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GEOSCIENCE AUSTRALIA

Chalcophile and Key Element Distribution in the Eastern Goldfields: seismic traverse EGF01

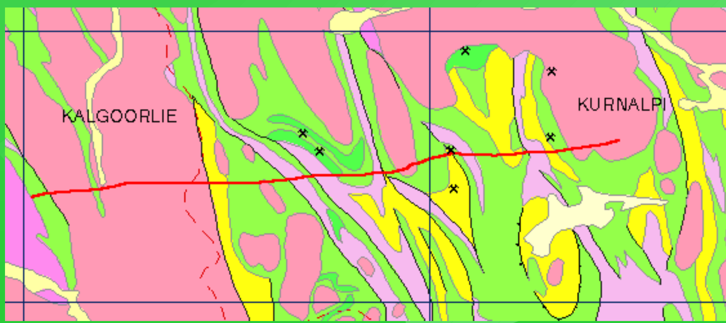
Aleks Kalinowski
Geoscience Australia, pmdcrc Y2 project

Aleks.Kalinowski@ga.gov.au
www.pmdcrc.com.au

predictive mineral discovery

Seismic Transect EFG01

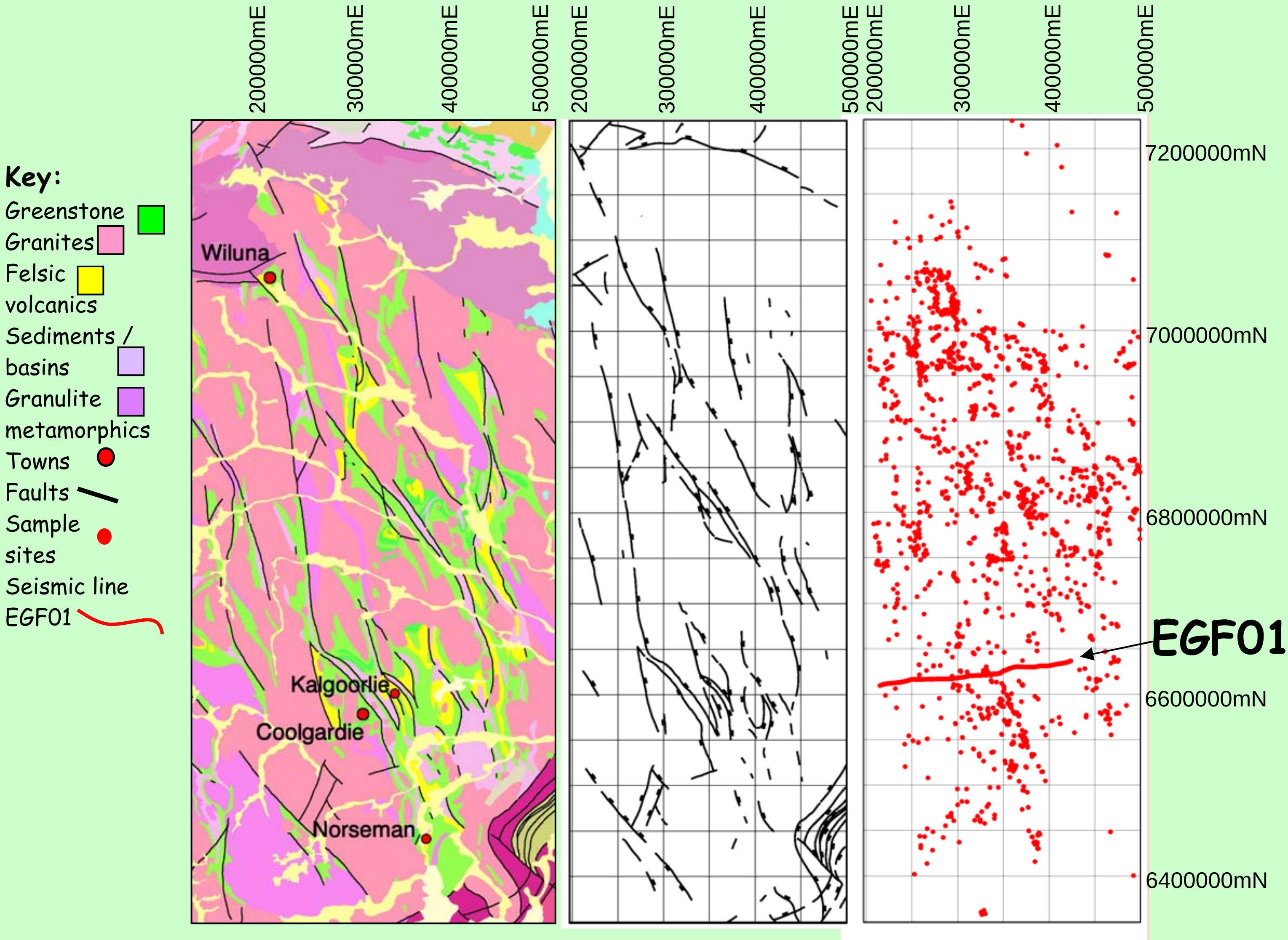
- The 213 km long seismic transect was completed in 1992*.
- 883 bottom hole samples were analysed for over 30 minor and trace elements including Ag, As, Ba, Be, Bi, Ce, Cr, Cu, Ga, Ge, Hf, Li, Mn, Mo, Nb, Nd, Ni, Pb, Rb, Sc, Se, Sn, Ta, Th, U, V, Y, Zn, Zr, Au, Pt, Pd.
- Although bedrock was targeted in geochemical sampling, it is important to bear in mind that it is inevitable that other material, such as regolith, was included.
- The Kalgoorlie Seismic Transect EGF01 (below, red line) passes through the Kalgoorlie and Kurnalpi 1:250 000 sheets. Dotted line is a magnetic boundary.
- * See Goleby *et al.*, 1993



Method

Geochemical profiles along EGF01

- Geochemical profiles produced using the geochemical analysis tool GDA.
- Profiles were compared to positions of known faults as well as geology - some new faults were discovered in the process.
- The geology and structure have since changed slightly from that used here (geology used here was current in January 2003).
- The next slide shows the 1:2 500 000 geology, main faults and geochemical sample sites (including seismic line EGF01) in the Eastern Goldfields (from Geoscience Australia's Ozchem database).



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The images

- The graphs in the accpmanying documents show a comparison of the abundance of a particular element along the length of the seismic line (from 120°30′ to 122°).
- Faults and geology are located below the graph for comparison (with legend below).
- Values are in parts per million (ppm) unless stated otherwise.
- A few graphs show a comparison between the abundance of several different elements, for example, the relationship between arsenic and gold.
- NB: these profiles are intended to be looked at from a regional perspective (hence some detail may be lost).

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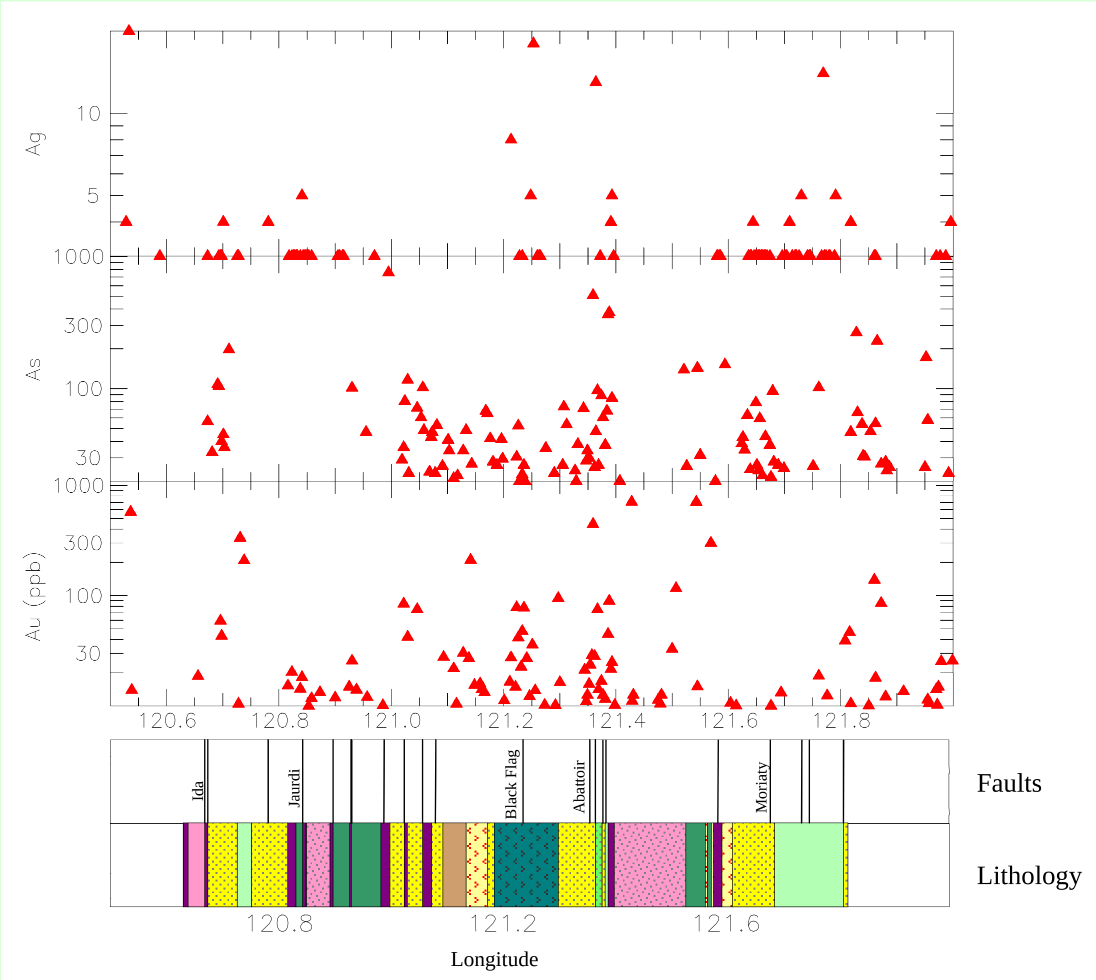
Gold, Arsenic and Silver Distribution Along EGF01



Lithology

Archean

- Monzogranite
- Monzogranite, granitoid, granite
- Polymictic conglomerate
- Sedimentary rock
- Felsic volcanics
- Basalt, dolerite, gabbro
- Basalt and komatiite
- Basalt, high-Mg and tholeiitic (upper)
- Komatiite
- Basalt, tholeiitic and high-Mg (lower)

Faults

West ↕ East

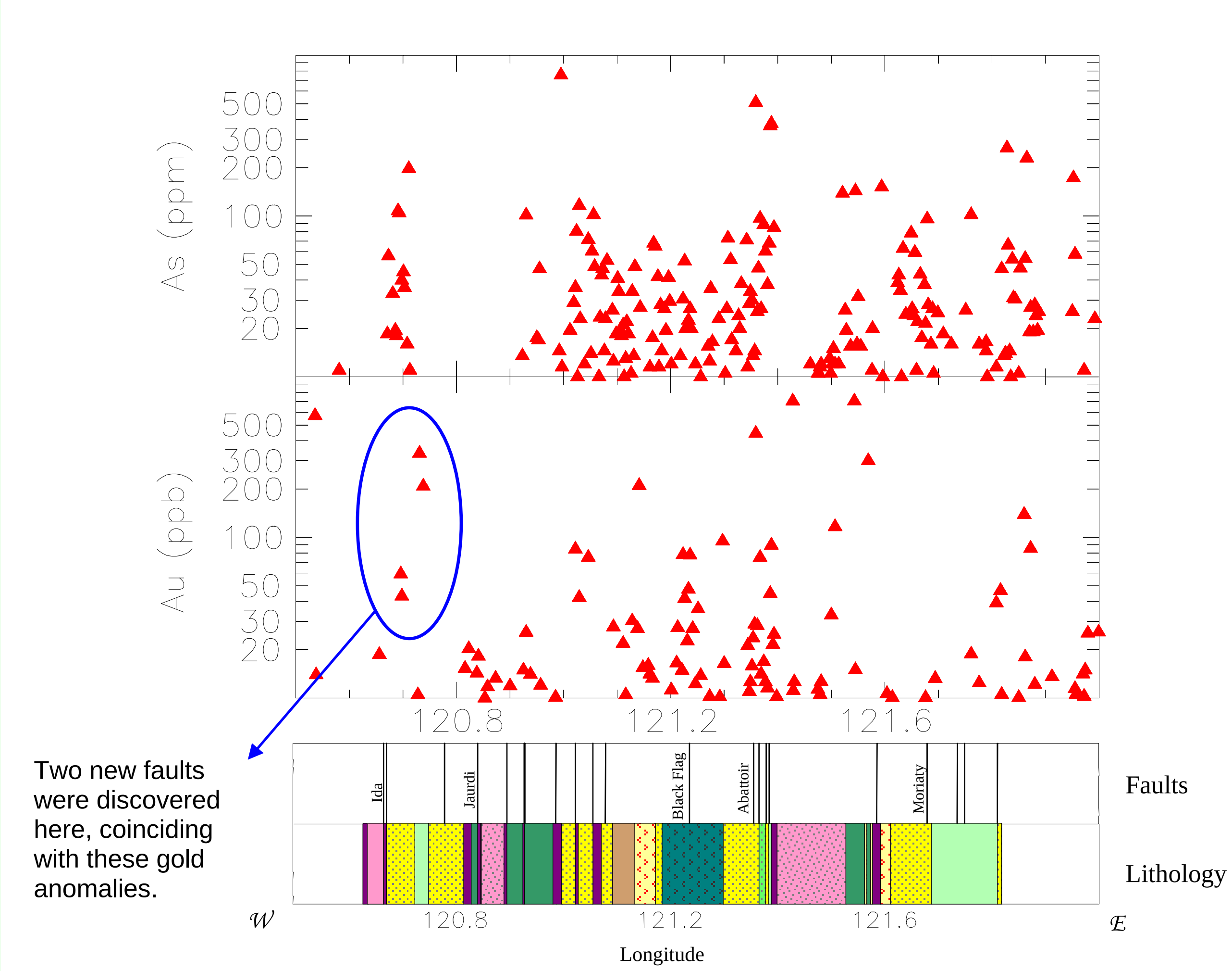
Ida Fault
Ida Fault Offshoot
Bullabulling Shear
Au Jaurdi D1 Thrust
Jaurdi D1 Thrust
Kunanaling Shear Zone (Western boundary)
Kunanaling Shear Zone (Eastern boundary)
Unnamed fault
Unnamed fault
Unnamed fault
Au Zuleika Shear
Au Black Flag Fault
Abattoir Shear
Au Boorara Shear Zone (Western boundary)
Au Boorara Shear Zone (Eastern boundary)
Au Kanowna Shear
Au D1 Thrust
Moriaty Shear
Unknown fault
Unknown fault
Unknown fault

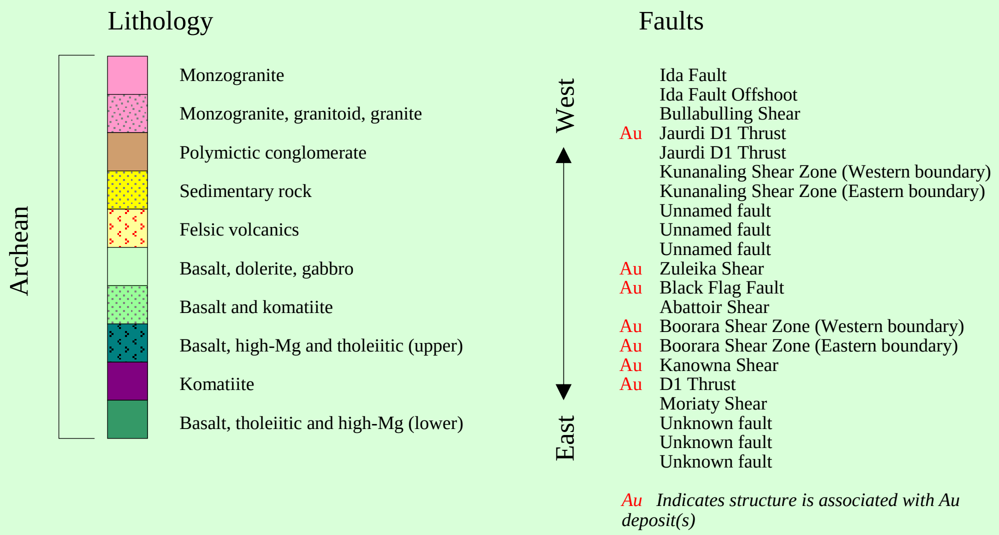
Au Indicates structure is associated with Au deposit(s)

Comments

The distribution of silver, arsenic and gold seems to coincide for the most part and is also related to faults rather than lithology. See also thr Au-As graph. The low abundance of silver, even relative to gold and arsenic, makes it a fairly insignificant factor in identifying potential mineralisation zones. Logarithmic Y-axes.

Gold and Arsenic Distribution Along EGF01

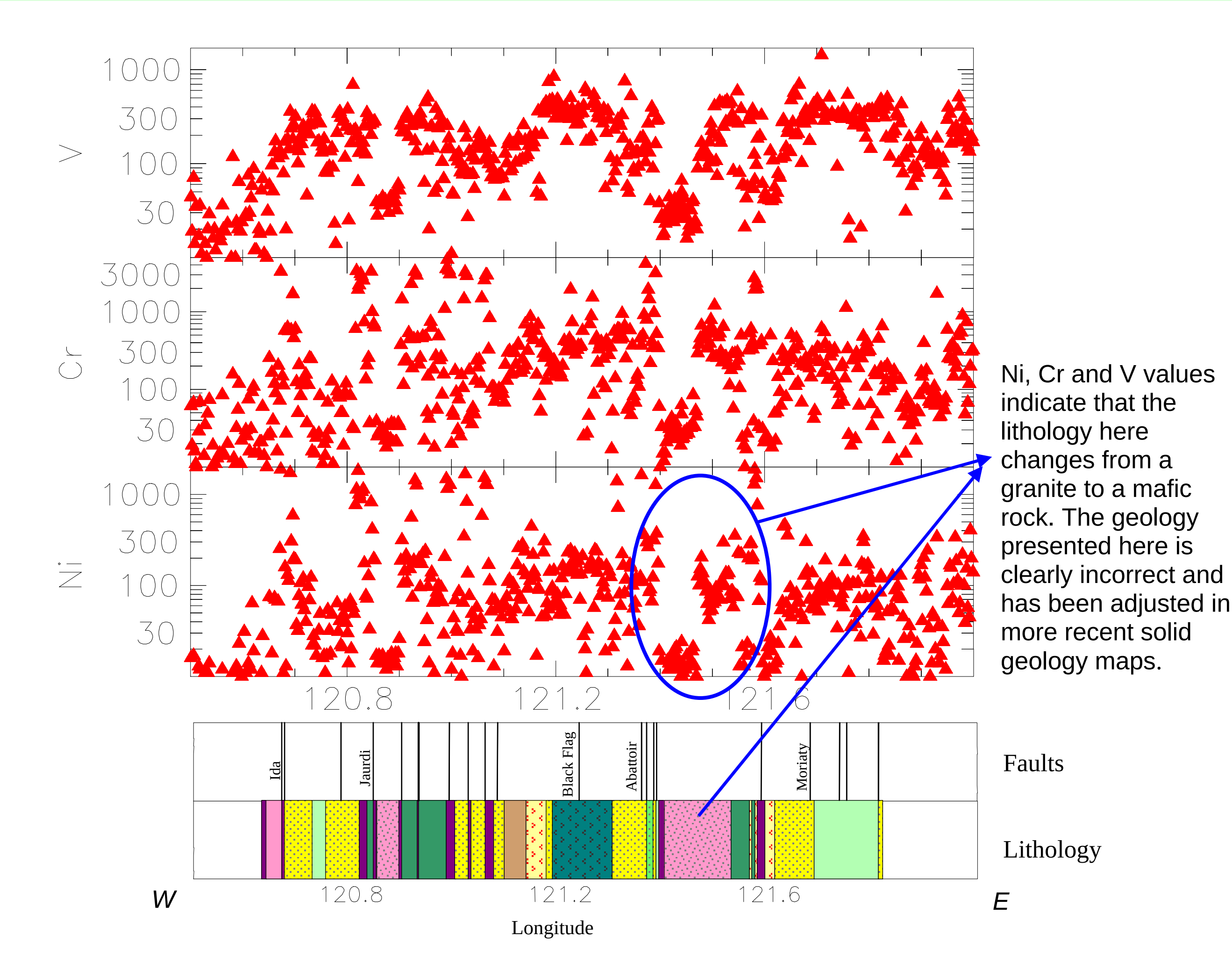




Comments

It is clear from the graph that gold distribution is controlled primarily by faults. There seems to be a reasonably close correlation between gold and arsenic although arsenic is by far the more abundant element. Gold anomalies are spatially restricted to the fault, apparently without a more extensive halo. This makes gold very good at picking up existing faults (and confirming the position of new faults) but not particularly useful as a vector to mineralisation. Arsenic anomalies appear to be slightly more widespread. Logarithmic Y-axis.

Nickel, Chromium and Vanadium Distribution Along EGF01



Lithology

Archean

- Monzogranite
- Monzogranite, granitoid, granite
- Polymictic conglomerate
- Sedimentary rock
- Felsic volcanics
- Basalt, dolerite, gabbro
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Unnamed fault
Unnamed fault
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Au Zuleika Shear
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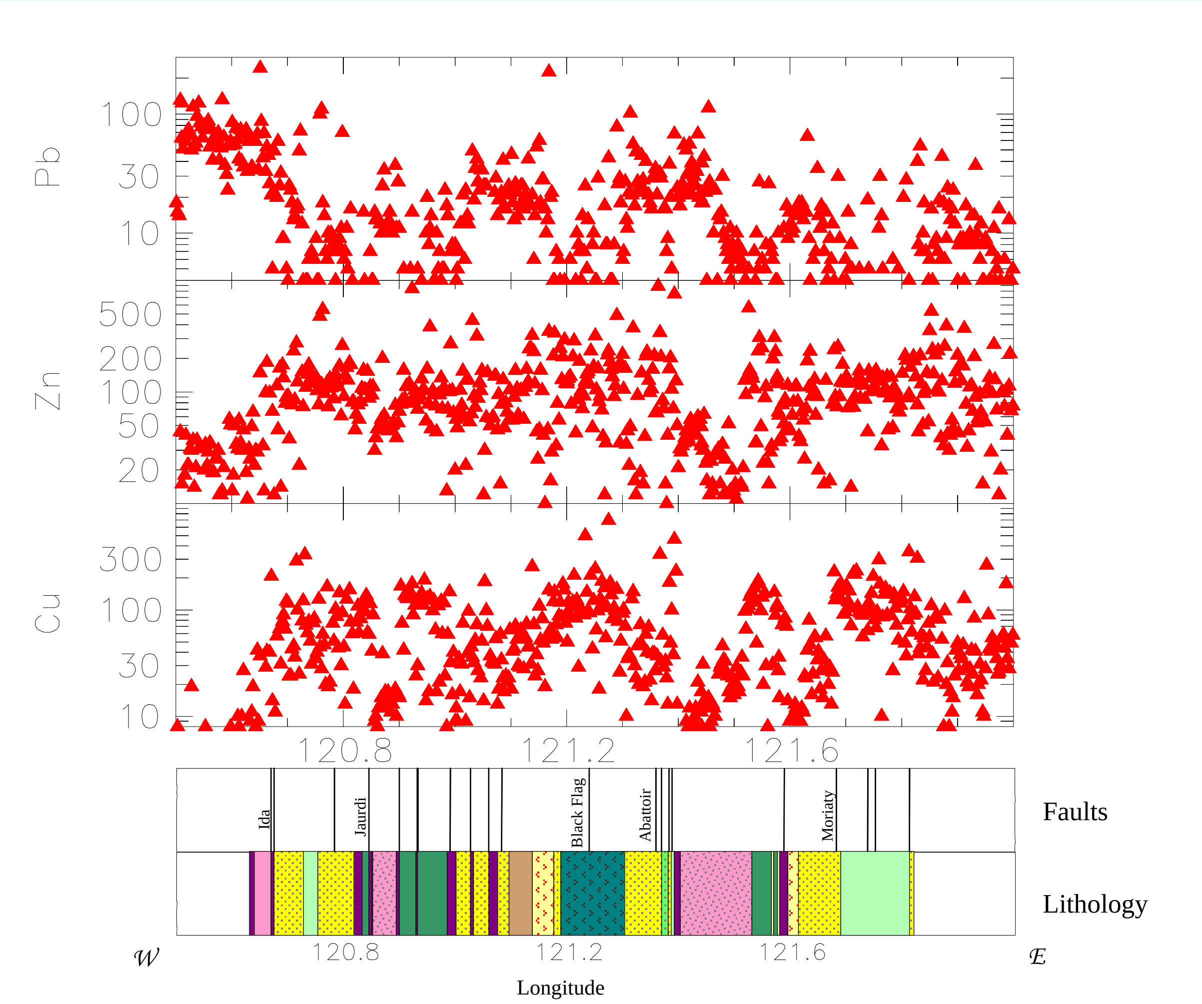
Au D1 Thrust
Moriaty Shear
Unknown fault
Unknown fault
Unknown fault

Au Indicates structure is associated with Au deposit(s)

Comments

The abundance of Ni, Cr and V seems to be closely related to rock type and for the most part unrelated to faults. For example, there is very little Ni, Cr and V in the granites (pink), as expected, while these elements are abundant in komatiites and basalts (green, purple). Values in ppm (very low and very high values were not used to construct these graphs). Logarithmic Y-axis.

Copper, Zinc and Lead Distribution Along EGF01



Lithology

Archean

- Monzogranite
- Monzogranite, granitoid, granite
- Polymictic conglomerate
- Sedimentary rock
- Felsic volcanics
- Basalt, dolerite, gabbro
- Basalt and komatiite
- Basalt, high-Mg and tholeiitic (upper)
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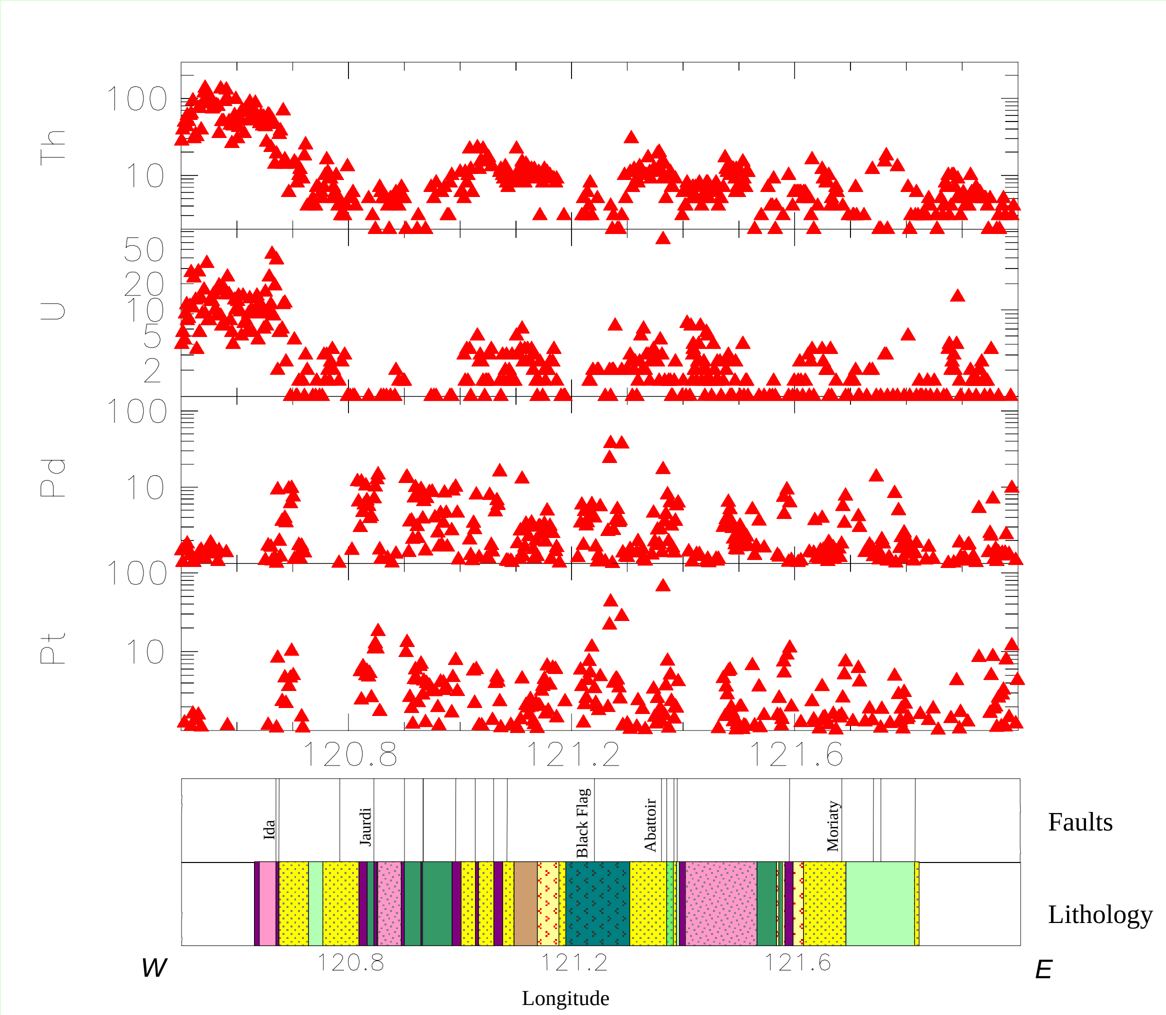
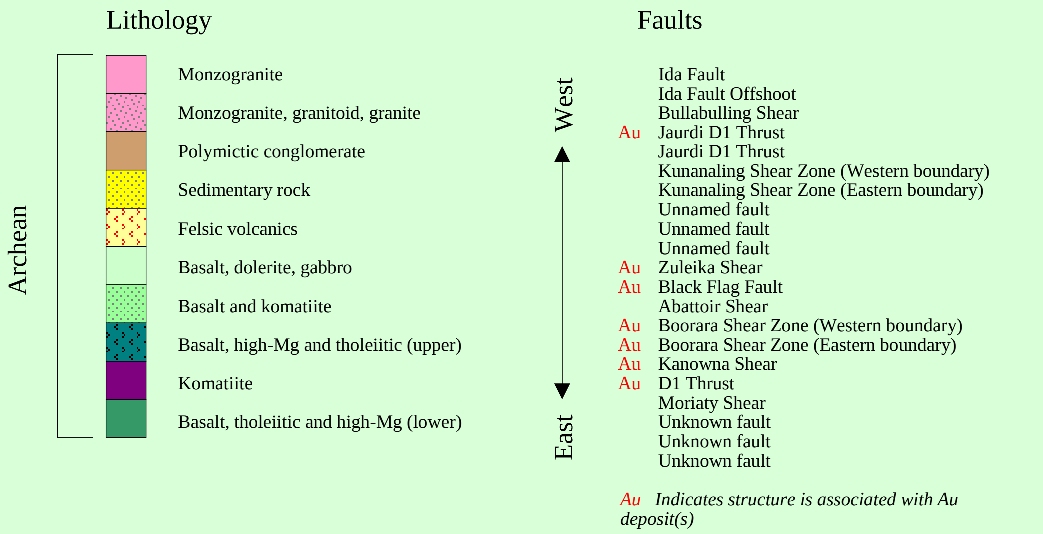
Unknown fault

Au Indicates structure is associated with Au deposit(s)

Comments
The distribution of copper, lead and zinc is much broader than that of gold and arsenic and is related mostly to lithology. Copper and zinc are closely related in distribution, being most abundant on mafic rocks, while lead is more abundant on granites and so shows an inverted or shifted pattern relative to copper and zinc. Logarithmic Y-axis.

Pt, Pd, U and Th Distribution Along EGF01

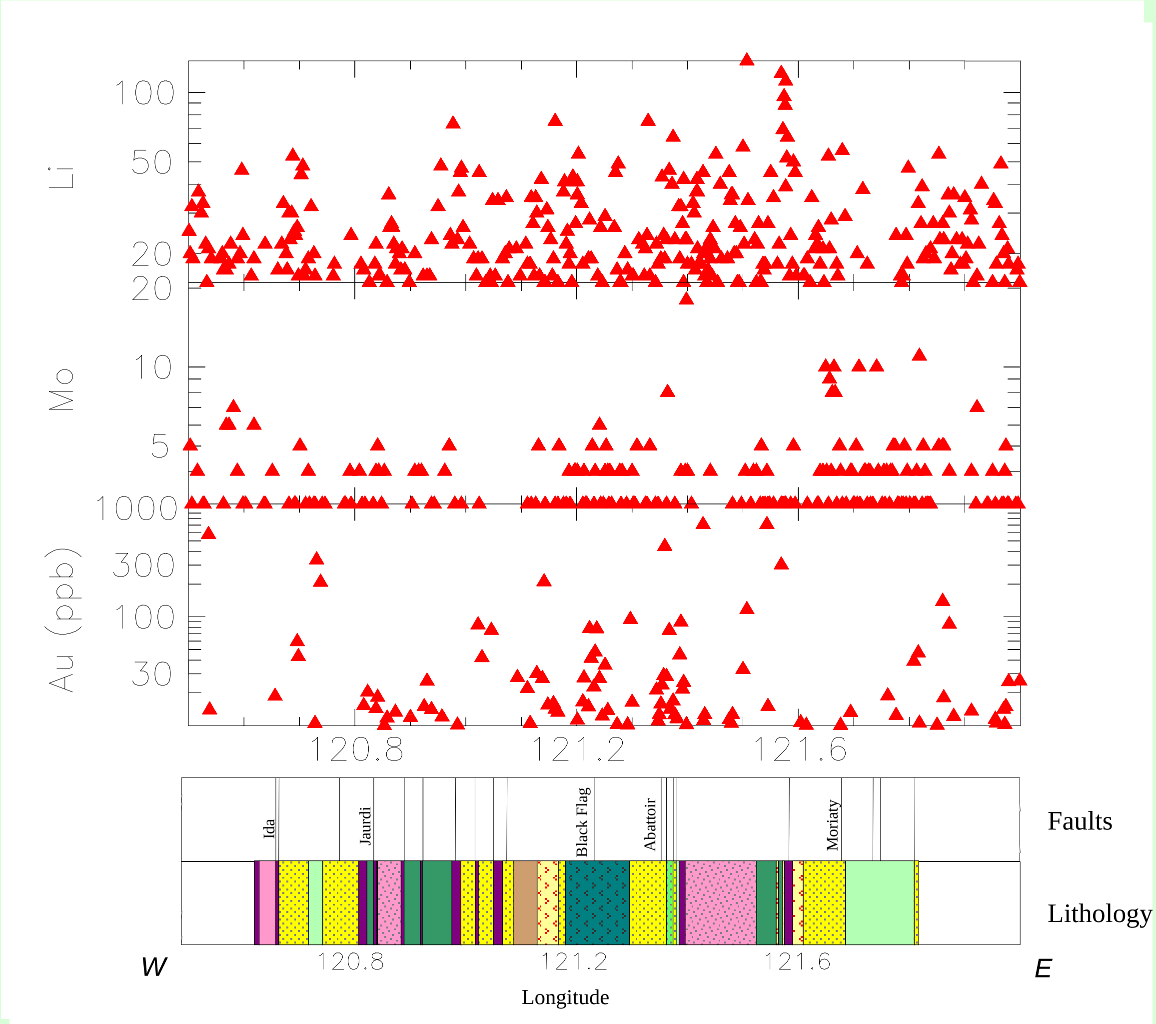




Comments

Pt and Pd, and U and Th, are pairs of elements which have very similar distribution patterns along EGF01. Lithology seems to be the key factor for both groups. Logarithmic Y-axes.

Gold, Mo, and Li Distribution Along EGF01



Lithology

Archean

- Monzogranite
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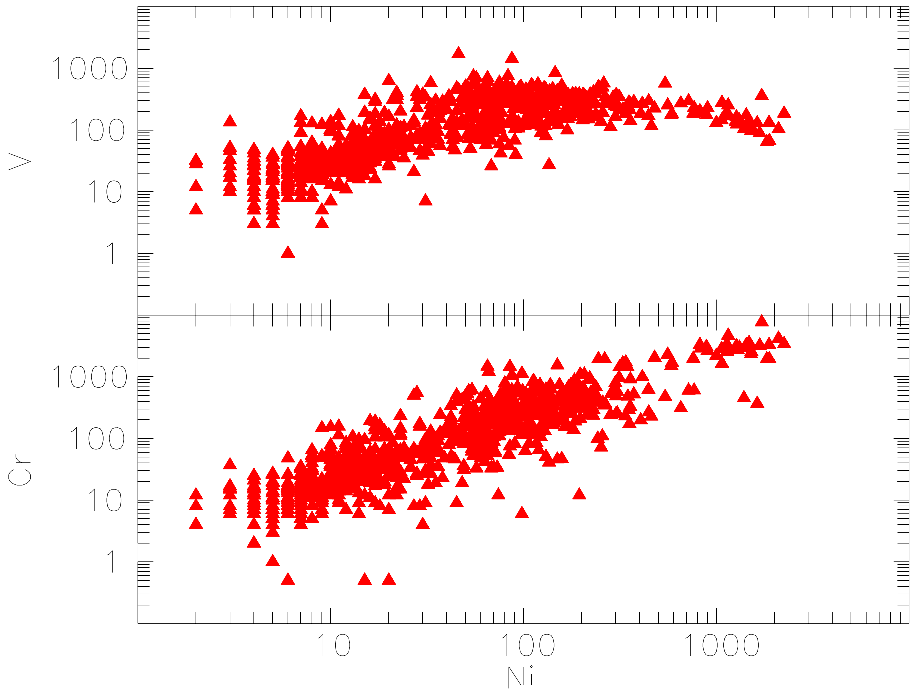
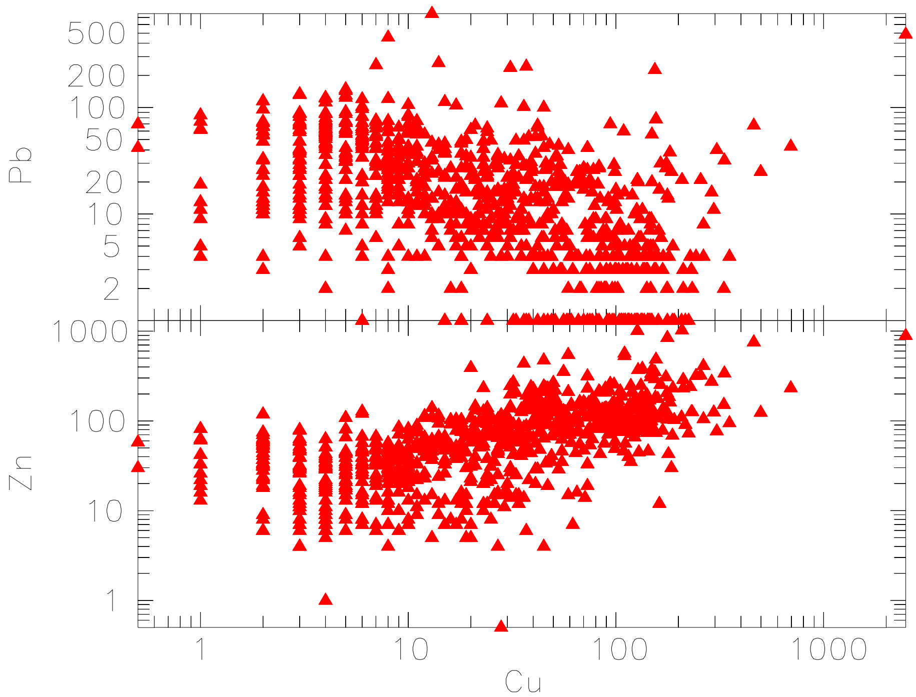
Au Kanowna Shear
Au D1 Thrust
Moriaty Shear
Unknown fault
Unknown fault
Unknown fault

Au Indicates structure is associated with Au deposit(s)



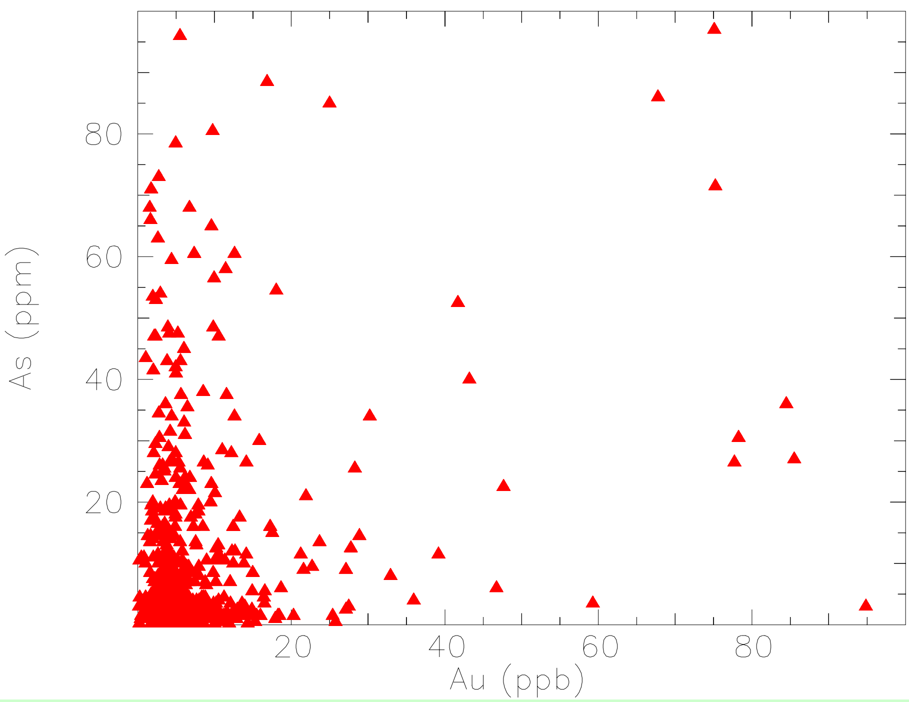
Ni vs Cr and V

Nickel and chromium have essentially a 1:1 relationship. This is obvious from a comparison of the abundance of these elements along the seismic line EGF01 (see Ni-Cr-V plot). Both of these elements are concentrated in ultramafic and mafic rocks. Vanadium has a similar relationship to the other elements to a point, although it decreases somewhat in abundance with higher nickel and chromium values (heading towards ultramafic rocks). All values are in ppm. Logarithmic axes.



Cu vs Zn and Pb

It is clear from a comparison of these elements along the seismic line (see Pb-Cu-Zn plot) that copper and zinc have an approximately 1:1 relationship and an inverse (or slightly 'shifted') relationship with lead. This figure also demonstrates these relationships. Values in ppm. Logarithmic axes.



Au vs As

In spite of the coincidence of gold and arsenic at faults along the seismic line (see Au-As and Au-As-Ag plots), the relationship between Au and As does not seem to be as straightforward as 1:1. While several samples above ~30ppb Au have correspondingly high As values, there are many samples that do not display this kind of relationship.