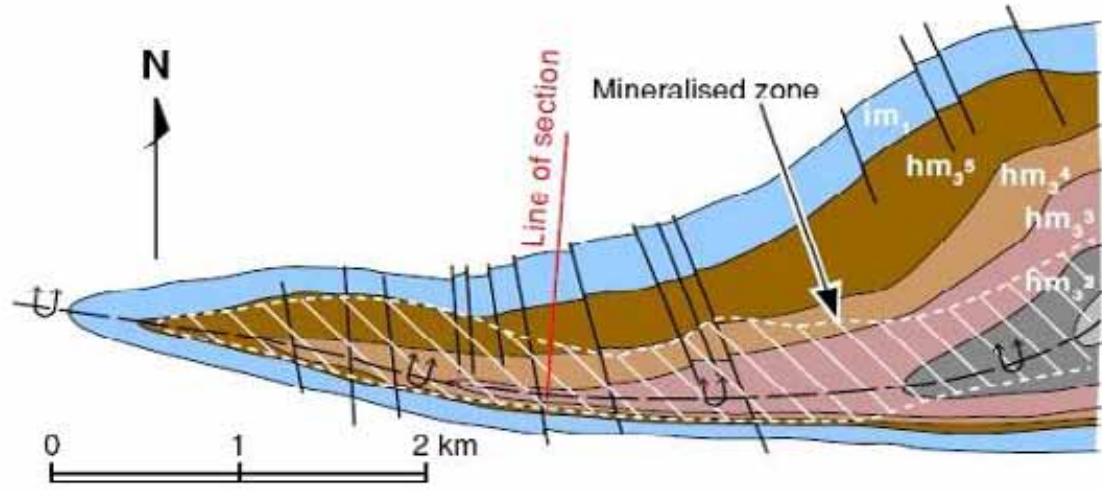
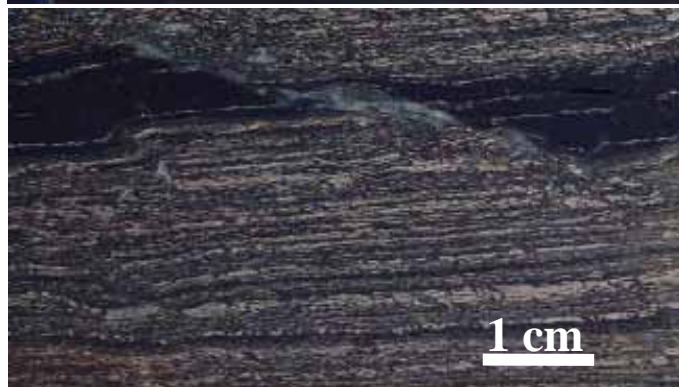
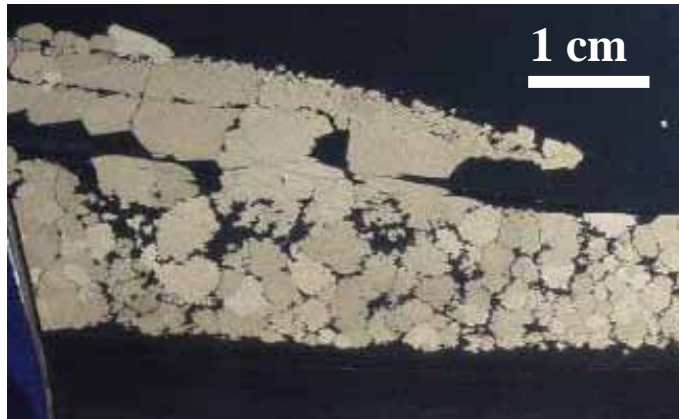
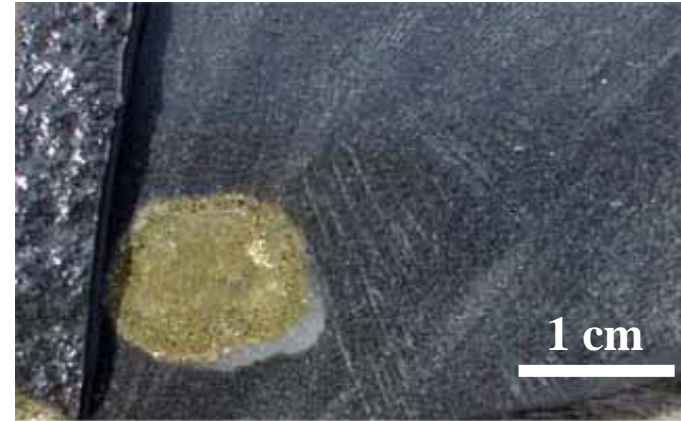
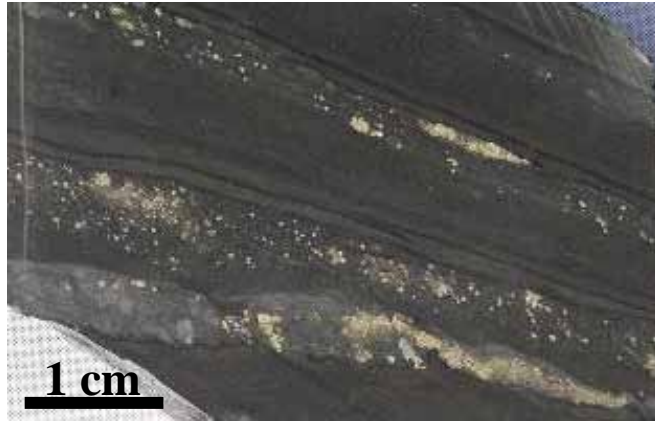


Figure 3. Partly schematic plan and cross section through the Sukhoi Log deposit (modified from Woods and Popov, unpubl.).

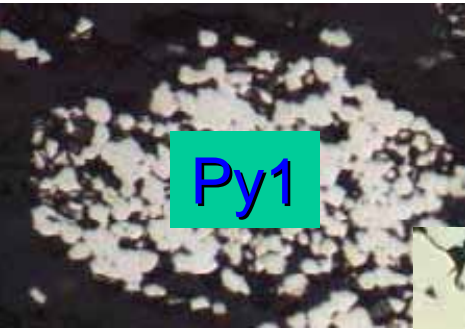


# Sulfide Mineralisation



# Pyrite History

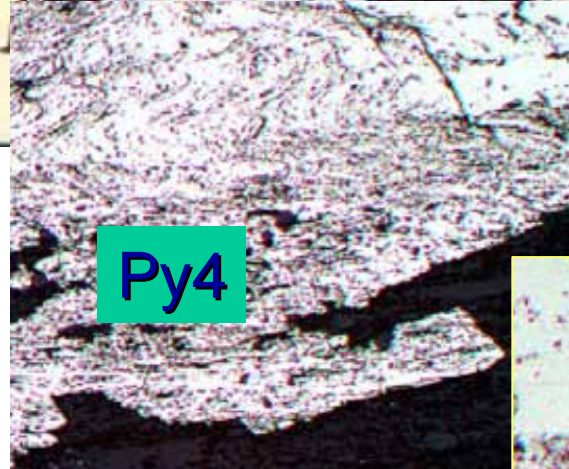
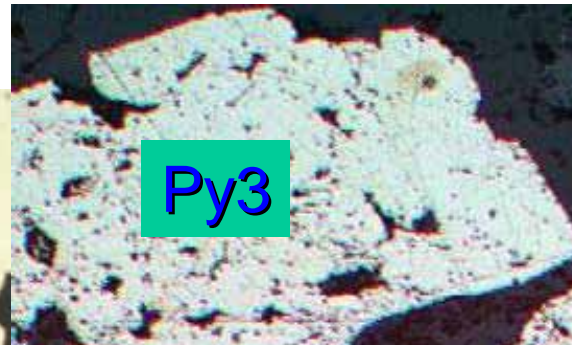
Sedimentary-diagenetic



Early-diagenetic

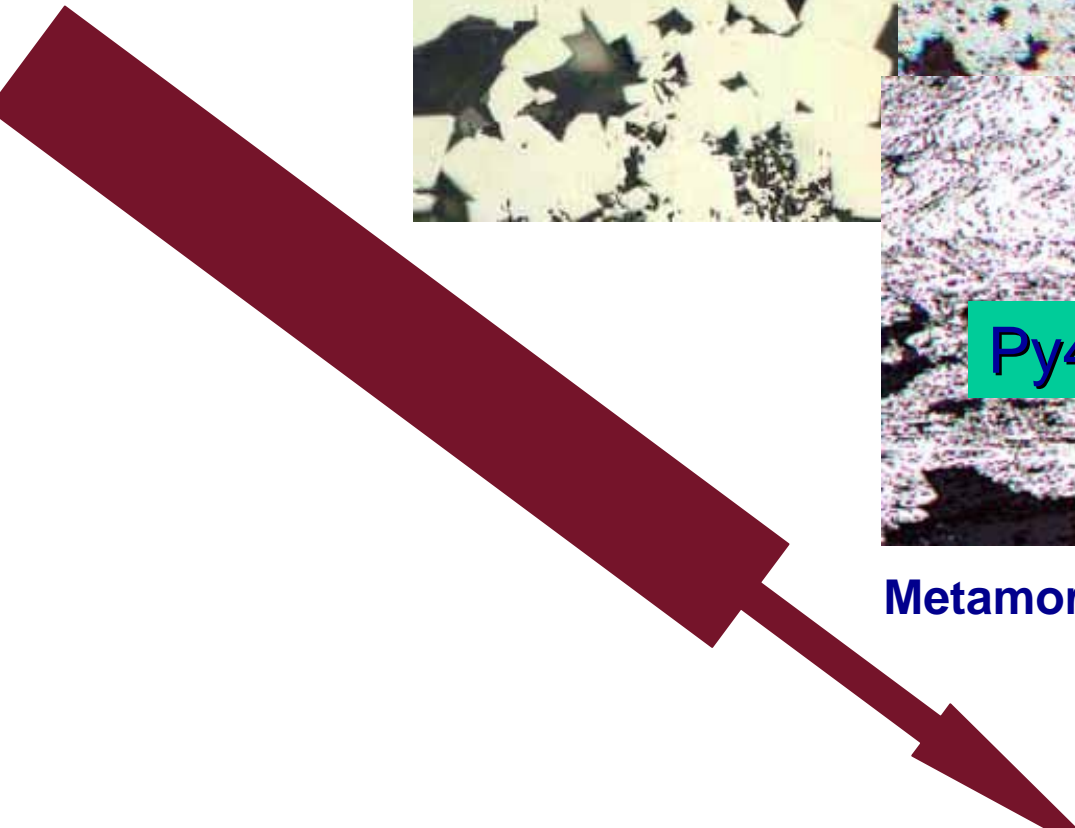
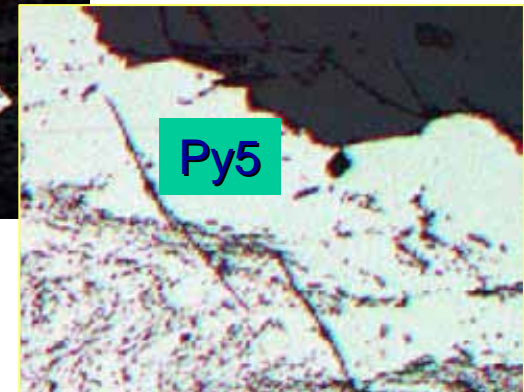


Late-diagenetic



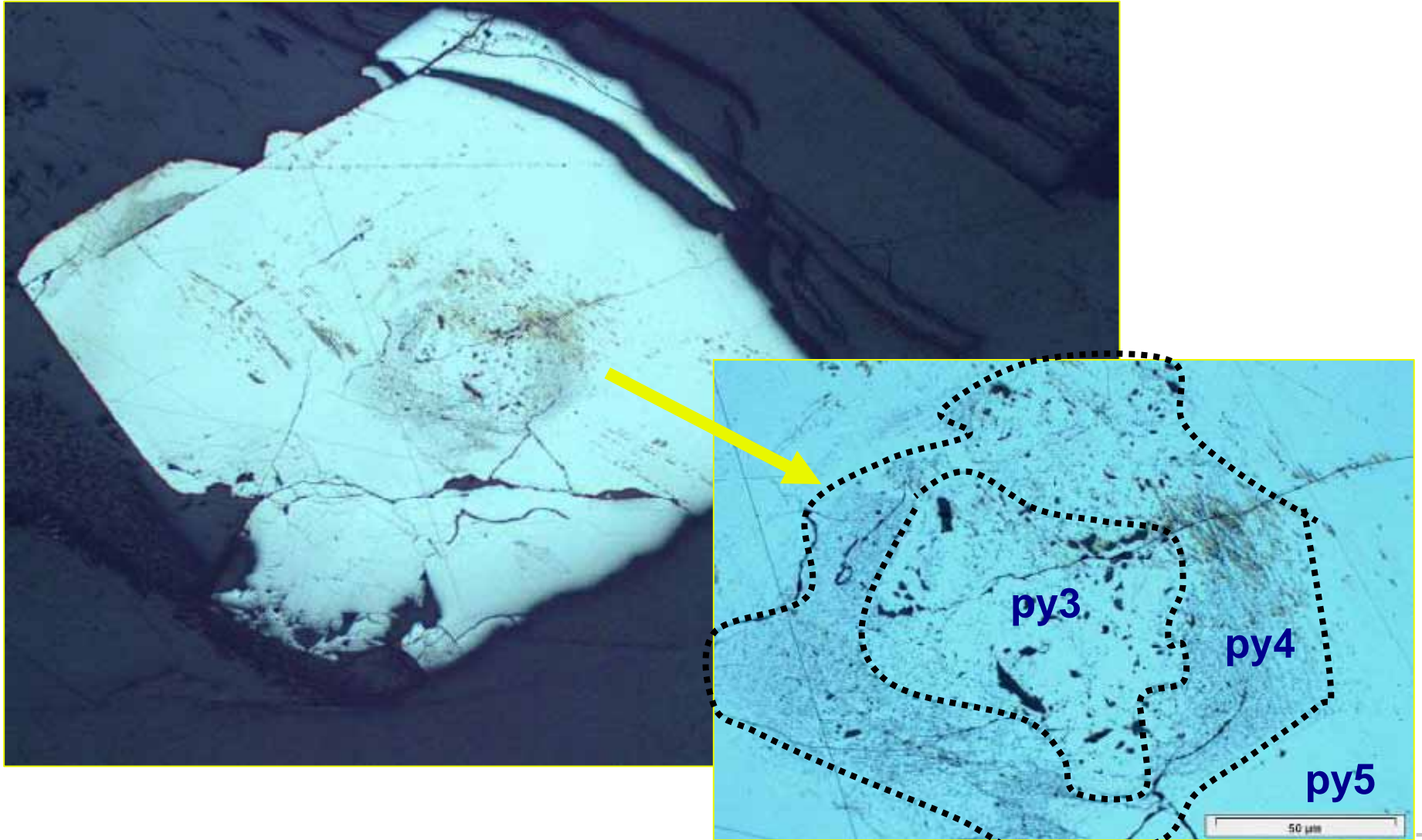
Metamorphic

Late-metamorphic

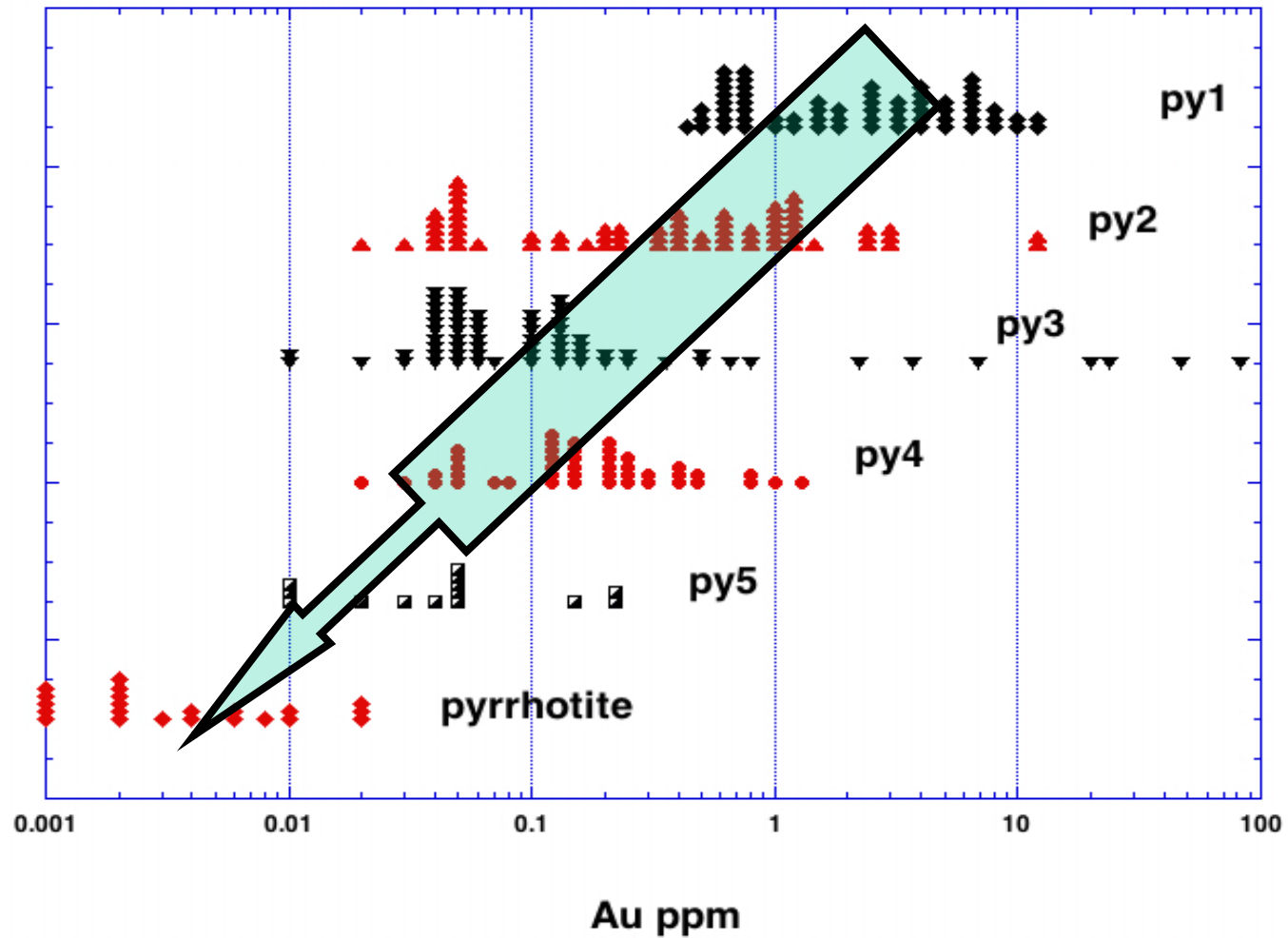




# Pyrite in py-qtz veins is zoned

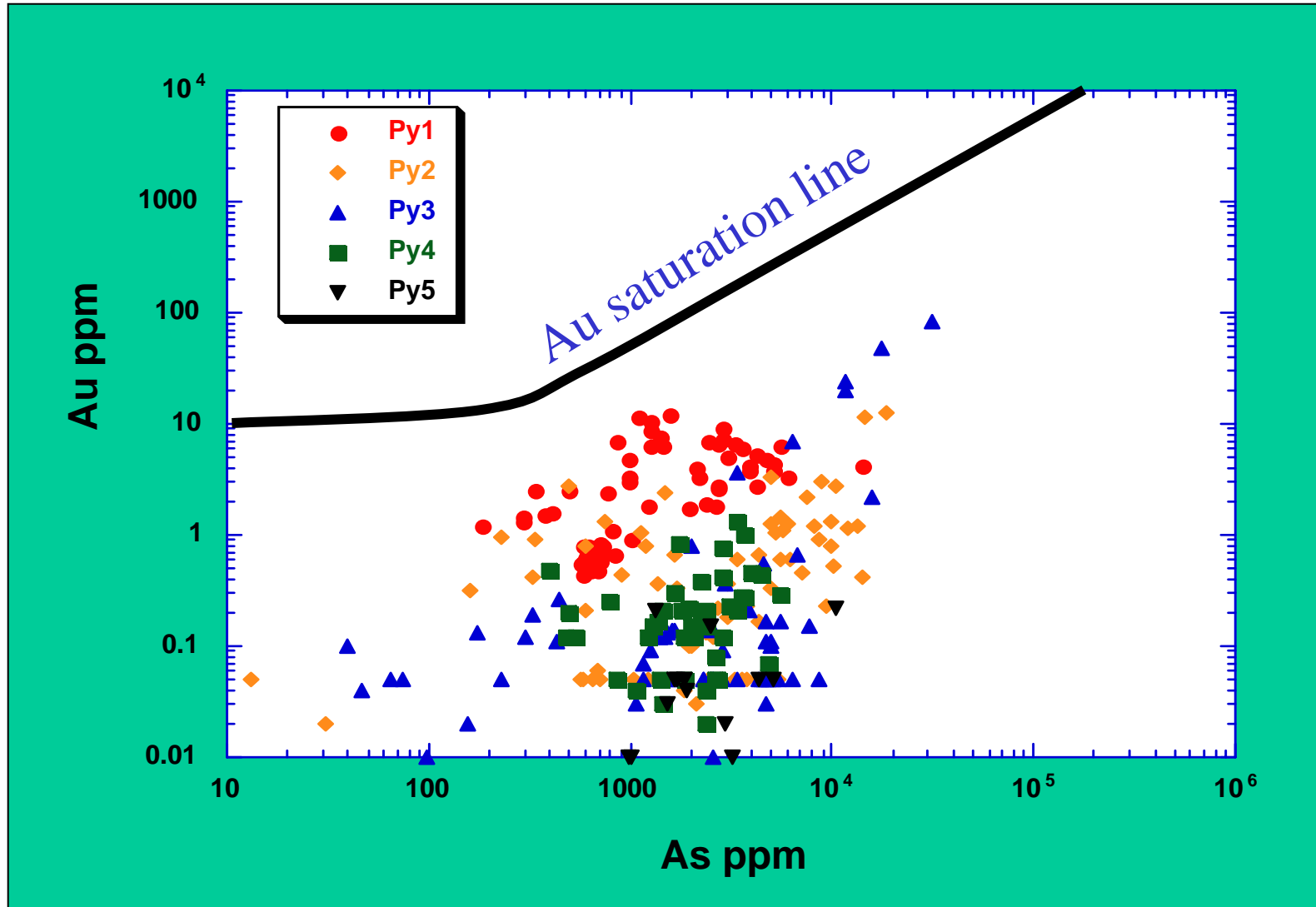


# Pyrite is Progressively Depleted in Gold from Py1 to Py5



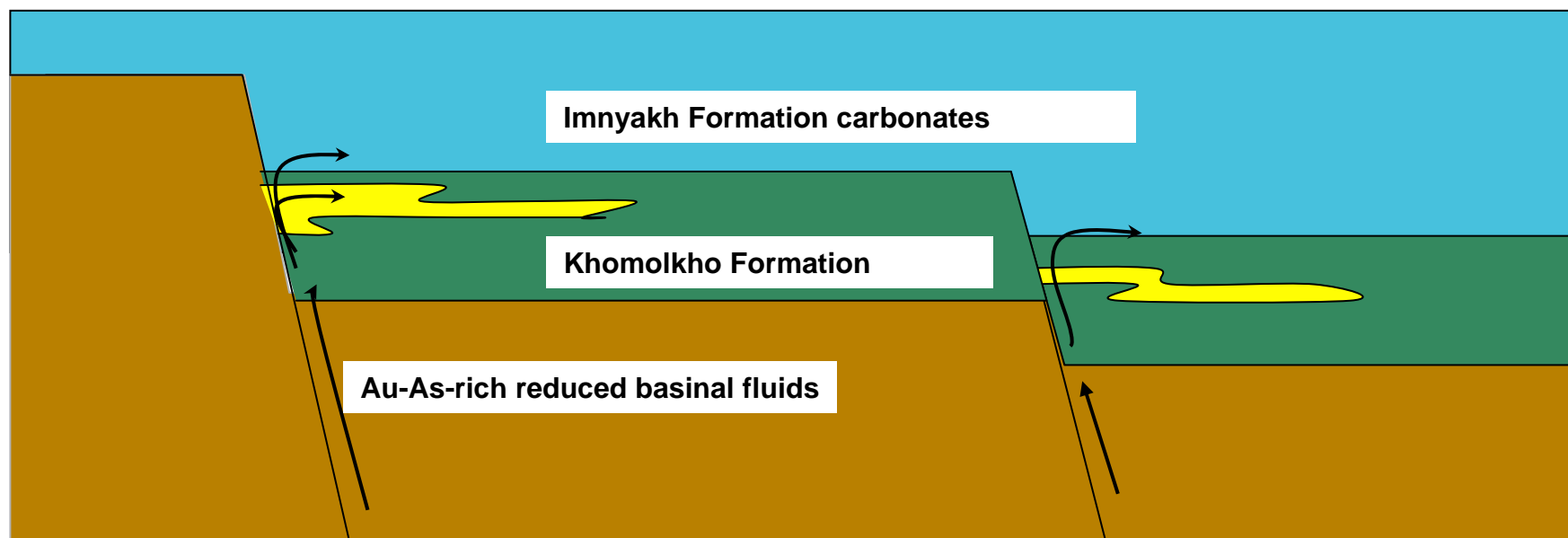


# Au-As Relations in SL Pyrite



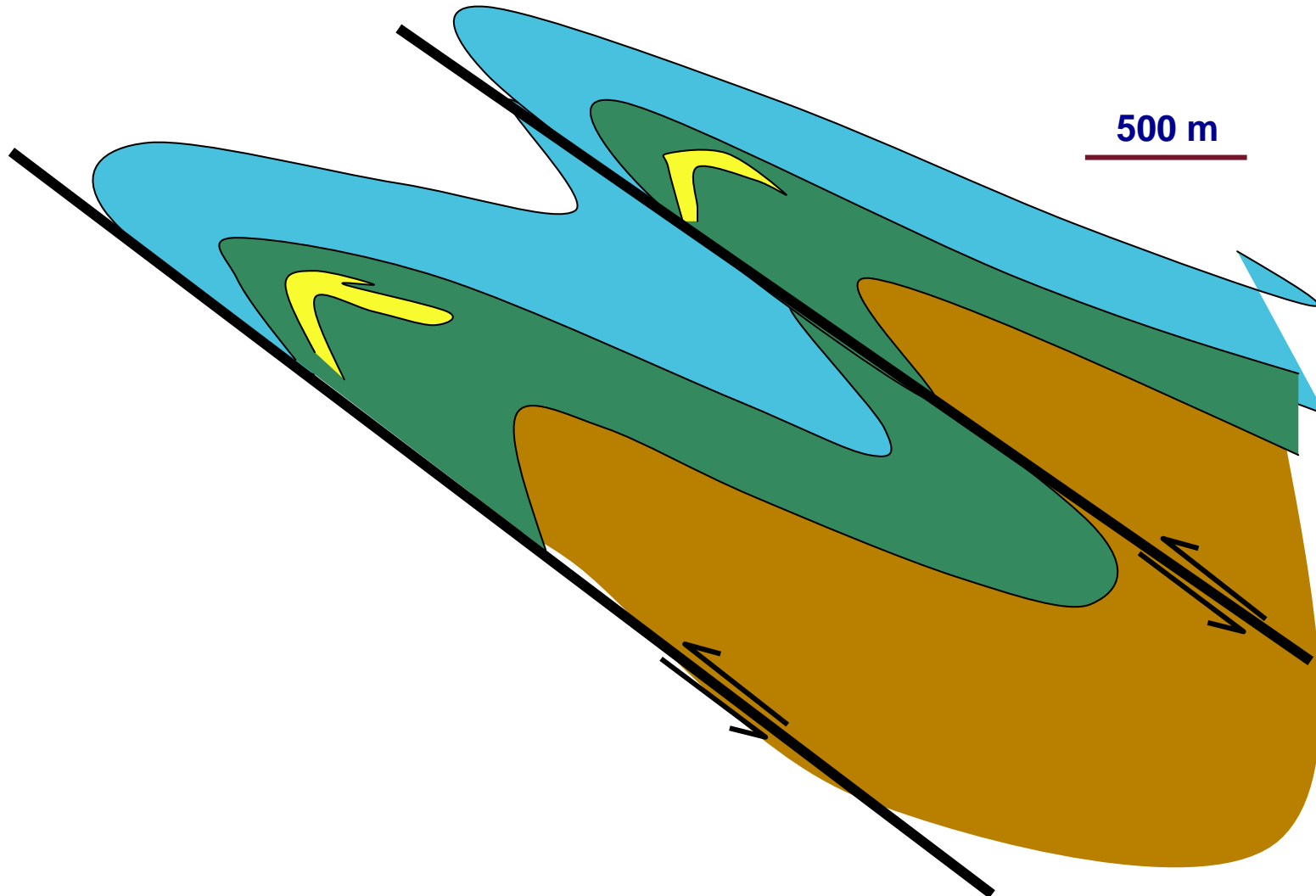
# Stage 1: Exhalation of Au-As-Rich Basinal Fluids

- : deposition of gold-arsenic bearing py1
- : syn-diagenetic growth of py2 and py3



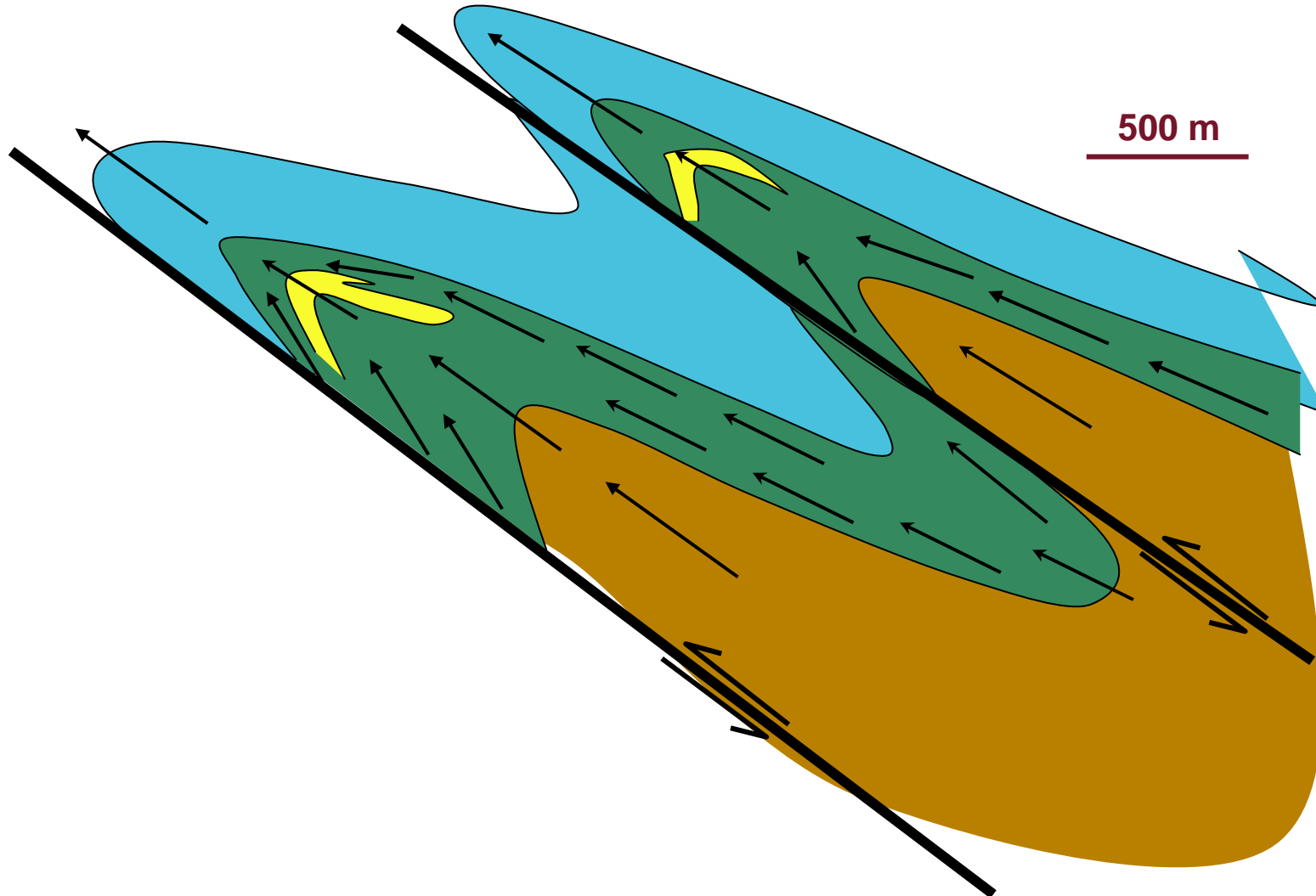
***Regional enrichment of gold and arsenic in black shales of Khomolkho Formation***

# Stage 2: Deformation; Normal faults Reactivated as Thrust Faults

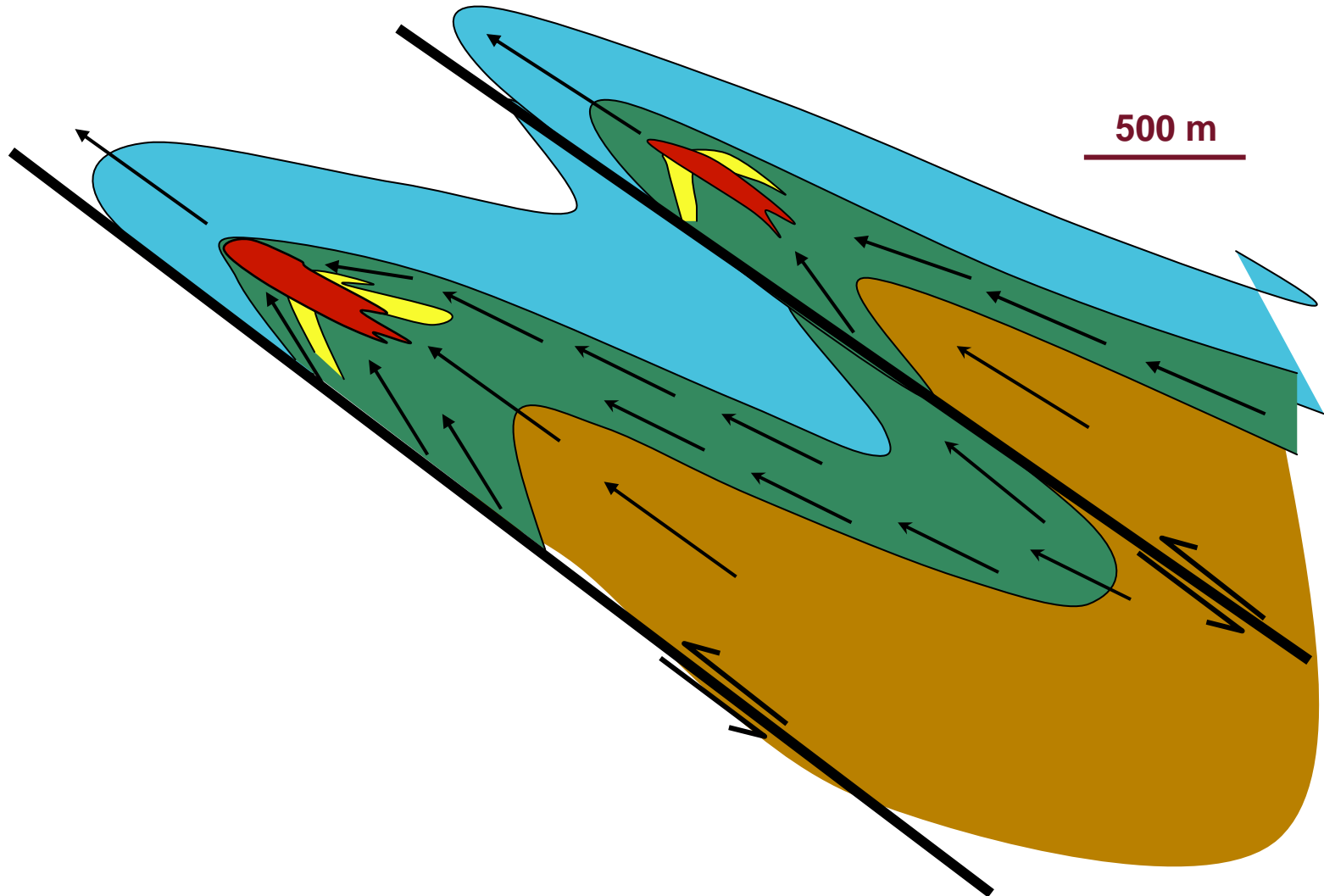




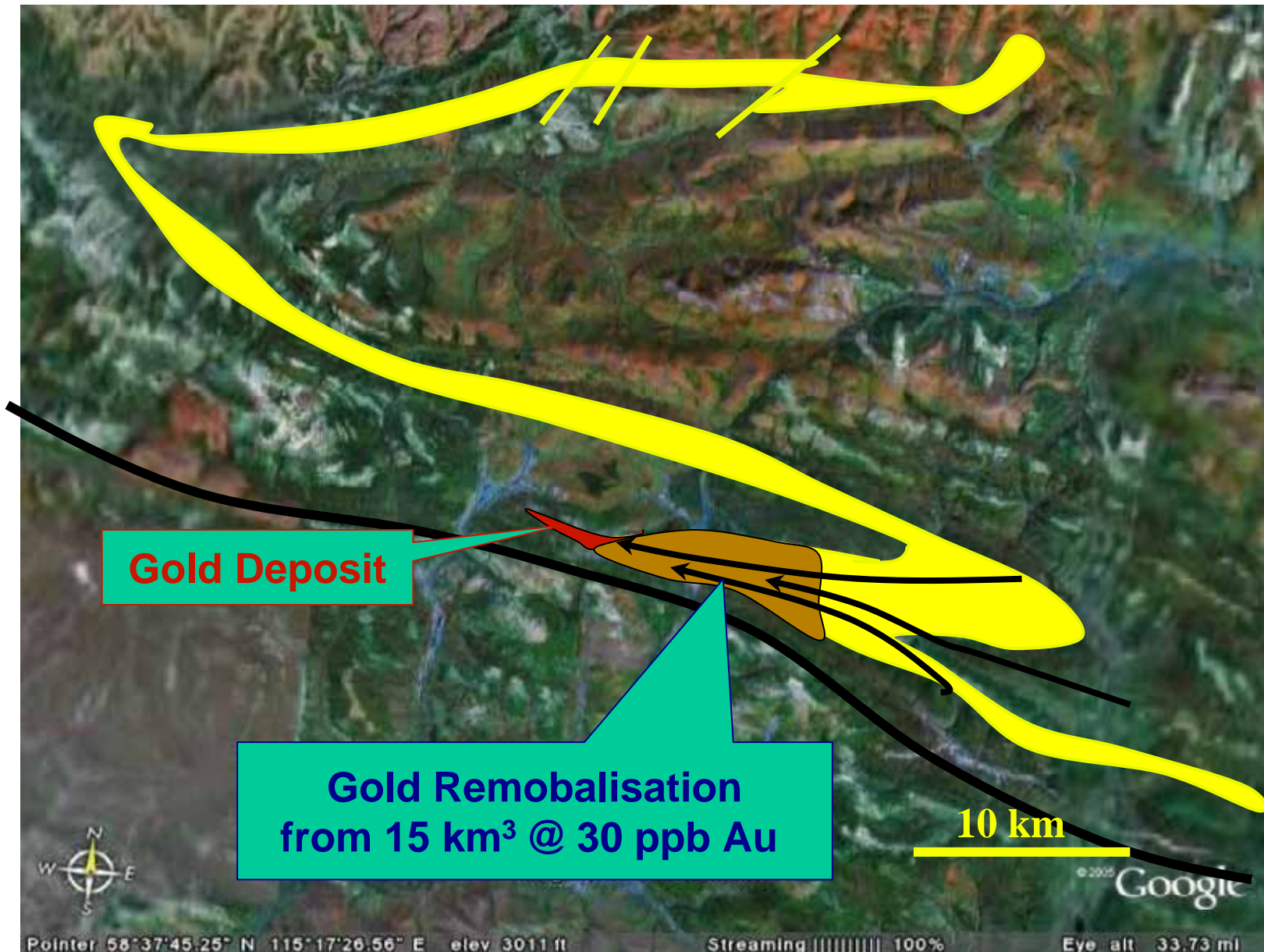
## Stage 2: Fluids focused into anticlinal cores below impermeable carbonates; leach gold in py1 from fold limbs



# Stage 2: Deformation; gold remobilisation into bedding parallel py3-py4-py5-quartz veinlets in anticlinal cores



# Gold concentration in anticlinal core





# Is Sukhoi Log Unique?



- Many other black-shale and turbidite hosted gold deposits may have a similar origin to Sukhoi Log
- E.g. Muruntau, Nataika, Macraes and the Victorian Goldfield
- Early concentration of syngenetic/diagenetic gold in sedimentary arsenian pyrite may be the key to the formation of these deposits

# Latest Edition of AJES:



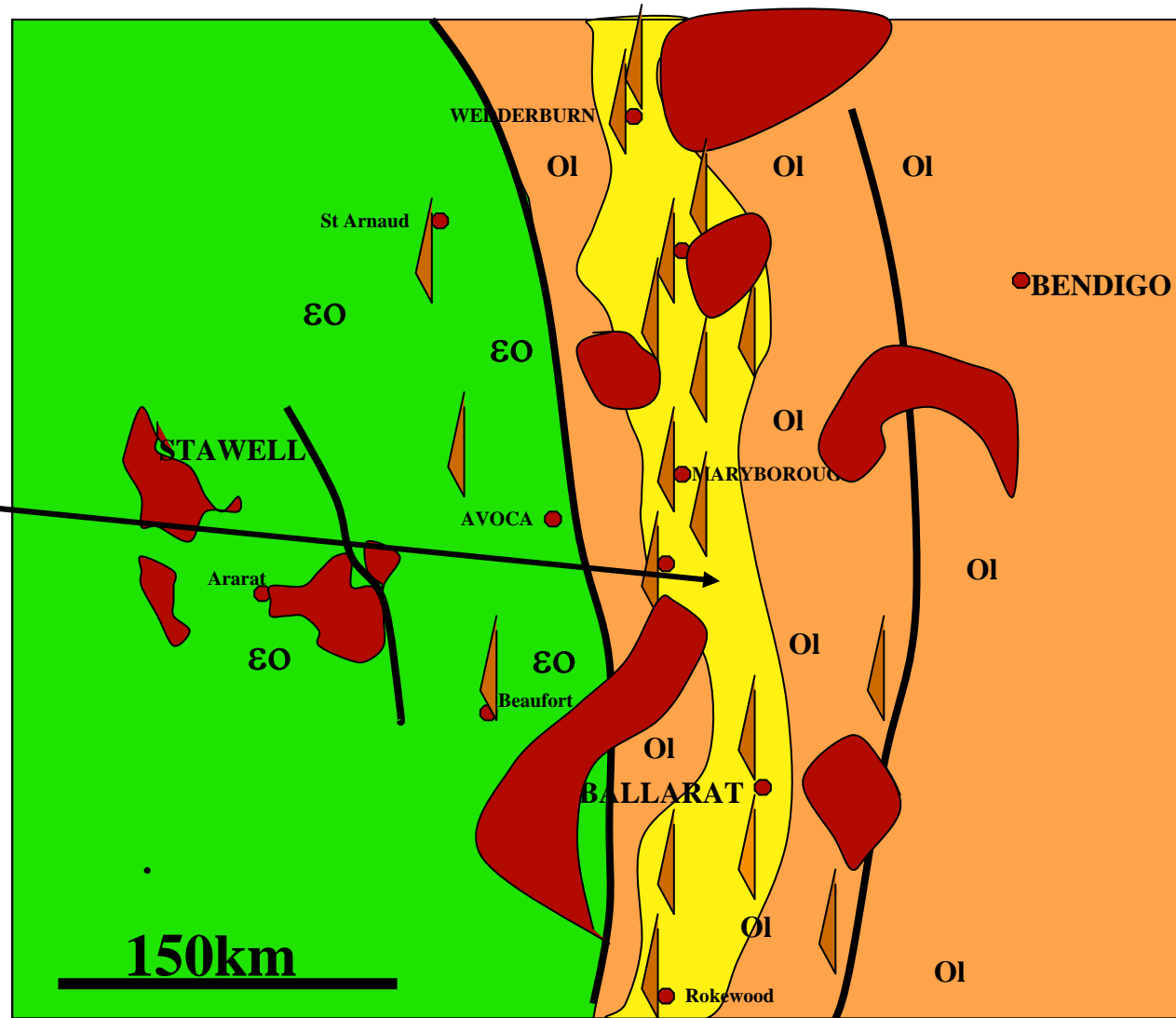
## “Syngenetic Gold in Western Victoria” BL Wood and RR Large



# Distribution of Indicators



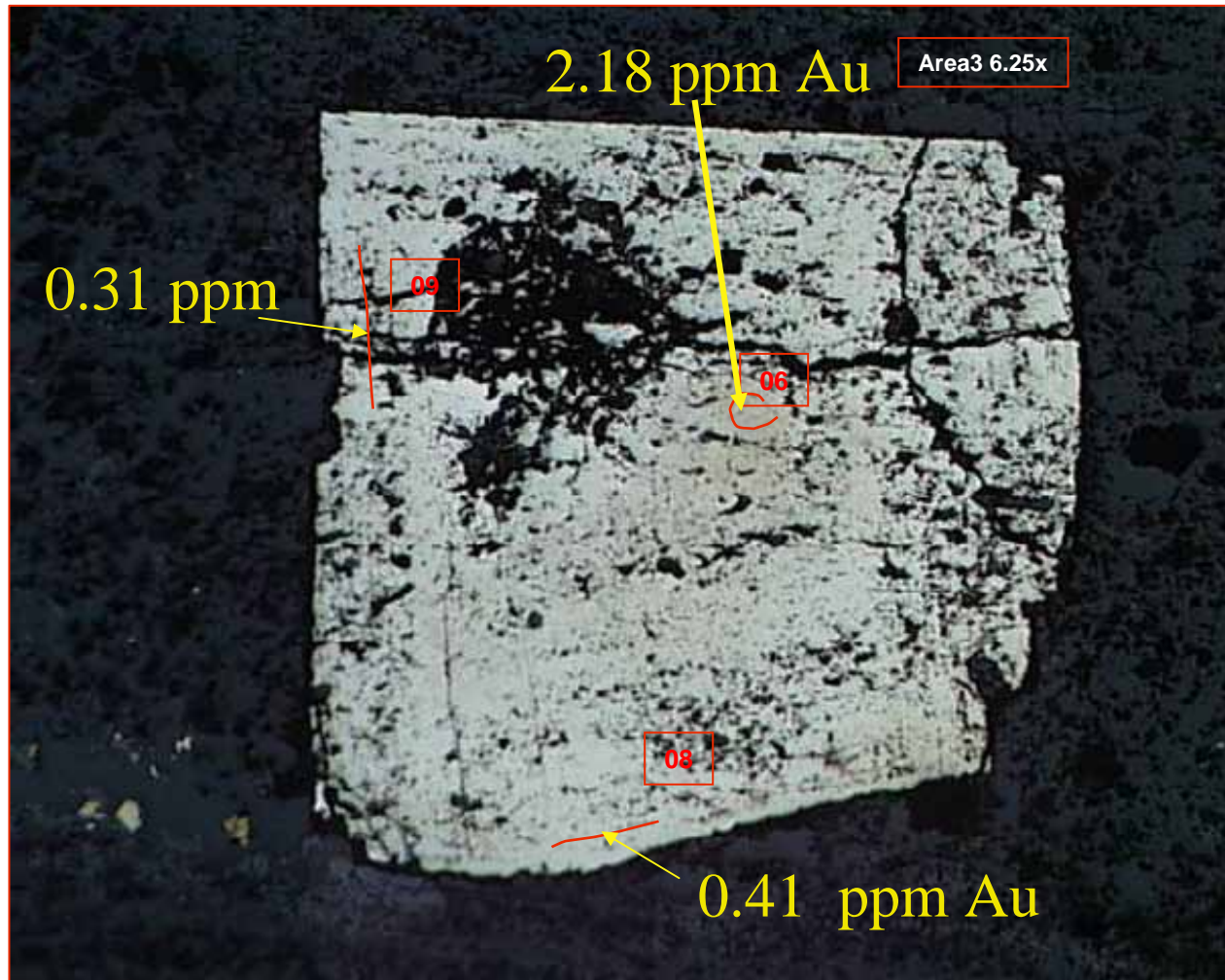
Ballarat  
Indicator  
Zone



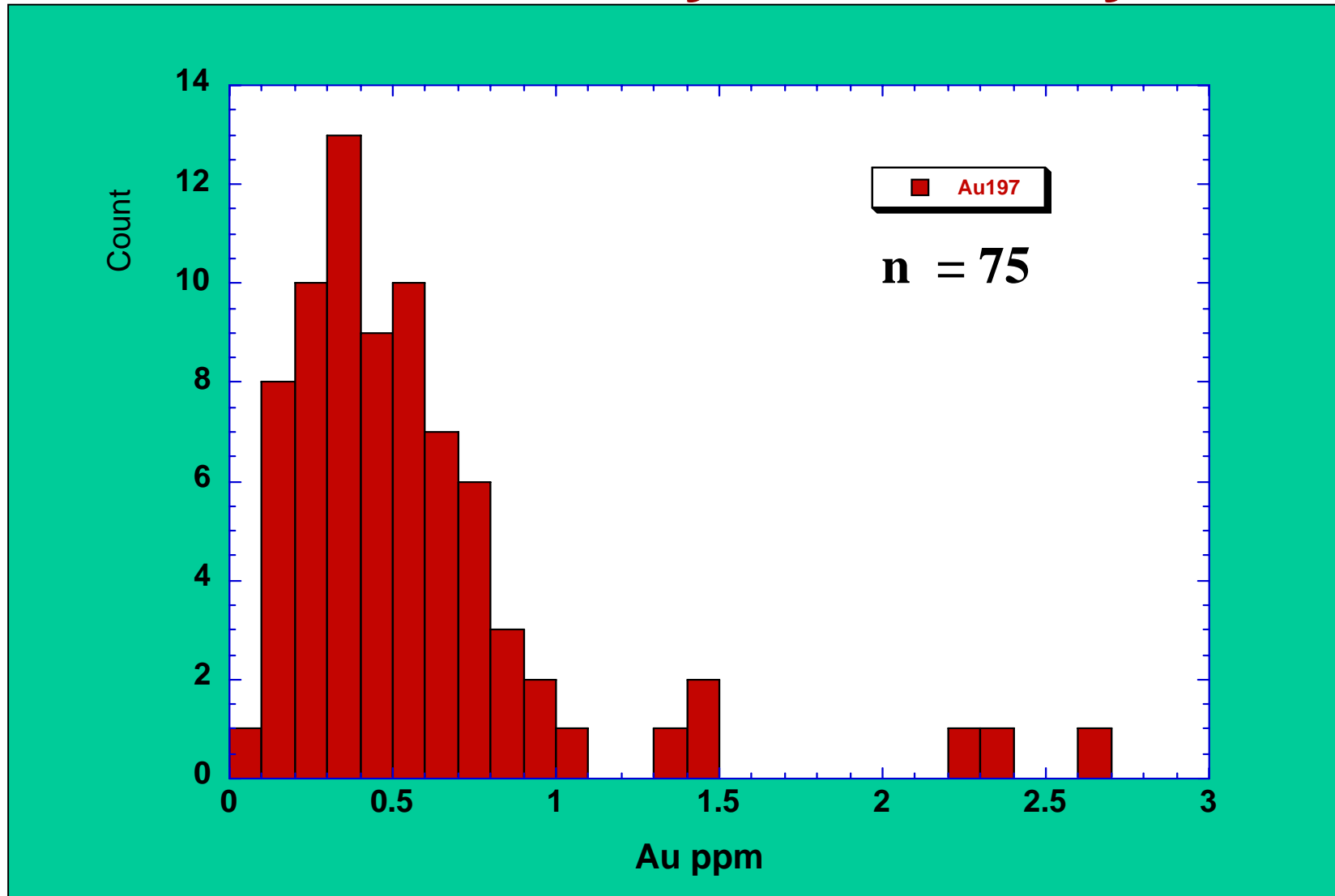
From Wood and Large (2007)



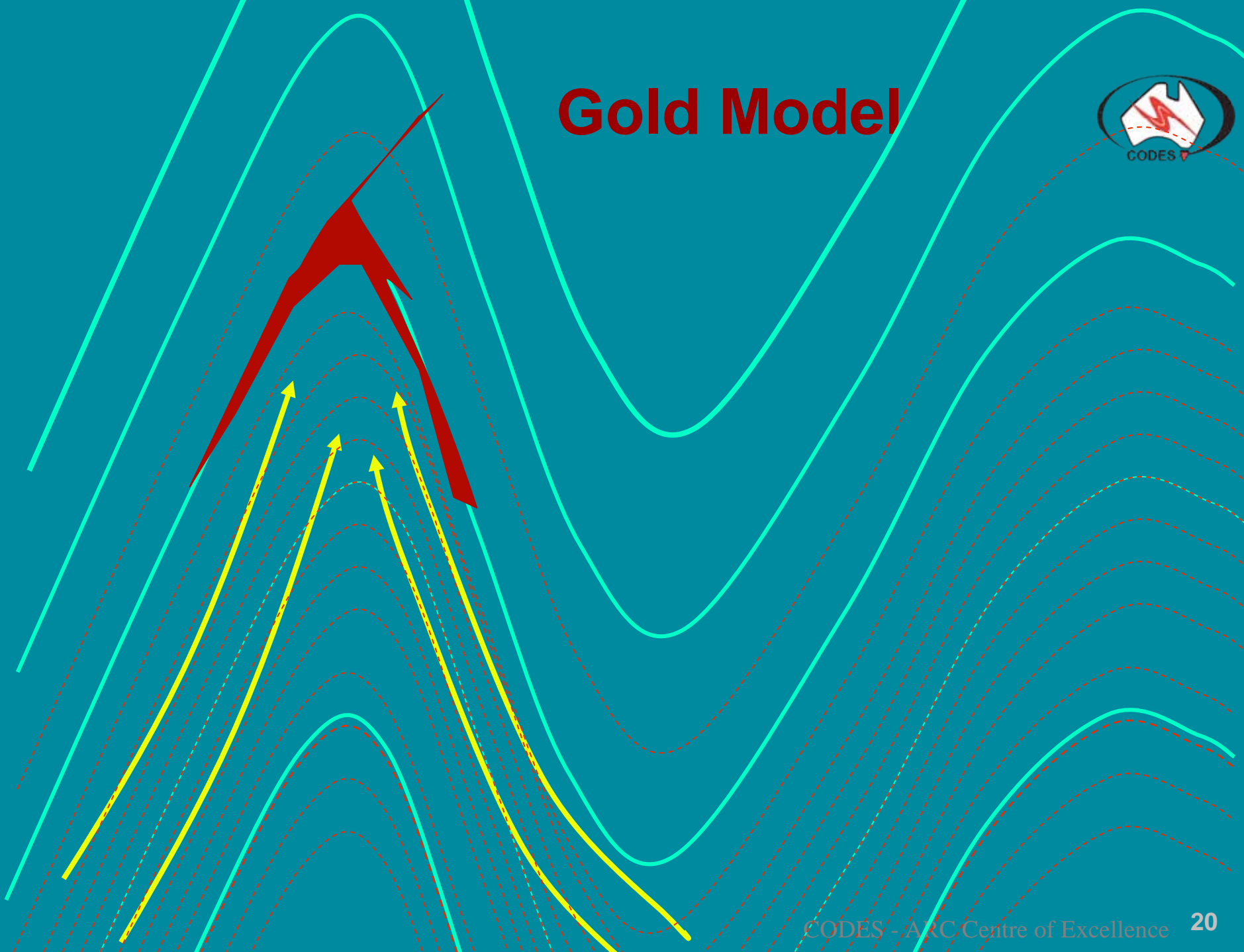
# Sample 2A; zoned pyrite



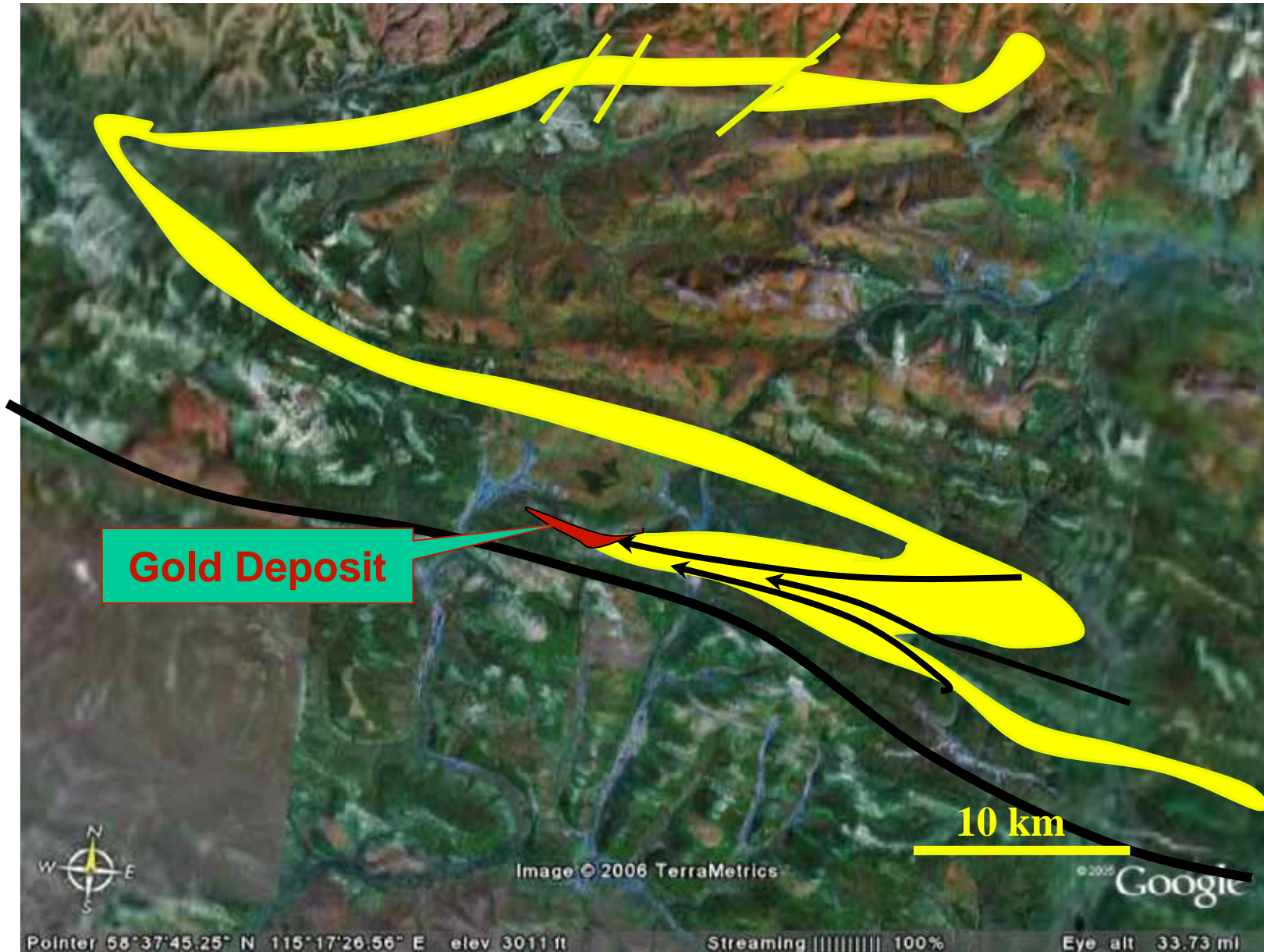
# Indicator beds - Vic Goldfields revised sensitivity for Au analyses



# Gold Model



# Gold concentration in anticlinal core





# **This Research Challenges Three Current Dogmas Related to Orogenic Gold Deposits**



**Dogma 1: “Gold is coming from some  
deep source or from  
crustal granites”**

**No.....**

***Gold is Already Present in the  
Sedimentary Basin***



## **Dogma 2: “Organic-Rich Sediments are Good Trap Rocks for Gold”**

**Yes, But.....**

***Organic-rich Sediments are  
Ideal Source Rocks for Au & As***

***plus Zn, Mo, Ni, Se, Te, V, PGE.....***

**Dogma 3: “Gold is introduced Late;  
i.e. Syn-tectonic or Post-tectonic”**

**No.....**

***Gold is Introduced Early;  
i.e. Pre-tectonic and Moved Around  
Late During Tectonism***

# Finding Gold in the Tasman



- Target black shale & reduced turbidite basins
- Focus on arsenic-rich parts of stratigraphy
- Test anticlinal and shear structures
- Join CODES Project on Sediment-Hosted Gold

**Finding Graduate Geologists.....**

**.....harder than finding gold.**

# Why?



- **Indiscriminant sacking spree in late nineties by industry - turned many off geology**
- **Mining is not flavour of the decade**
- **Reduction and downsizing of Geology Schools at Universities**
- **Less Geology taught in high schools**
- **Government bums-on-seats funding model**

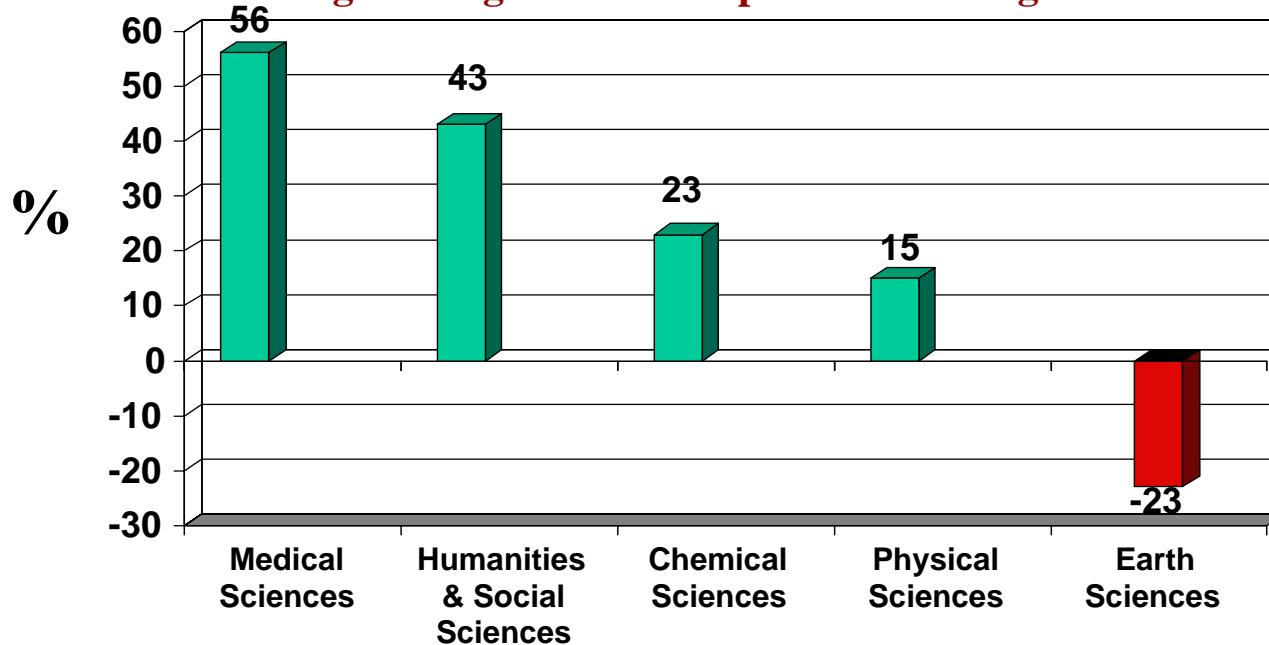


# Government Funding Model



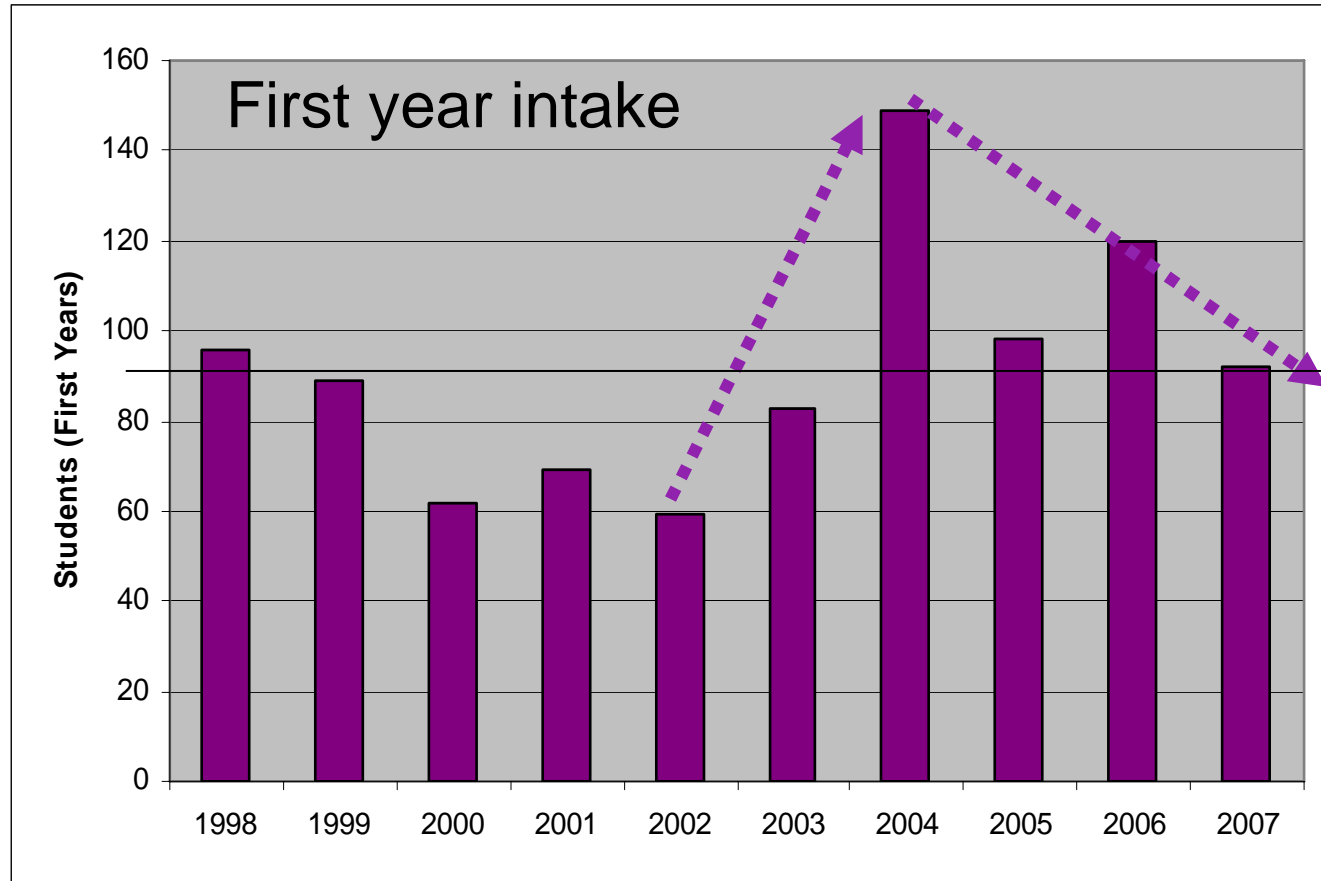
- Totally driven by student numbers
- Geology Department funds continue to decline leading to staff reductions and department amalgamations
- Insufficient funding for geology research means that earth science research is in decline

Percentage Change in R&D Expenditure in Higher Education in last 10 years



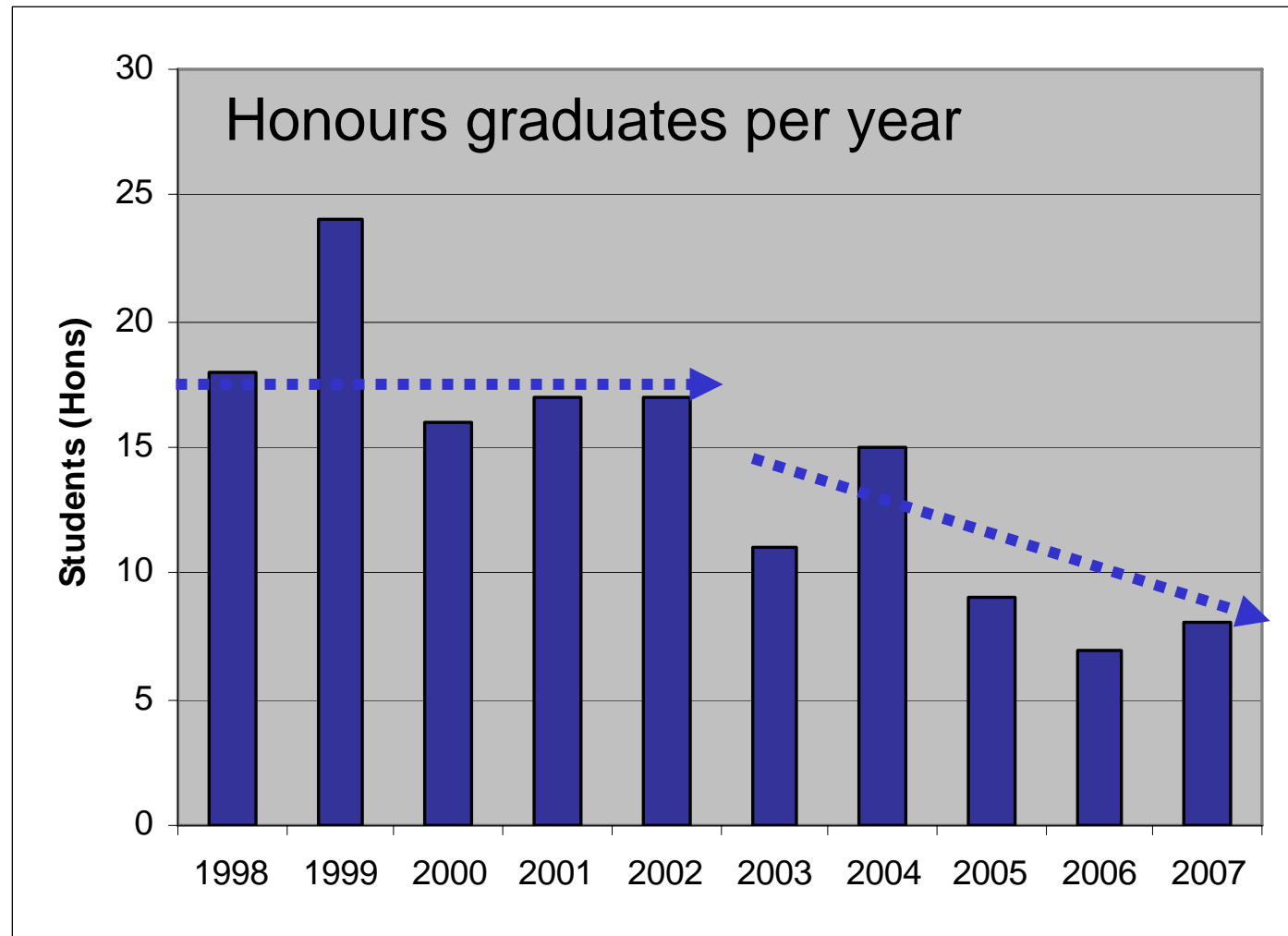


# UTAS Geology Intake

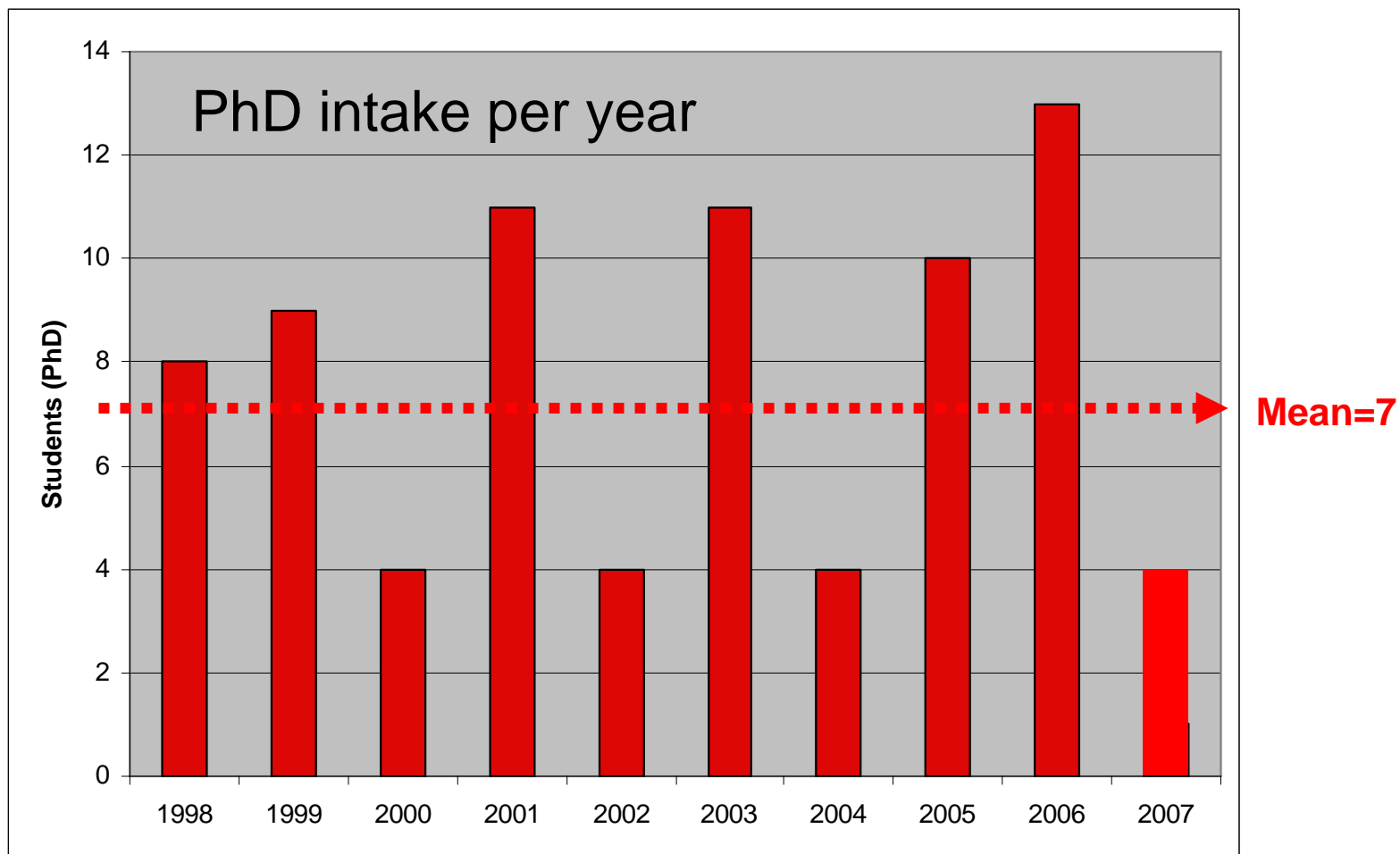


Mean=90

# Supply of Graduates for Industry



# UTAS PhD Numbers



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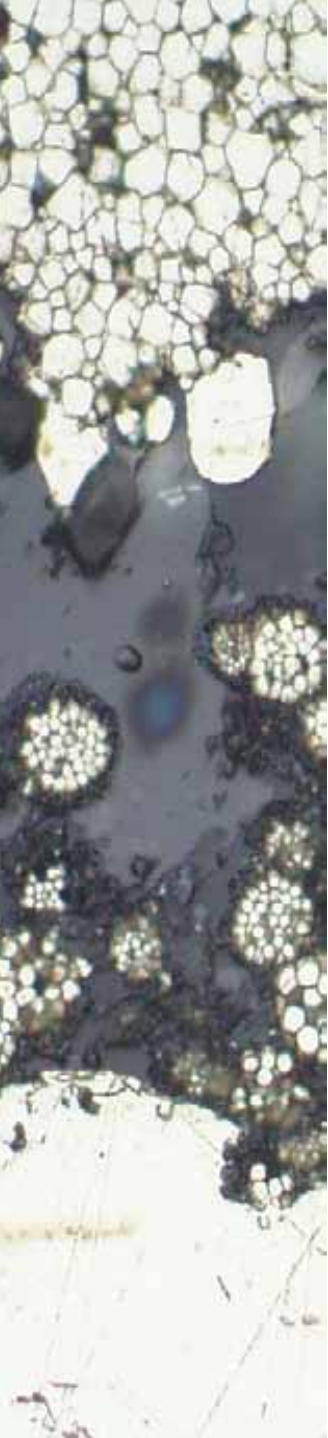
# The Crisis Situation

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- **First year in-take has been dropping**
- **Quality of first year students in decline**
- **Honours in-take has halved because of strong jobs market**
- **Dramatic decline in local PhD numbers, but offset by increased international students**
- **Many PhD students leaving before completing thesis because of excellent job opportunities**
- **Funding for teaching has dramatically declined due to these factors**





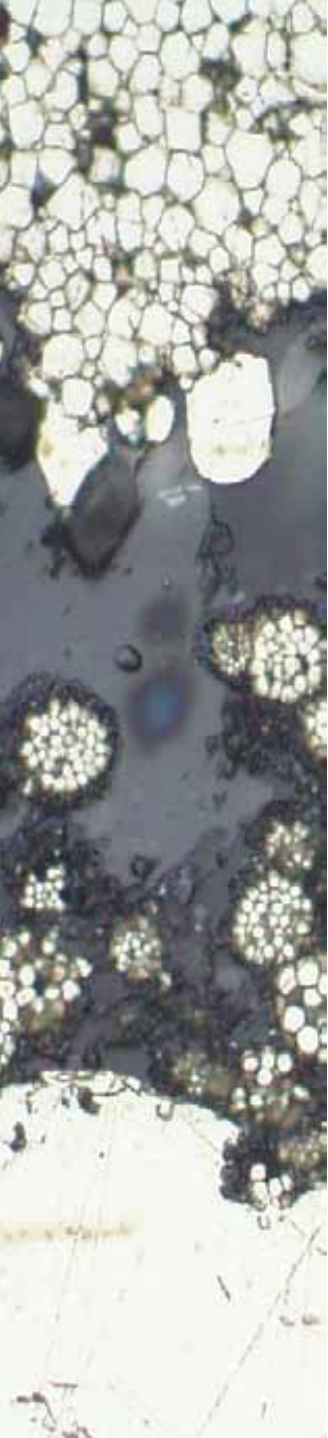
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# Solution to the Problem

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- **A unified Government approach to recognise the problem and increase funding per geology graduate**
- **Strong support from minerals industry to University Geoscience Departments**
- **Stop pinching our students before they graduate with Hons or PhD**
- **Send some of your geology staff to undertake the Mineral Geoscience Masters Program - UTAS, UWA, JCU.**



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# Solution to the Problem

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- Recognise the value of Honours with a significant salary differential
- Currently graduate salaries are 65k to 100k
- I suggest:
  - *BSc only: \$50 to 70k*
  - *BSc (Hons): \$80 to 100k*
  - *Or pay a 20k hiring bonus to hons grads*

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# UTAS Solution to Increase Intake

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- **UTAS Undergraduate Scholarship Scheme to encourage top science students into Earth Science courses**
- **Target is for 12 Industry Sponsor funded scholarships at \$10-15k pa**
- **Eight Scholarships are already funded:**
  - *AngloAmerican, Newcrest, St Barbara, Newmont, Barrick, Mineral Resources Tas., TeckComico and Oxiana*
- **We need more companies to join the program**

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# ARC Centre of Excellence in Ore Deposits

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