Dispersion of low abundance elements determined using commercial ICP-ES/MS: case studies from Cornwall, England

Charlie Moon
University of Leicester
cjm@le.ac.uk
Provisional version July 2003
Objects

- Examine the distribution and dispersion of low abundance elements in a well understood area
- Based on commercially available analyses ICP-ES/MS
- Any surprises?
ICP-ES/MS Determination
Major Deposit Types

Schematic Mineralisation
Cornwall and W Devon
Placer Development in SW England (Camm and Hosking 1985)
Wheal Jane Study

• Major mine 1970-1991, > 30,000 t Sn conc
  80,000 t Zn
• Variety of mineralisation styles
  Greisen, main stage vein, caunter lode, cross course
• Sulphide rich, amenable to mechanised stoping
• Environmental spill, 1991 into Carnon, Cd of concern
Wheal Jane Cross Section

(After Rayment et al., 1971 & www.phdcsm.freeserve.co.uk)
Regional Geochemical Setting

Regional Sn Soils
looking NE
scene width 5 km
Nangiles Soil Lines As

Line B

750 m width

Nangiles Soils
As ppm
Nangiles Soil Lines Cu

Copper ppm

- 23.6 - 100
- 100 - 140
- 140 - 180
- 180 - 200
- 200 - 375

Line B

Width 750 m
Line B
Line B
Wheal Jane Study

• Can detect dykes
• Anomalies over B lode: Sn, W, Cu, As, Sb, Bi, Hg, In
• Pb- broad, cross courses?
• Lack of Zn or Cd- leaching?
• In stable, In(OH)₃
• Environmental concern- no Tl, low Hg
St Columb Area

• Well mineralised area
  Late plutons: tungsten vein - Castle-an-Dinas
  Breccia: tin - Treliver
  Stockwork tin + skarns - Mulberry
  Main stage vein Cu-Sn - Lanivet
  NW-SE Fe-Sb veins -
  Thrust controlled Pb-Zn - Trelow
  U veins: Sn associated? - St. Wenn

• Detailed soil coverages
Regional geochemical setting
(Camm and Moon, 2001)
Dispersion downstream Menalhyl River
St Columb signatures

- W rich cusps: W, Cu, As, Bi, Nb, Hg, Tl, Be
- Sn breccias: (Sn)
- Sn-Cu veins: (Sn), Cu, In, Tl, Sb, Zn, (W, Nb)
- U veins: Bi, Co
- Pb thrust related: Pb, Cd
Conclusions

• Combined ICP-ES/MS adds elemental data to differentiate deposit types
• Aqua regia is useful even for refractory elements
• Need data on element mobility
• In SW England high In is unexpected