Local Scale Variation

Lag sampling in the Cobar Area
NSW, Australia

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Local Scale Variations

- Structural Geology (D. Thomas, CAMECO)
  - Scale independence
  - Micro = Macro

- Does geochemical data behave like this?
- An orebody is a **local scale variation** in geochemical data

- Are regional interpretations appropriate?
Local Scale Variation

- Intro. to Cobar Geology
- Cobar Lag
- Cobar RAB
- Deeper Drilling - RC percussion
- Lessons
- Conclusions
Cobar Mineral Field

- Au: 3.5 Moz (prr)
- Cu: >0.6 Mt (p)
- Pb & Zn: 2.5 Mt & 4.2 Mt (prr)

Major deposits (pre-mining resources)

- Peak: 5.2 Mt @ 9.1 g/t Au
- CSA: 48 Mt @ 3.1% Cu, 0.3% Pb, 1.1% Zn, 18 g/t Ag
- Elura: 42 Mt @ 5.4% Pb, 8.6% Zn, 18 g/t Ag
after Glen, 1987; 1994
Cobar Goldfield Geology

Legend
Cobar Basin
- U. Amphitheatre Group
- Alley Ck Sandstone Member
- CSA Siltstone
- Great Cobar Slate
- Chesney Formation - including Transition Unit
- Basement
- Girilambone Group
- Gold Mine
- Copper Mine
- Mineralised Fault

after Stegman & Pocock, 1995
Oxidised zone of the New Cobar deposit, NSW
Example of lag types from the Cobar region

A quartz lag
B lithic lag
C ferruginous non mag lag
D ferruginous mag. lag

After McQueen, 2005
Cobar - Eastern Australia

- Rock lag (“deflationary”) sampling completed over entire tenement package - ~7,000 samples
- Depositional areas avoided
- Initial analysis of background
Spatial Linking

1km

Fe Ppm (log)

Ni Ppm (log)

Ni (ppm)

East

4000 4200

100 200

40000 60000 80000 100000

40000 60000 80000 100000

Arundell & Berthelsen

IGES 2005
- Link by Easting
- Correlations are….

Fe with …

1. As, Bi, Pb, (Mn)
2. As, Bi, Sb, (Mn)
3. Bi, Cd, Mn, Mo, Pb, Sb

8.2c
Lessons

- Background samples: non mineralised
- Correlations different for different areas
- Ratios will be inappropriate - in some areas
- Analyse each area separately OR
- Regional interpretation (e.g., leveling) need to be acutely aware of and account for these local scale effects
RAB drilling

- RAB drilling - point sampling
- “Deep soil” rather than primary bedrock - upper saprolite (2-3m)
- Again background analysis
- Correlations different in different areas and different to lag
RAB Samples

Fe with ...

1. As, Co, Zn
2.
3. As, Bi, Pb, Sb
4. As, Cu, Mn

Correlations with Mn are not as widespread as for Lag samples
New Cobar Open cut (2001)
Resolution Lag samples

- Link by East
- Fe -> As, Bi, Pb, Sb, W
- Co -> part Fe
- Also Cu, Mn, Zn
- Mn correlation in PART
- Same SMALL grid has strong Fe and Mn spatially separate
Resolution Lag samples
Lessons

- Correlations different for different areas and different sampling media
- Lag showed strong Mn correlation, RAB Fe correlations - LOCALLY!!!
- Not all elements!
- Analyse each media and each area separately OR regional interpretation must account for these local scale effects
Resolution Prospect

- Was depletion present?
- RAB refusal / textured rock - 5m
- Upper saprolite - pink
- Is this a good geochemical sample?
Resolution - Section 4800N

LHS: Mn, Fe, Zn, Pb
RHS: Au

Au 0.16ppm
Quartz vein

Au 0.06ppm
Fe

50m
RC98RS010 - depleted to 52m; Mn at 54m
Resolution

- Oxidised to 40-80m
- Depletion to 50m (RAB refusal - 5m)
- Enrichment of Mn, Co, Zn adjacent to background Pb. *HM/GO boundary*
- Minor Au mineralisation above associated with QV and Fe NOT Mn - *Au removed?*
- Drill to below Mn layer(s) / HM-GO as minimum
Lessons

- RAB refusal **MAY** not equal good geochemical sample - *in some areas*
- Initial drilling to primary rock / sulphide (penetrate 10m?) to determine whether depletion is present
- Depth of depletion is a local phenomena in the Cobar area
Conclusions

- An orebody is a local scale variation in geochemical data
- “Subtle” signals may be not so subtle if we view data differently
- Regional scale data analysis is likely to miss “excursion” style anomalism
- Complex Regolith -> Rejoice in the Local variability - it will hide ore!