

# **INTRUSION RELATED GOLD WORKSHOP**

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**COLOMBIA  
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# Reduced Intrusion-Related Gold Systems:

An overview of current understanding with examples from the Tintina Gold Province, Alaska and Yukon

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Based on material provided by Craig Hart (Yukon Geological Survey), John Mair (Centre for Global Metallogeny) and Rich Goldfarb (USGS).

# Overview of Short Course Presentation

- Background: *Intrusion-related ore deposit types – a brief overview of settings, magmas and metallogeny*
- Characteristics of **REDUCED INTRUSION-RELATED GOLD SYSTEMS (RIRGS)** – *an introduction to global examples and settings*
- Introduction to the **Tintina Gold Province** (Alaska and Yukon)
- Exploration strategies
- Comparisons to other gold-deposit types

# Overview of Intrusion-Related Gold Deposits

# Plan of Attack

1. Intrusion-related Gold **Deposits**
2. Reduced Intrusion-related Gold **Systems** (RIRGS)
3. Tectonic Setting and Regional Metallogeny
4. Where in the world ... ?

# Models of Intrusion-related Gold Deposits

## 1. Porphyry Copper-Gold Deposits (PCG)

- defined as  $>0.3$  gpt Au

## 2. Alkalic Porphyry Copper-Gold Deposits (AlkPCG)

- Alkalic bulk tonnage Au

## 3. Reduced Porphyry Copper-Gold Deposits (RedPCG)

- Rowins

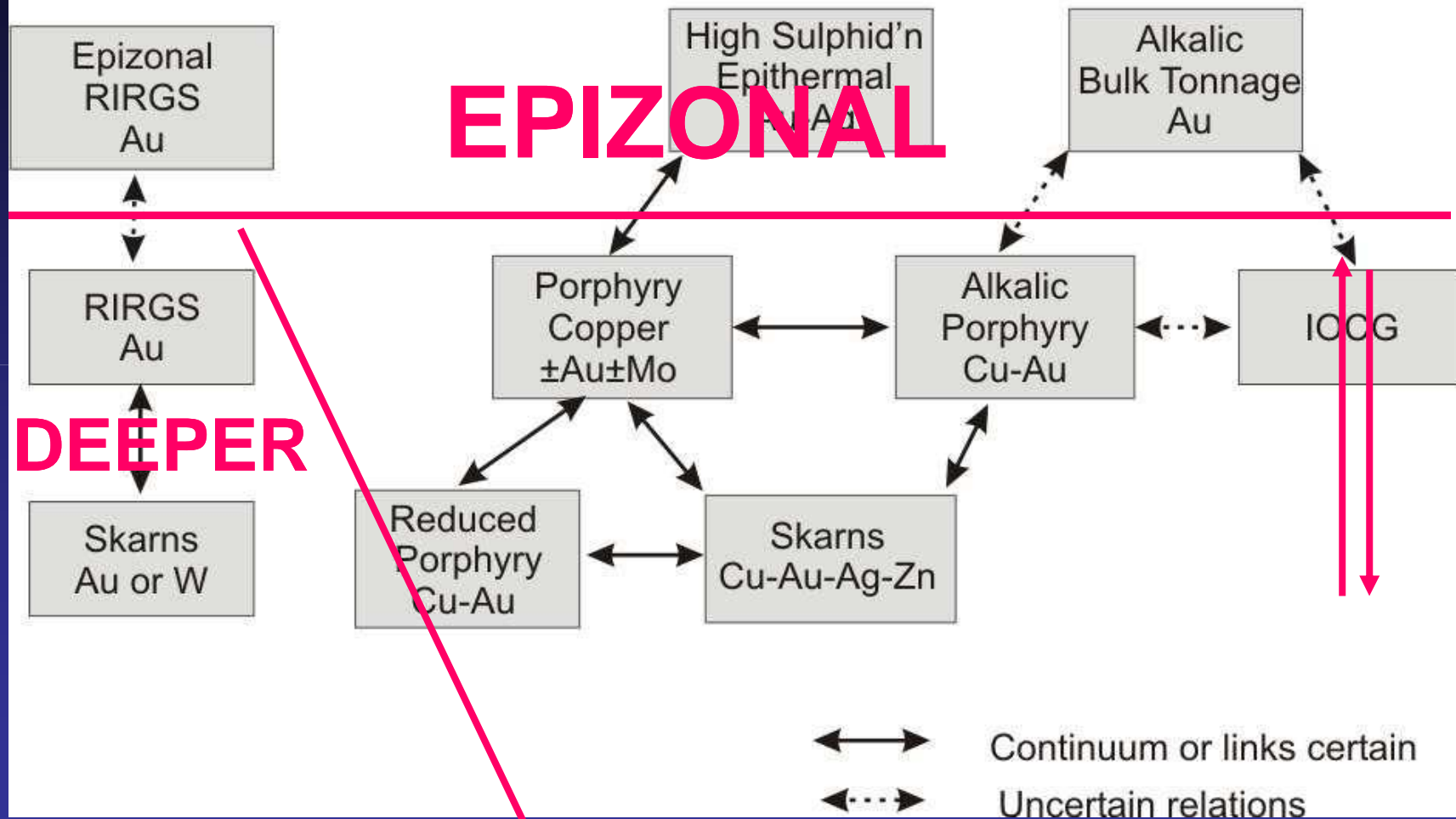
## 4. Intrusion-related Gold Systems (IRGS)

- Reduced (RIRGS)

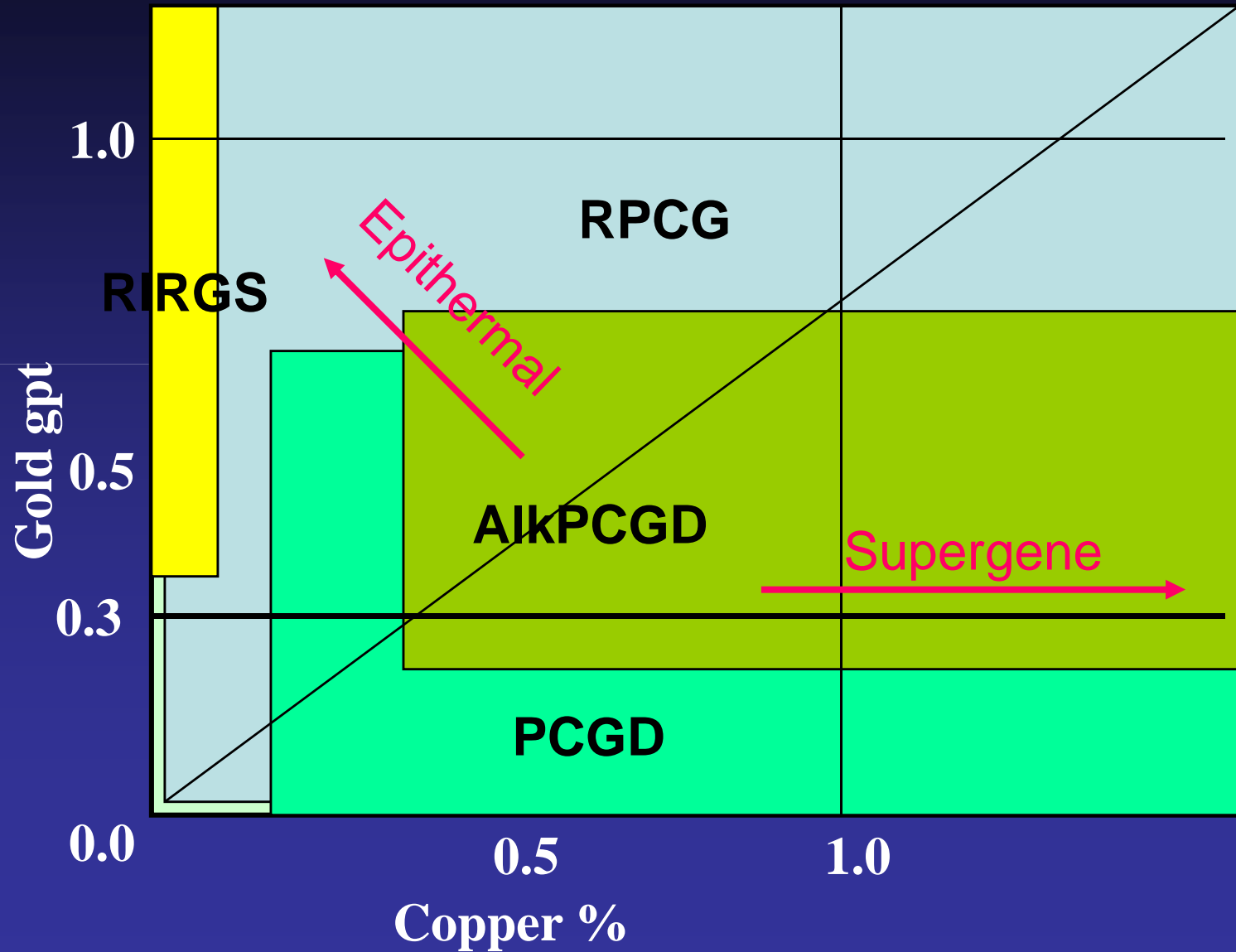
## 5. Other Models & etc...

- Alkalic associated epizonal (i.e. Cripple Creek)
- Distal disseminated (Ag-rich)
- Archean examples

## Spectrum and Relationships of Intrusion-related Gold Deposit Models



# Copper-Gold Contents





# Nature of Associated Granitoids

Reduced

Oxidized

Calc-Alkaline

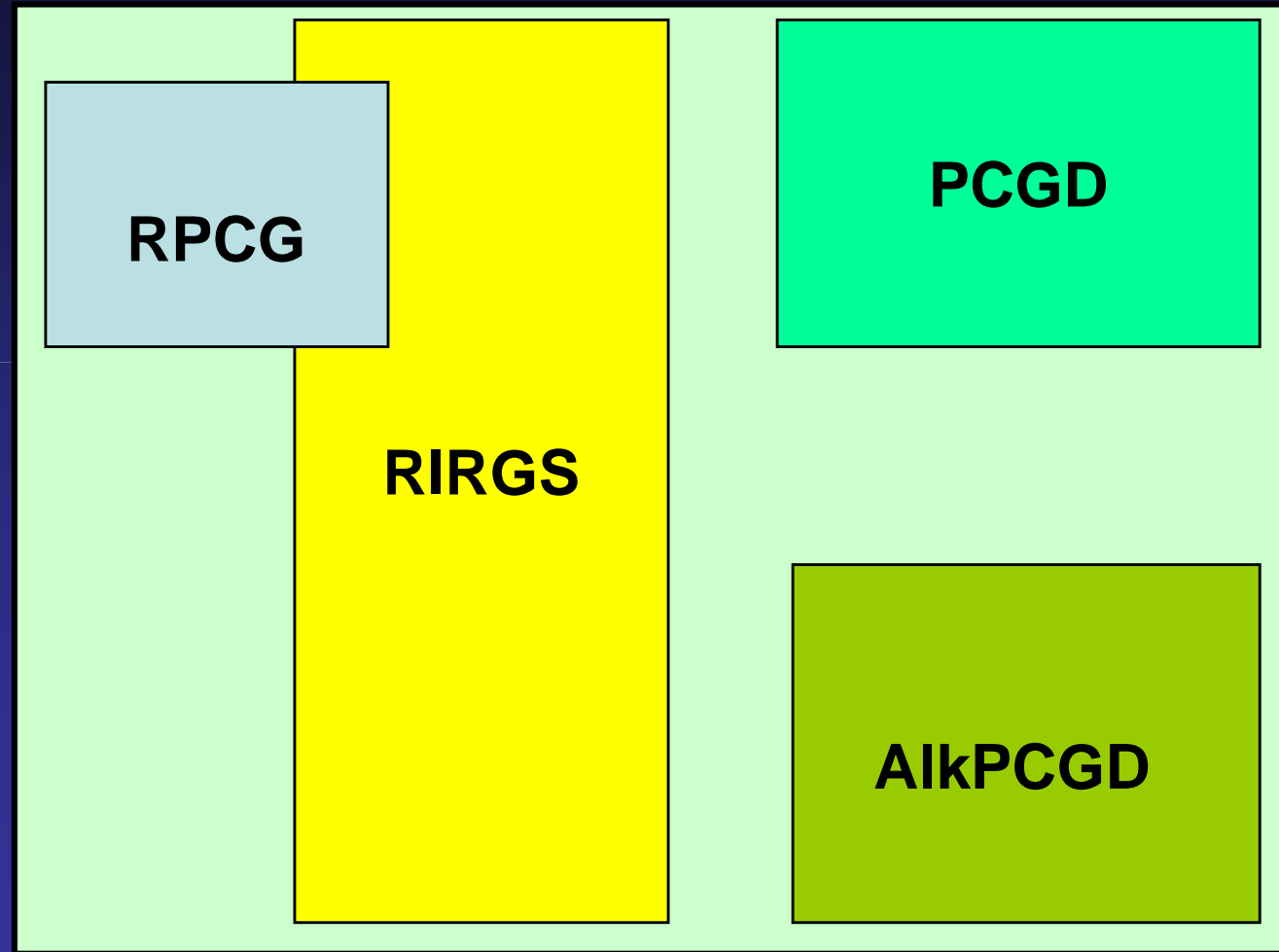
Alkaline

**RPCG**

**RIRGS**

**PCGD**

**AIkPCGD**



# Intrusion-Related Gold Systems

- New model type, in development since ~1997
- Not gold porphyries
- prev. assoc'n with Sn&W, poss. placer Au
- moderately reduced & radiogenic granites
- Back-arc to continental margin
- **key references...**
  - McCoy et al., 1997 SEG Monograph 9 Alaska
  - Thompson et al., 1999 MD
  - 2000 Cordilleran RoundUP Volume
  - Lang et al, 2000 SEG Newsletter v. 40
  - Thompson and Newberry, 2000, SEG Gold in 2000
  - Lang and Baker, 2001 MD, v. 36
  - Hart et al., 2002, SEG SpPub 9

# Intrusion-related Gold Systems

**NOT gold porphyries!!!**

**NO**

- economic base metals
- widespread alteration
- concentric shells of alteration
- multi-directional stockworks
- meteoric fluid contribution
- oxidized magmas or fluids

# Intrusion-related Gold Systems



- Intrusion-centred
- small high-level pluton
- Assoc'd skarns
- Distal Pb-Ag-Zn veins
- Possible epizonal ores

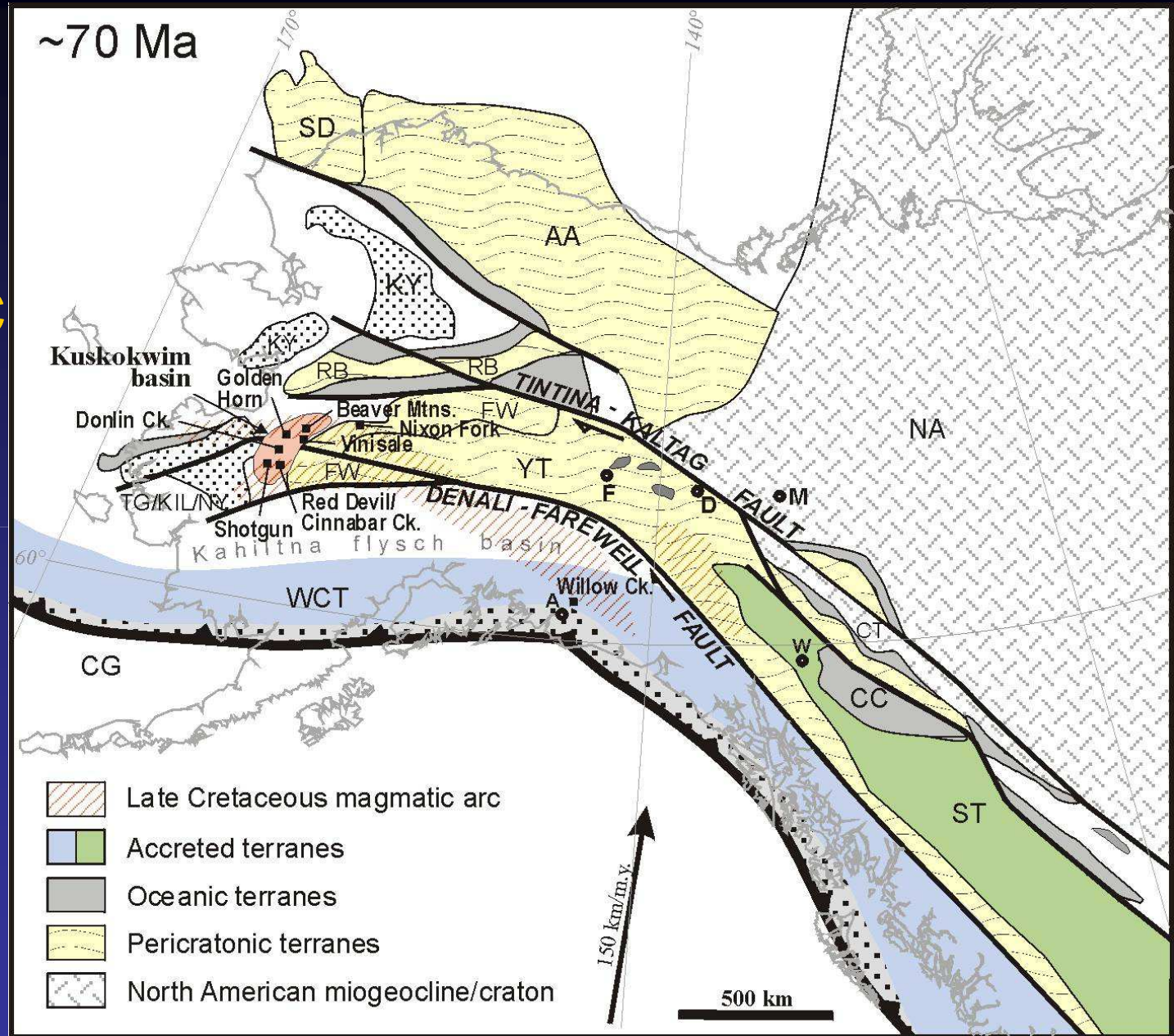
# Reduced Systems

- low  $fO_2$  mineral assemblages (below QFM+3)
- Intrusions are titanite-ilmenite NOT magnetite series
- Granites have low mag succ (0-20 x .001 SI)
- Flat aeromagnetic signatures
- Low  $Fe_2O_3/FeO$  ratios (0.15-0.4)
- Fluids locally have  $CH_4$
- Reduced IRGS

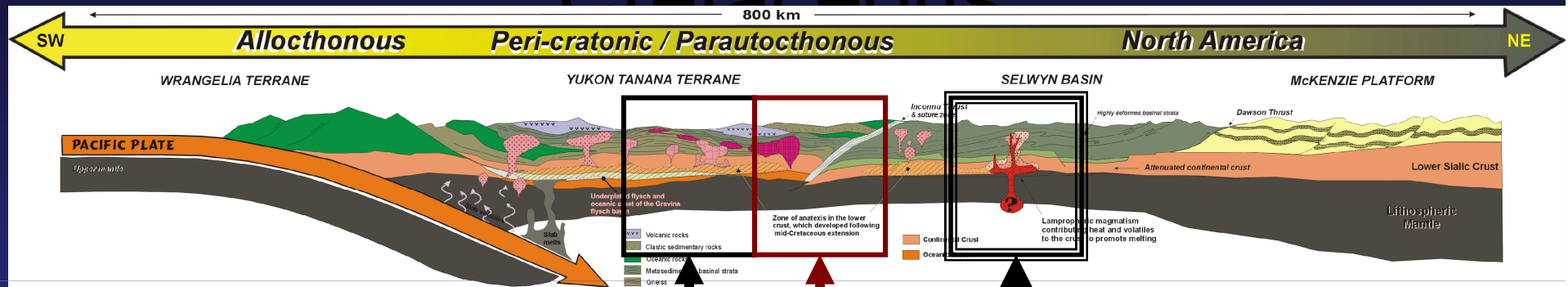
# Tectonic Setting

- Continental margin arc to back-arc
- Post-deformation to post-collision
- Push the arc into the back-arc
- Interactions/melts with reducing host rocks
- Converging metallogeny Au with W-Sn

# TGP Tectonic Setting



# the Northern Cordilleran Orogen in the Late Cretaceous



**Early K collisional orogenic Au-ve (Pogo ??)**  
**Mid-late Jurassic accretionary orogenic veins (source of Klondike placers)**  
**Early Late K RIRGS**



Oxidized magmas

Reduced magmas

Cu-Au

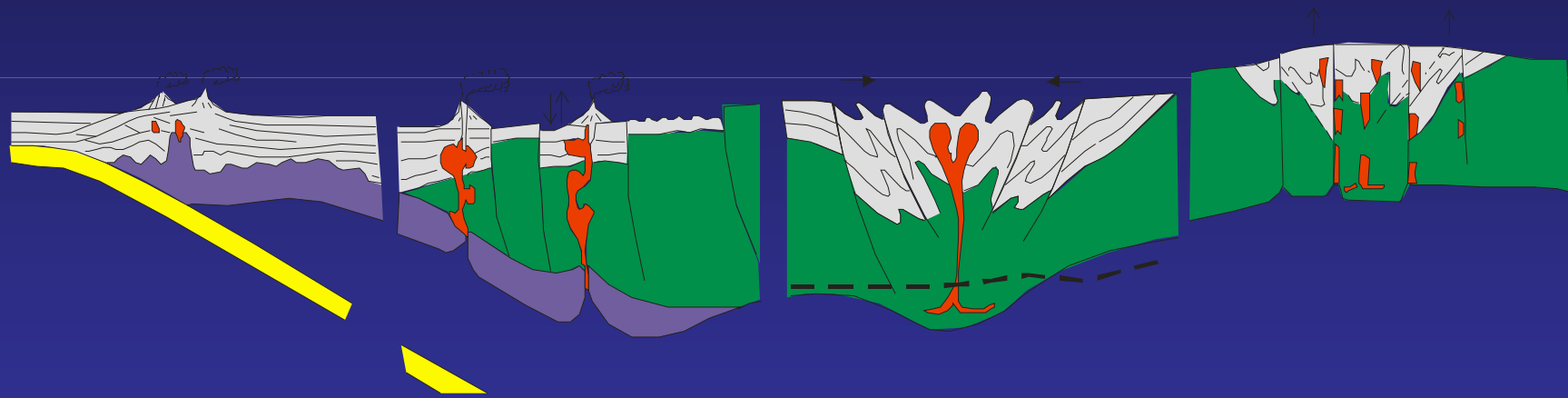
W-Sn

M-type

I-type

S-type

A-type



Oxidized magmas

Reduced magmas

Cu-Au

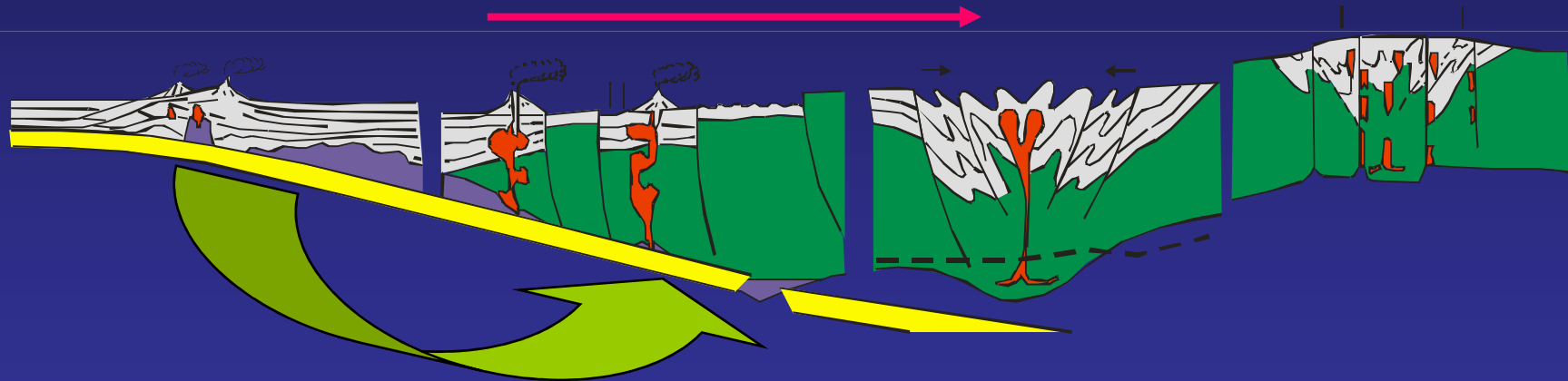
Au-W-Sn

M-type

I-type

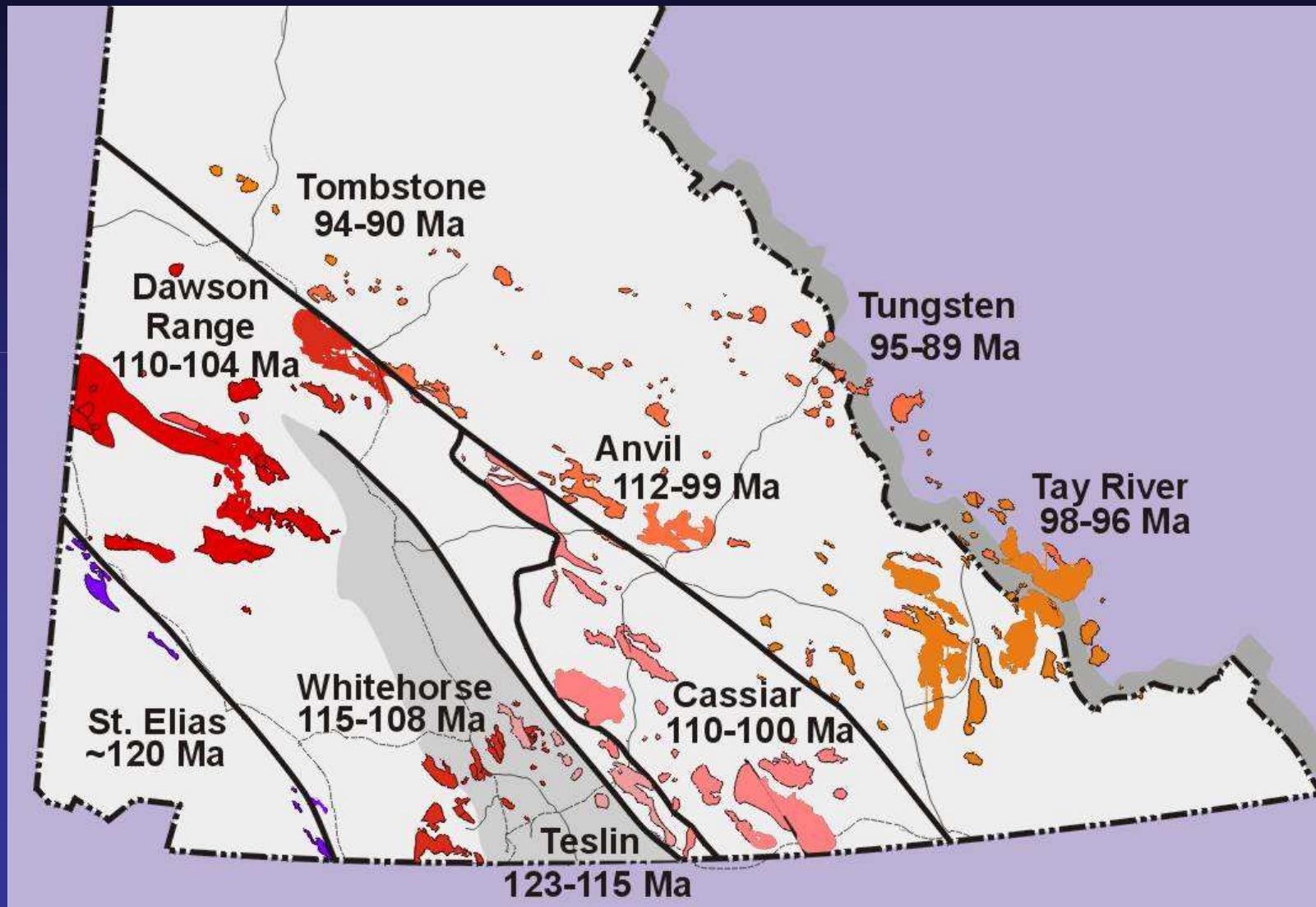
I-Type

A-type

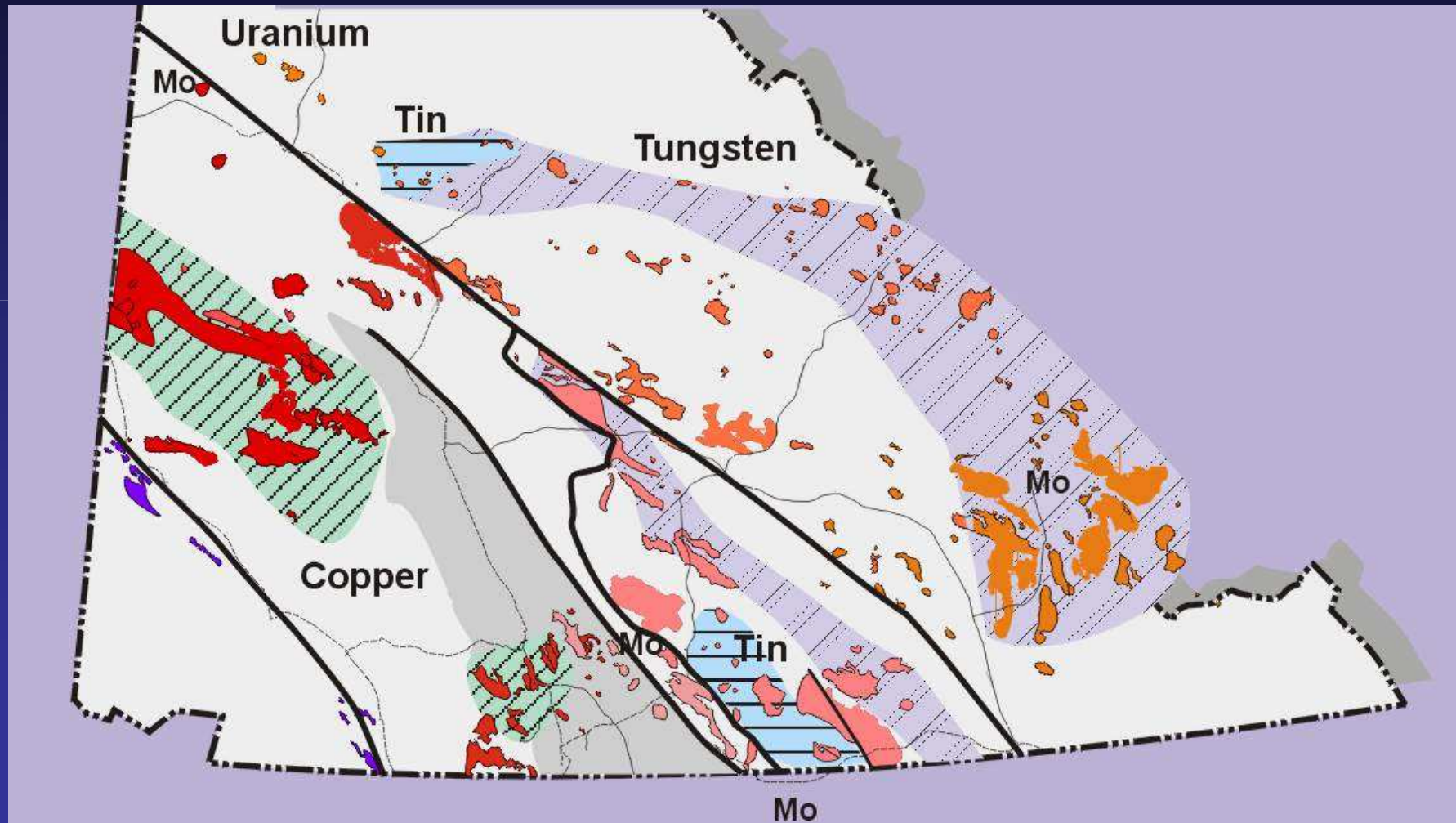


Slab-shallowing

# mK Plutonic Suites & Ages



# mK Intrusive Metallogeny





# mK Intrusive-related Gold

