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Fordeling Sulitjelma:

Ngo.koord:

X1: 1018 300	Y1: -35 200	Z:
X2: 1019 800	Y2: -34 000	

Sulis koord:

X3: 500	Y3: -500	Z:
X4: 2000	Y4: 500	

Resyme:
REVIEW OF HALOS SURROUNDING THE GIKEN II OREBODY. VECTOR-PROFILES ARE DRAWN FOR THE ELEMENTS WHICH SHOW HALOS. INTERPRETATION OF PATTERNS. CONSIDERATION OF GEOCHEMICAL PATTERNS IN THE FOOTWALL ROCKS.

Andre:

Kommentar:

Perry

PROJECT REPORT HALO LITHOGEOCHEMISTRY PROJECT 5.12.83

This report is primarily to report upon the re-contructed profiles and contour maps that have been constructed using last years data. They show a far clearer pattern than was evident before and indicate that structure places great controls on the geochemical distribution.

CONTOUR MAPS

Contour maps over the sampled area have been drawn for the elements Ag and Cu. The map for Copper shows a good correlation with the company map although the sampling point frequency infers a certain degree of error. The Cu map indicates that within the Giken II ore body, there are two main areas of high grade copper. These are towards the N. edge of the ore body and also towards the S. edge.

In contrast, the map showing the distribution of Ag, indicates only one major peak, near to the N. edge of the ore body.

These maps shall be transferred to transparency in the near future and additionally, maps for Zn and Pb shall be prepared.

Also, a map has been produced for the K_2O content of the footwall rocks. This shows two main areas and coincides with the occurences of biotite and chlorite schists, very well. The boundary between the two areas tends to run parallel to sub-parallel with the edge of the ore body.

PROFILES

Profiles A-B,C-D,E-F,G-H,I-J and X-Y were constructed (see the map below). These profiles run along the strike of the Giken II ore body. Each trace element shows a similar pattern on each of the profiles. Profile C-D is typical and runs across the middle of the ore body. See the schematic profiles below (Figs. 2&3)

Copper Cu shows a saddle-shaped curve, with a narrow peak near to the N. edge of the ore body and a rather wider peak towards the S. boundary.

Zinc Zn shows a pattern very similar to that of Cu. As can be seen on fig. 2, the peaks of Cu and Zn do not coincide however.

Silver Ag shows an interesting pattern. Ag is highest near to the N. edge of the ore body, and there is only one single peak.

Lead Pb is highest towards the S. edge of the ore body. (The opposite of Ag)

Cobalt Co shows a similar pattern to Cu.

Cadmium Cd shows a very similar pattern to Zn.

Bismuth Bi shows a similar pattern to Pb.

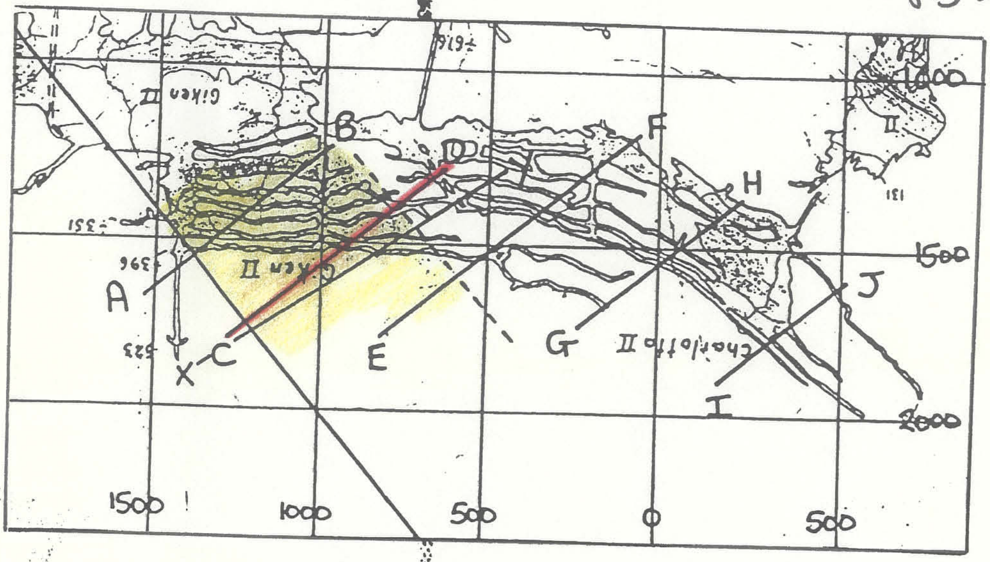
Other elements which show enrichment in the ore body on the profiles are Mo,Sb,As and Au.

Elements which show depletion in the ore body are Y,V,Sm and Mn.

The elements Ce,La,Sc,Sr,Rb,Cr,Ni,Nb,Sn,Cs,Ta and U show no particular pattern. The elements Th (and possibly W and Cs) show good correlation with the major quartz veins cutting the ore body. (see fig. 4)

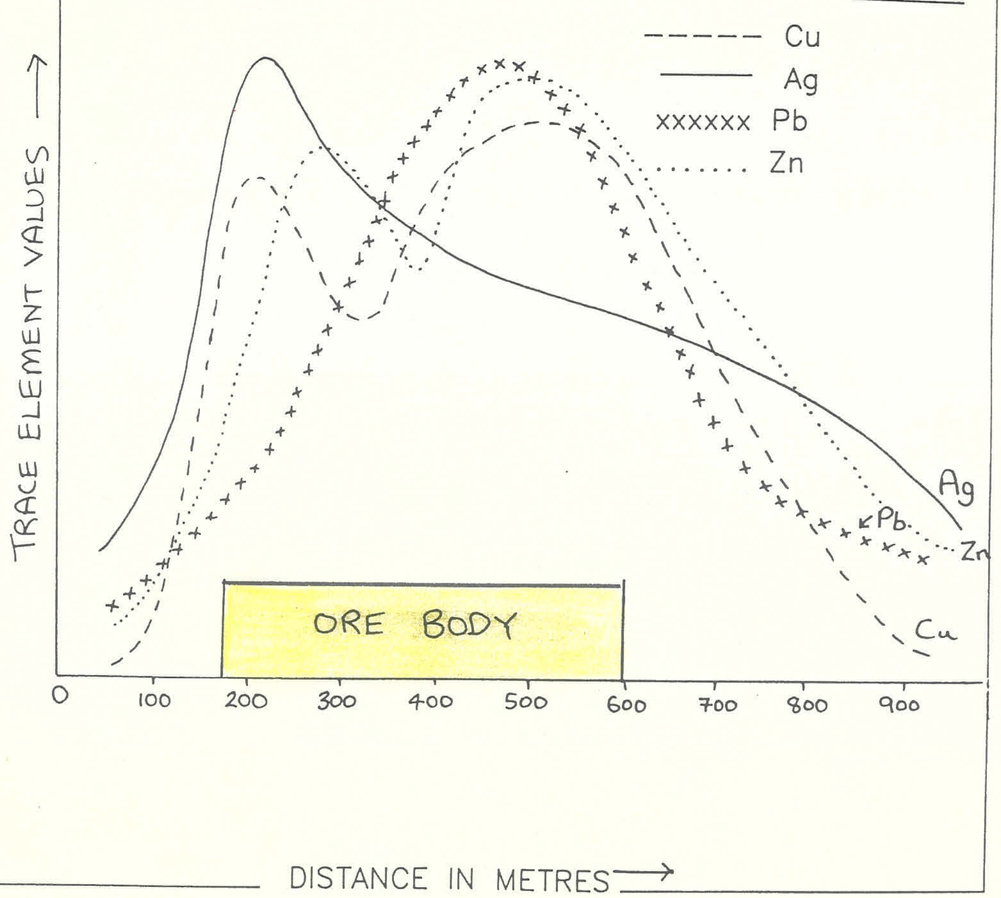
Figures 5 and 6 show the behaviour of certain elements as vectors along this profile direction, where the trace element concentration is expressed as a multiple of the background value. It is clearly shown in these diagrams that ALL the potential indicator elements (Co,Bi,Pb,Ag,Cd,As,Zn and Cu) are depleted much more rapidly away from the N. edge of the ore body than from the S. edge. The size of the halos can be expressed numerically as the distance between the edge of the ore body (shown on the diagram) and the distance at which the trace element abundances are reduced to background levels.

fig 1



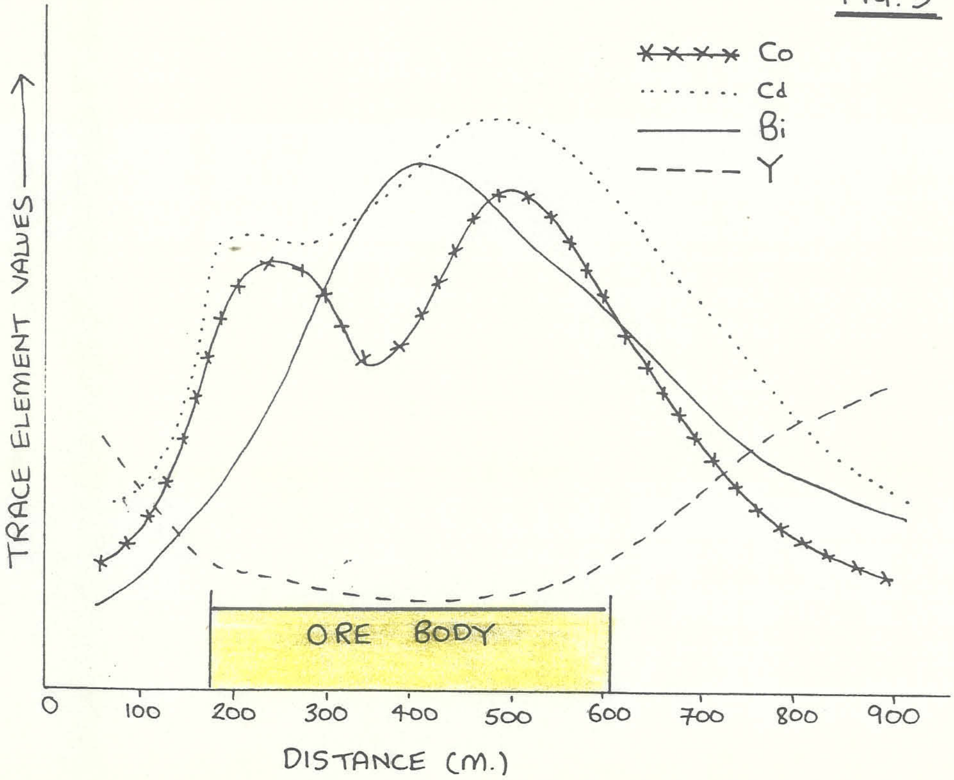
SCHEMATIC PROFILE ACROSS C–D

FIG. 2



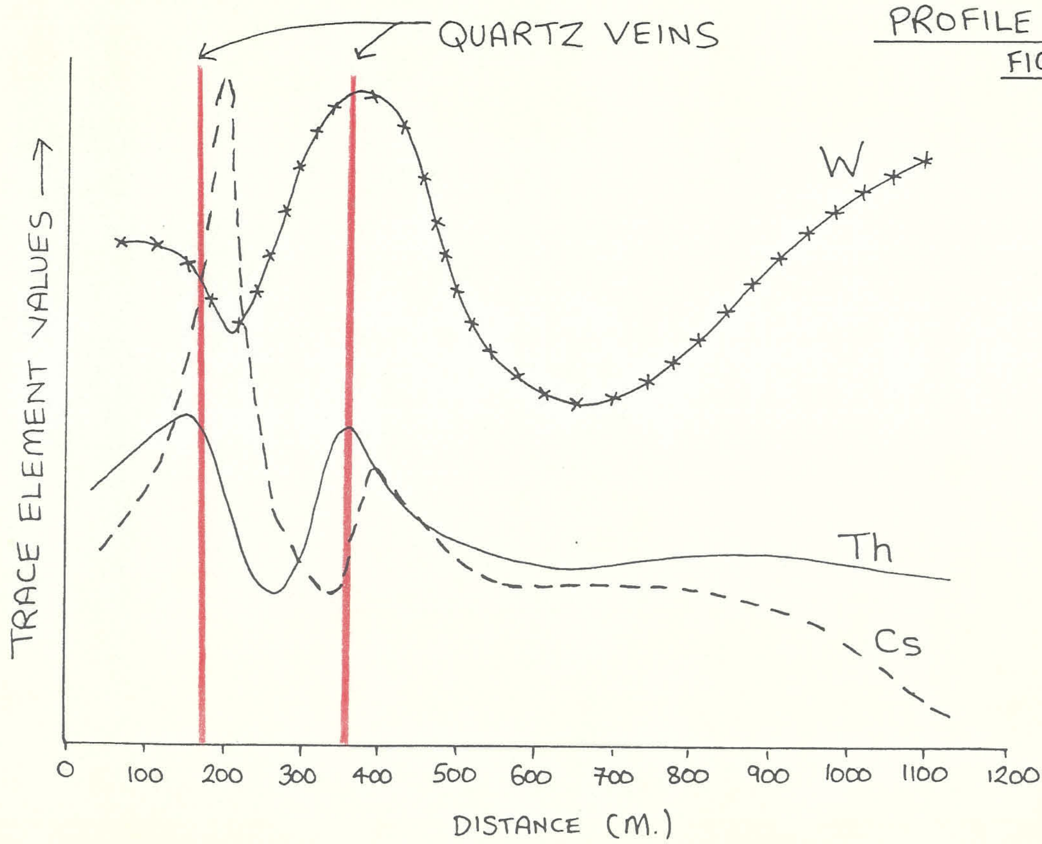
SCHEMATIC PROFILE ACROSS C-D

FIG. 3



PROFILE X-Y

FIG. 4



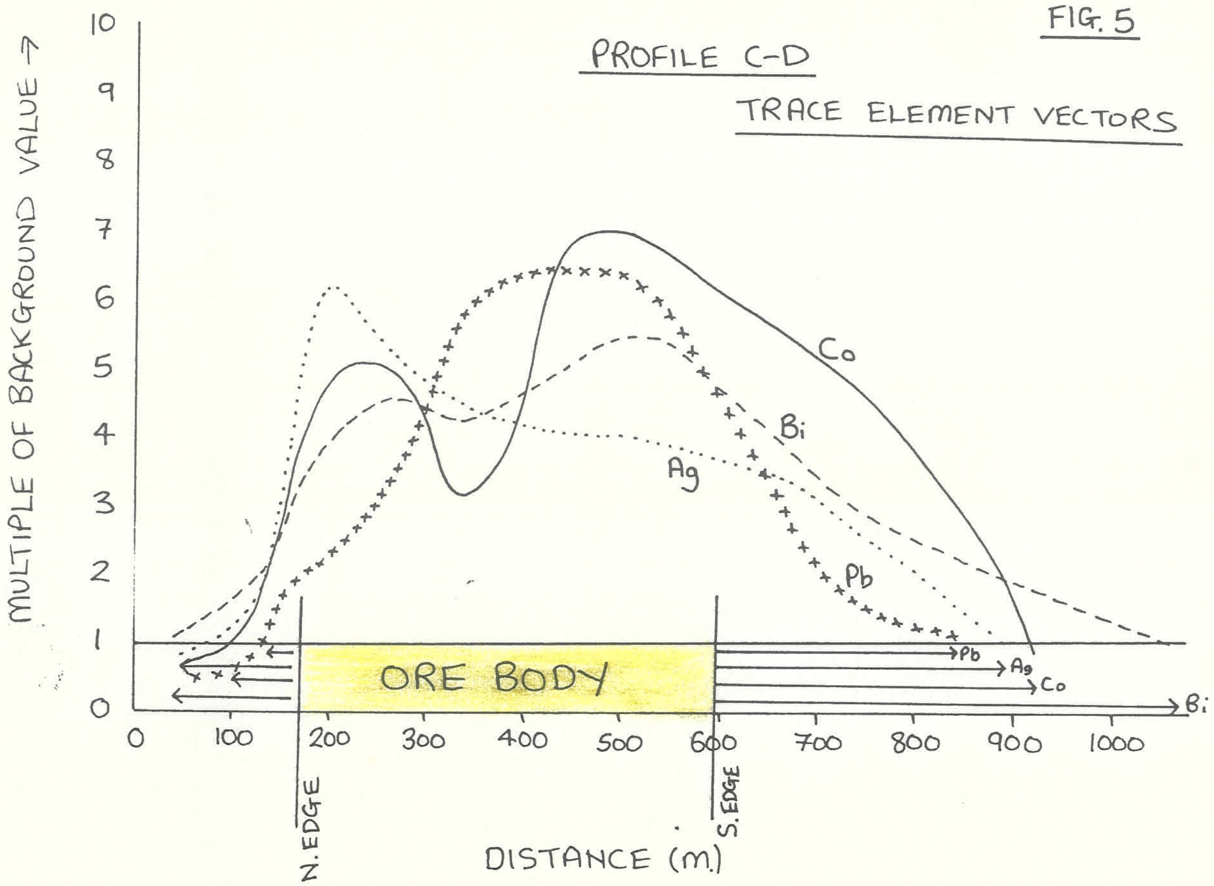
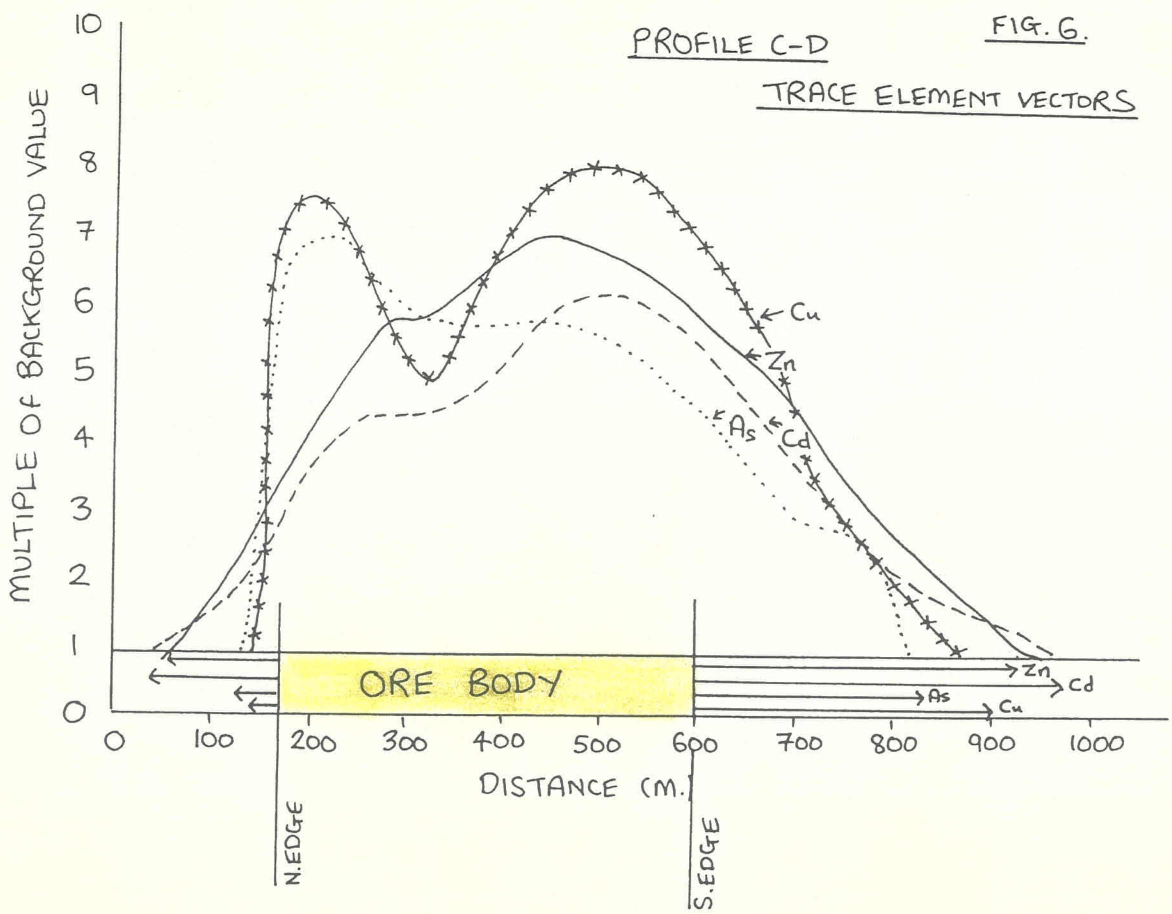


FIG. 5
PROFILE C-D
TRACE ELEMENT VECTORS
MULTIPLE OF BACKGROUND VALUE →
10
9
8
7
6
5
4
3
2
1
0
Co
Bi
Ag
Pb
ORE BODY
Pb
Ag
Co
Bi
0
100
200
300
400
500
600
700
800
900
1000
N. EDGE
S. EDGE
DISTANCE (m.)



PROFILE C-D
FIG. 6.
TRACE ELEMENT VECTORS
MULTIPLE OF BACKGROUND VALUE
10
9
8
7
6
5
4
3
2
1
0
Cu
Zn
As
Cd
ORE BODY
Zn
Cd
As
Cu
0
100
200
300
400
500
600
700
800
900
1000
DISTANCE (M.)
N. EDGE
S. EDGE

The table below shows the extent of the halos in metres:

Element	Pb	Co	Bi	Ag	Cu	Zn	Cd	As
to N.	40	70	130	110	30	110	130	50
to S.	250	330	480	300	300	320	370	230

It can be seen that some elements have a wider halo than others (longitudinal zoning is the term used) and follows this order:

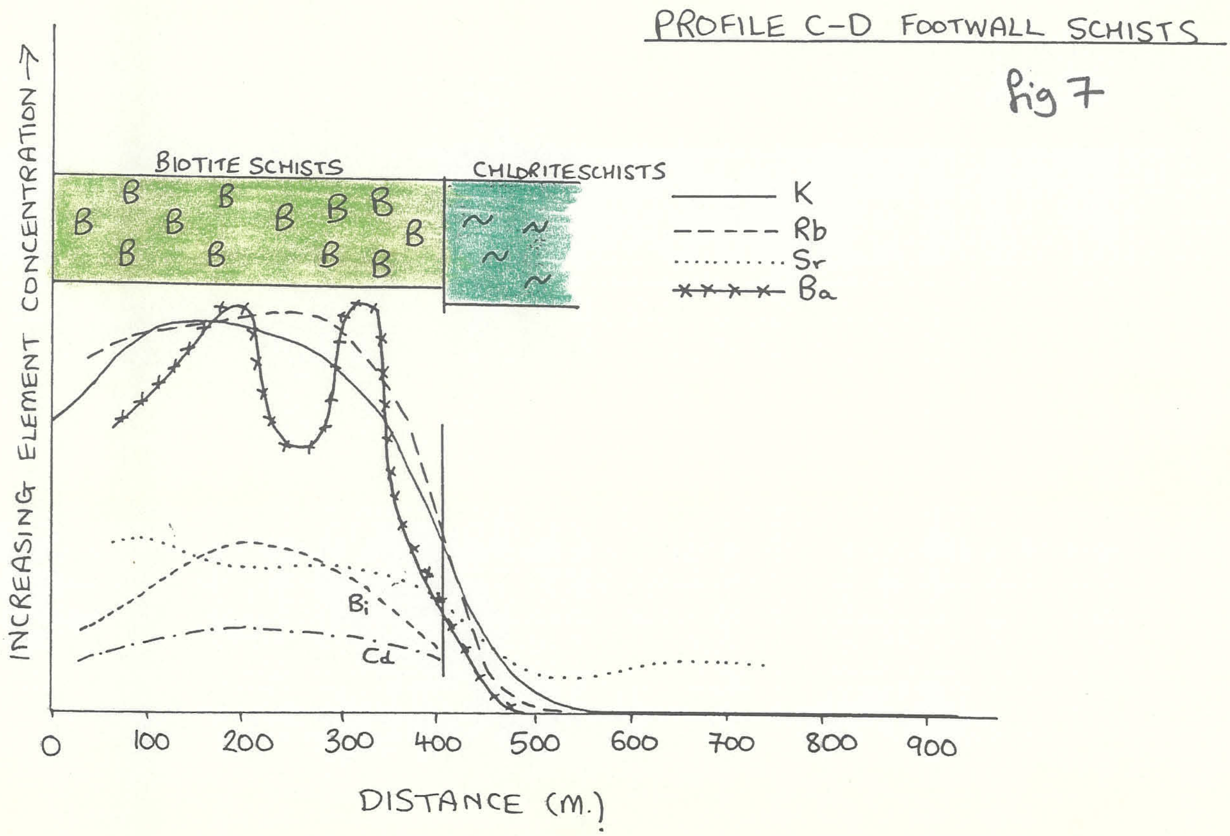
Bi > Cd > Co > Zn > Ag > Cu > Pb > As

(where Bi has the widest halo of all the trace elements)

Now that I have plotted these profiles along the strike, I am able to confirm that those elements which show the best potential for use as vectors are still the same group as before (ag,Bi,Cd,Pb,Co,As) although the corrected data for Sb, no longer shows such a clear trend as before. This is because the pre-corrected data was merely a function of interference from sulphides when analysed.

FOOTWALL SCHISTS

As the contour map for the element K shows, there is a sudden change between biotite schists in the E. part of the ore body and chlorite schists in the W. part. When a profile is drawn for K, this change is very clear. (see fig. 7 below) Other elements also change dramatically. The elements Rb,Sr and Ba are shown on the graph to follow the behaviour of K very closely. I consider now that the footwall immediately below the Giken zone does represent a feeder zone as shown in the diagram below. The dramatic change from biotite schists to chlorite schists representing the change from feeder zone to host rocks. This idea has yet to be proved, but it seems to be a good model and fits well with the data. There also appears to be zonation of other elements within this "feeder" zone, this is particularly true for Bi and Cd (see fig.7). These two elements are more concentrated in the central part and could possibly indicate that the central part of the feeder zone is the most hydrothermally altered, as would be expected. Bi and Cd are among the elements which are shown to have been enriched during the hydrothermal process.



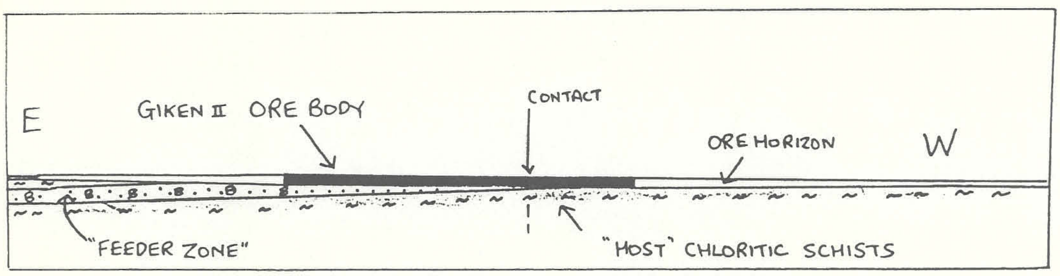


Fig. 8 E-W profile indicating possible "feeder" zone.

The evidence for this is:

1. Above stratigraphy is observed in all places along the section.
2. Concentration of ore elements in the hydrothermally altered "feeder" zone relative to other areas of hydrothermal activity.
3. The abrupt contact between the two footwall lithologies, which could not be explained by the "margin" of hydrothermal activity.

This was done by comparing populations of biotite schists and breccias as representing hydrothermally altered examples and a group of chlorite schists and breccias representing non-altered (or minimally altered) examples. The differences between the two populations are considerable. Keratophyres were taken as a separate group.

The elements which have been enriched by the hydrothermal process are indicated in the tablebelow with the <u>enrichment factor</u>, which expresses the ratio of the concentration in the altered rocks to the unaltered rocks:

Element	Enrichment Factor
K	31
Ba	24
Rb	17
Mo	11
Bi	7
Cu	4.6
Sr	2.9
Zn	2.4
Cd	2.3
Sb	1.9
Ag	1.9
Li	1.8
Pb	1.7

The following elements are depleted in the altered rocks:

Element	Enrichment factor	
As	0.34	*n.b.
Nb	0.38	
Y	0.52	
Co	0.70	
Ni	0.79	
V	0.80	

The following elements can be considered to have been relatively immobile during the process: Al.Mg,Sc,Ce,U,La,Mn,Cr,Fe,Na,Ti,Ca.

In the keratophyre group, the same general trends are observed, with the important exception that the elements Zn,Cu and Pb appear to have been strongly <u>depleted</u> during the alteration process.

This data is interesting and deserves more careful study to discover the reason for the trends and as a guideline to the elements whose distribution is controlled by this process rather than the primary processes of ore body formation.

IMMOBILE ELEMENTS

Some preliminary work has been carried out on the following elements: Ti,Zr,Y,Cr,P,Ni and Nb on analyses of amphibolite to clarify the nature of these immobile elements in the Sulitjelma environment and to give clues as to the original environment of formation. My Zr data is poor and a small number of samples will have to reanalysed by total extraction for that element. Nevertheless, with the exception of the Zr-Y-Ti triangular diagram (which shows extremely wide scatter), the data of these immobile elements seems to suggest an ocean floor basalt. This work deserves to be continued and carefully controlled to try and confirm this.