UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

GEOCHEMICAL AND MINERALOGICAL ANALYSES OF U.S. GEOLOGIC SURVEY OIL-SHALE CORE CR-2, PICEANCE CREEK BASIN, COLORADO

by

Walter E. Dean, Janet K. Pitman, and George H. Harrach

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INTRODUCTION

U.S. Geological Survey oil-shale core CR-2 was drilled in the northern part of the Piceance Creek Basin, in the southeast corner of T. 1 N., R. 97 W., Rio Blanco County, Colorado (fig. 1). The cored interval contains the Parachute Creek Member and underlying Garden Gulch Member of the Green River Formation (Eocene). The Parachute Creek Member is well known for its thick, rich oil-shale sequences and beds rich in the saline minerals nahcolite and dawsonite. The Parachute Creek Member forms the main body of the Green River Formation and has been subdivided into rich and lean oil-yield zones (Donnell and Blair, 1970; Cashion and Donnell, 1972) as shown in figure 2.

The Garden Gulch Member contains more clay, less carbonate minerals, and generally has lower oil yields than the overlying Parachute Creek Member.

X-RAY DIFFRACTION MINERALOGY

About 1500 samples were collected at 0.3-meter intervals throughout the CR-2 core; they were crushed, homogenized, and used to determine oil yield by Fischer Assay (Donnell and Pitman, 1976). Splits from the oil-yield samples were used to determine whole-rock mineralogy by X-ray diffraction. Mineral determinations were made with a Picker X-ray diffractometer using Ni-filtered,

CuK radiation. For the minerals identified, relative peak-height intensities were measured above background. The following minerals were detected in greater than trace amounts and were identified by known peak position.

Mineral	Formula	Peak position (degrees 2Θ)
Analcime	$NaAlSi_2O_3.H_2O$	26.0
Aragonite	$CaCO_3$	26.2
Calcite	$CaCO_3$	29.4
Dawsonite	$NaAl(CO_3)(OH)_2$	15.9
Dolomite	$(Mg,Ca)(CO_3)_2$	30.9
Illite	$(OH_4K_4(Si_6Al_2)(Mg.Fe)_6O_{20}$	8.9
K-feldspar	$KAlSi_3O_8$	27.5
Nahcolite	$NaHCO_3$	30.4
Na-feldspar	$NaAlSi_3O_8$	28.0
Pyrite	FeS_2	33.0
Quartz	SiO_2	26.6
Siderite	$FeCO_3$	32.0

Profiles of the relative concentrations of these minerals throughout the core are shown in figure 3. Only a qualitative comparison can be made between the mineral curves because interferences between principal peak positions of more than one mineral make accurate identification difficult. This was particularly true when mineral abundance was relatively low. Accurate peak locations may also be difficult to determine because minerals such as calcite and dolomite commonly vary in composition and their corresponding peaks shift within a certain range.

CHEMICAL ANALYSES

Chemical analyses were determined for selected samples from the Garden Gulch and Parachute Creek Member of the Green River Formation. Concentrations of aluminum, iron, magnesium, calcium, potassium, titanium, boron, chromium, copper, gallium, manganese, molybdenum, nickel, lead, scandium, strontium, vanadium, ytterbium, and zirconium were measured by semiquantitative optical emission spectroscopy in 264 0.3-meter-interval composite samples from the Garden Gulch Member (tables 1 and 2; figure 4). More complete, quantitative analyses were also obtained for silicon, aluminum, iron, magnesium, calcium, sodium, potassium titanium, sulfur, lithium, rubidium, mercury, uranium, and thorium in 32 samples, representing about every tenth 0.3-meter-interval sample from the Garden Gulch Member (table 2 and 3; fig. 4). The Mahogany zone, which is the richest oil-shale unit (fig. 2) is between about 229 and 320 meters in the CR-2 core. A total of 74 samples were collected within this 90-meter section on the basis of a nested analysis-of-variance sampling design in which geochemical variability was examined at 30-meter, 3-meter, and 0.3-meter levels (tables 4, 5, and 6; figs. 5 and 6). The 90-meters of core containing the Mahogany zone was subdivided into three 30-meter intervals; each 30-meter interval was subdivided into ten 3-meter intervals; each 30-

meter interval was subdivided into ten 0.3-meter intervals (composited individual samples; fig. 5). From each 30-meter interval, two 0.3-meter samples (the first and sixth) were collected from each of the ten 3-meter intervals. Each of the samples was crushed and homogenized for analysis. Duplicate analyses were obtained for every fifth sample in order to determine the analytical variance (fig. 5).

The 300-meter interval between the bottom of the Mahogany zone (320 meters) and the top of the Garden Gulch Member (620 meters) contains most of the Parachute Creek Member (fig. 2). This interval also contains the saline facies of the Parachute Creek Member as indicated by the presence of the evaporite minerals nahcolite and dawsonite. The middle 300 meters was also sampled according to a nested analysis-of-variance design in order to examine geochemical variability at the 30-, 3-, and 0.3-meter levels (tables 7, 8, and 9; figs. 7 and 8). The same basic design used for the Mahogany zone was used for the middle 300 meters except that two 0.3-meter samples were collected from only two (the first and sixth) of the ten 3-meter intervals (figure 6). This design resulted in the collection of 53 samples for elemental analysis (including 11 analytical duplicates).

Profiles of element concentration in the entire CR-2 core are shown in figure 9. Observed ranges of major element concentrations in samples from the entire CR-2 core, and geometric means for each element in each of the three study zones are plotted in figure 10. Observed ranges of trace and minor elements in samples from the CR-2 core, and geometric means for each element in each of the three study zones are plotted in figure 11.

REFERENCES

Cashion, W. B., and Donnell, J. R., 1972, Chart showing correlation of selected key units in the organic-rich sequence of the Green River Formation, Piceance Basin, Colorado, and Uinta Basin, Utah: U.S. Geological Survey Oil and Gas Inv. Chart OC-65.

Donnell, J. R., and Blair, R. W., Jr., 1970, Resource appraisal of three oil-shale zones in the Green River Formation, Piceance Creek Basin, Colorado: Colorado School of Mines Quart., v. 65, no. 4, p. 73-87.

Donnell, J. R., and Pitman, J. K., 1976, Oil-shale Fischer assays, average values and histograms of USGS coreholes CR-1 and CR-2, Piceance Creek Basin, Colorado: U.S. Geological Survey Open-File Report 75-580.

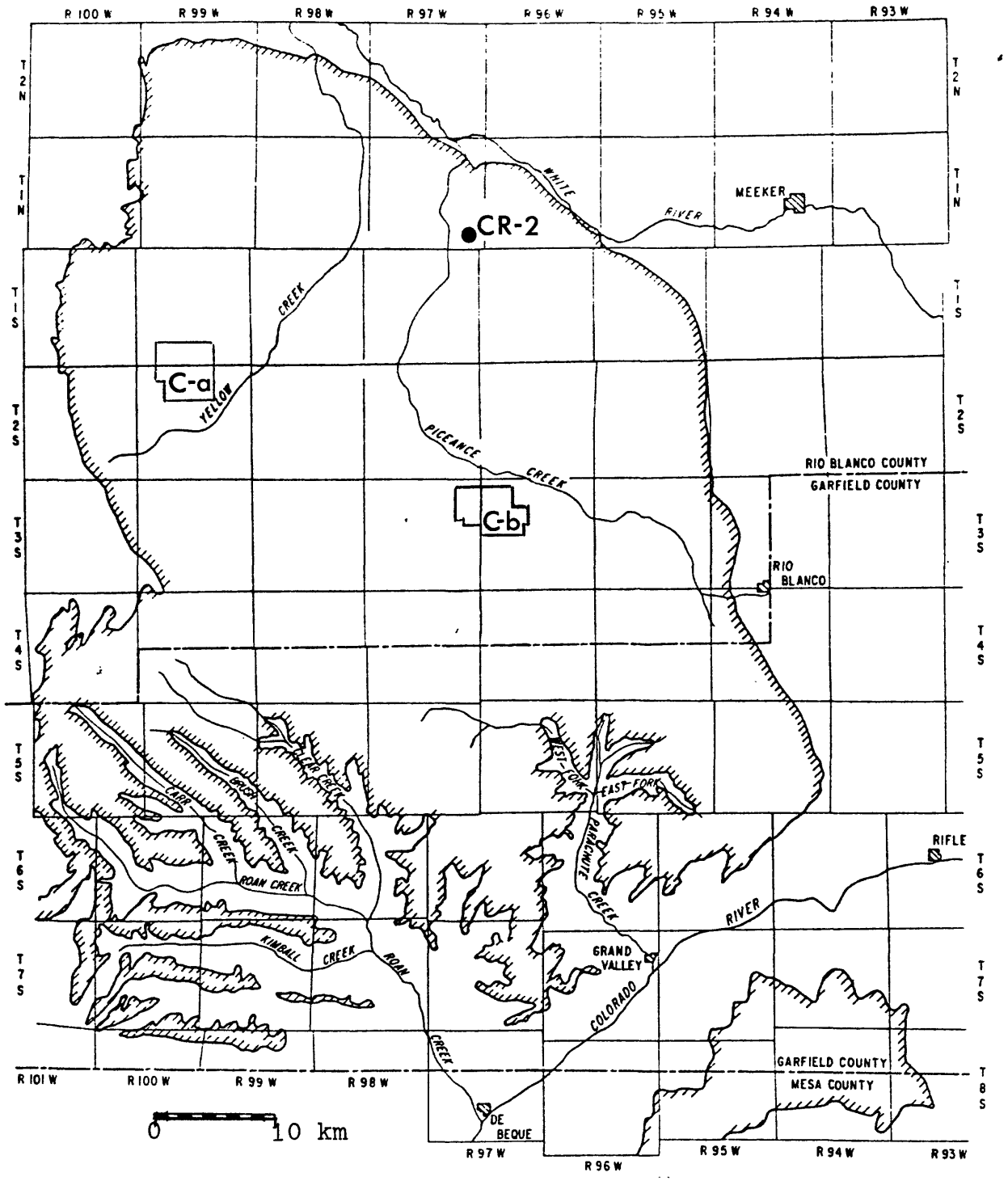


Figure 1.--Index map of the Piceance Creek Basin, Colorado, showing the location of USGS corehole CR-2. The blocks labeled C-a and C-b are the two Colorado prototype oil shale development lease tracts. Hachured line encloses the Piceance Creek Basin.

Figure 2.--Percent oil by Fischer Assay in USGS corehole CR-2, Piceance Creek Basin, Colorado. Heavy line through original data represents a 31-point weighted moving average of the original data. The oil-yield rich (R) and lean (L) zones of Cashion and Donnell (1972) and the three geochemical study zones discussed in this report are indicated to the right of the plot.

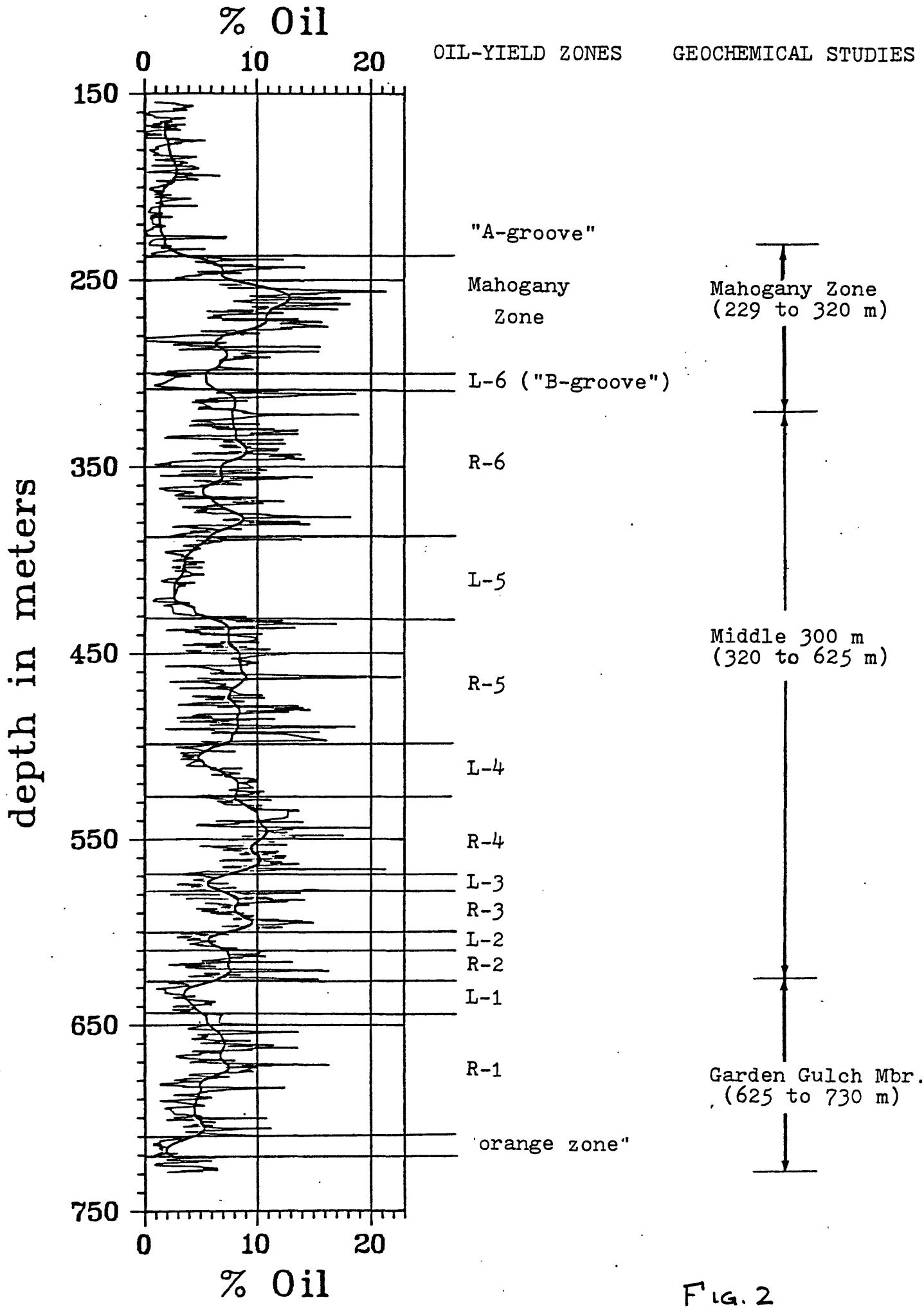

% Oil
0
10
20
OIL-YIELD ZONES
GEOCHEMICAL STUDIES
150
250
350
450
550
650
750
depth in meters
"A-groove"
Mahogany
Zone
L-6 ("B-groove")
R-6
L-5
R-5
L-4
R-4
L-3
R-3
L-2
R-2
L-1
R-1
orange zone"
Mahogany Zone
(229 to 320 m)
Middle 300 m
(320 to 625 m)
Garden Gulch Mbr.
(625 to 730 m)
0
10
20
% Oil

Fig. 2

Figure 3.--Profiles of relative concentrations of quartz, dolomite, calcite, potassium feldspar, albite, illite, analcime, nahcolite, and dawsonite determined by X-ray diffraction in oil shale from the Green River Formation, USGS corehole CR-2 Piceance Creek Basin, Colorado. Values are in relative X-ray diffraction intensities. Profiles indicated by "-of" are computed on an organic-free basis. Heavy smoothed curve drawn through most plots was computed using a weighted moving average.

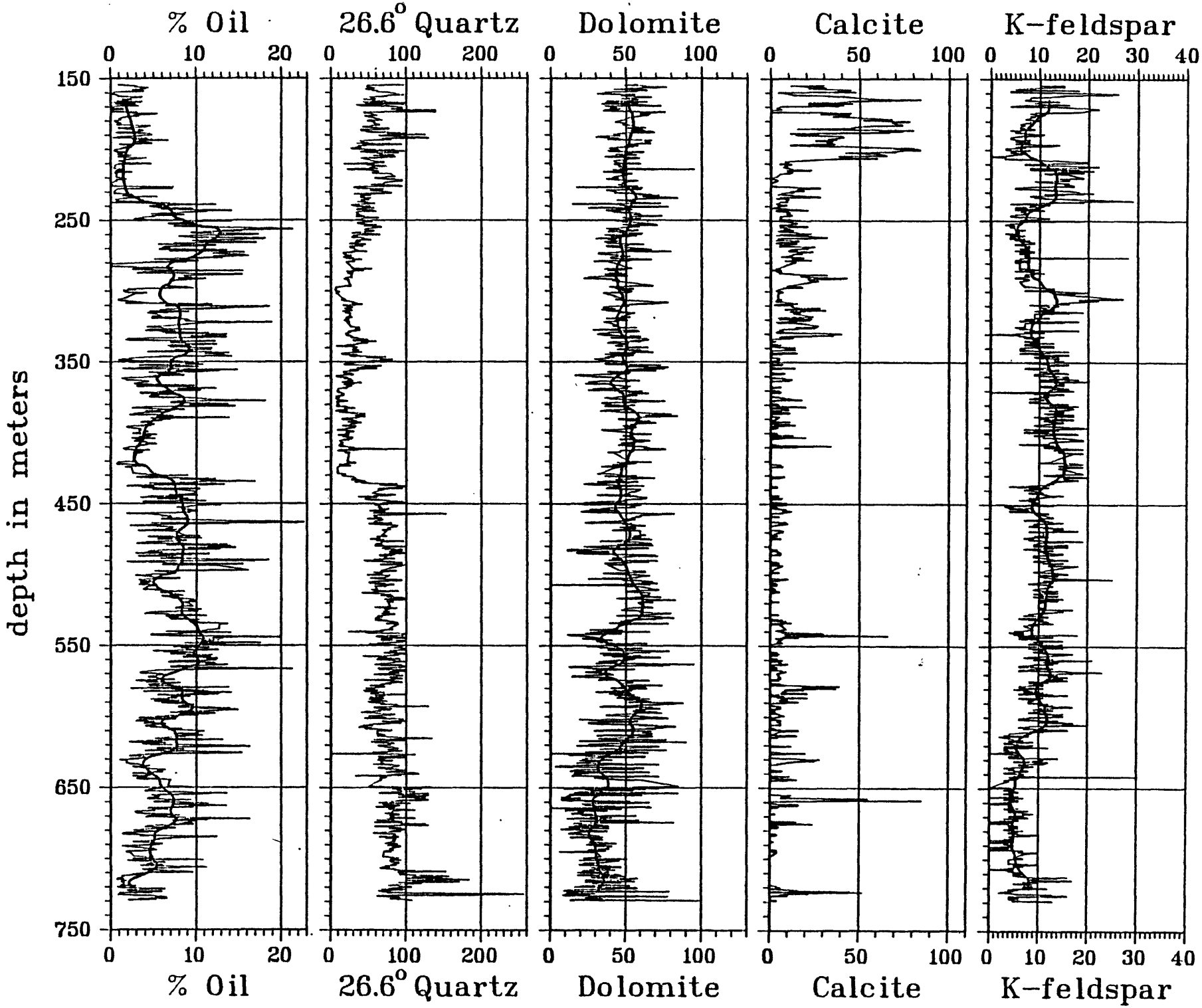

% Oil
26.6° Quartz
Dolomite
Calcite
K-feldspar
0 10 20
0 100 200
0 50 100
0 50 100
0 10 20 30 40
150
250
350
450
550
650
750
depth in meters

Figure 3

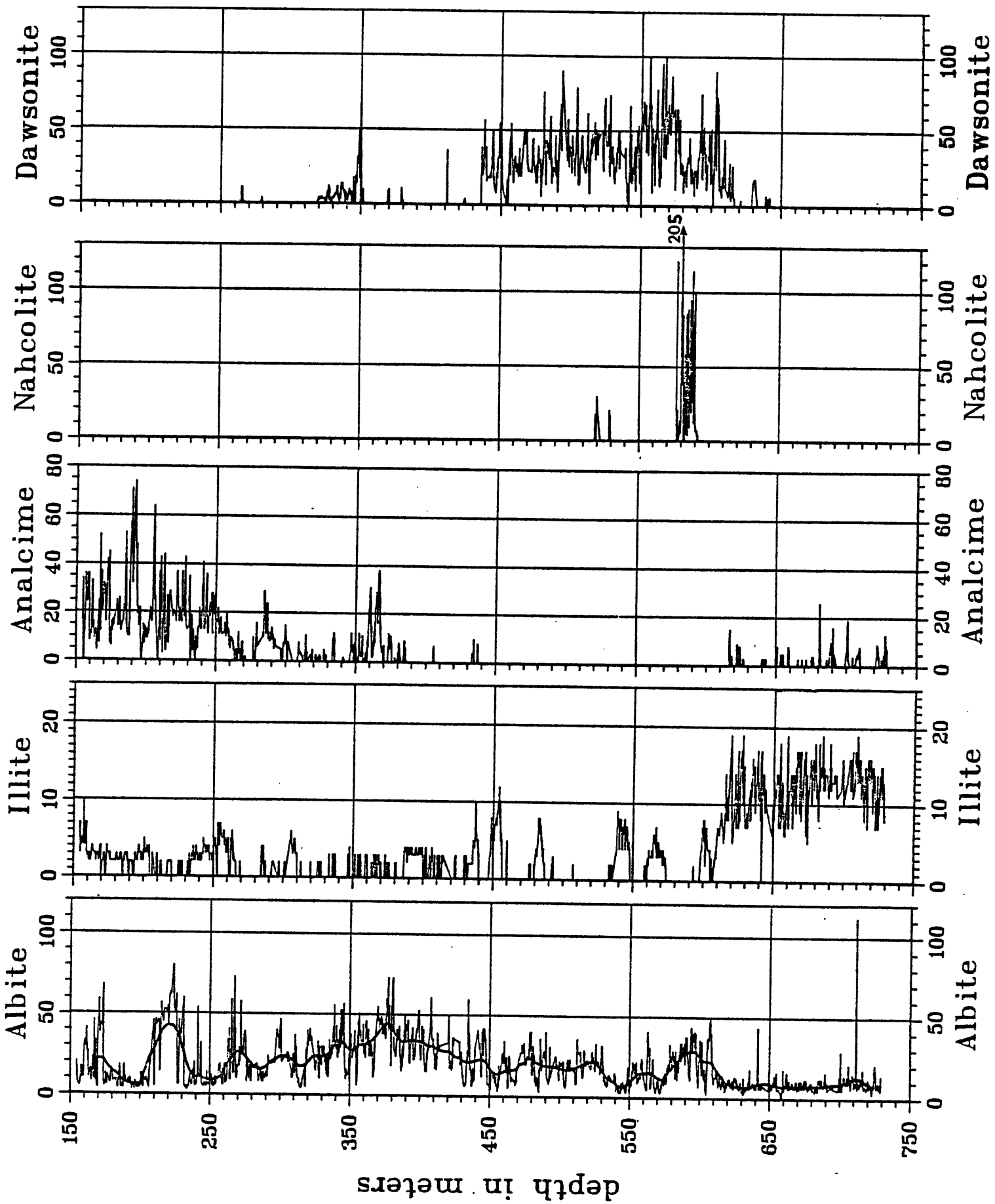
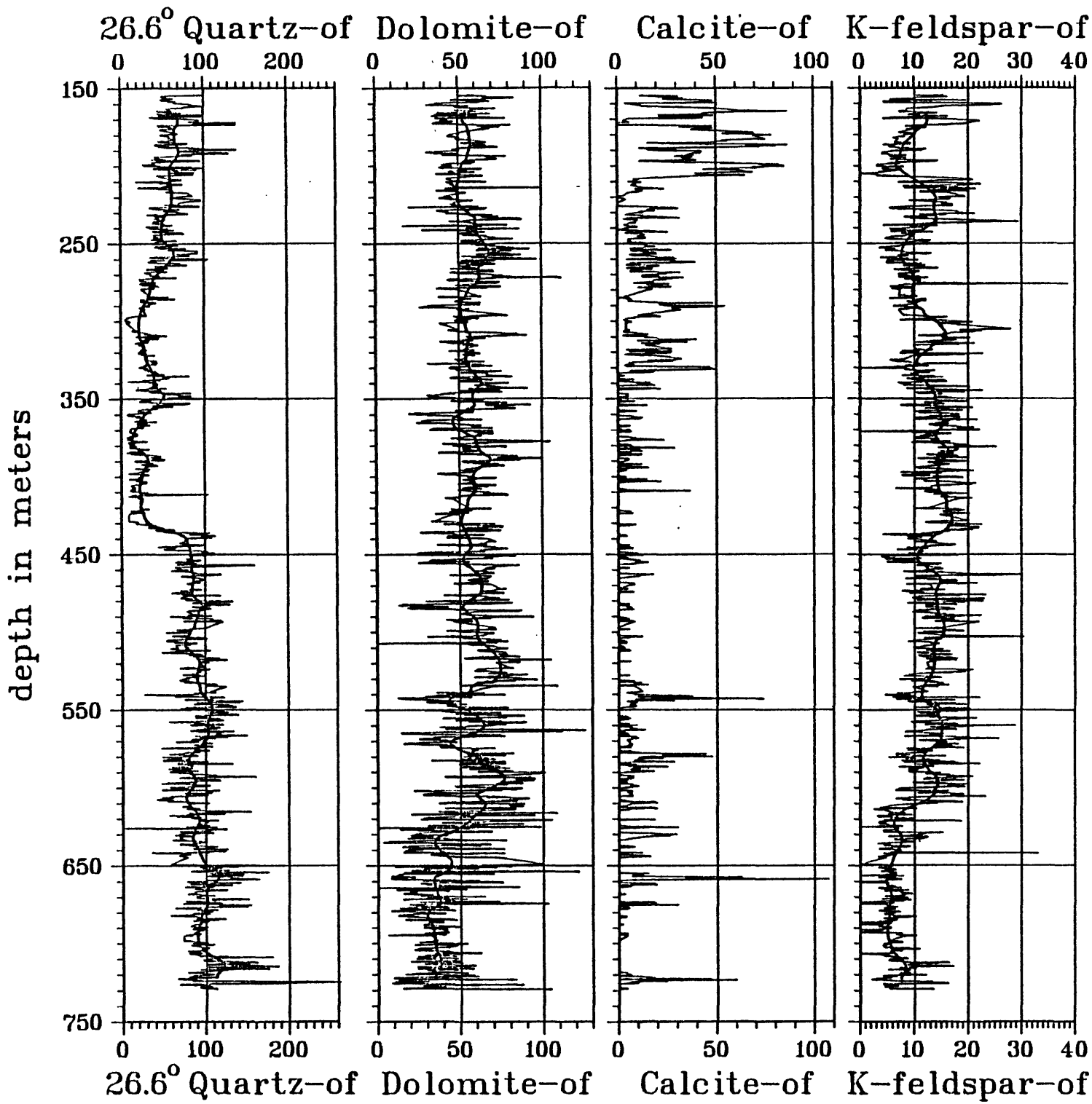

Dawsonite
Nahcolite
Analcime
Illite
Albite
205
depth in meters
150
250
350
450
550
650
750

Fig. 3 (cont.)


26.6° Quartz-of
Dolomite-of
Calcite-of
K-feldspar-of
0 100 200
0 50 100
0 50 100
0 10 20 30 40
150
250
350
450
550
650
750
depth in meters

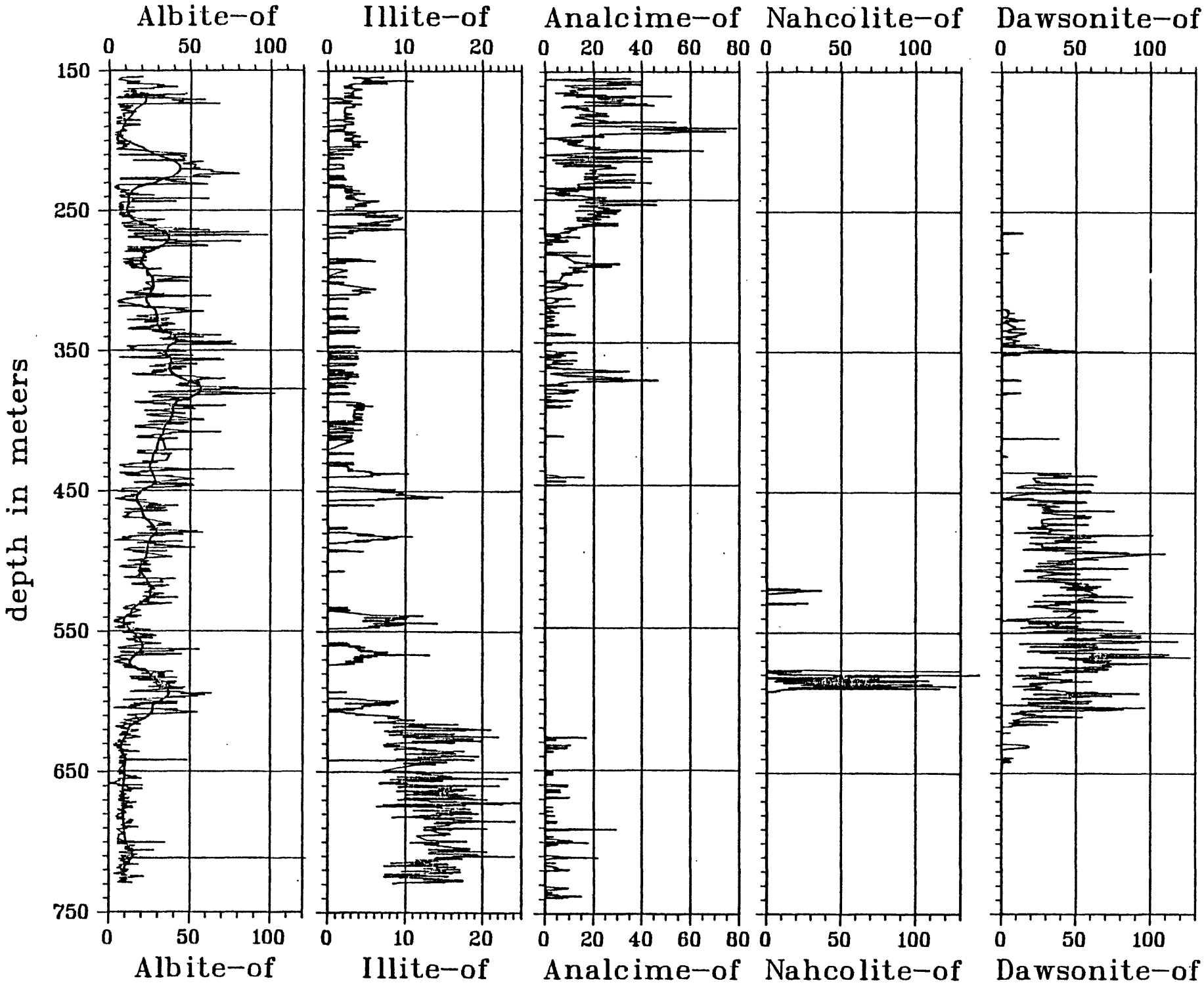

Albite-of
Illite-of
Analcime-of
Nahcolite-of
Dawsonite-of
0 50 100
0 10 20
0 20 40 60 80
depth in meters
150
250
350
450
550
650
750

Fig. 3 (Cont.)

Figure 4.--Profiles of concentrations of Al, Fe, Mg, Ca, K, Ti, B, Ba, Cr, Cu, Ga, Mn, Mo, Ni, Pb, Sc, Sr, V, Yb, and Zr determined by semi-quantitative optical emission spectroscopy, and As, Hg, Li, Rb, Sb, Sn, Zn, Th, and U determined by X-ray fluorescence (XRF), atomic absorption spectrophotometry (aa), and neutron activation analysis (naa) in oil shale from the Garden Gulch Member of the Green River Formation (625 to 730 meters) in the USGS corehole CR-2, Piceance Creek Basin, Colorado. Original data points are connected with a dashed line. Solid line through original data represents a 5-point weighted moving average of the original data for X-ray fluorescence, atomic absorption, and neutron activation analysis data, and a 31-point weighted moving average for semiquantitative spectrographic data.

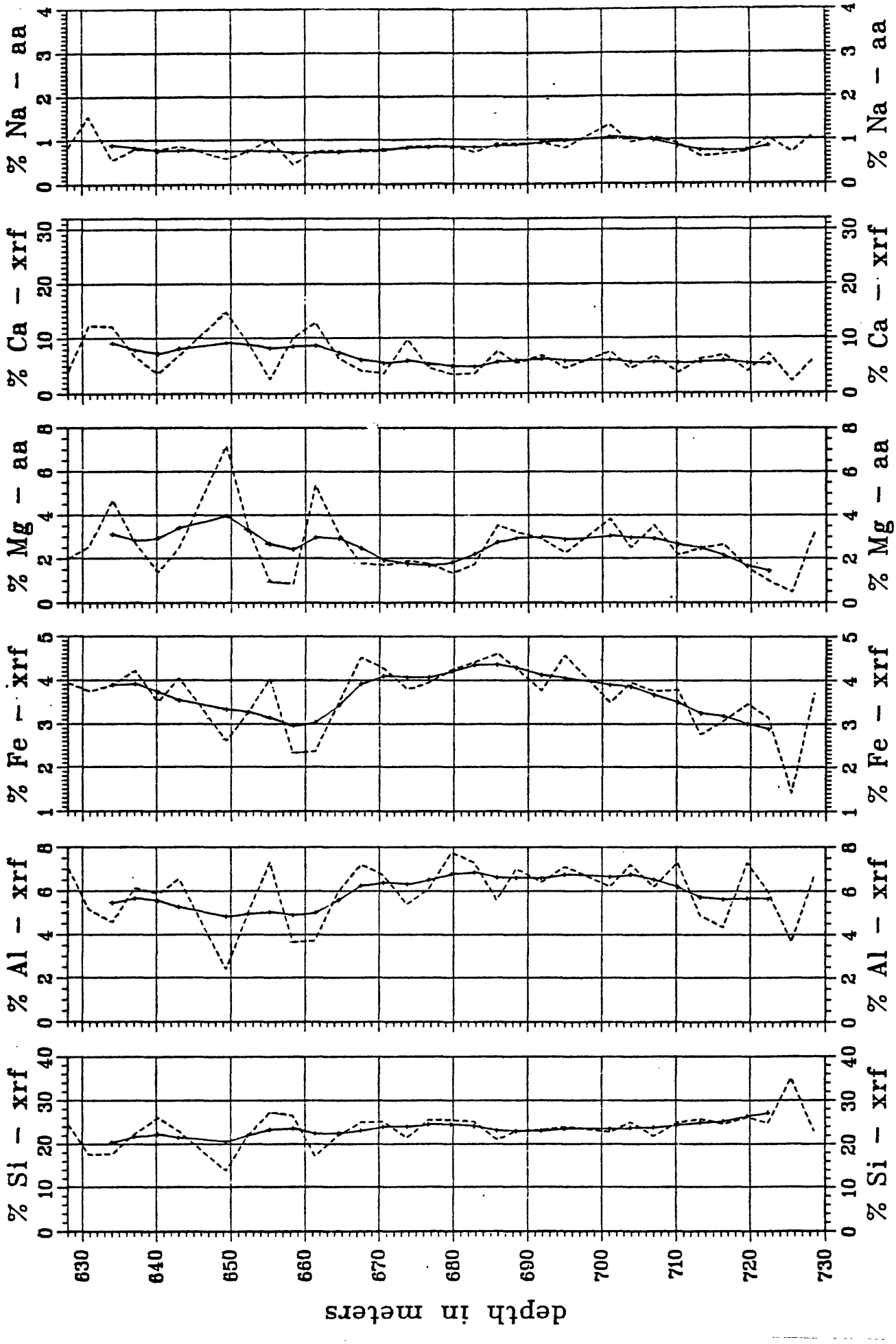

% Si - xrf
% Al - xrf
% Fe - xrf
% Mg - aa
% Ca - xrf
% Na - aa
depth in meters
630
640
650
660
670
680
690
700
710
720
730
RAW DATA
SMOOTHED DATA

Figure 4

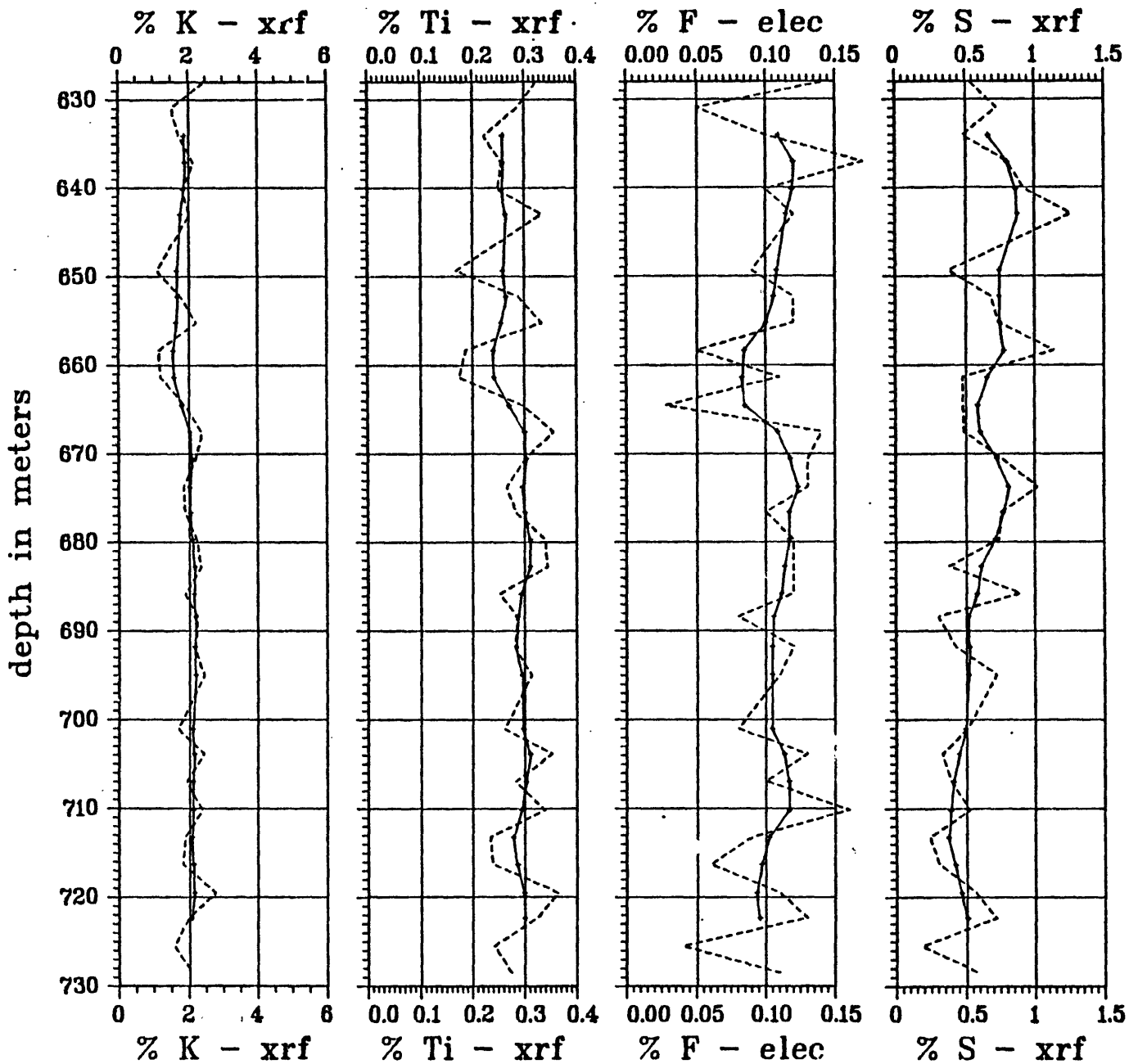

% K - xrf
% Ti - xrf
% F - elec
% S - xrf
depth in meters
630
640
650
660
670
680
690
700
710
720
730
0 2 4 6
0.0 0.1 0.2 0.3 0.4
0.00 0.05 0.10 0.15
0 0.5 1 1.5

Fig. 4 (cont.)

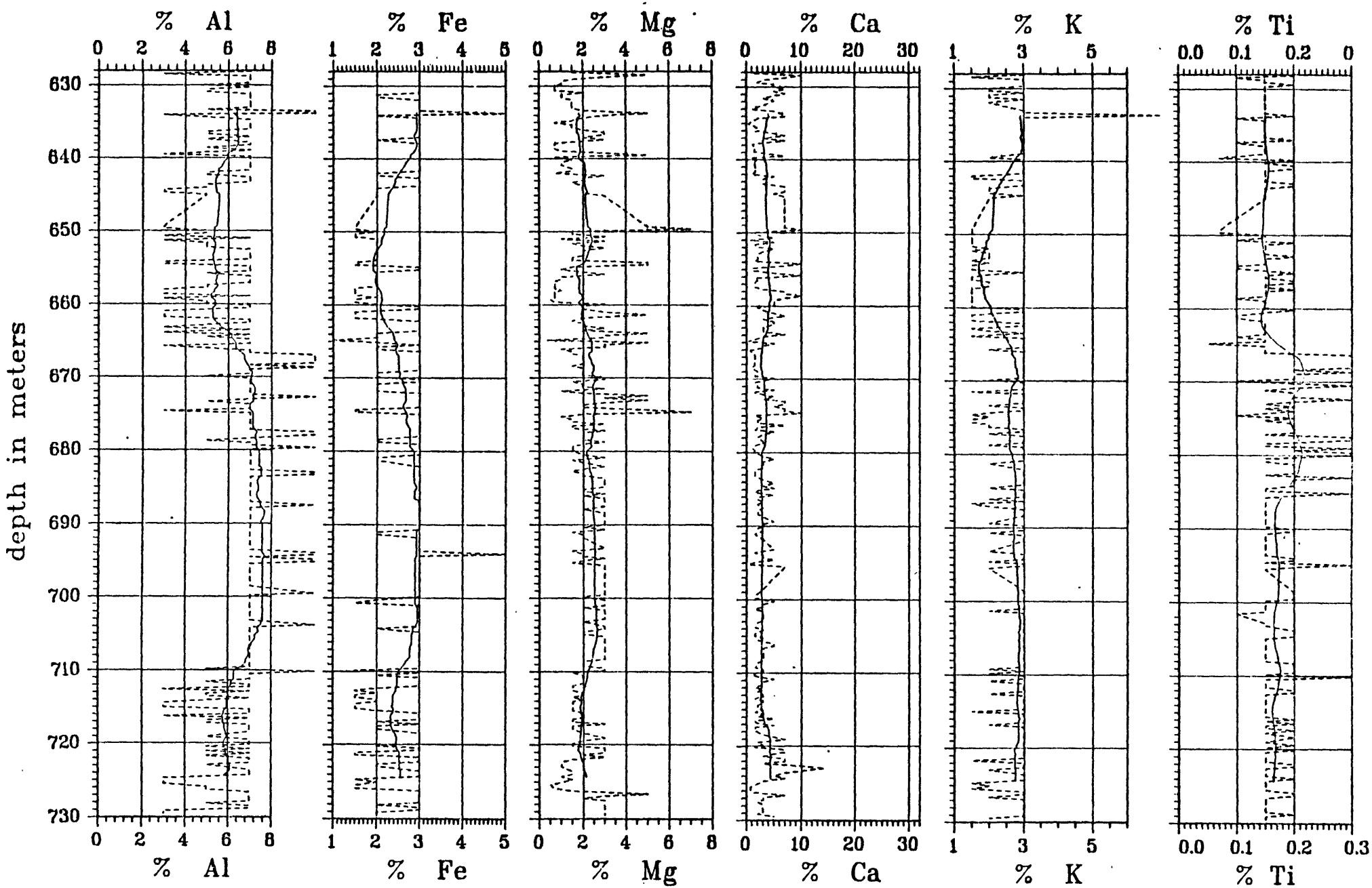

% Al
0 2 4 6 8
% Fe
1 2 3 4 5
% Mg
0 2 4 6 8
% Ca
0 10 20 30
% K
1 3 5
% Ti
0.0 0.1 0.2 0
depth in meters
630
640
650
660
670
680
690
700
710
720
730
0 2 4 6 8
1 2 3 4 5
0 2 4 6 8
0 10 20 30
1 3 5
0.0 0.1 0.2 0.3

Fig. 4 (cont.)

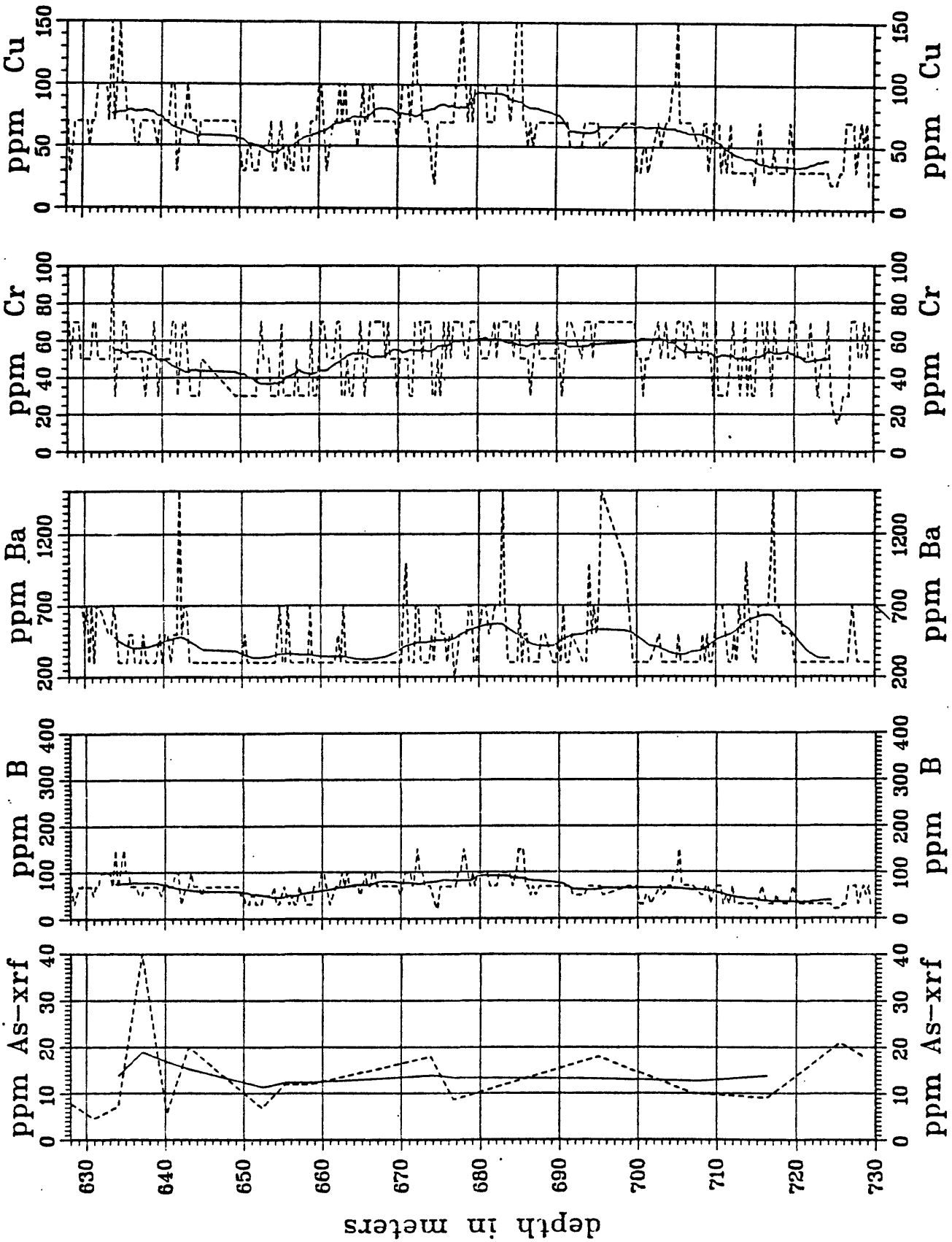

depth in meters
630
640
650
660
670
680
690
700
710
720
730
ppm As-xrf
0 10 20 30 40
ppm B
0 100 200 300 400
ppm Ba
200 700 1200
ppm Cr
0 20 40 60 80 100
ppm Cu
0 50 100 150

Fig. 4 (cont.)

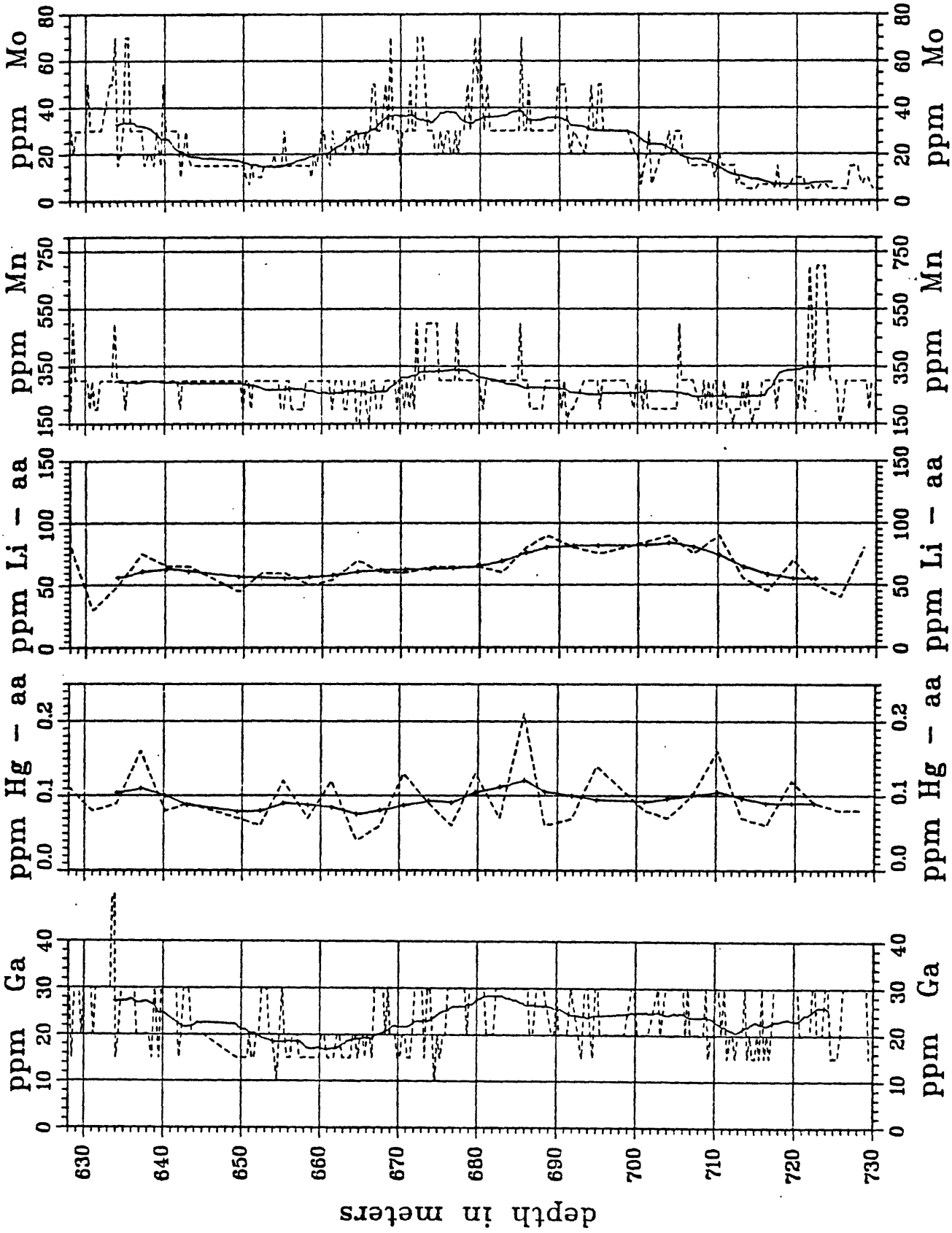

ppm Ga
0 10 20 30 40
ppm Hg - aa
0.0 0.1 0.2
ppm Li - aa
0 50 100 150
ppm Mn
150 350 550 750
ppm Mo
0 20 40 60 80
630 640 650 660 670 680 690 700 710 720 730
depth in meters

Fig. 4 (cont.

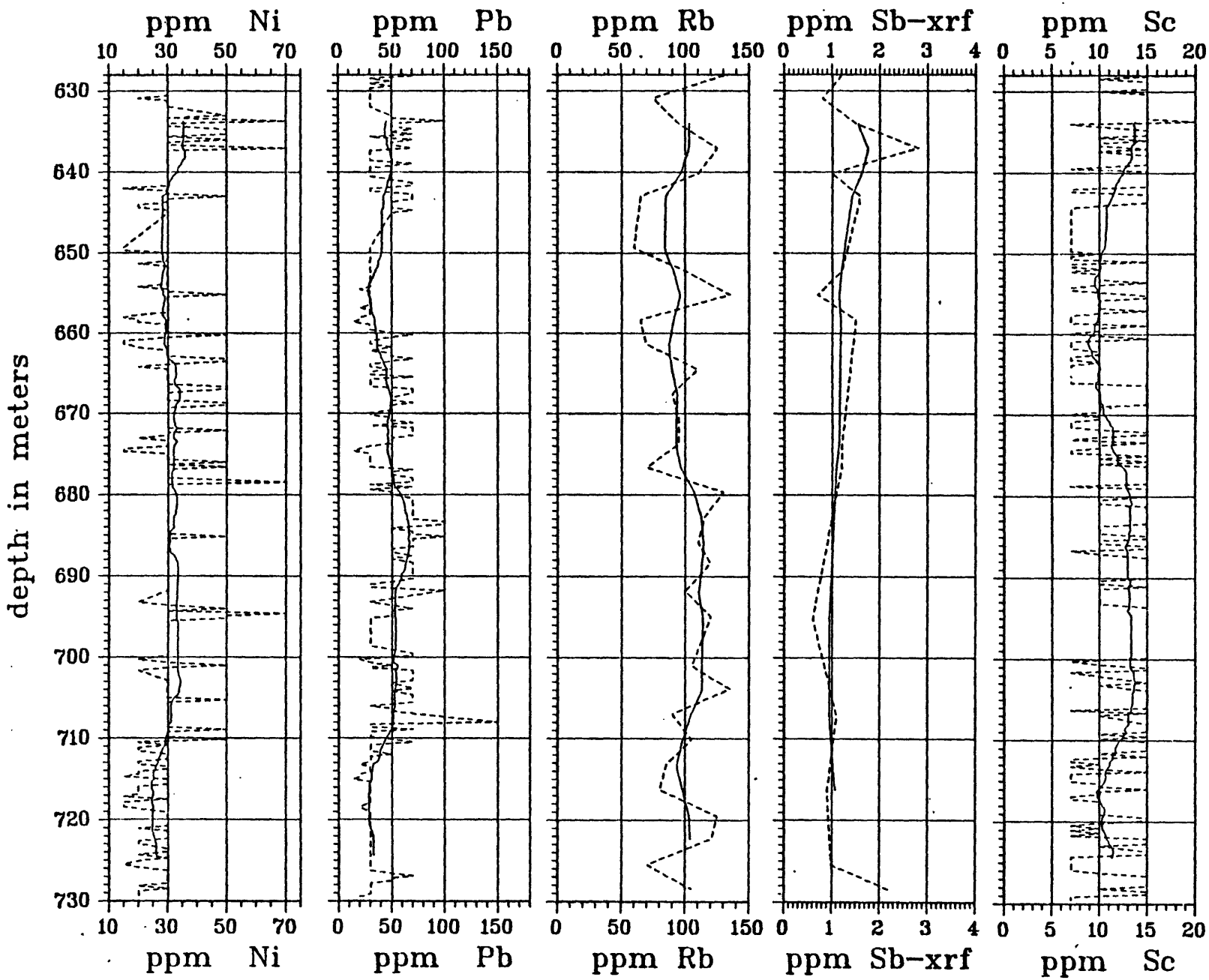

ppm Ni
ppm Pb
ppm Rb
ppm Sb-xrf
ppm Sc
depth in meters
630
640
650
660
670
680
690
700
710
720
730
10 30 50 70
0 50 100 150
0 50 100 150
0 1 2 3 4
0 5 10 15 20

Fig. 4 (cont.)

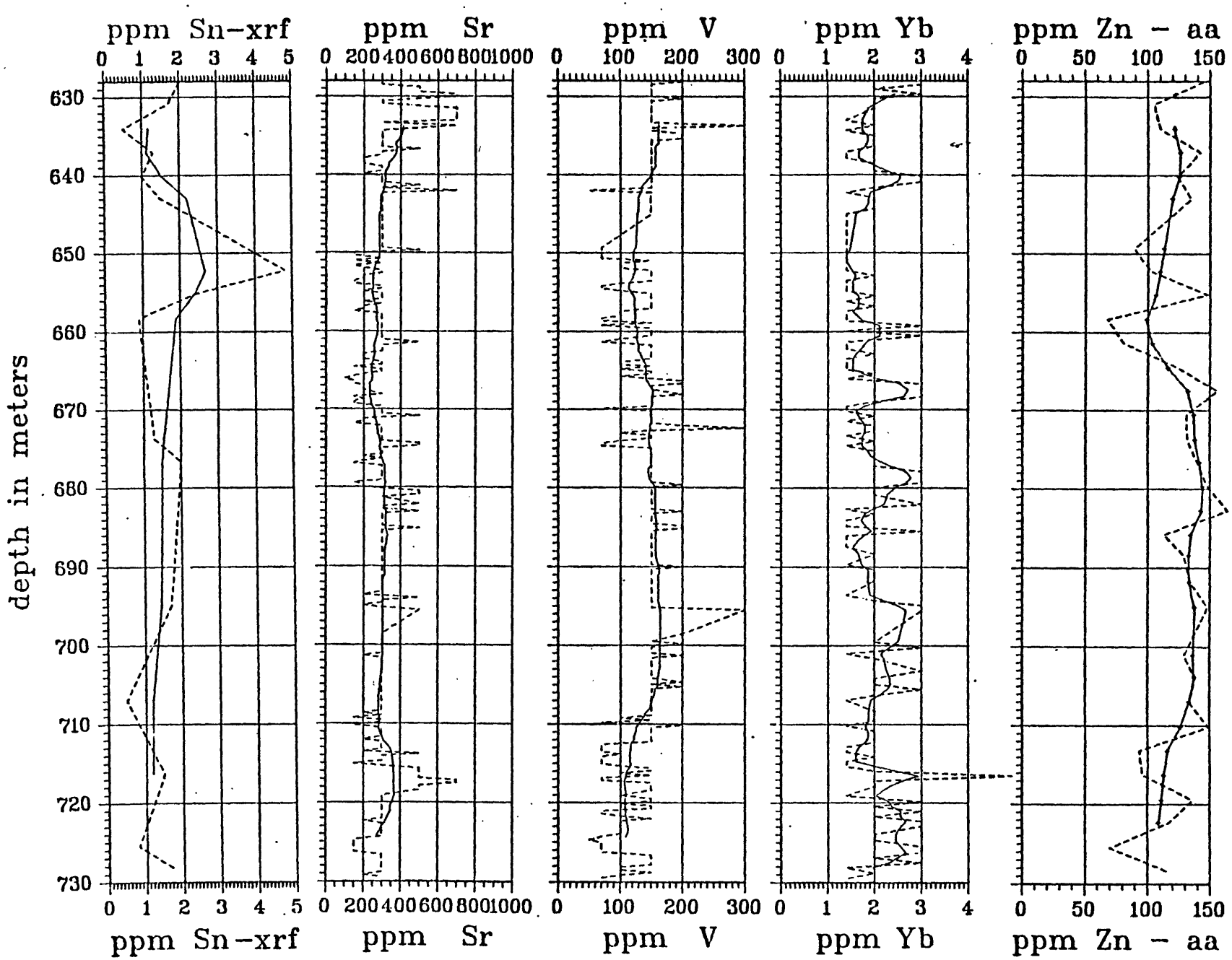

ppm Sn-xrf
ppm Sr
ppm V
ppm Yb
ppm Zn - aa
depth in meters
630
640
650
660
670
680
690
700
710
720
730
0 1 2 3 4 5
0 200 400 600 800 1000
0 100 200 300
0 1 2 3 4
0 50 100 150

Fig. 4 (cont.)

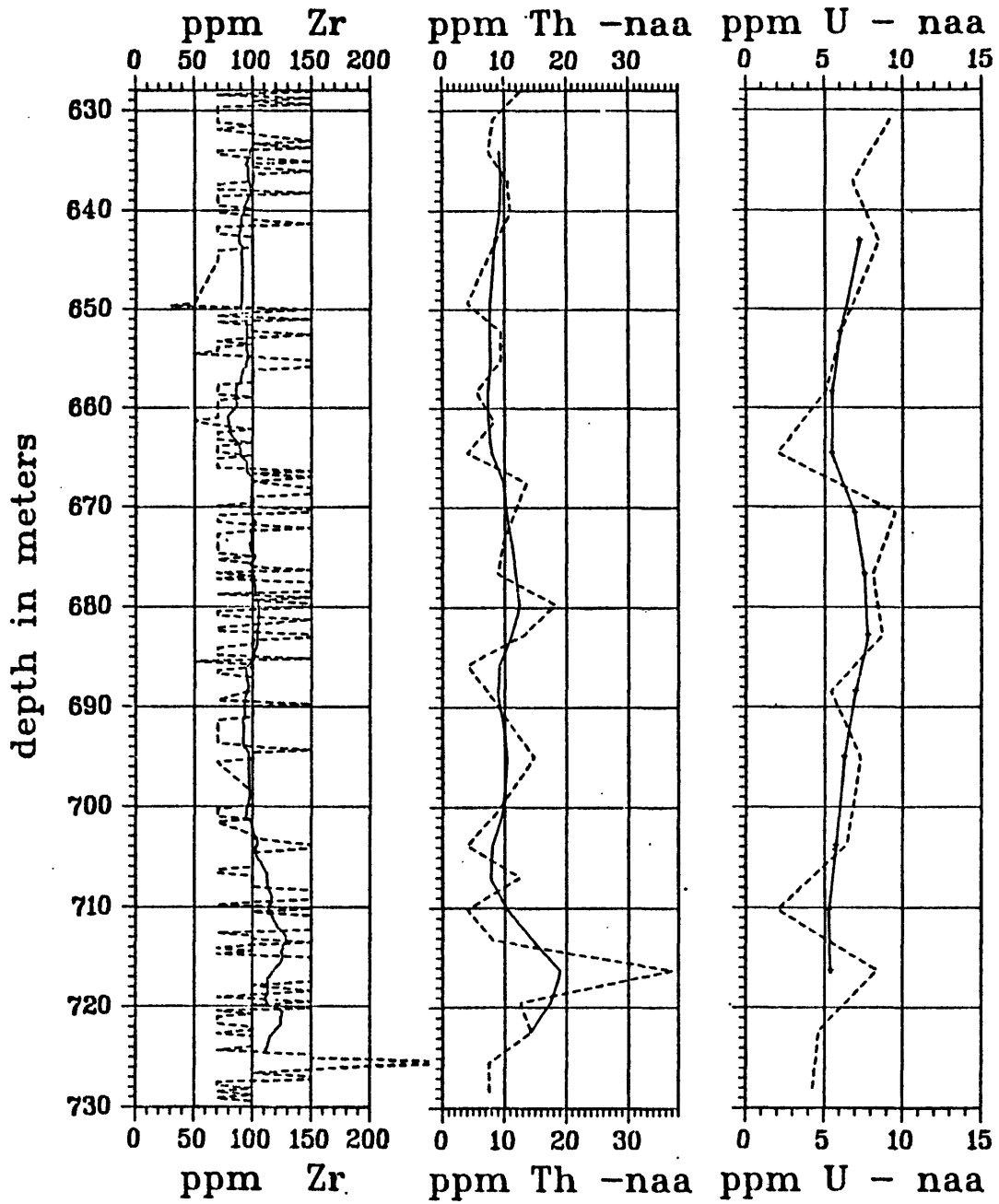

ppm Zr
0 50 100 150 200
ppm Th -naa
0 10 20 30
ppm U - naa
0 5 10 15
depth in meters
630
640
650
660
670
680
690
700
710
720
730
0 50 100 150 200
ppm Zr
0 10 20 30
ppm Th -naa
0 5 10 15
ppm U - naa

Fig. 4 (cont.)

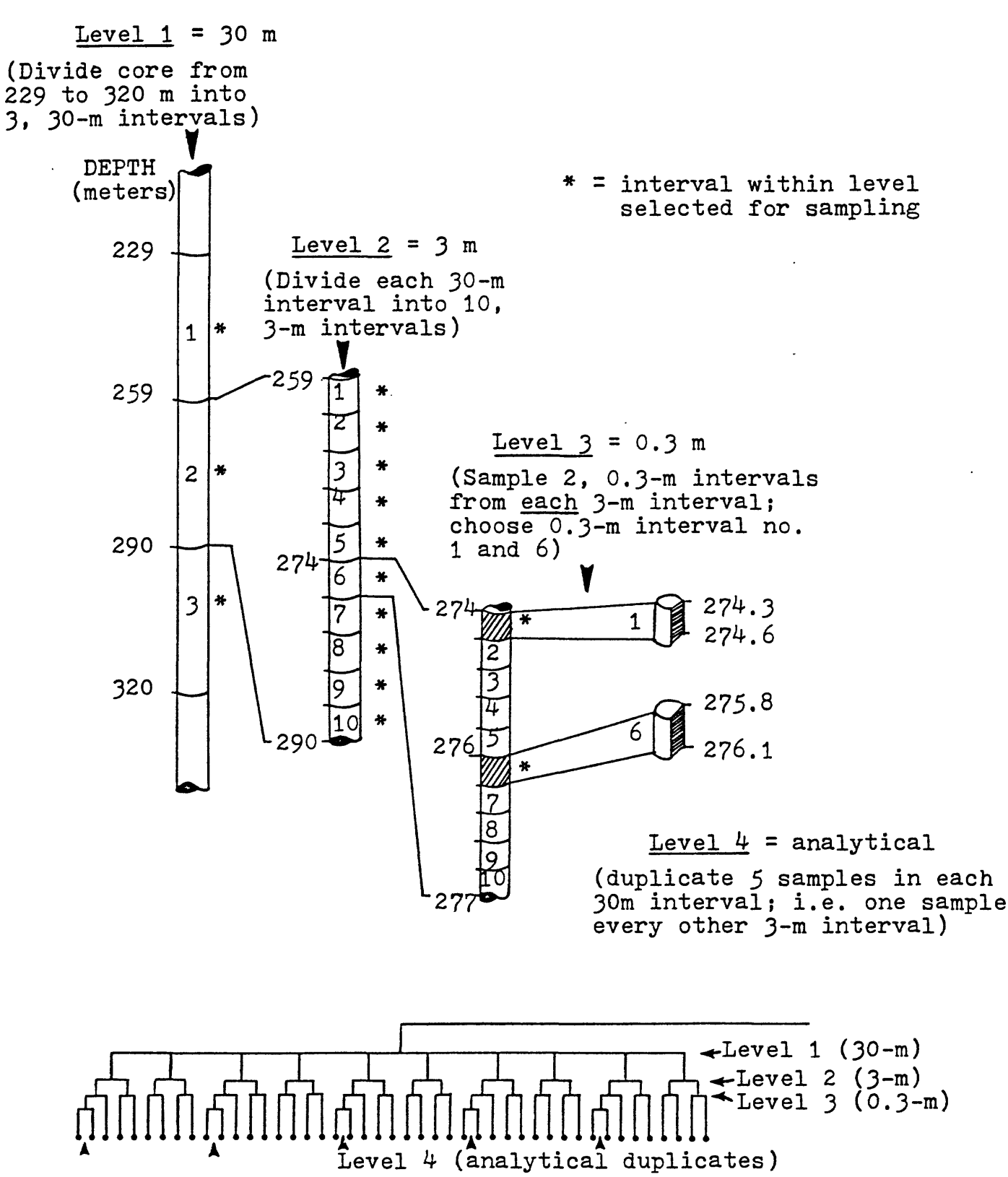


Figure 5.--Analysis of variance sampling design for the section 229 - 320 meters including the Mahogany zone, in the USGS corehole CR-2, Piceance Creek Basin, Colorado.

Figure 6.--Profiles of concentrations of Si, Al, Fe, Mg, Ca, Na, K, Ti, F, S, organic-C, carbonate-C, As, B, Ba, Co, Cr, Cu, Ga, Hg, La, Li, Mn, Mo, Nb, Ni, Pb, Rb, Sb, Sc, Sn, Sr, V, Y, Yb, Zn, Sr, Th, and U determined by X-ray fluorescence (xrf), semiquantitative optical emission specteoscopy (s), atomic absorption spectrophotometry (aa), specific ion electrode (elec), and neutron activation analysis (naa) in oil shale from the Mahogany zone (229 to 320 meters) in the USGS corehole CR-2, Piceance Creek Basin, Colorado. Original data points are connected with a dashed line. Duplicate analyses are indicated by two points connected by a horizontal bar at the same depth. Solid line through original data represents a 5-point weighted moving average of the original data.

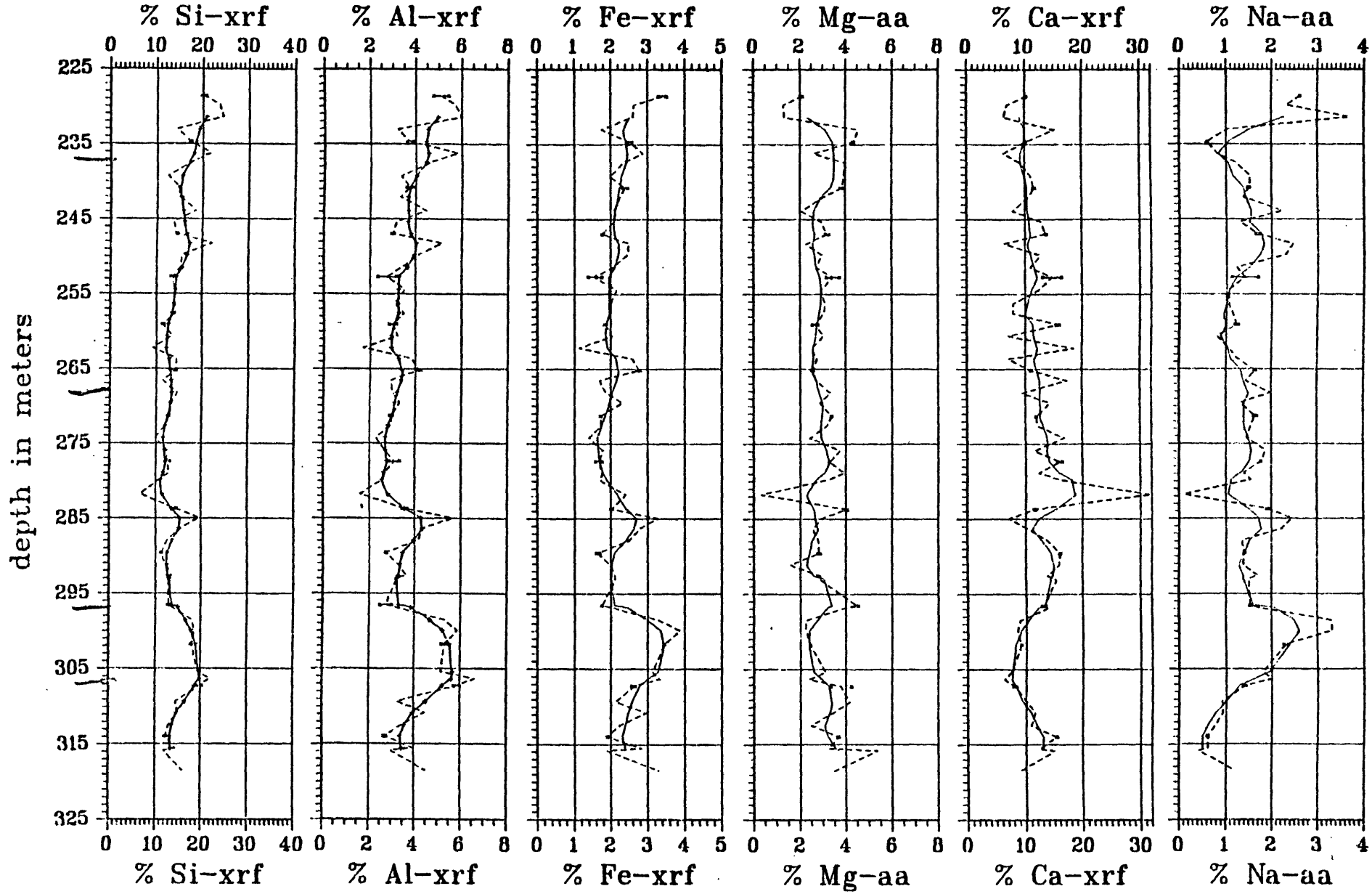

% Si-xrf
% Al-xrf
% Fe-xrf
% Mg-aa
% Ca-xrf
% Na-aa
depth in meters
225
235
245
255
265
275
285
295
305
315
325

Figure 6

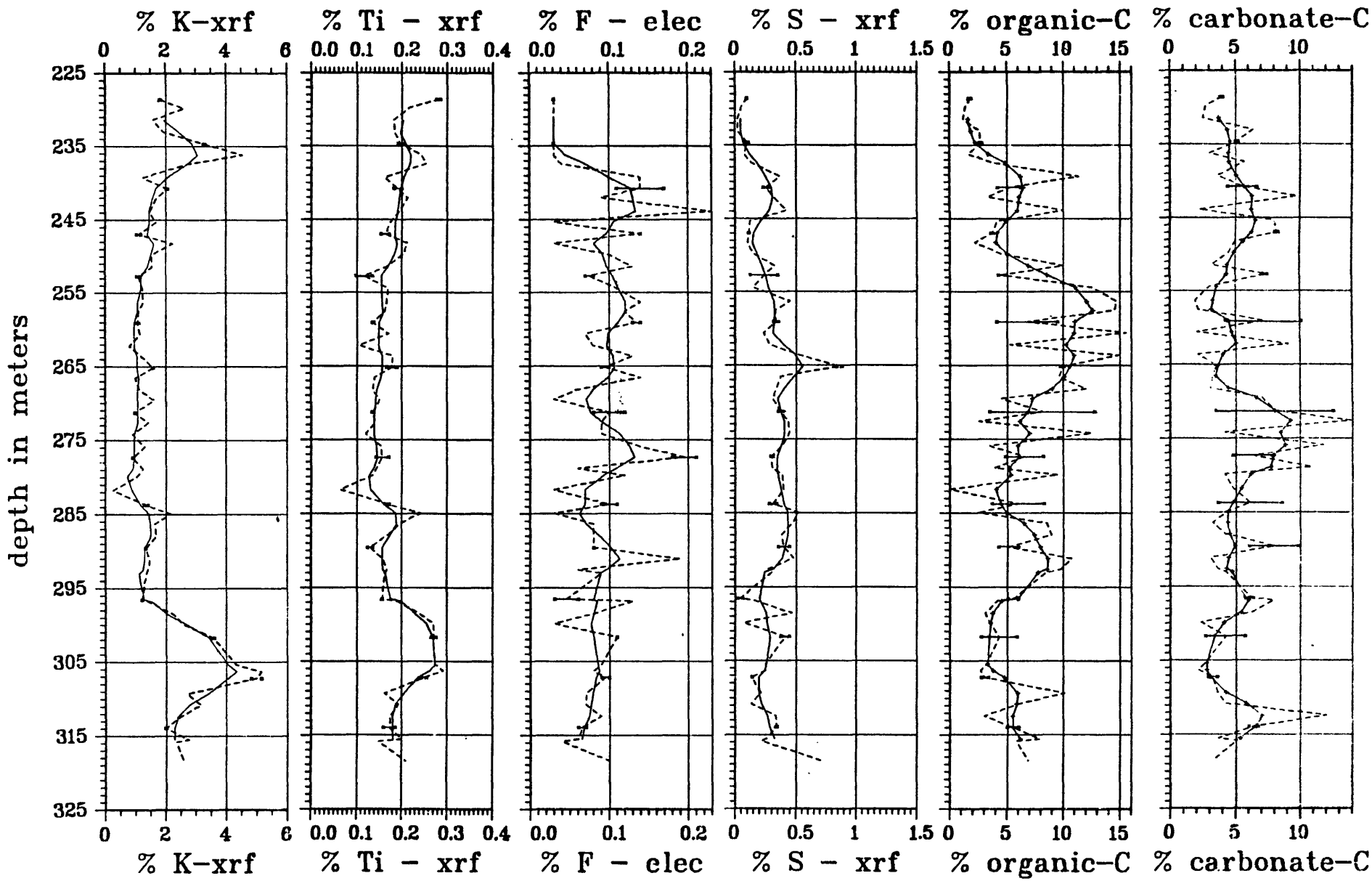

% K-xrf
% Ti - xrf
% F - elec
% S - xrf
% organic-C
% carbonate-C
depth in meters
225
235
245
255
265
275
285
295
305
315
325
0 2 4 6
0.0 0.1 0.2 0.3 0.4
0.0 0.1 0.2
0 0.5 1 1.5
0 5 10 15
0 5 10

Fig. 6 (cont.)

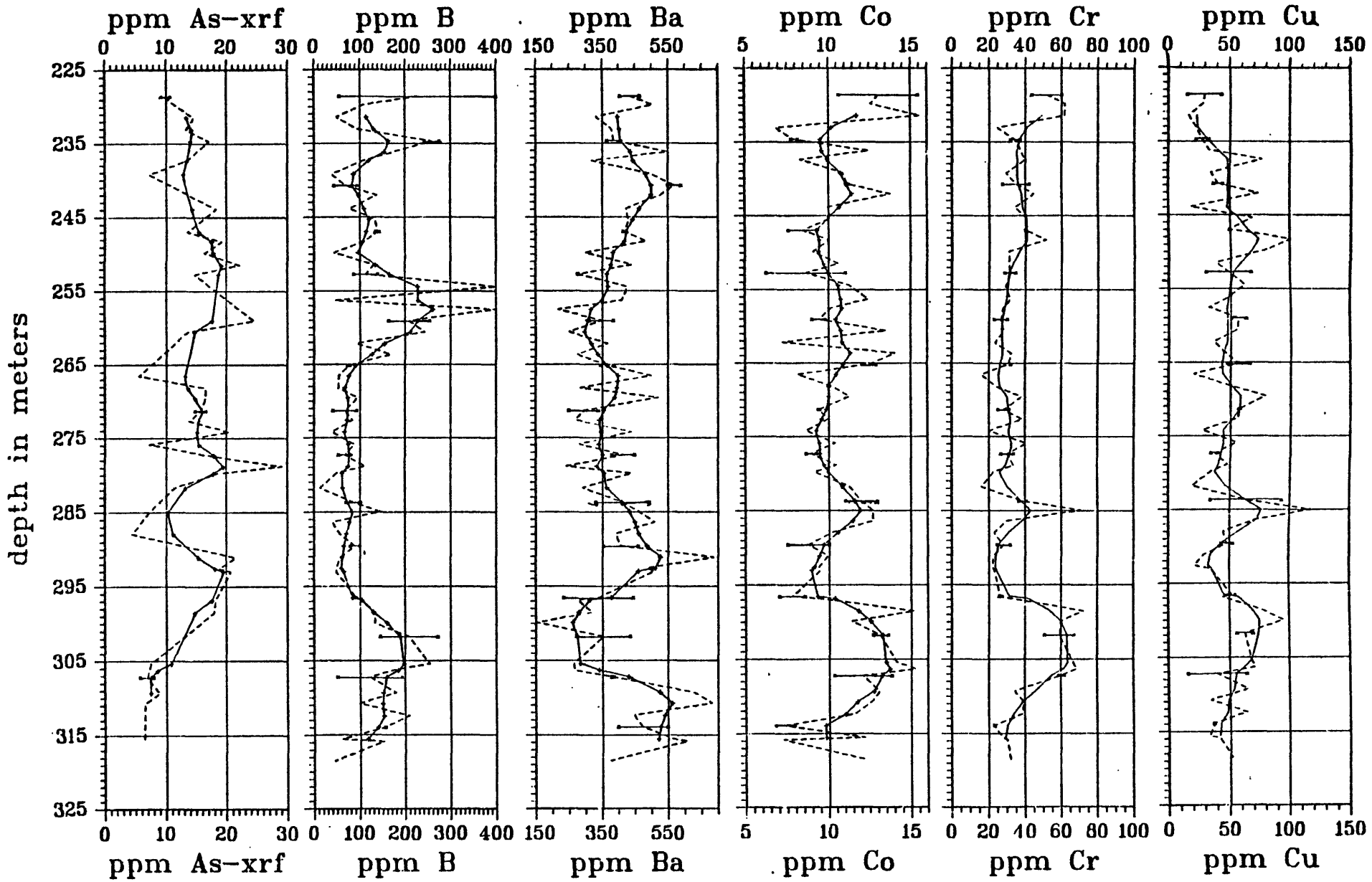

ppm As-xrf
ppm B
ppm Ba
ppm Co
ppm Cr
ppm Cu
depth in meters
225
235
245
255
265
275
285
295
305
315
325
0 10 20 30
0 100 200 300 400
150 350 550
5 10 15
0 20 40 60 80 100
0 50 100 150

Fig. 6 (cont.)

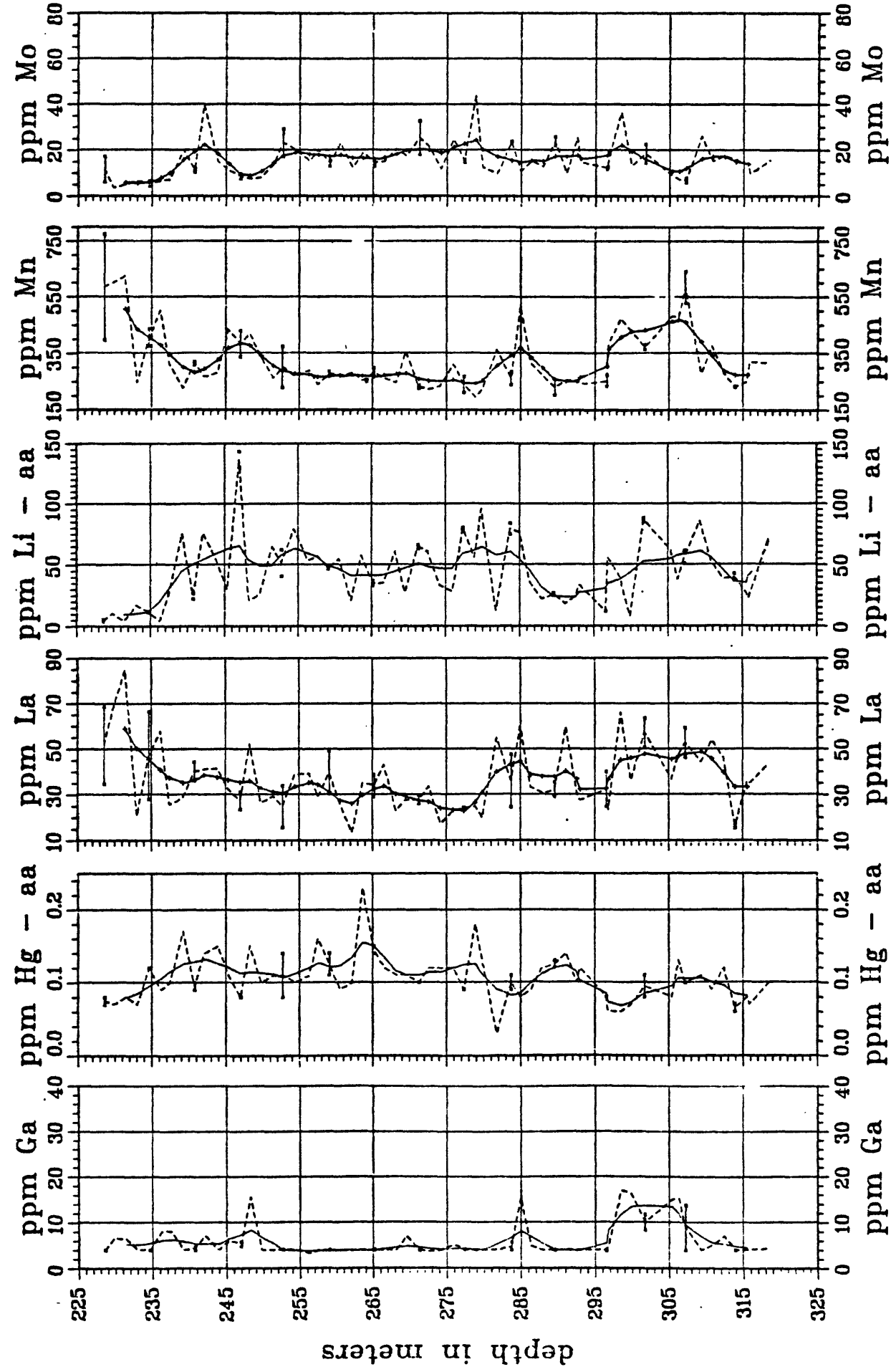

ppm Ga
ppm Hg - aa
ppm La
ppm Li - aa
ppm Mn
ppm Mo
depth in meters
225
235
245
255
265
275
285
295
305
315
325

Fig. 6 (cont.)

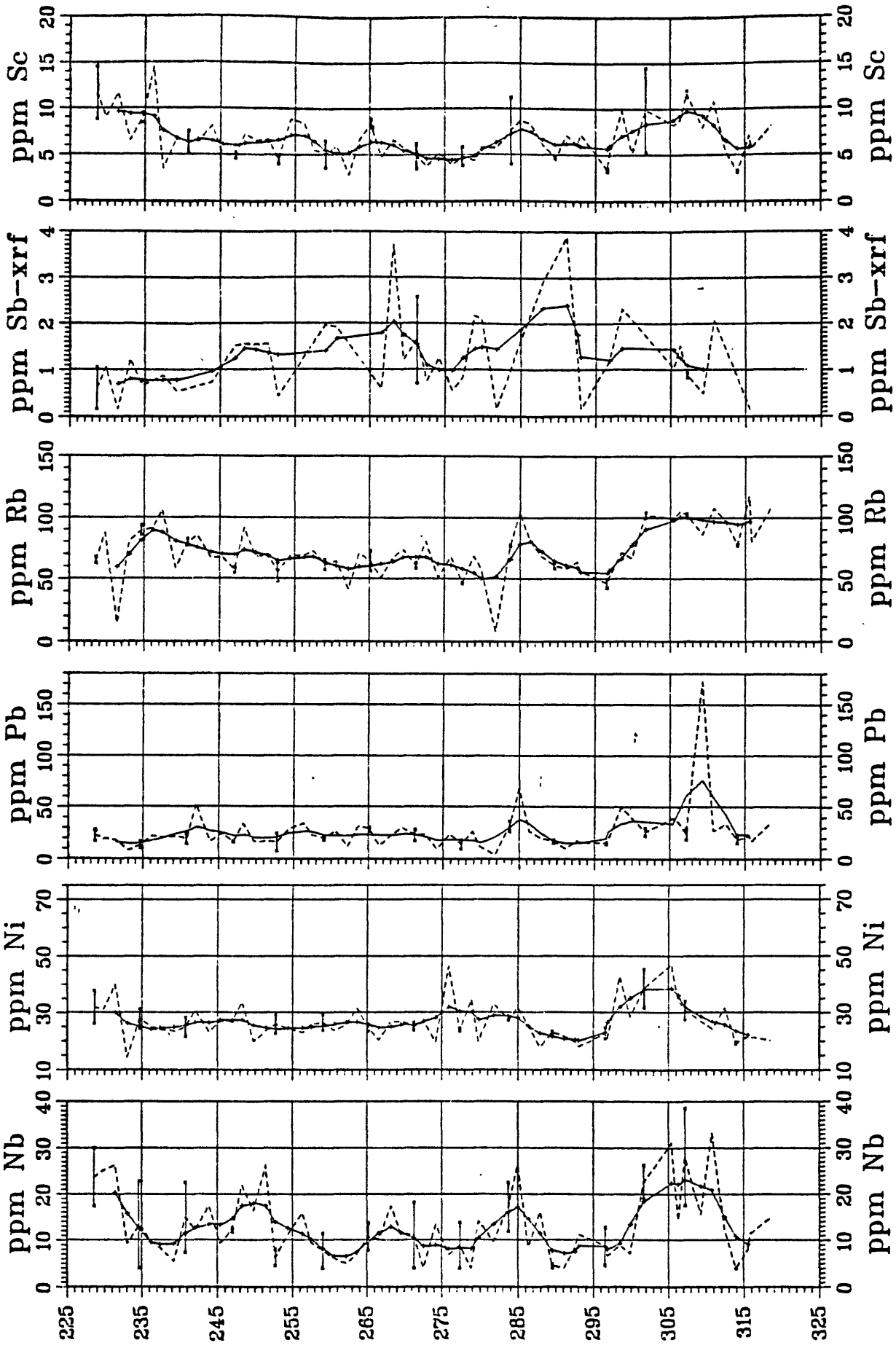

ppm Sc
ppm Sb-xrf
ppm Rb
ppm Pb
ppm Ni
ppm Nb
depth in meters
225
235
245
255
265
275
285
295
305
315
325

Fig. 6 (cont.)

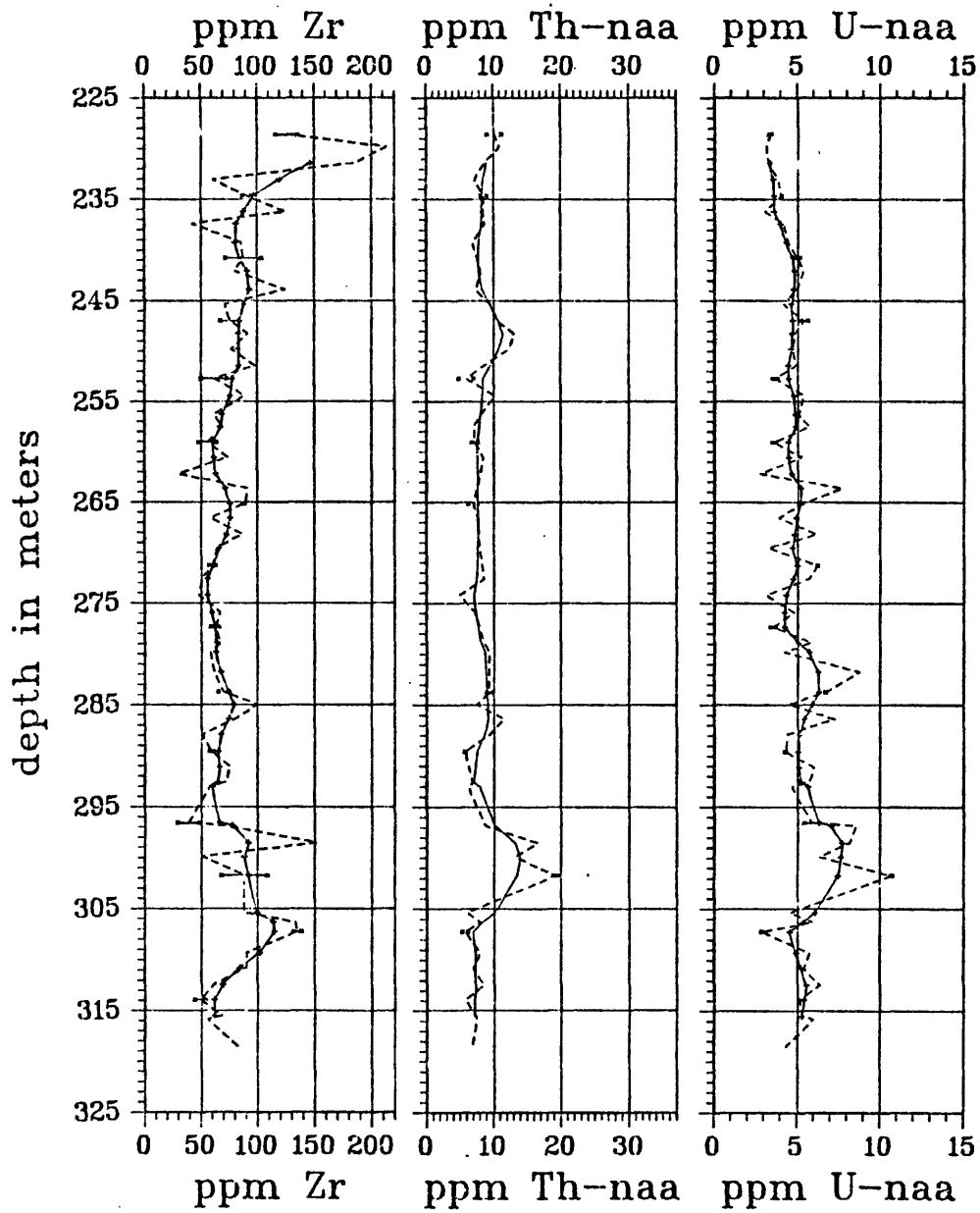

ppm Zr
ppm Th-naa
ppm U-naa
0 50 100 150 200
0 10 20 30
0 5 10 15
depth in meters
225
235
245
255
265
275
285
295
305
315
325

Fig. 6 (cont.)

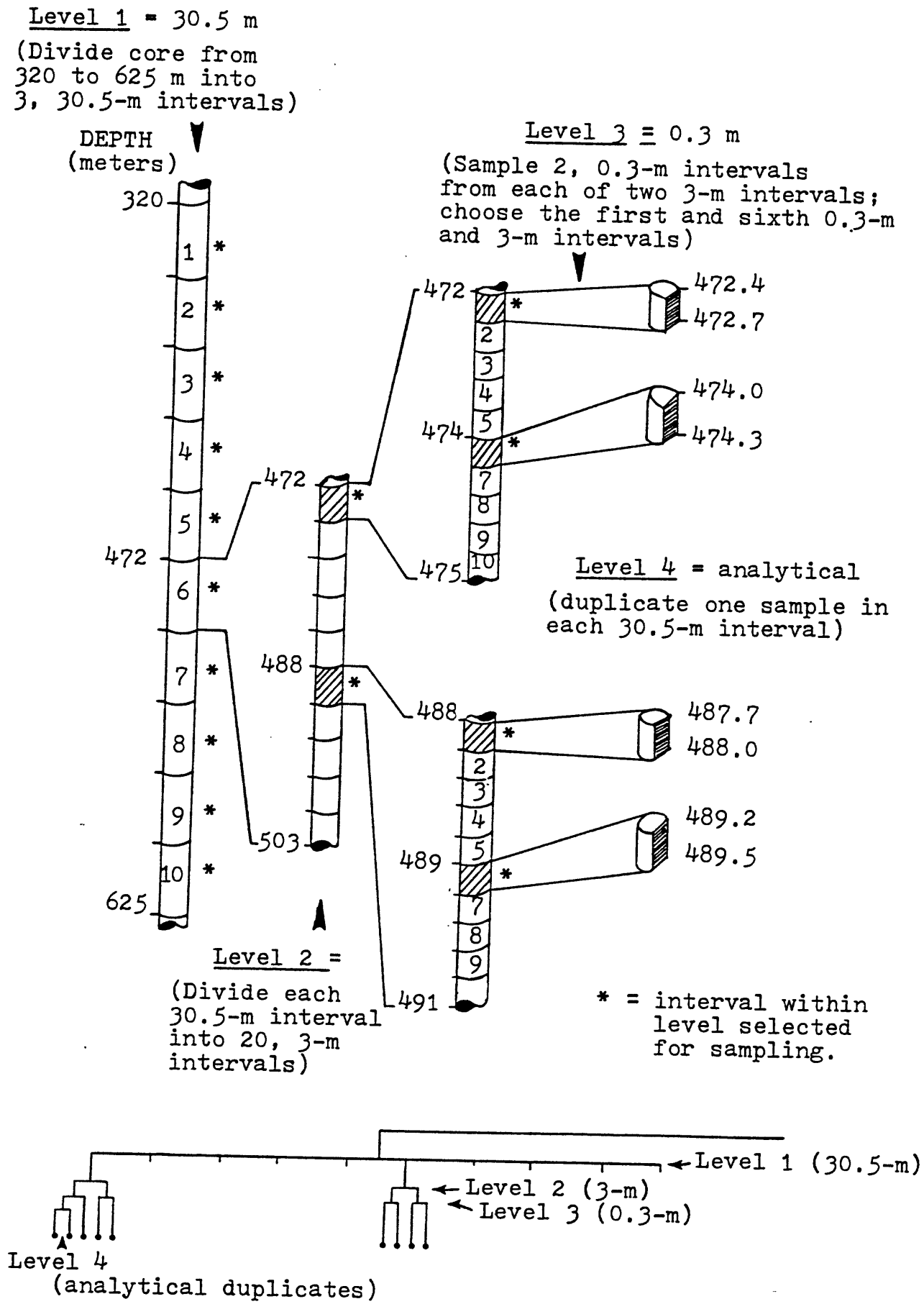
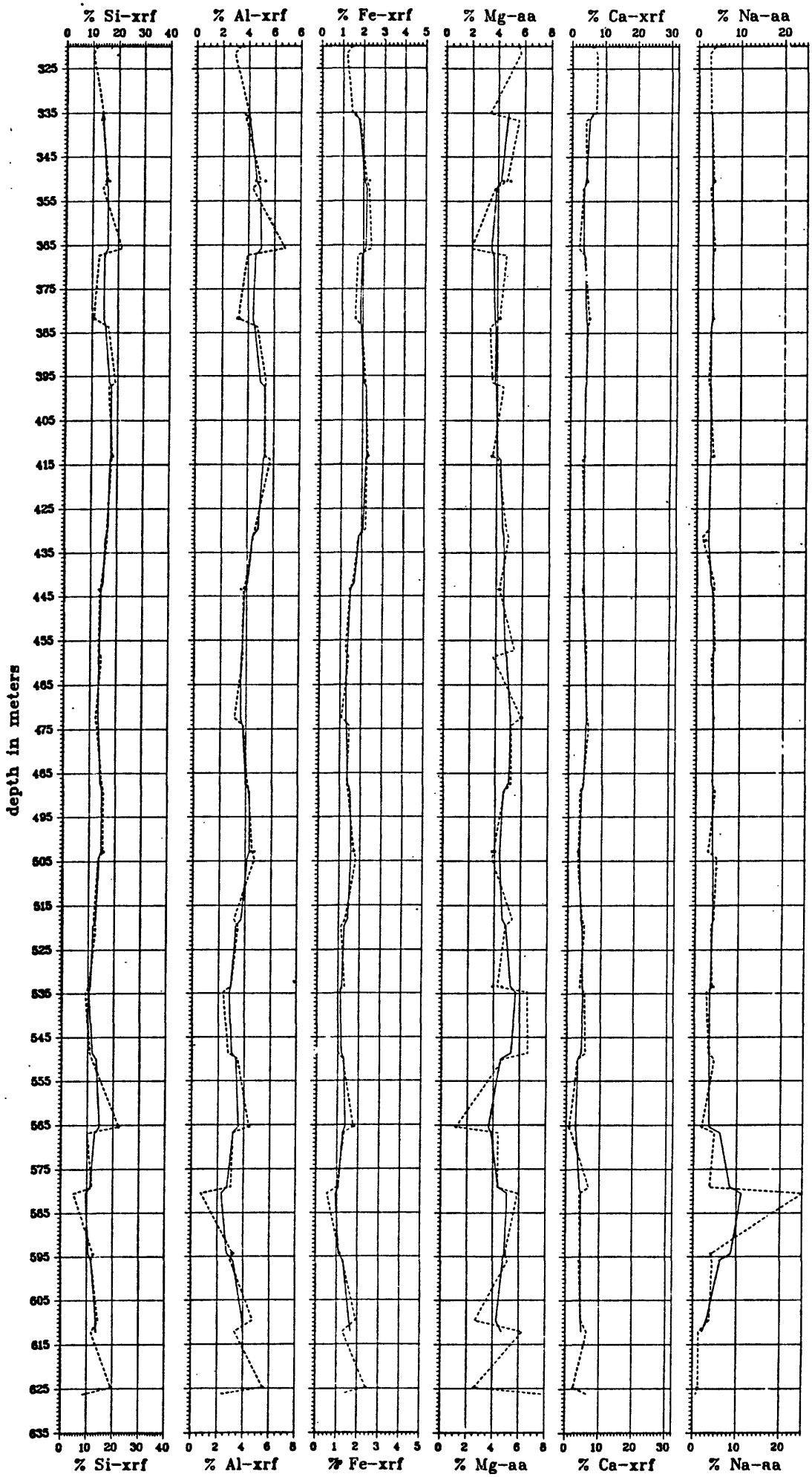


Figure 7.--Analysis-of-variance sampling design for 320 to 625 meters in the USGS corehole Cr-2, Piceance Creek Basin, Colorado.

Figure 8.--Profiles of concentrations of Si, Al, Fe, Mg, Ca, Na, K, Ti, F, S, organic-C, carbonate-C, As, B, Ba, Co, Cr, Cu, Hg, La, Li, Mn, Mo, Nb, Ni, Pb, Rb, Sb, Sc, Sn, Sr, V, Y, Yb, Zn, Zr, Th, and U determined by X-ray fluorescence (xrf), semiquantitative optical emission spectroscopy (s), atomic absorption spectrophotometry (aa), specific ion electrode (elec), and neutron activation analysis (naa) in oil shale from the central 300 meters (320 to 625 meters) in the USGS corehole Cr-2, Piceance Creek Basin, Colorado. Original data points are connected with a dashed line. Duplicate analyses are indicated by two points connected with a horizontal bar at the same depth. Solid line represents a 5-point weighted moving average of the original data.


% Si-xrf
% Al-xrf
% Fe-xrf
% Mg-aa
% Ca-xrf
% Na-aa
depth in meters
325
335
345
355
365
375
385
395
405
415
425
435
445
455
465
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565
575
585
595
605
615
625
635

Figure 8

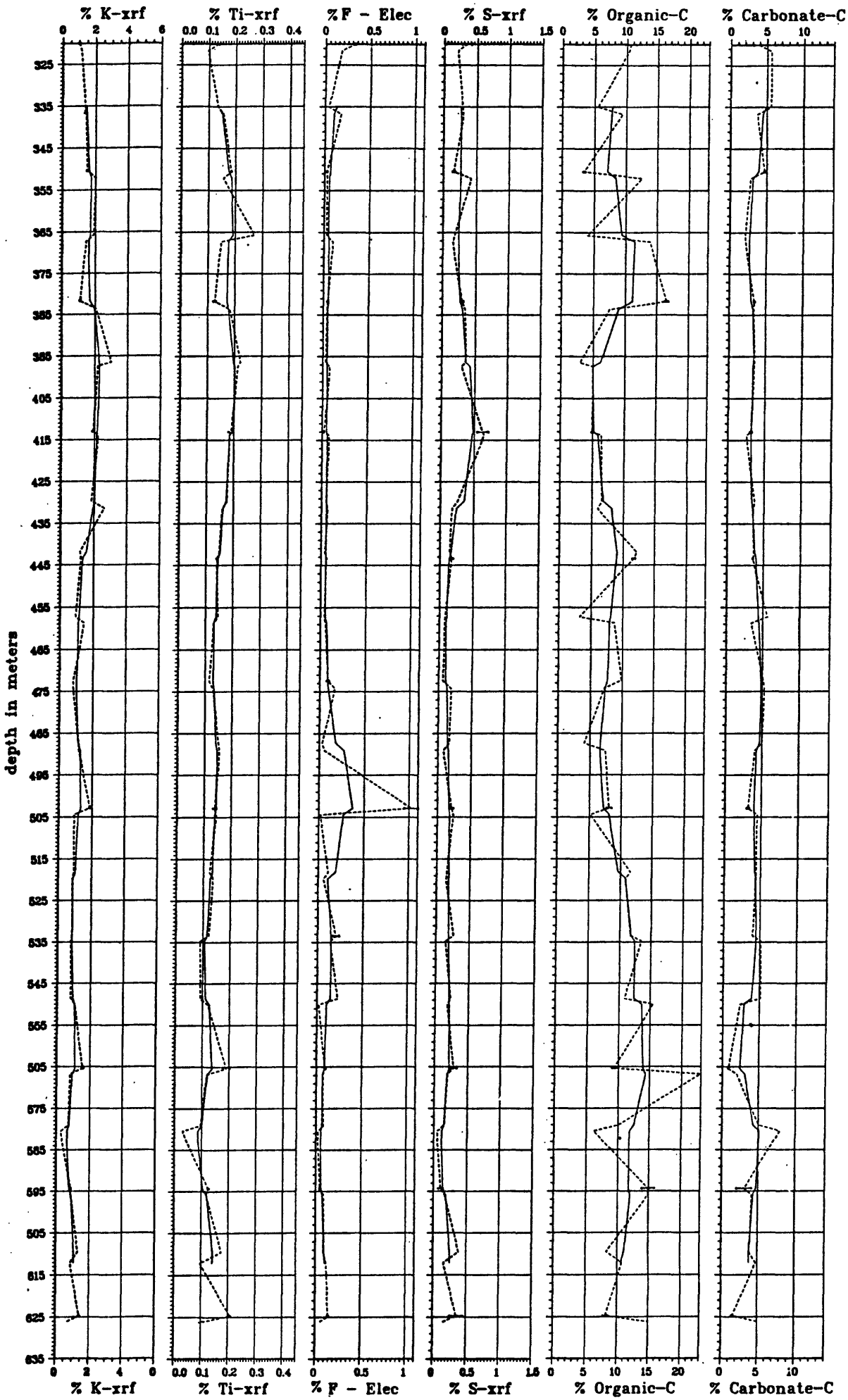
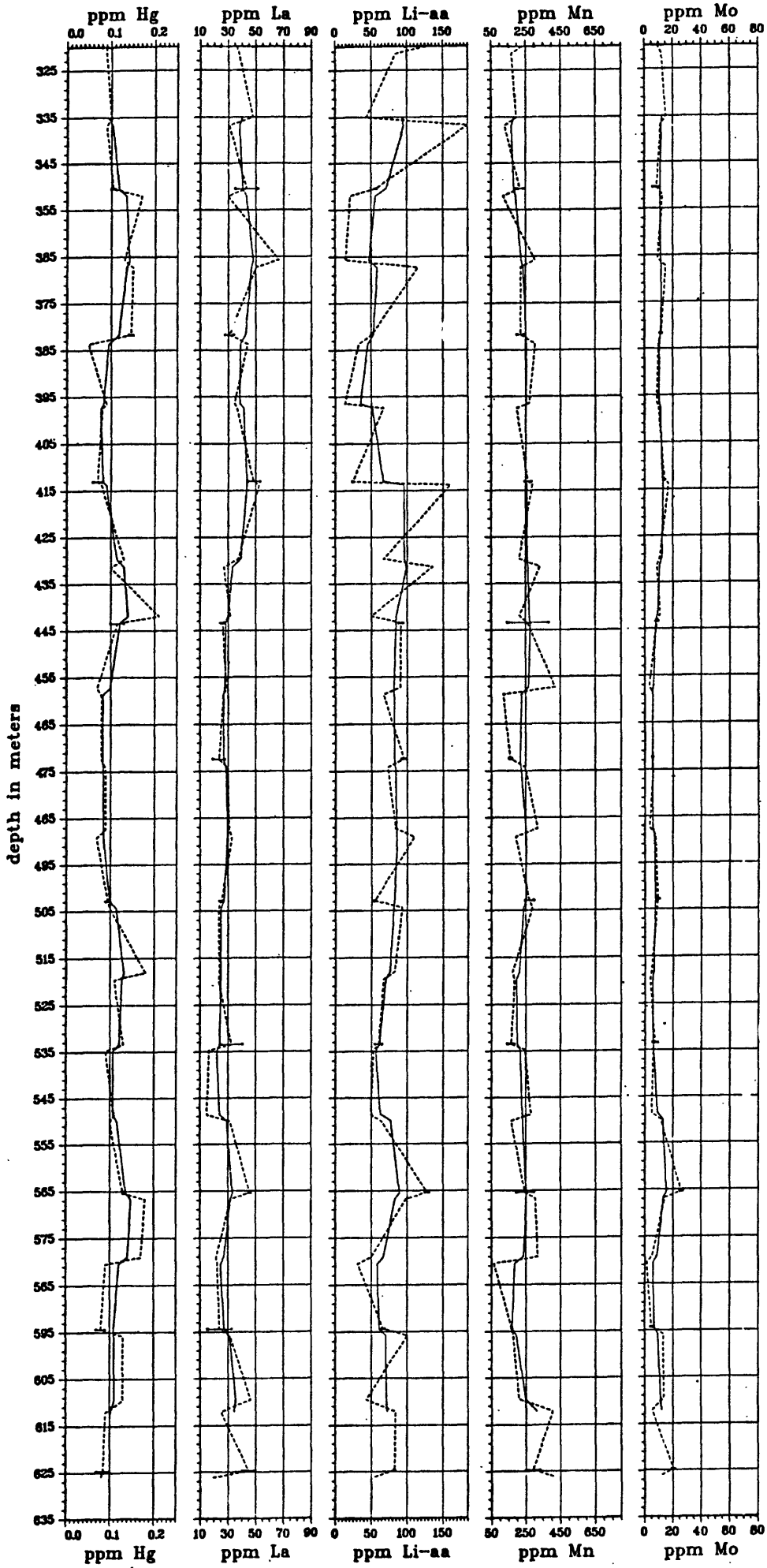

% K-xrf
% Ti-xrf
% F - Elec
% S-xrf
% Organic-C
% Carbonate-C
depth in meters
325
335
345
355
365
375
385
395
405
415
425
435
445
455
465
475
485
495
505
515
525
535
545
555
565
575
585
595
605
615
625
635

Fig. 8 (cont.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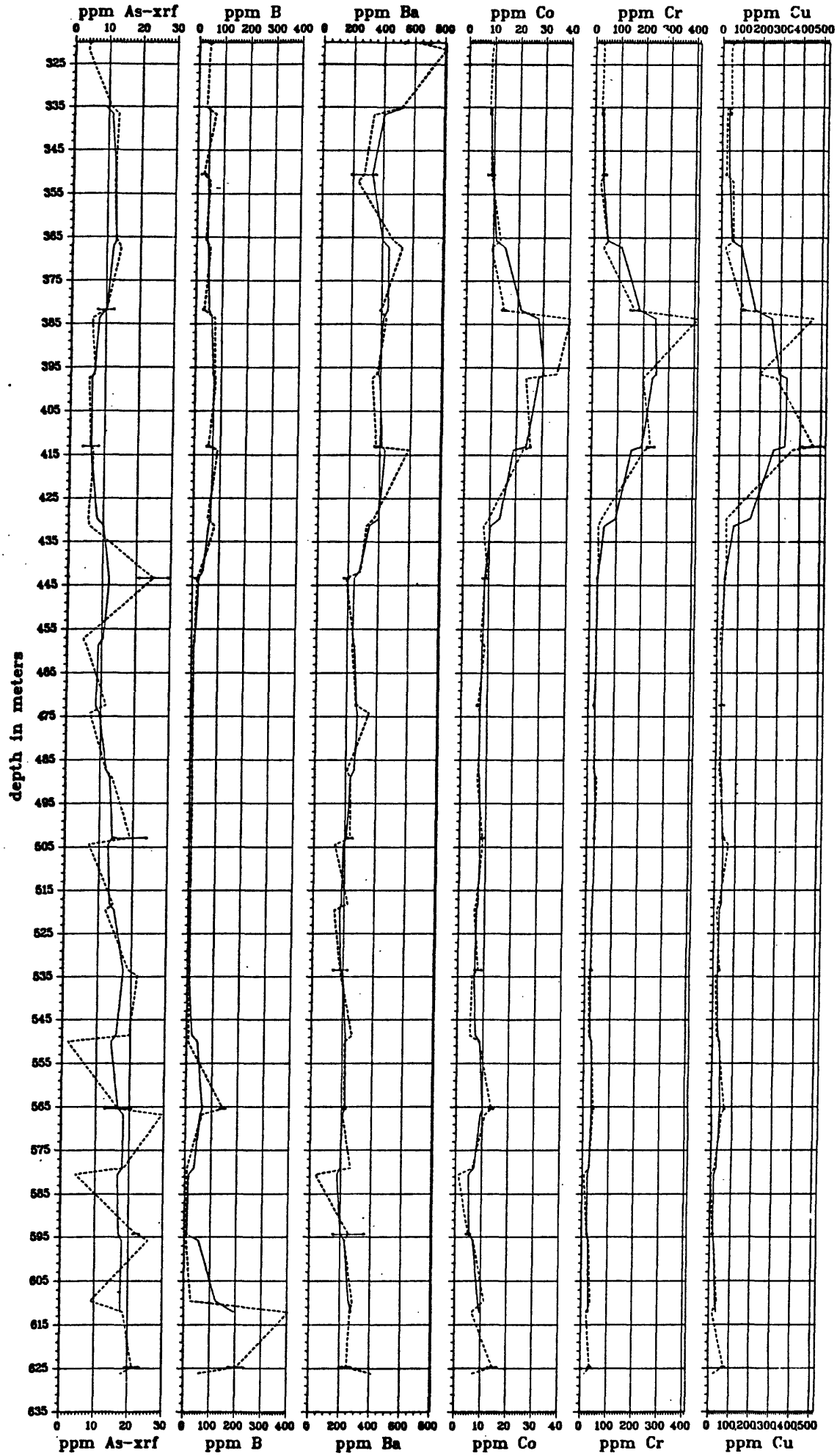
0.0 0.1 0.2
ppm La
10 30 50 70 90
ppm Li-aa
0 50 100 150
ppm Mn
50 250 450 650
ppm Mo
0 20 40 60 80
depth in meters
325 335 345 355 365 375 385 395 405 415 425 435 445 455 465 475 485 495 505 515 525 535 545 555 565 575 585 595 605 615 625 635
0.0 0.1 0.2
ppm Hg
10 30 50 70 90
ppm La
0 50 100 150
ppm Li-aa
50 250 450 650
ppm Mn
0 20 40 60 80
ppm Mo

Fig. 8 (cont.)


ppm As-xrf
ppm B
ppm Ba
ppm Co
ppm Cr
ppm Cu
depth in meters
325
335
345
355
365
375
385
395
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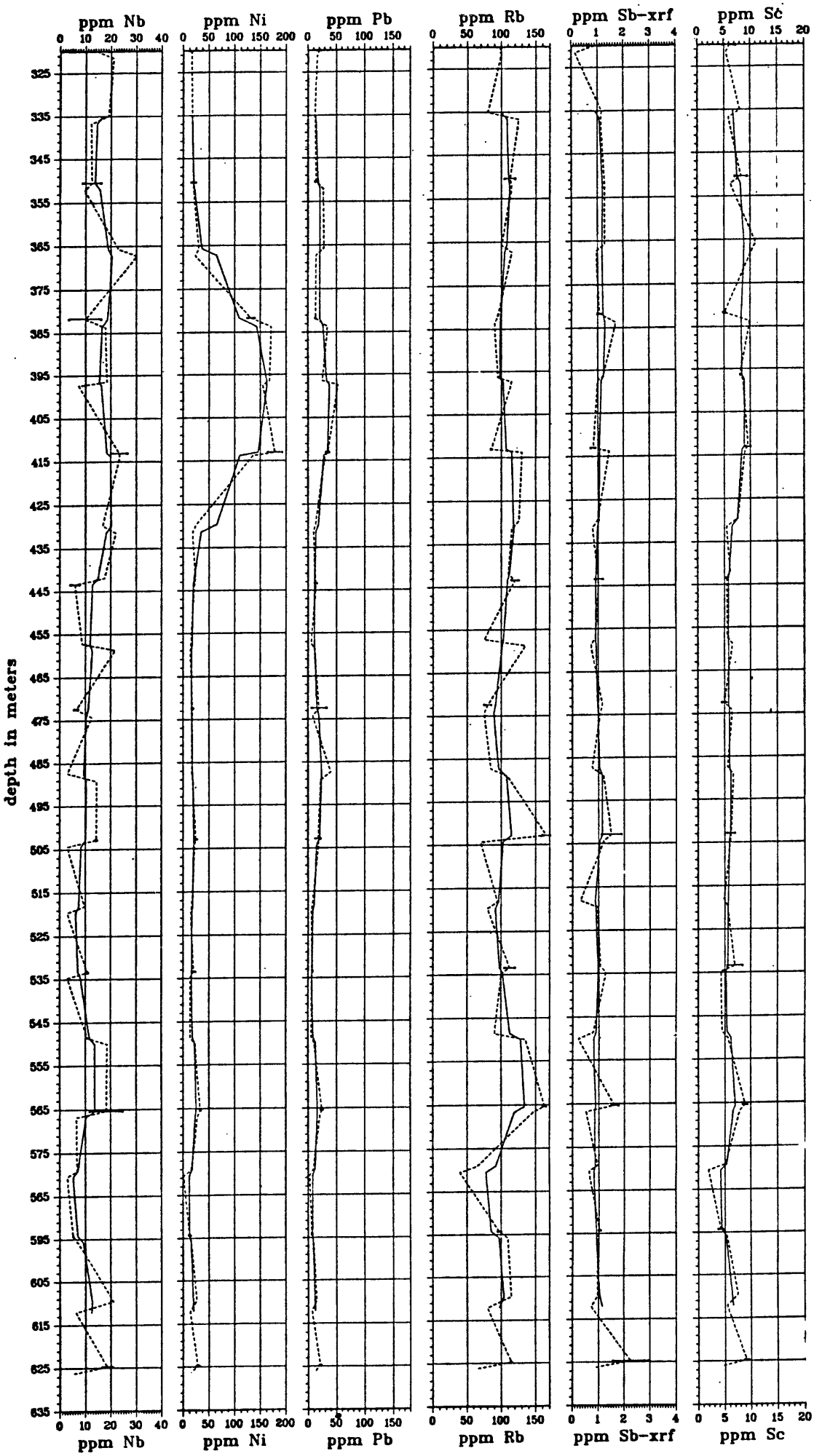
415
425
435
445
455
465
475
485
495
505
515
525
535
545
555
565
575
585
595
605
615
625
635
0 10 20 30
0 100 200 300 400
0 200 400 600 800
0 10 20 30 40
0 100 200 300 400
0 100 200 300 400 500

Fig. 8 (cont.)


ppm Nb
ppm Ni
ppm Pb
ppm Rb
ppm Sb-xrf
ppm Sc
depth in meters
325
335
345
355
365
375
385
395
405
415
425
435
445
455
465
475
485
495
505
515
525
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545
555
565
575
585
595
605
615
625
635

Fig. 8 (cont.)

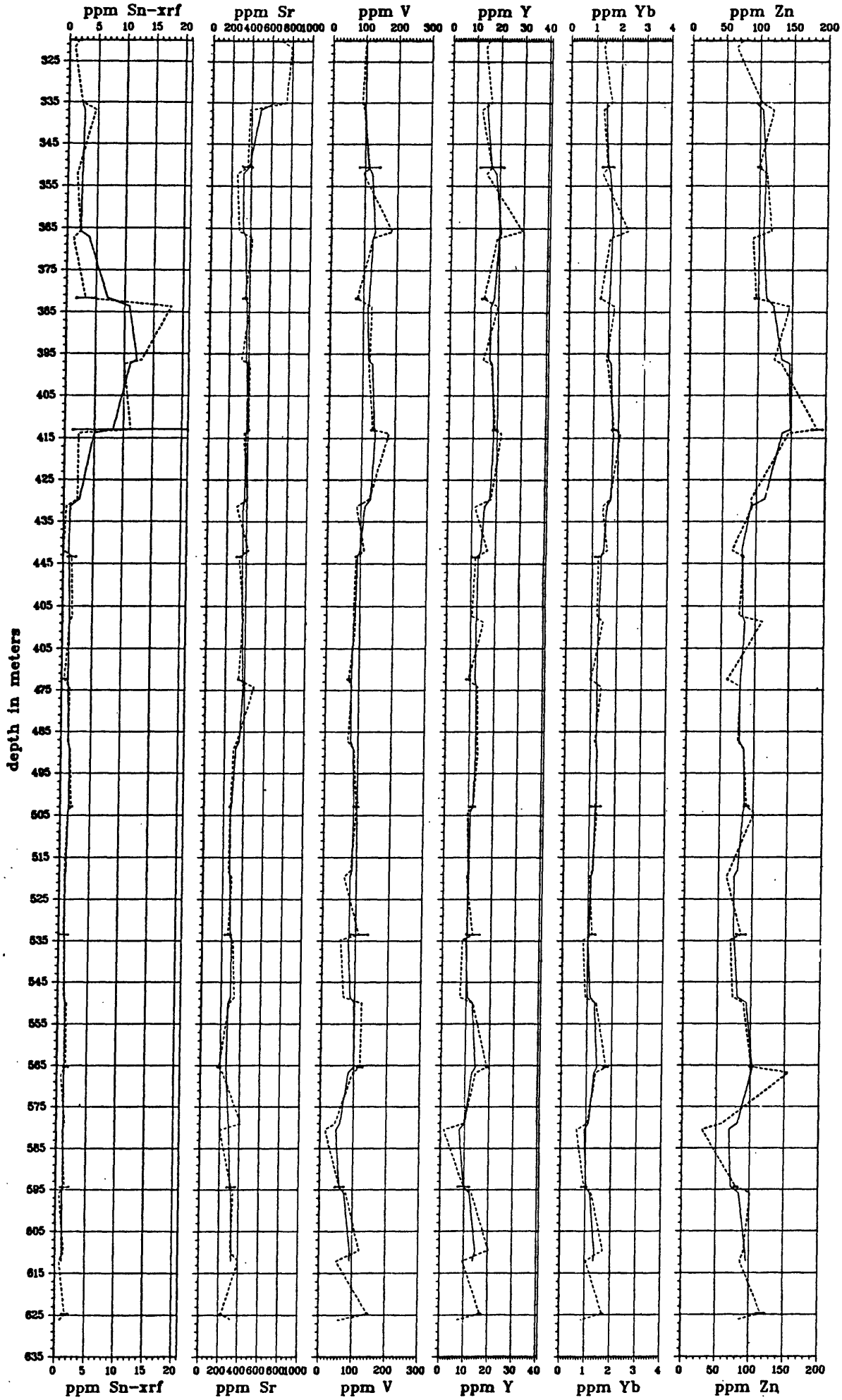

ppm Sn-xrf
ppm Sr
ppm V
ppm Y
ppm Yb
ppm Zn
depth in meters
325
335
345
355
365
375
385
395
405
415
425
435
445
405
405
475
485
495
505
515
525
535
545
555
565
575
585
595
605
615
625
635

Fig. 8 (cont.)

Figure 9.--Profiles of concentrations of Si, Al, Fe, Mg, Ca, Na, K, Ti, F, S, carbonate-C, organic-C, As, B, Ba, Co, Cr, Cu, Hg, La, Li, Mo, Mn, Nb, Ni, Pb, Rb, Sb, Sc, Sn, Sr, V, Y, Yb, Zn, Zr, Th, and U determined by X-ray fluorescence (xrf), semiquantitative optical emission spectroscopy, atomic absorption spectrophotometry (aa), and neutron activation analysis (naa) in oil shale from the Green River Formation in the USGS corehole CR-2, Piceance Creek Basin, Colorado. The profiles are 15-point weighted moving averages of original data.

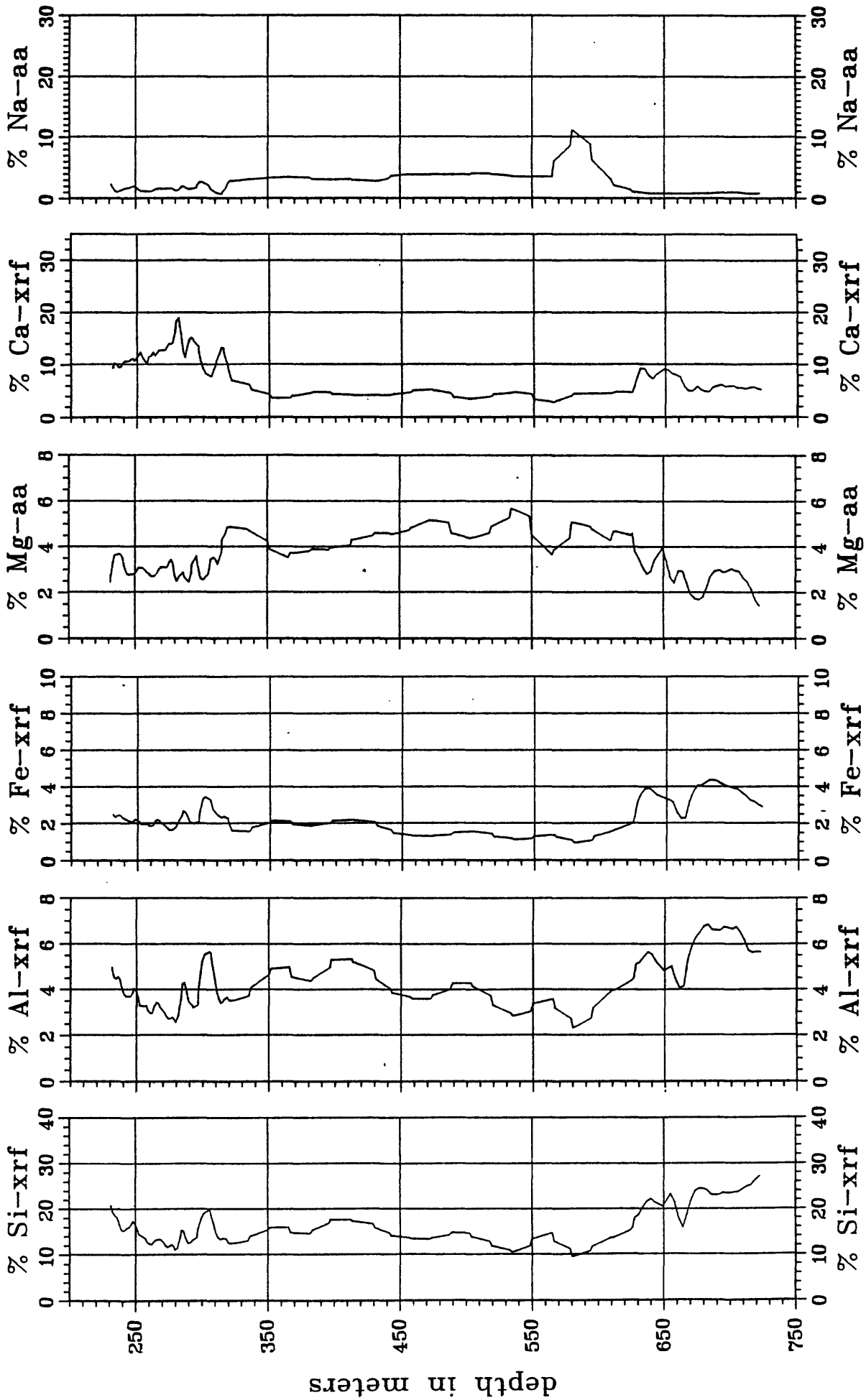

% Si-xrf
% Al-xrf
% Fe-xrf
% Mg-aa
% Ca-xrf
% Na-aa
depth in meters
250
350
450
550
650
750

Figure 9

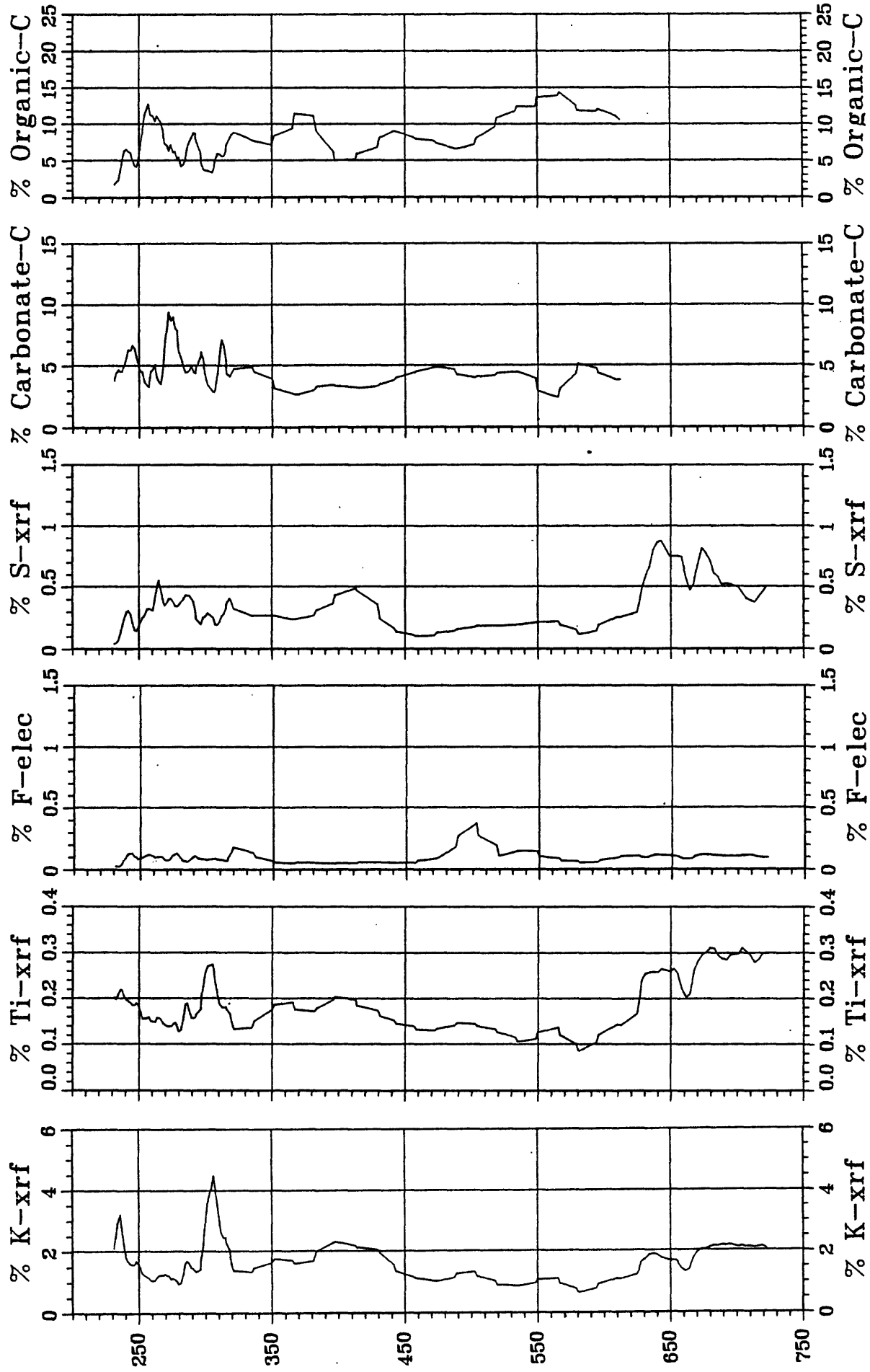

% Organic-C
% Carbonate-C
% S-xrf
% F-elec
% Ti-xrf
% K-xrf
depth in meters
250
350
450
550
650
750

Fig. 9 (cont.

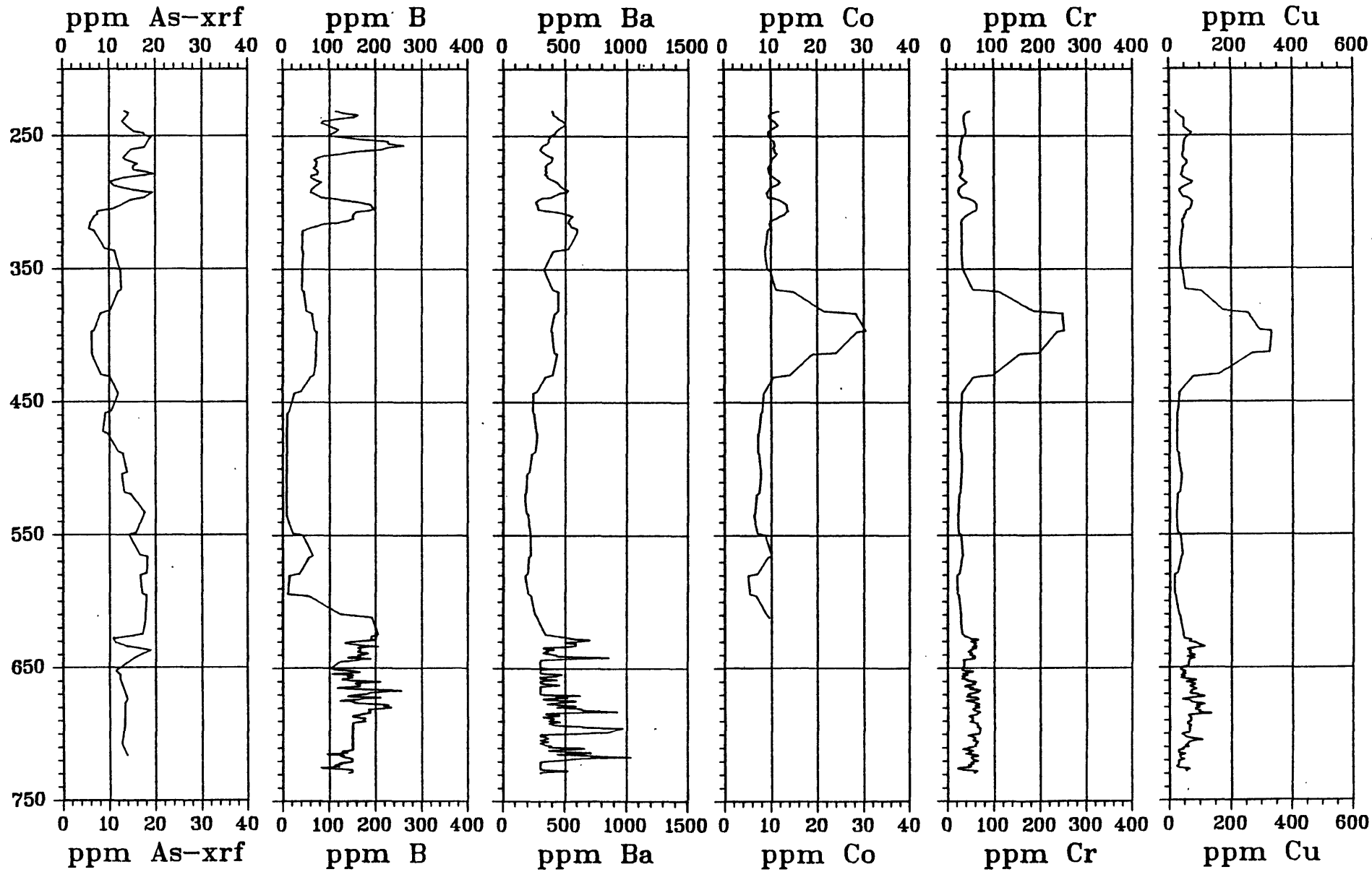
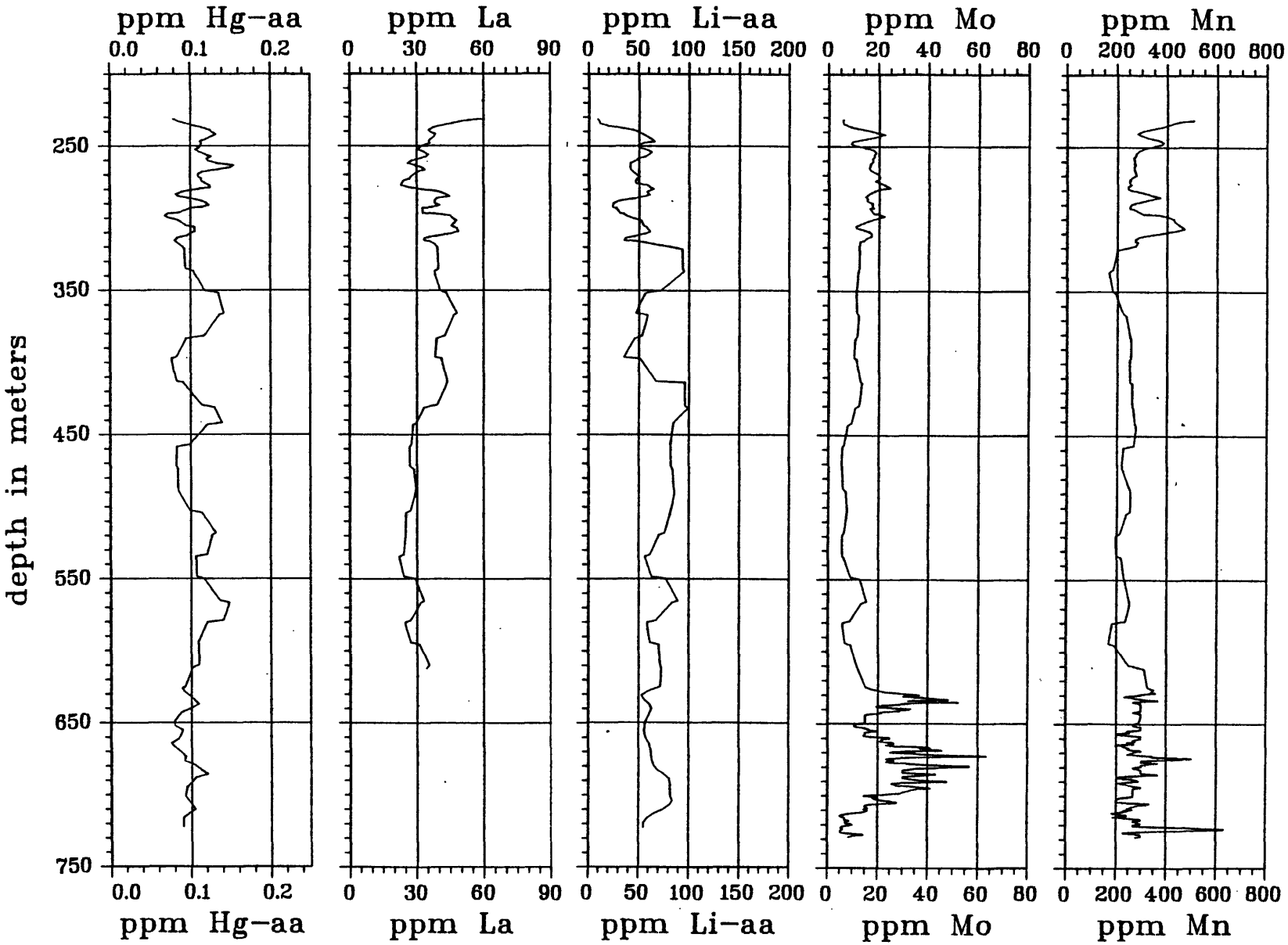

ppm As-xrf
ppm B
ppm Ba
ppm Co
ppm Cr
ppm Cu
depth in meters
250
350
450
550
650
750
0 10 20 30 40
0 100 200 300 400
0 500 1000 1500
0 200 400 600

Fig. 9 (cont.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0.0 0.1 0.2
ppm La
0 30 60 90
ppm Li-aa
0 50 100 150 200
ppm Mo
0 20 40 60 80
ppm Mn
0 200 400 600 800
depth in meters
250
350
450
550
650
750
0.0 0.1 0.2
ppm Hg-aa
0 30 60 90
ppm La
0 50 100 150 200
ppm Li-aa
0 20 40 60 80
ppm Mo
0 200 400 600 800
ppm Mn

Fig. 9 (cont.)

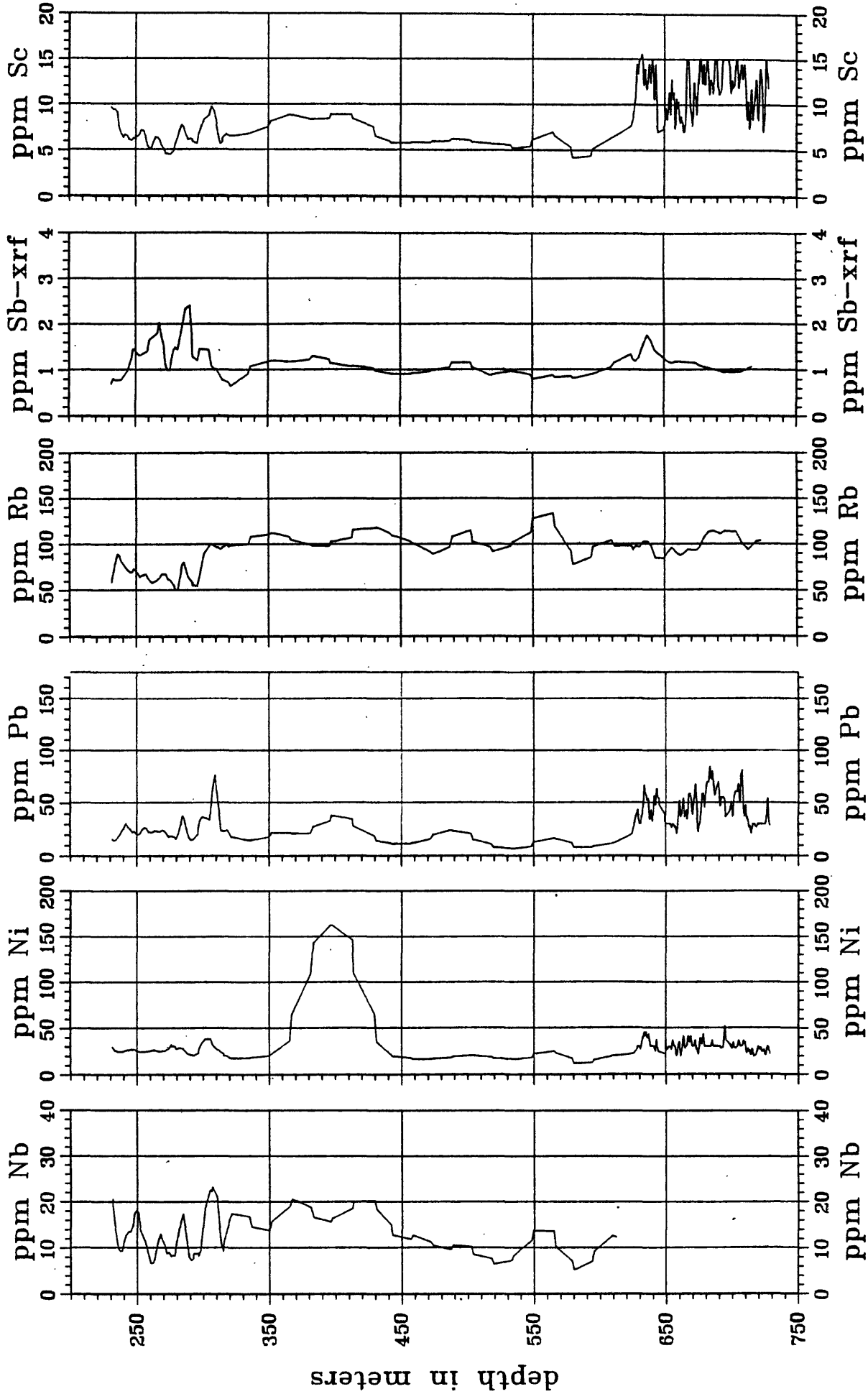

ppm Nb
ppm Ni
ppm Pb
ppm Rb
ppm Sb-xrf
ppm Sc
depth in meters
250
350
450
550
650
750

Fig. 9 (cont.)

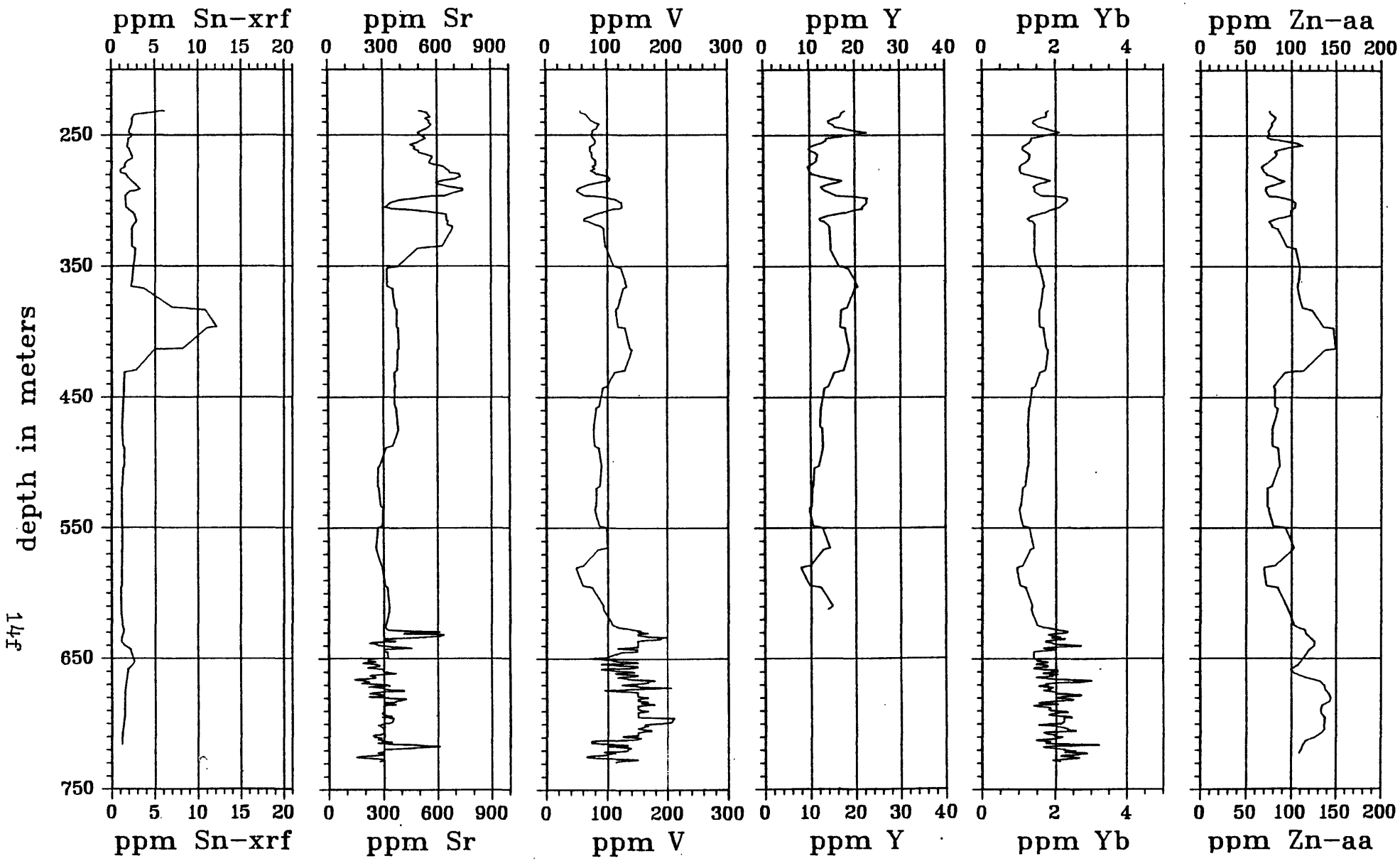

ppm Sn-xrf
0 5 10 15 20
ppm Sr
0 300 600 900
ppm V
0 100 200 300
ppm Y
0 10 20 30 40
ppm Yb
0 2 4
ppm Zn-aa
0 50 100 150 200
depth in meters
250
350
450
550
650
750

Fig. 9 (cOnt.)

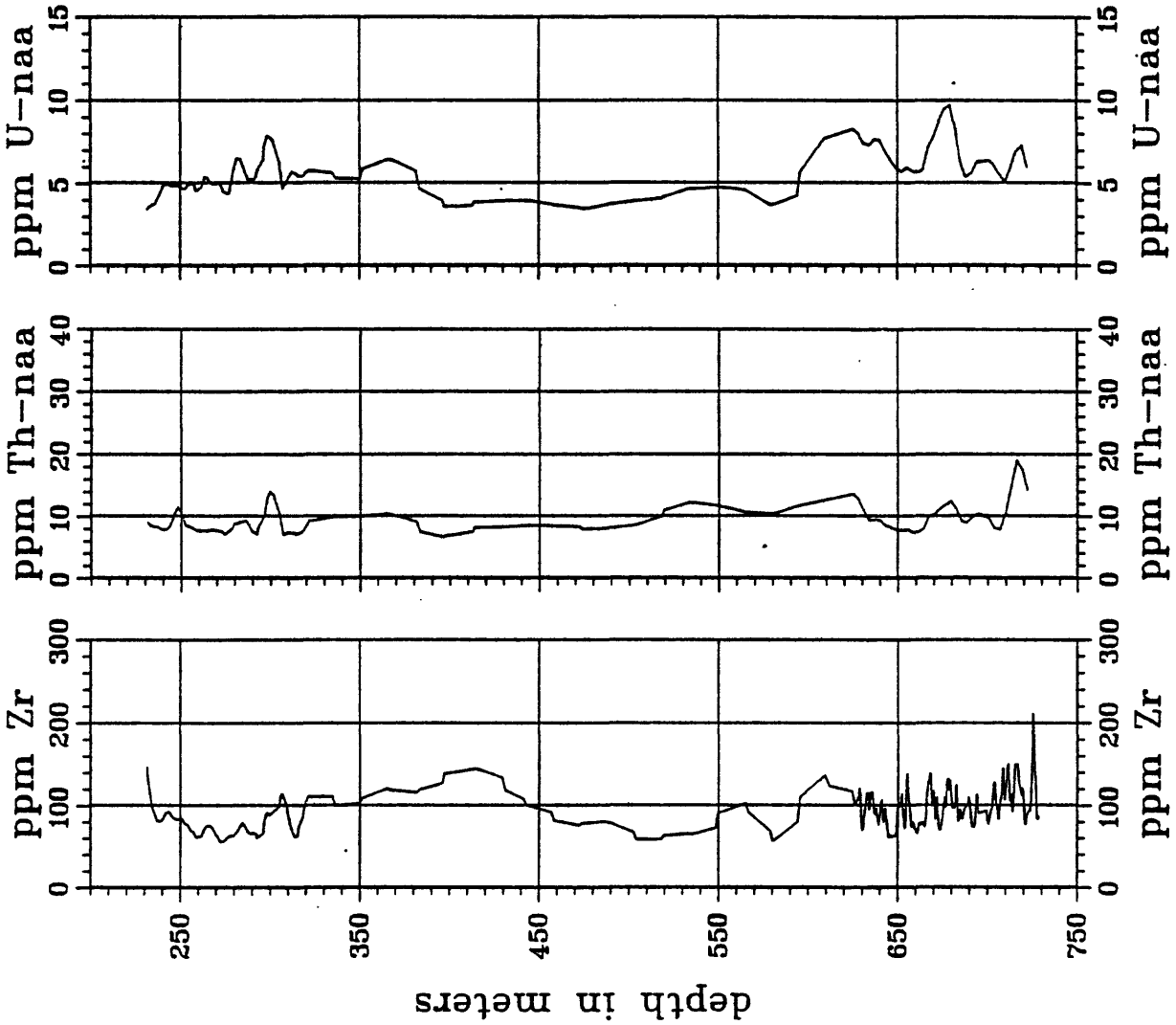

ppm Zr
0
100
200
300
ppm Th-naa
0
10
20
30
40
ppm U-naa
0
5
10
15
depth in meters
250
350
450
550
650
750

Fig. 9 (cont.)

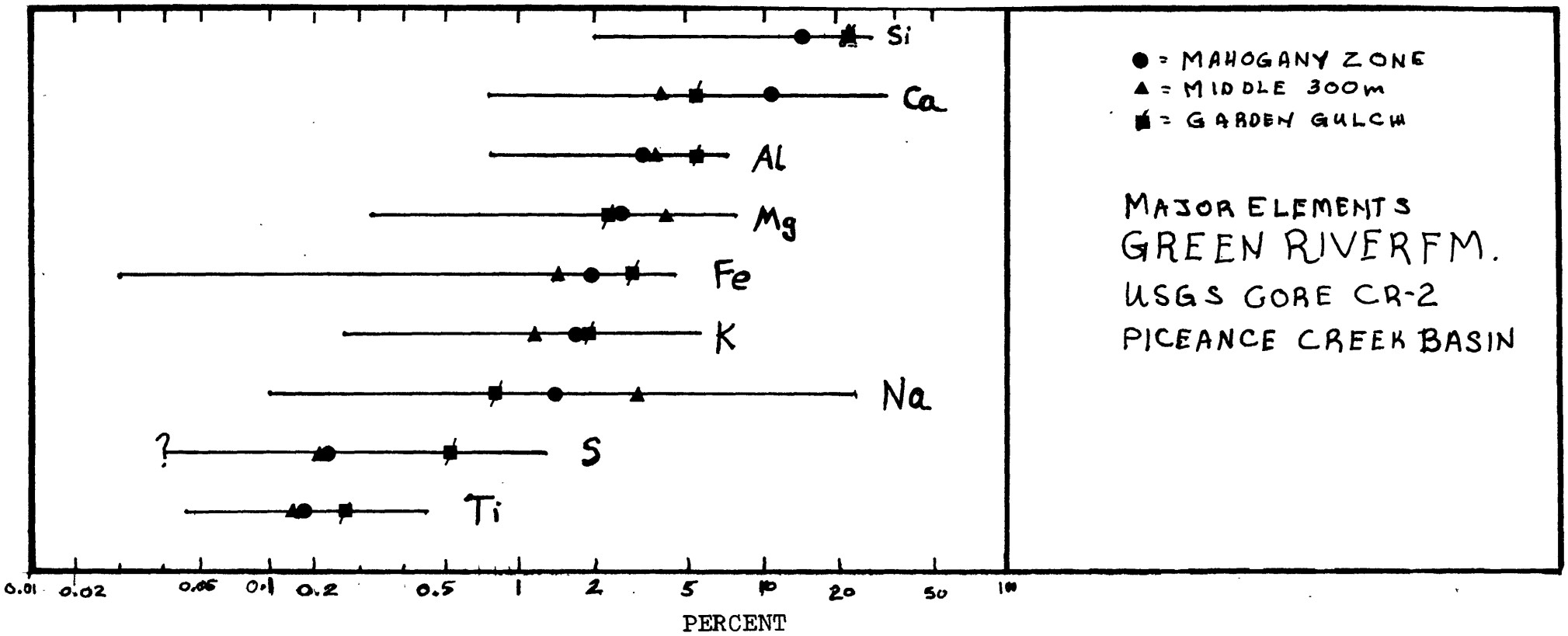
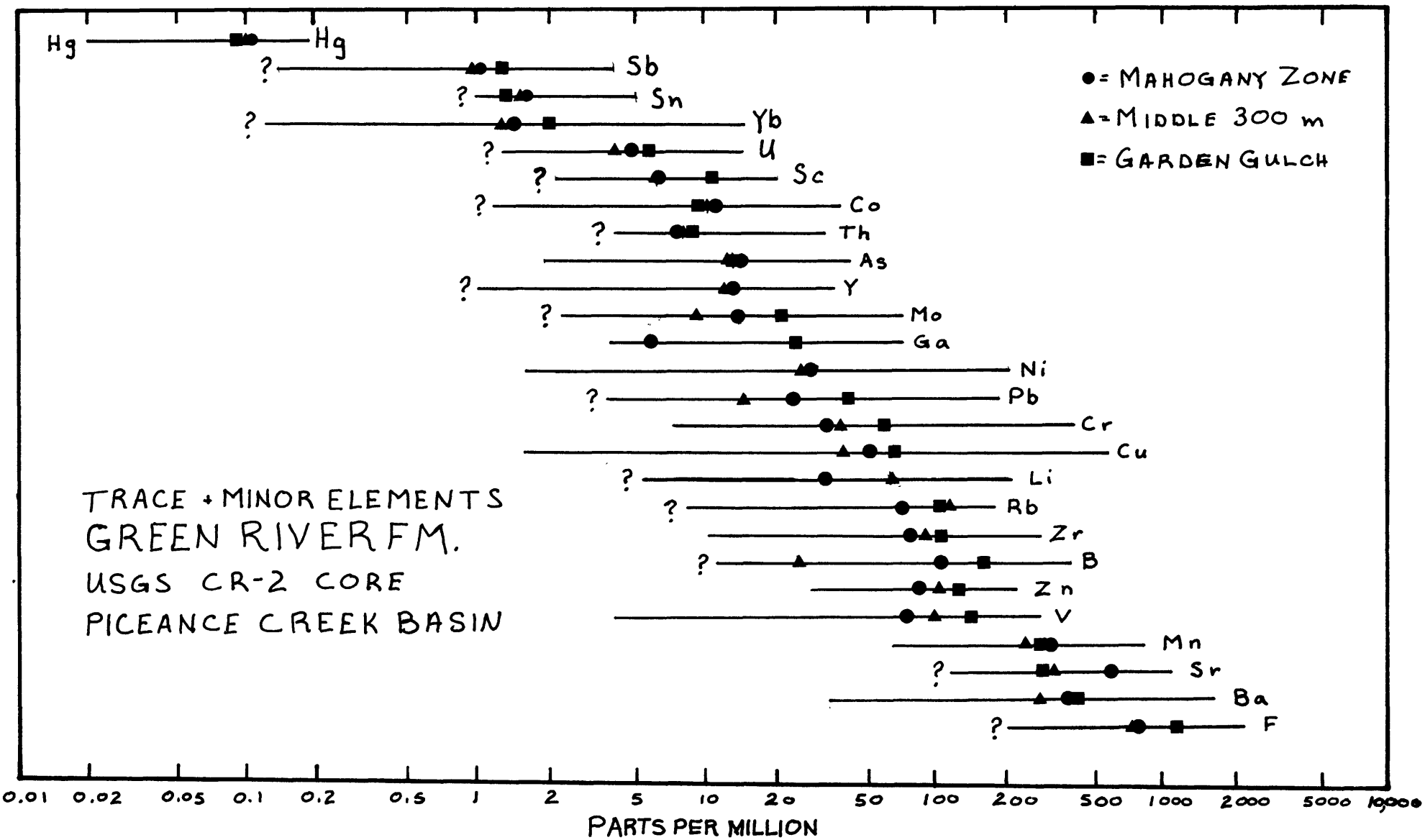


Figure 10.--Observed ranges of major elements in samples of the Green River Formation, USGS corehole CR-2, Piceance Creek Basin, Colorado. Geometric means are indicated for 229 to 320 meters (including the Mahogany zone; circles), 320 to 625 meters (triangles), and 625 to 730 meters (squares). Query at the end of the concentration range for S indicates that lowest concentrations for this element were below the detection limit.

Figure 11.--Observed ranges of trace and minor elements in samples of the Green River Formation, USGS corehole CR-2, Piceance Creek Basin, Colorado. Geometric means are indicated for 229 to 320 meters (including the Mahogany zone; circle), 320 to 625 meters (triangles), and 625 to 730 meters (squares). Query at lower end of concentration range indicates that lowest concentrations for that element are below the detection limit.



16a

Figure 11

Table 1.--Chemical analyses by semi-quantitative optical emission spectroscopy of 264 samples from the Garden Gulch Member of the Green River Formation, in USGS corehole CR-2, Piceance Creek Basin, Colorado

[Values are in percent (%) or parts per million (ppm) dry weight of sample.]

Table 1

Garden Gulch

Sample	Depth-m	% Al-s	% Fe-s	% Mg-s	% Ca-s	% K-s	% Ti-s	ppm B-s	ppm Ba-s	ppm Cr-s	ppm Cu-s
2060.8	628.1318	7.0	3.0	1.50	1.50	3.0	.20	300	700	70	70
2062	628.4976	3.0	3.0	5.00	10.00	1.5	.10	150	700	50	30
2063	628.8024	7.0	3.0	3.00	7.00	3.0	.15	200	700	70	50
2064	629.1072	7.0	3.0	1.50	3.00	3.0	.15	200	700	70	70
2065	629.4120	7.0	3.0	1.00	2.00	3.0	.20	200	700	70	70
2066	629.7168	7.0	3.0	1.00	5.00	3.0	.15	150	700	50	70
2067	630.0216	5.0	3.0	.70	5.00	2.0	.15	150	500	50	70
2068	630.3264	7.0	3.0	.70	7.00	2.0	.15	150	700	50	70
2069	630.6312	5.0	3.0	.70	5.00	3.0	.15	150	300	50	70
2070	630.9360	5.0	3.0	2.00	7.00	2.0	.15	100	700	50	50
2071	631.2408	7.0	2.0	1.00	5.00	2.0	.15	150	300	70	70
2072	631.5456	7.0	2.0	1.00	3.00	3.0	.15	150	700	70	70
2073.3	631.9418	7.0	3.0	1.50	5.00	2.0	.15	100	700	50	100
2077.0	633.0696	7.0	3.0	1.50	1.00	3.0	.15	200	500	50	100
2078	633.3744	5.0	3.0	2.00	5.00	3.0	.15	150	500	50	70
2079.2	633.7402	14.3	5.0	5.00	7.00	7.0	.20	300	700	100	150
2080.3	634.0754	3.0	2.0	3.00	7.00	3.0	.10	150	500	30	70
2081.3	634.3802	5.0	3.0	2.00	2.00	3.0	.15	150	300	50	100
2082.6	634.7765	7.0	3.0	1.50	1.00	3.0	.15	150	300	50	150
2083.6	635.0813	7.0	3.0	.70	.30	3.0	.15	200	300	70	100
2084.6	635.3861	7.0	3.0	1.50	1.50	3.0	.15	150	300	70	100
2085.6	635.6909	7.0	3.0	1.50	2.00	3.0	.15	150	500	50	70
2086.8	636.0566	7.0	3.0	2.00	1.50	3.0	.15	200	500	50	70
2088.0	636.4224	5.0	3.0	3.00	5.00	3.0	.15	150	300	50	70
2089.0	636.7272	5.0	3.0	3.00	7.00	3.0	.15	150	300	50	50
2090.2	637.0930	7.0	3.0	2.00	3.00	3.0	.20	200	300	50	50
2091.3	637.4282	5.0	2.0	3.00	7.00	3.0	.10	150	500	50	70
2092.9	637.9159	7.0	3.0	.70	1.00	3.0	.15	150	300	30	70
2094.0	638.2512	7.0	3.0	.70	1.50	3.0	.15	150	300	50	70
2095.2	638.6170	5.0	3.0	.70	1.50	3.0	.15	200	300	50	70
2096.4	638.9827	7.0	3.0	1.00	1.50	3.0	.15	200	300	70	70
2098.2	639.5314	3.0	3.0	5.00	7.00	2.0	.07	150	500	30	50
2099.2	639.8362	7.0	3.0	.70	.70	3.0	.20	200	300	50	70
2100.4	640.2019	7.0	3.0	1.50	2.00	3.0	.15	150	500	50	70
2101.6	640.5677	7.0	3.0	1.00	1.50	3.0	.20	150	500	50	70
2102.9	640.9639	7.0	3.0	1.00	1.50	3.0	.20	150	300	50	70
2104.2	641.3602	7.0	3.0	1.50	2.00	3.0	.15	200	500	70	100
2105.4	641.7259	7.0	3.0	1.50	1.50	3.0	.15	200	500	70	100
2106.5	642.0612	5.0	2.0	.70	1.00	1.5	.15	50	1,500	30	30
2107.5	642.3660	5.0	2.0	3.00	5.00	1.5	.15	150	500	50	50
2108.6	642.7013	7.0	3.0	2.00	3.00	3.0	.15	200	700	70	70
2109.6	643.0061	7.0	3.0	2.00	3.00	3.0	.20	200	700	70	70
2110.7	643.3414	7.0	3.0	1.50	3.00	3.0	.20	200	300	50	100
2112.0	643.7376	5.0	3.0	2.00	7.00	2.0	.15	150	300	30	70
2113.2	644.1034	5.0	2.0	2.00	7.00	2.0	.15	150	300	30	70

Garden Gulch

Sample	ppm Ga-s	ppm Mn-s	ppm Mo-s	ppm Ni-s	ppm Pb-s	ppm Sc-s	ppm Sr-s	ppm V-s	ppm Yb-s	ppm Zr-s
2060.8	30	200	30	30	70	15	300	200	3.0	150
2062	15	500	20	30	30	10	300	150	2.0	70
2063	30	300	30	30	50	15	500	150	2.0	150
2064	30	300	30	30	30	15	500	150	2.0	100
2065	30	300	30	30	50	15	500	150	3.0	150
2066	20	300	30	30	30	15	700	150	2.0	70
2067	30	300	30	30	30	10	700	150	2.0	70
2068	30	300	50	30	30	15	500	200	3.0	70
2069	30	200	30	30	30	15	300	150	2.0	70
2070	30	300	30	20	30	15	300	150	2.0	70
2071	20	200	30	30	30	15	500	150	2.0	70
2072	30	200	30	30	30	15	700	150	2.0	100
2073.3	30	300	30	30	30	15	700	150	1.4	70
2077.0	30	300	50	50	50	15	700	150	2.0	150
2078	30	300	50	30	50	15	300	150	2.0	100
2079.2	70	500	70	70	100	20	700	300	3.0	150
2080.3	15	300	15	30	50	7	500	150	1.4	70
2081.3	20	300	20	30	50	10	300	150	1.4	70
2082.6	30	300	30	50	70	15	300	200	2.0	100
2083.6	30	200	70	50	50	15	300	200	3.0	150
2084.6	30	300	70	50	70	15	300	200	2.0	100
2085.6	30	300	30	30	30	10	300	150	2.0	100
2086.8	30	300	30	50	70	15	300	150	2.0	150
2088.0	30	300	30	30	50	10	300	150	2.0	100
2089.0	20	300	30	30	50	10	500	150	1.4	100
2090.2	20	300	30	70	70	15	300	150	2.0	100
2091.3	20	300	15	30	30	10	300	150	1.4	70
2092.9	20	300	20	30	30	15	200	150	2.0	70
2094.0	20	300	20	30	30	15	200	150	2.0	150
2095.2	15	300	15	30	30	15	200	150	2.0	70
2096.4	30	300	30	30	70	15	300	150	2.0	70
2098.2	15	300	15	30	30	7	300	150	1.4	70
2099.2	30	300	50	30	30	15	200	150	3.0	100
2100.4	30	300	30	30	30	15	300	150	3.0	70
2101.6	30	300	30	30	30	15	300	150	3.0	100
2102.9	30	300	30	30	50	15	300	150	2.0	100
2104.2	30	300	30	30	70	15	500	150	2.0	150
2105.4	30	300	30	30	70	15	300	150	2.0	70
2106.5	15	200	10	15	30	7	700	50	1.4	70
2107.5	20	300	20	30	30	7	300	150	1.4	70
2108.6	30	300	30	30	70	15	300	150	2.0	100
2109.6	30	300	20	50	70	15	300	150	2.0	100
2110.7	30	300	15	30	70	15	300	150	2.0	100
2112.0	20	300	15	30	50	15	300	150	2.0	100
2113.2	20	300	15	20	50	10	300	150	2.0	70

Table 4 (cont.)

Sample	Depth-m	% Al-s	% Fe-s	% Mg-s	% Ca-s	% K-s	% Ti-s	ppm B-s	ppm Ba-s	ppm Cr-s	ppm Cu-s
2114.2	644.4082	3.0	2.0	2.00	7.00	2.0	.15	150	300	30	70
2115.3	644.7434	3.0	2.0	2.00	5.00	3.0	.15	150	300	30	50
2116.4	645.0787	5.0	2.0	3.00	7.00	2.0	.15	150	300	50	70
2130.5	649.3764	3.0	1.5	5.00	7.00	1.5	.07	70	300	30	70
2131.5	649.6812	3.0	1.5	7.00	10.00	1.5	.07	70	300	30	50
2132.6	650.0165	5.0	2.0	1.50	1.50	1.5	.15	150	300	30	50
2133.8	650.3822	5.0	1.5	1.50	2.00	1.5	.15	100	500	30	30
2135.0	650.7480	3.0	1.5	3.00	5.00	1.5	.10	70	300	30	30
2136.0	651.0528	7.0	2.0	1.00	.70	1.5	.20	150	300	30	50
2137.0	651.3576	3.0	2.0	3.00	5.00	1.5	.15	100	300	30	50
2138	651.6624	5.0	2.0	1.50	1.50	1.5	.15	150	300	30	30
2139	651.9672	5.0	2.0	2.00	2.00	2.0	.15	150	300	30	30
2140	652.2720	5.0	2.0	3.00	5.00	1.5	.15	150	300	50	30
2141.1	652.6073	7.0	2.0	2.00	3.00	2.0	.15	150	300	70	50
2142.2	652.9426	7.0	2.0	2.00	2.00	2.0	.20	200	300	50	50
2143.3	653.2778	7.0	2.0	2.00	2.00	2.0	.15	150	300	50	50
2144.4	653.6131	7.0	2.0	1.50	2.00	1.5	.15	150	300	50	50
2145.5	653.9484	7.0	2.0	1.50	1.50	2.0	.15	150	300	30	70
2146.5	654.2532	3.0	1.5	5.00	10.00	1.5	.10	70	300	30	30
2147.5	654.5580	3.0	1.5	5.00	7.00	1.5	.10	70	500	30	30
2148.5	654.8628	7.0	3.0	1.50	1.00	1.5	.15	150	700	30	50
2149.7	655.2286	7.0	3.0	1.00	1.50	3.0	.20	200	300	70	70
2150.7	655.5334	7.0	2.0	2.00	5.00	2.0	.15	150	300	30	50
2151.8	655.8686	5.0	2.0	3.00	10.00	1.5	.15	100	700	30	30
2153.0	656.2344	7.0	2.0	1.00	1.50	1.5	.20	150	300	30	50
2154.0	656.5392	7.0	2.0	1.00	2.00	2.0	.20	150	300	30	30
2155.0	656.8440	7.0	2.0	.70	1.50	2.0	.15	150	300	30	30
2156.0	657.1488	7.0	2.0	.70	1.50	2.0	.15	150	300	50	70
2157.0	657.4536	5.0	2.0	.70	1.50	1.5	.20	150	300	30	50
2158.0	657.7584	5.0	1.5	.70	3.00	1.5	.15	150	300	30	50
2159	658.0632	3.0	1.5	1.00	7.00	1.5	.15	100	300	30	30
2160	658.3680	3.0	1.5	.70	7.00	1.5	.15	150	300	30	30
2161.0	658.6728	3.0	1.5	.70	10.00	1.5	.10	100	700	30	30
2162	658.9776	7.0	2.0	.70	7.00	1.5	.15	150	300	70	70
2163.0	659.2824	3.0	1.5	.50	5.00	1.5	.15	150	300	30	70
2164.2	659.6482	5.0	1.5	.70	5.00	1.5	.15	150	300	30	70
2165.2	659.9530	5.0	2.0	3.00	5.00	1.5	.15	150	300	50	100
2166.2	660.2578	7.0	3.0	2.00	2.00	3.0	.20	300	300	70	100
2167.3	660.5930	7.0	3.0	2.00	3.00	3.0	.15	200	300	70	70
2168.7	661.0198	3.0	1.5	3.00	5.00	1.5	.10	150	300	50	30
2169.9	661.3855	3.0	1.5	5.00	7.00	1.5	.10	150	300	50	50
2171.3	661.8122	3.0	1.5	2.00	3.00	1.5	.15	150	300	50	70
2172.7	662.2390	7.0	3.0	1.50	5.00	3.0	.15	150	500	70	70
2173.8	662.5742	7.0	3.0	2.00	5.00	3.0	.15	200	300	70	100
2174.9	662.9095	5.0	3.0	2.00	3.00	1.5	.15	150	700	30	70

Table (cont)

Sample	ppm Ga-s	ppm Mn-s	ppm Mo-s	ppm Ni-s	ppm Pb-s	ppm Sc-s	ppm Sr-s	ppm V-s	ppm Yb-s	ppm Zr-s
2114.2	20	300	15	20	50	7	300	150	1.4	70
2115.3	20	300	15	30	70	7	300	150	1.4	70
2116.4	20	300	15	30	50	7	300	150	1.4	70
2130.5	15	300	15	15	30	7	300	70	1.4	50
2131.5	15	300	15	15	30	7	500	70	1.4	30
2132.6	15	200	15	30	30	10	150	70	1.4	150
2133.8	15	300	10	30	30	7	150	70	1.4	100
2135.0	15	300	7	30	30	7	300	70	1.4	70
2136.0	20	200	15	30	30	15	150	150	2.0	150
2137.0	15	300	10	20	30	7	300	100	1.4	70
2138	15	300	10	30	30	7	150	100	1.4	100
2139	20	300	10	30	30	10	200	100	1.4	100
2140	20	300	10	30	30	7	300	150	1.4	100
2141.1	30	300	15	30	30	10	300	150	2.0	150
2142.2	30	300	15	30	30	10	200	150	2.0	100
2143.3	30	300	15	30	30	10	200	150	1.4	70
2144.4	20	300	15	30	30	15	150	150	2.0	100
2145.5	20	300	20	30	30	10	150	100	1.4	70
2146.5	15	300	15	20	30	7	300	70	1.4	70
2147.5	10	300	15	30	20	7	300	70	1.4	50
2148.5	20	200	15	30	30	10	200	100	1.4	100
2149.7	30	200	30	50	30	15	300	150	2.0	150
2150.7	20	300	15	30	30	15	300	150	2.0	150
2151.8	15	300	15	30	30	10	300	150	1.4	150
2153.0	15	200	15	30	30	10	200	150	2.0	100
2154.0	20	200	15	30	30	10	300	150	2.0	100
2155.0	20	200	15	30	20	10	200	150	1.4	100
2156.0	20	200	15	30	30	15	200	150	1.4	100
2157.0	15	200	15	30	30	10	150	100	1.4	100
2158.0	15	200	15	20	30	7	300	100	1.4	70
2159	15	300	15	15	20	7	300	100	1.4	70
2160	15	300	15	20	20	7	300	70	1.4	70
2161.0	15	300	10	20	14	7	300	70	1.4	70
2162	15	300	20	30	30	15	300	150	3.0	100
2163.0	15	300	15	30	30	10	300	70	2.0	70
2164.2	15	300	20	30	30	10	300	150	1.4	70
2165.2	15	300	30	30	50	7	300	150	1.4	70
2166.2	20	300	30	50	70	10	300	150	3.0	70
2167.3	20	300	20	30	50	15	300	150	2.0	70
2168.7	15	300	15	15	30	7	300	100	1.4	70
2169.9	15	200	30	15	30	7	500	70	1.4	50
2171.3	15	300	20	20	50	7	300	150	1.4	70
2172.7	20	300	20	30	30	10	300	150	3.0	100
2173.8	20	300	20	30	50	10	300	150	2.0	70
2174.9	15	200	20	30	50	7	200	150	1.4	70

Table 1 (cont.)

Sample	Depth-m	% Al-s	% Fe-s	% Mg-s	% Ca-s	% K-s	% Ti-s	ppm B-s	ppm Ba-s	ppm Cr-s	ppm Cu-s
2176	663.2448	3.0	3.0	3.00	3.00	2.0	.15	150	300	30	100
2177.0	663.5496	7.0	3.0	2.00	3.00	3.0	.15	200	300	50	70
2178.3	663.9458	3.0	2.0	5.00	7.00	1.5	.10	150	300	30	70
2179.3	664.2506	7.0	2.0	3.00	3.00	3.0	.15	150	300	30	70
2180.3	664.5554	5.0	2.0	3.00	2.00	3.0	.15	150	300	50	70
2181.4	664.8907	7.0	1.0	.35	.21	3.0	.05	50	--	50	50
2182.4	665.1955	7.0	2.0	5.00	5.00	3.0	.15	150	300	70	70
2183.4	665.5003	7.0	3.0	3.00	3.00	3.0	.15	150	300	50	100
2184.4	665.8051	3.0	2.0	3.00	3.00	2.0	.15	150	300	30	70
2185.4	666.1099	5.0	2.0	1.00	.70	3.0	.15	150	300	50	70
2186.4	666.4147	7.0	3.0	1.50	1.00	3.0	.30	200	300	70	100
2187.4	666.7195	7.0	3.0	1.50	1.50	3.0	.30	300	300	70	100
2188.4	667.0243	10.0	3.0	2.00	1.50	3.0	.30	300	300	70	70
2190.0	667.5120	10.0	3.0	2.00	1.50	3.0	.30	200	300	70	70
2192	668.1216	10.0	3.0	2.00	1.50	3.0	.30	200	300	70	70
2193	668.4264	7.0	3.0	1.50	1.00	3.0	.20	200	300	50	70
2194	668.7312	10.0	3.0	2.00	1.50	3.0	.30	200	300	70	70
2195	669.0360	7.0	3.0	2.00	2.00	3.0	.20	150	300	50	70
2196	669.3408	7.0	2.0	2.00	1.50	3.0	.20	200	300	50	70
2197	669.6456	7.0	2.0	2.00	1.50	3.0	.20	200	300	50	70
2198	669.9504	5.0	2.0	3.00	5.00	2.0	.10	150	300	30	50
2199	670.2552	7.0	3.0	3.00	3.00	3.0	.20	150	300	50	70
2200	670.5600	7.0	3.0	1.50	1.50	3.0	.30	150	700	50	100
2201.1	670.8953	7.0	2.0	2.00	2.00	3.0	.20	150	1,000	50	100
2202.1	671.2306	7.0	2.0	2.00	2.00	3.0	.15	150	300	50	100
2203.2	671.5354	7.0	2.0	3.00	5.00	1.5	.20	100	300	30	70
2204.2	671.8402	7.0	2.0	1.00	1.50	3.0	.20	150	300	30	100
2205.2	672.1450	7.0	3.0	2.00	3.00	3.0	.20	300	700	70	150
2206.2	672.4498	7.0	3.0	5.00	5.00	3.0	.30	200	700	70	100
2207.3	672.7850	10.0	3.0	3.00	3.00	3.0	.20	200	300	70	100
2208.3	673.0898	7.0	3.0	5.00	7.00	3.0	.15	150	300	50	70
2209.4	673.4251	5.0	3.0	3.00	7.00	2.0	.20	150	300	70	70
2210.5	673.7604	7.0	3.0	2.00	5.00	3.0	.15	200	300	70	70
2211.6	674.0957	7.0	3.0	2.00	7.00	3.0	.20	150	500	70	50
2212.6	674.4005	7.0	1.5	5.00	7.00	2.0	.15	100	300	30	30
2213.6	674.7053	3.0	1.5	7.00	10.00	1.5	.10	70	700	30	20
2214.6	675.0101	7.0	3.0	2.00	1.50	2.0	.20	200	700	50	70
2215.8	675.3758	7.0	3.0	1.00	3.00	1.5	.15	150	500	30	70
2217	675.7416	7.0	3.0	1.50	2.00	1.5	.20	150	500	70	70
2218	676.0464	7.0	3.0	1.50	2.00	2.0	.20	150	300	50	70
2219	676.3512	7.0	3.0	3.00	7.00	2.0	.20	150	500	70	70
2220	676.6560	7.0	3.0	1.50	2.00	3.0	.20	150	500	50	70
2221	676.9608	7.0	3.0	1.50	1.50	3.0	.20	200	200	70	70
2222	677.2656	7.0	3.0	3.00	5.00	2.0	.15	200	300	70	100
2223.0	677.5704	10.0	3.0	2.00	3.00	3.0	.30	200	500	70	100

Table 1 (cont.)

Garden Gulch continued

Sample	ppm Ga-s	ppm Mn-s	ppm Mo-s	ppm Ni-s	ppm Pb-s	ppm Sc-s	ppm Sr-s	ppm V-s	ppm Yb-s	ppm Zr-s
2176	15	200	30	50	70	7	200	150	1.4	70
2177.0	15	300	30	50	50	10	200	150	3.0	100
2178.3	15	300	20	30	30	7	300	100	1.4	70
2179.3	20	300	30	20	30	7	300	100	1.4	70
2180.3	20	150	30	30	50	7	150	150	1.4	70
2181.4	15	100	20	30	30	7	300	100	1.4	100
2182.4	20	300	20	30	30	7	300	150	2.0	70
2183.4	20	300	30	30	70	7	200	150	2.0	70
2184.4	15	200	20	30	30	7	150	100	1.4	70
2185.4	20	150	30	30	30	7	100	150	2.0	70
2186.4	20	300	50	30	30	15	150	200	3.0	150
2187.4	15	300	50	50	30	15	150	200	3.0	100
2188.4	30	200	30	50	70	15	200	150	3.0	150
2190.0	30	200	30	30	70	15	200	150	3.0	100
2192	30	300	50	30	50	15	300	200	3.0	150
2193	20	300	30	30	50	15	150	150	2.0	150
2194	30	300	70	50	70	15	200	150	2.0	150
2195	20	300	30	50	50	10	150	150	2.0	100
2196	20	300	30	30	50	10	150	150	1.4	100
2197	20	200	30	30	50	10	300	150	2.0	100
2198	15	300	15	30	30	7	300	70	1.4	70
2199	15	300	30	30	30	10	300	150	2.0	150
2200	20	200	30	30	50	10	300	150	2.0	150
2201.1	20	300	30	30	50	7	500	150	1.4	70
2202.1	15	200	50	30	70	7	200	150	1.4	70
2203.2	15	300	30	30	30	7	200	150	1.4	70
2204.2	20	200	30	30	70	10	150	150	2.0	100
2205.2	30	500	70	50	70	15	300	200	2.0	150
2206.2	30	300	70	30	70	15	300	300	2.0	100
2207.3	30	300	70	30	70	10	300	150	2.0	70
2208.3	30	300	50	20	50	7	300	100	1.4	70
2209.4	15	500	30	30	50	15	300	150	2.0	70
2210.5	30	500	30	30	50	10	300	150	2.0	70
2211.6	30	500	30	30	30	10	300	100	2.0	70
2212.6	20	500	20	15	20	7	500	70	1.4	70
2213.6	10	500	20	15	14	7	500	70	1.4	70
2214.6	20	300	30	30	30	15	300	150	2.0	100
2215.8	15	300	20	30	30	10	300	150	2.0	70
2217	20	300	30	30	30	15	300	150	2.0	100
2218	20	300	30	50	30	10	200	150	2.0	100
2219	30	300	20	30	30	15	300	150	2.0	150
2220	30	300	20	50	30	15	200	150	2.0	70
2221	30	300	30	30	70	15	150	150	2.0	100
2222	30	500	20	30	50	15	300	150	2.0	70
2223.0	30	300	30	30	50	15	300	150	3.0	150

Table 1, cont

Garden Gulch continued

Sample	Depth-m	% Al-s	% Fe-s	% Mg-s	% Ca-s	% K-s	% Ti-s	ppm B-s	ppm Ba-s	ppm Cr-s	ppm Cu-s
2224.4	677.9971	10.0	3.0	2.00	2.00	3.0	.30	300	500	70	150
2226.0	678.4848	7.0	2.0	2.00	3.00	3.0	.15	200	500	50	100
2227	678.7896	5.0	2.0	3.00	3.00	2.0	.15	150	700	50	70
2228	679.0944	7.0	3.0	2.00	1.50	3.0	.30	300	700	70	100
2229	679.3992	7.0	3.0	1.50	1.00	3.0	.20	200	300	70	70
2230	679.7040	10.0	3.0	1.50	1.50	3.0	.30	200	300	70	100
2231	680.0088	7.0	3.0	1.50	1.50	3.0	.30	300	500	70	100
2232.7	680.5270	7.0	3.0	2.00	3.00	3.0	.15	200	700	50	100
2234.0	680.9232	7.0	2.0	3.00	5.00	3.0	.15	200	700	50	100
2235.2	681.2890	7.0	2.0	1.50	3.00	2.0	.20	150	500	50	70
2238	682.1424	7.0	3.0	3.00	3.00	3.0	.20	200	700	70	70
2239	682.4472	7.0	3.0	2.00	1.50	3.0	.20	200	700	50	100
2240	682.7520	7.0	3.0	1.50	1.50	3.0	.15	200	700	70	100
2241	683.0568	10.0	3.0	2.00	1.50	3.0	.30	150	1,500	70	100
2242.0	683.3616	10.0	3.0	2.00	2.00	3.0	.20	200	700	70	100
2243.2	683.7274	7.0	3.0	3.00	3.00	3.0	.20	200	300	70	100
2244.6	684.1541	7.0	3.0	3.00	5.00	3.0	.20	200	300	70	70
2246	684.5808	7.0	3.0	3.00	3.00	2.0	.15	150	300	50	100
2247	684.8856	7.0	3.0	3.00	5.00	3.0	.15	150	300	70	150
2248	685.1904	7.0	3.0	2.00	2.00	3.0	.30	200	700	70	150
2249	685.4952	7.0	3.0	2.00	1.50	3.0	.20	150	300	50	150
2250	685.8000	7.0	3.0	3.00	5.00	3.0	.15	150	500	50	70
2251	686.1048	7.0	3.0	2.00	2.00	2.0	.15	150	500	50	70
2252	686.4096	7.0	3.0	3.00	2.00	3.0	.15	150	300	50	50
2253.0	686.7144	7.0	3.0	3.00	3.00	1.5	.15	150	300	30	70
2254.2	687.0802	7.0	3.0	3.00	2.00	2.0	.15	150	300	50	50
2255.7	687.5374	10.0	3.0	3.00	3.00	3.0	.15	150	300	70	70
2257	687.9336	7.0	3.0	2.00	2.00	3.0	.15	200	500	50	70
2258.5	688.3908	7.0	3.0	3.00	2.00	3.0	.15	200	500	50	70
2261.9	689.4271	7.0	3.0	3.00	5.00	2.0	.15	150	300	50	70
2263	689.7624	7.0	3.0	3.00	3.00	3.0	.15	150	300	50	70
2264	690.0672	7.0	3.0	3.00	3.00	3.0	.20	200	500	70	70
2265.0	690.3720	7.0	3.0	2.00	2.00	3.0	.20	200	300	50	70
2266.2	690.7378	7.0	3.0	3.00	3.00	2.0	.15	150	700	30	70
2267.3	691.0730	7.0	2.0	1.50	1.50	3.0	.15	150	300	50	70
2268.4	691.4083	7.0	2.0	2.00	2.00	3.0	.15	150	300	70	70
2269.7	691.8046	7.0	3.0	2.00	3.00	3.0	.15	150	500	70	50
2274.4	693.2371	7.0	3.0	3.00	5.00	2.0	.15	150	300	50	50
2275.7	693.6334	7.0	3.0	1.50	1.50	3.0	.15	150	300	70	70
2277	694.0296	10.0	5.0	2.00	3.00	3.0	.20	150	1,000	70	70
2278	694.3344	10.0	3.0	2.00	3.00	3.0	.20	150	500	70	70
2279	694.6392	7.0	3.0	3.00	5.00	2.0	.15	150	700	50	70
2280	694.9440	10.0	3.0	2.00	1.50	3.0	.30	150	500	70	70
2281	695.2488	10.0	3.0	1.50	.30	3.0	.20	150	700	70	70
2282	695.5536	7.0	3.0	3.00	7.00	2.0	.15	150	1,500	70	50

Table 1 (cont.)

Garden Gulch continued

Sample	ppm Ga-s	ppm Mn-s	ppm Mo-s	ppm Ni-s	ppm Pb-s	ppm Sc-s	ppm Sr-s	ppm V-s	ppm Yb-s	ppm Zr-s
2224.4	30	300	30	30	70	15	300	150	3.0	150
2226.0	30	300	50	70	70	15	300	150	3.0	150
2227	20	300	30	30	30	7	300	150	1.4	70
2228	30	300	50	30	70	15	300	150	3.0	150
2229	30	300	70	30	30	15	150	150	2.0	100
2230	30	300	50	30	50	15	200	200	2.0	150
2231	30	300	70	30	50	15	200	150	2.0	150
2232.7	30	200	30	30	70	10	500	150	2.0	70
2234.0	30	300	50	30	70	10	500	150	2.0	70
2235.2	20	300	30	30	70	15	300	150	3.0	150
2238	20	300	30	30	70	15	500	150	3.0	70
2239	30	300	30	30	70	15	300	150	1.4	70
2240	30	300	30	30	70	15	300	150	2.0	150
2241	30	300	30	30	70	15	500	200	2.0	150
2242.0	30	300	30	30	100	15	300	150	2.0	100
2243.2	30	300	30	30	100	10	300	150	1.4	100
2244.6	30	300	30	30	50	10	300	150	1.4	70
2246	30	300	30	30	70	10	300	150	1.4	70
2247	30	300	30	30	70	15	300	200	2.0	70
2248	30	500	70	50	100	15	500	200	3.0	150
2249	30	300	30	30	70	10	300	150	1.4	50
2250	30	300	30	30	70	10	300	150	1.4	100
2251	30	300	50	30	70	15	300	150	1.4	100
2252	30	200	30	30	70	15	300	150	1.4	70
2253.0	20	200	30	30	50	7	300	150	1.4	70
2254.2	20	200	30	30	50	10	300	150	1.4	100
2255.7	30	200	30	30	70	15	300	150	2.0	100
2257	30	200	30	30	50	15	300	150	2.0	100
2258.5	30	300	30	30	70	15	300	150	2.0	100
2261.9	20	300	30	30	70	15	300	150	1.4	70
2263	20	300	50	30	70	15	300	150	2.0	150
2264	30	300	50	30	70	15	300	200	2.0	100
2265.0	20	200	50	30	70	10	300	150	2.0	100
2266.2	20	300	50	30	50	10	300	150	2.0	100
2267.3	20	150	30	30	30	15	300	150	3.0	100
2268.4	20	200	20	30	30	10	300	150	2.0	70
2269.7	30	200	30	30	100	10	300	150	2.0	70
2274.4	15	300	20	20	30	10	300	150	1.4	70
2275.7	30	300	30	30	50	15	200	150	2.0	70
2277	30	300	50	50	70	15	500	150	2.0	100
2278	20	300	30	30	50	15	300	150	2.0	150
2279	15	300	30	70	50	15	300	150	3.0	100
2280	30	300	50	50	50	15	200	150	2.0	100
2281	30	200	50	50	30	15	300	150	3.0	100
2282	20	300	30	30	30	15	500	300	2.0	70

Table 1 (cont.)

Sample	Depth-m	% Al-s	% Fe-s	% Mg-s	% Ca-s	% K-s	% Ti-s	ppm B-s	ppm Ba-s	ppm Cr-s	ppm Cu-s
2292.0	698.6016	7.0	3.0	3.00	3.00	3.0	.20	150	1,000	70	70
2295.2	699.5770	10.0	3.0	3.00	1.50	3.0	.20	150	300	70	70
2296.1	699.8513	7.0	3.0	2.00	1.50	3.0	.15	150	300	70	70
2297.6	700.3085	7.0	2.0	3.00	5.00	3.0	.15	150	300	50	30
2298.9	700.7047	7.0	1.5	3.00	3.00	3.0	.15	150	300	50	30
2300	701.0400	7.0	3.0	3.00	3.00	3.0	.15	150	300	30	50
2301	701.3448	7.0	3.0	2.00	1.50	2.0	.15	150	300	50	50
2302	701.6496	7.0	3.0	3.00	3.00	3.0	.10	150	300	50	30
2306.1	702.8993	7.0	3.0	3.00	3.00	3.0	.15	150	500	70	70
2307.2	703.2346	7.0	3.0	2.00	2.00	3.0	.15	150	300	50	50
2309.3	703.8746	10.0	3.0	3.00	1.50	3.0	.20	150	300	70	70
2310.4	704.2099	7.0	2.0	3.00	3.00	3.0	.20	150	300	50	70
2312.0	704.6976	7.0	3.0	2.00	1.50	3.0	.20	150	300	50	100
2313	705.0024	7.0	3.0	2.00	1.50	3.0	.15	150	300	50	100
2314	705.3072	7.0	3.0	3.00	3.00	3.0	.15	150	500	70	150
2315	705.6120	7.0	3.0	3.00	2.00	3.0	.15	150	300	70	70
2316.5	706.0692	7.0	3.0	3.00	5.00	3.0	.15	150	300	70	70
2317.5	706.3740	7.0	3.0	3.00	5.00	3.0	.15	150	300	50	70
2318.5	706.6788	7.0	3.0	3.00	3.00	3.0	.15	150	300	70	70
2319.5	706.9836	7.0	3.0	3.00	3.00	3.0	.15	150	300	70	70
2323.0	708.0504	7.0	3.0	3.00	3.00	3.0	.15	150	300	50	50
2324.0	708.3552	7.0	3.0	3.00	3.00	3.0	.20	150	500	50	50
2325	708.6600	7.0	3.0	2.00	2.00	3.0	.20	150	300	70	70
2326	708.9648	7.0	3.0	2.00	2.00	3.0	.20	150	500	70	70
2327	709.2696	7.0	3.0	2.00	1.50	2.0	.20	150	300	50	30
2328	709.5744	7.0	3.0	3.00	3.00	3.0	.20	150	300	50	50
2329	709.8792	5.0	1.5	3.00	3.00	2.0	.15	150	500	30	70
2330	710.1840	10.0	3.0	1.50	1.00	3.0	.30	150	700	70	70
2331.2	710.5498	7.0	2.0	2.00	2.00	3.0	.15	150	700	30	70
2332.3	710.8850	7.0	3.0	2.00	5.00	2.0	.15	150	700	30	30
2333.5	711.2508	7.0	3.0	2.00	3.00	3.0	.15	150	500	30	50
2334.7	711.6166	5.0	3.0	2.00	3.00	3.0	.15	150	300	30	30
2336	712.0128	7.0	3.0	1.50	1.50	3.0	.20	150	300	50	70
2337	712.3176	7.0	2.0	1.50	3.00	3.0	.20	150	500	70	30
2338	712.6224	3.0	1.5	1.50	2.00	2.0	.15	100	300	50	30
2339	712.9272	7.0	2.0	2.00	3.00	3.0	.15	150	700	50	30
2340	713.2320	5.0	1.5	2.00	3.00	3.0	.15	100	500	30	30
2341	713.5368	5.0	1.5	1.50	1.50	3.0	.15	150	500	50	30
2342	713.8416	7.0	2.0	2.00	3.00	3.0	.15	150	1,000	70	30
2343	714.1464	5.0	2.0	1.50	3.00	3.0	.15	150	700	30	30
2344	714.4512	3.0	1.5	1.50	2.00	3.0	.15	100	500	50	30
2345	714.7560	3.0	1.5	1.50	2.00	3.0	.15	70	300	30	30
2346	715.0608	3.0	1.5	1.50	3.00	1.5	.15	70	300	30	20
2347	715.3656	7.0	2.0	1.50	1.50	3.0	.15	150	700	70	50
2348	715.6704	7.0	3.0	2.00	3.00	3.0	.15	150	700	70	70

Table 1 (cont.)

Sample	ppm Ca-s	ppm Mn-s	ppm Mo-s	ppm Ni-s	ppm Pb-s	ppm Sc-s	ppm Sr-s	ppm V-s	ppm Yb-s	ppm Zr-s
2292.0	20	300	30	30	30	15	300	200	2.0	100
2295.2	30	200	20	30	70	15	300	150	2.0	100
2296.1	30	300	20	30	70	15	300	200	3.0	100
2297.6	20	300	7	20	20	7	300	150	1.4	70
2298.9	20	200	15	30	30	10	300	150	1.4	70
2300	20	300	20	50	50	15	300	150	1.4	70
2301	20	200	30	30	30	15	200	200	2.0	100
2302	20	200	7	20	70	7	300	150	1.4	70
2306.1	30	200	20	30	70	15	300	150	3.0	100
2307.2	20	200	20	30	50	10	300	150	2.0	100
2309.3	30	200	30	30	70	15	300	150	2.0	150
2310.4	30	200	20	30	50	15	300	150	3.0	150
2312.0	30	200	30	30	70	15	300	200	2.0	100
2313	30	200	30	30	70	15	300	150	2.0	100
2314	30	500	30	50	70	15	300	200	3.0	100
2315	30	300	20	30	70	15	300	150	3.0	100
2316.5	30	300	20	30	30	15	300	150	2.0	100
2317.5	20	300	15	30	50	7	300	150	2.0	70
2318.5	30	300	15	30	50	15	300	150	1.4	70
2319.5	20	300	15	30	70	10	300	150	1.4	100
2323.0	20	200	15	30	150	15	300	150	2.0	100
2324.0	20	300	15	30	30	15	300	150	2.0	150
2325	20	200	15	30	30	15	200	150	2.0	150
2326	30	300	20	50	70	15	300	150	2.0	150
2327	15	200	15	30	30	10	150	100	2.0	150
2328	20	300	10	30	30	15	300	150	2.0	100
2329	20	300	15	30	30	10	300	70	1.4	70
2330	30	200	20	50	50	15	150	200	3.0	150
2331.2	30	200	15	20	70	15	300	150	2.0	100
2332.3	20	300	15	30	30	15	300	150	2.0	150
2333.5	30	200	15	20	30	15	300	150	2.0	150
2334.7	15	200	15	20	30	10	300	150	2.0	150
2336	20	150	15	30	50	15	200	150	2.0	150
2337	20	200	7	30	30	7	300	150	1.4	150
2338	15	200	10	30	30	7	300	70	1.4	70
2339	20	200	7	20	30	10	300	70	1.4	100
2340	20	300	7	20	20	7	300	70	1.4	100
2341	20	200	5	30	30	10	200	70	2.0	150
2342	30	300	5	30	30	15	500	100	2.0	100
2343	15	200	5	20	30	7	300	70	2.0	70
2344	20	150	5	20	20	7	300	70	1.4	100
2345	15	200	5	15	20	7	300	70	2.0	70
2346	15	200	7	30	14	7	150	70	1.4	150
2347	20	200	7	30	30	10	300	100	2.0	150
2348	15	300	7	30	30	10	500	150	2.0	150

Table 1 (cont.)

Sample	Depth-m	% Al-s	% Fe-s	% Mg-s	% Ca-s	% K-s	% Ti-s	ppm B-s	ppm Ba-s	ppm Cr-s	ppm Cu-s
2349	715.9752	7.0	3.0	2.00	2.00	3.0	.20	150	700	70	50
2350	716.2800	3.0	3.0	2.00	5.00	3.0	.15	70	700	50	30
2351	716.5848	7.0	3.0	1.50	1.50	3.0	.20	150	700	70	30
2352	716.8896	5.0	2.0	1.50	2.00	2.0	.15	150	1,000	50	30
2353	717.1944	5.0	3.0	3.00	5.00	3.0	.15	100	1,500	30	30
2354	717.4992	7.0	2.0	1.50	1.50	3.0	.20	150	700	70	50
2355.3	717.8954	7.0	2.0	1.50	1.50	3.0	.15	150	700	50	30
2357.1	718.4441	7.0	3.0	2.00	3.00	3.0	.20	150	500	50	30
2359.3	719.1146	5.0	3.0	3.00	7.00	3.0	.15	150	500	50	30
2360.6	719.5109	7.0	3.0	2.00	2.00	3.0	.20	150	500	70	70
2361.8	719.8766	7.0	3.0	1.50	3.00	3.0	.15	150	300	70	50
2362.8	720.1814	7.0	2.0	1.50	1.50	3.0	.20	150	300	70	30
2363.8	720.4862	5.0	3.0	3.00	7.00	3.0	.15	150	300	50	30
2364.8	720.7910	7.0	3.0	3.00	7.00	3.0	.15	150	300	50	30
2365.8	721.0958	5.0	1.5	3.00	5.00	3.0	.15	150	300	50	30
2366.8	721.4006	7.0	1.5	2.00	3.00	3.0	.15	100	300	50	30
2367.9	721.7359	5.0	3.0	3.00	7.00	1.5	.15	100	300	50	30
2369	722.0712	7.0	3.0	1.50	7.00	3.0	.20	150	300	70	30
2370	722.3760	7.0	3.0	1.00	3.00	3.0	.20	150	300	50	30
2371	722.6808	7.0	2.0	1.00	10.00	3.0	.15	100	300	50	30
2372.0	722.9856	5.0	2.0	1.00	14.30	2.0	.15	70	300	30	30
2374.1	723.6257	7.0	3.0	1.50	7.00	3.0	.15	150	300	50	30
2375.3	723.9914	7.0	3.0	1.50	5.00	3.0	.20	150	300	50	30
2376.5	724.3572	7.0	3.0	1.00	7.00	3.0	.15	100	300	70	30
2377.8	724.7534	3.0	1.5	1.50	3.00	1.5	.15	70	300	30	20
2379	725.1192	3.0	2.0	1.00	2.00	2.0	.15	70	300	20	20
2380.3	725.5154	3.0	1.5	.50	.70	1.5	.15	70	300	15	20
2381.6	725.9117	5.0	1.5	.70	.70	3.0	.20	150	300	20	30
2382.8	726.2774	5.0	3.0	1.50	1.50	3.0	.20	150	300	30	30
2384.0	726.6432	7.0	3.0	5.00	7.00	2.0	.15	150	300	30	70
2385	726.9480	7.0	3.0	3.00	3.00	3.0	.15	150	500	30	70
2386	727.2528	7.0	3.0	2.00	3.00	3.0	.15	150	700	70	70
2387	727.5576	7.0	3.0	3.00	2.00	3.0	.15	150	500	70	70
2388	727.8624	7.0	3.0	3.00	3.00	3.0	.15	150	300	70	30
2389.0	728.1672	5.0	2.0	3.00	3.00	3.0	.15	150	300	50	50
2390.1	728.5025	7.0	3.0	3.00	3.00	3.0	.15	150	300	50	70
2391.2	728.8378	7.0	3.0	3.00	3.00	3.0	.20	150	300	70	50
2392.3	729.1730	3.0	2.0	3.00	2.00	3.0	.15	150	300	50	70
2393.4	729.5083	3.0	2.0	3.00	5.00	2.0	.15	70	300	70	20

Table 1 (cont.)

Golden Gulch , continued

Sample	ppm Ga-s	ppm Mn-s	ppm Mo-s	ppm Ni-s	ppm Pb-s	ppm Sc-s	ppm Sr-s	ppm V-s	ppm Yb-s	ppm Zr-s
2349	30	300	7	20	30	15	500	150	3.0	150
2350	15	300	7	20	30	10	500	100	5.0	150
2351	20	300	7	20	30	10	500	150	2.0	150
2352	15	300	7	20	30	7	500	70	2.0	150
2353	20	300	5	15	30	7	700	70	2.0	150
2354	30	200	15	30	30	10	700	150	2.0	150
2355.3	30	300	5	15	30	10	500	150	1.4	100
2357.1	30	300	5	15	20	10	500	150	1.4	150
2359.3	30	300	7	30	30	10	300	100	2.0	70
2360.6	30	300	10	30	30	15	300	150	3.0	150
2361.8	30	300	10	30	30	15	300	150	2.0	100
2362.8	30	200	10	30	30	10	300	100	2.0	150
2363.8	30	300	10	30	30	7	300	150	2.0	70
2364.8	20	300	10	30	30	10	300	150	3.0	100
2365.8	20	200	5	20	30	7	300	70	3.0	70
2366.8	20	300	5	30	30	10	300	70	2.0	70
2367.9	20	700	7	30	30	7	300	100	1.4	70
2369	20	500	5	30	30	15	300	150	3.0	100
2370	30	300	5	30	30	15	200	100	3.0	100
2371	30	700	5	20	30	15	300	100	3.0	70
2372.0	20	700	7	20	30	10	300	100	3.0	100
2374.1	20	700	7	30	30	15	300	100	2.0	100
2375.3	30	500	5	30	30	15	300	100	3.0	100
2376.5	30	300	5	20	30	7	300	70	2.0	70
2377.8	15	300	5	30	30	7	150	50	1.4	150
2379	15	300	5	20	30	7	150	70	3.0	150
2380.3	15	150	5	15	30	7	150	70	2.0	300
2381.6	20	200	5	20	30	7	150	70	3.0	200
2382.8	30	300	5	30	30	10	150	70	3.0	150
2384.0	30	300	15	30	50	15	300	150	2.0	100
2385	30	300	15	30	70	15	300	150	2.0	150
2386	30	300	15	30	50	15	300	150	3.0	150
2387	30	300	15	30	50	15	300	150	2.0	70
2388	30	300	10	30	30	15	300	150	1.4	70
2389.0	30	300	7	20	30	10	300	100	2.0	100
2390.1	30	300	10	30	30	15	300	100	2.0	70
2391.2	30	300	10	20	30	15	300	150	3.0	100
2392.3	30	200	7	20	30	7	200	100	1.4	70
2393.4	15	300	5	20	20	7	300	70	1.4	100

Table 1 (cont.)

Table 2.--Summary of composition of the Garden Gulch Member of the Green River Formation, USGS corehole CR-2, Piceance Creek Basin, Colorado

[Data expressed in parts per million except where noted as percent (%); Ratio, number of samples in which the element was found in measurable concentrations to number of samples analyzed; leaders (--) indicate no data available]

Element	Method	Ratio	Observed Range	Geometric Mean	Geometric Deviation
Si, %---	1	32:32	2.0-35	22	1.59
Al, %---	1	32:32	1.7-7.7	5.5	1.41
Fe, %---	1	32:32	.03-4.6	3.1	2.41
Mg, %---	3	32:32	.45-7.2	2.2	1.77
Ca, %---	1	32:32	1.4-15	5.6	1.73
Na, %---	3	32:32	.45-1.5	.82	1.28
K, %----	1	32:32	.70-2.8	1.9	1.33
Ti, %---	1	32:32	.12-.36	.27	1.28
F, %----	4	32:32	.028-.17	.10	1.50
S, %----	1	32:32	.13-1.3	.53	1.68
Org-C, %	5		--	--	--
Carb-C %	5		--	--	--
As------	1	16:16	4.5-40	12	1.78
B-------	2	262:264	<70-300	150	1.33
Ba------	2	263:263	200-1500	400	1.49
Co------	2	117:264	<10-20	9.0	1.36
Cr------	2	264:264	15-100	49	1.40
Cu------	2	264:264	20-150	58	1.56
Ga------	2	264:264	10-70	22	1.34
Ge------	1		--	--	--
Hg------	3	32:32	.040-.21	.088	1.43
La------	2		--	--	--
Li------	3	32:32	30-90	63	1.29
Mn------	2	264:264	100-700	280	1.31
Mo------	2	243:264	<7-70	19	1.97
Nb------	2		--	--	--
Ni------	2	264:264	15-70	29	1.33
Pb------	2	261:264	<20-150	41	1.52
Rb------	3	32:32	60-140	98	1.27
Sb------	1	16:16	.60-2.8	1.2	1.49
Sc------	2	199:264	<10-20	11	1.37
Sn------	1	16:16	.50-4.8	1.4	1.78
Sr------	2	264:264	100-700	290	1.42
V-------	2	264:264	50-300	130	1.37
Y-------	2		--	--	--
Yb------	2	178:264	<2-5	1.9	1.31
Zn------	3	32:32	68-160	120	1.25
Zr------	2	264:264	30-300	96	1.39
U-------	6	32:32	2.0-15	5.9	1.68
Th------	6	32:32	4.0-37	9.0	1.64

Analytical Methods:

1 - X-ray fluorescence
2 - Semiquantitative optical emission spectroscopy
3 - Atomic absorption spectrophotometry
4 - Specific ion electrode
5 - Gasometric
6 - Neutron activation analysis

Table 3.--Chemical analyses of 32 samples from the Garden Gulch Member of the Green River Formation, USGS corehole CR-2, Piceance Creek Basin, Colorado

[Analyses were by X-ray fluorescence (-x), atomic absorption spectrophotometry (-a), specific ion electrode (-elec), semi-quantitative optical emission spectroscopy (-s), or neutron activation analysis (-n). Values are in percent (%) or parts per million (ppm) dry weight of sample. Leaders (--) indicate no data available.]

Table 3

Garden Gulch Zone (chem)

Sample	Depth-m	% Si-x	% Al-x	% Fe-x	% Mg-a	% Ca-x	% Na-a	% K-x	% Ti-x	Total-c
2060.8	628.1318	24.34	7	3.0	1.5	1.5	.85	3.0	.20	4.59
2070	630.9360	17.54	5	3.0	2.0	7.0	1.54	2.0	.15	6.90
2080.3	634.0754	17.73	3	2.0	3.0	7.0	.54	3.0	.10	8.74
2090.2	637.0930	22.31	7	3.0	2.0	3.0	.80	3.0	.20	7.41
2100.4	640.2019	26.05	7	3.0	1.5	2.0	.79	3.0	.15	5.19
2109.6	643.0061	22.91	7	3.0	2.0	3.0	.87	3.0	.20	7.58
2130.5	649.3764	13.84	3	1.5	5.0	7.0	.57	1.5	.07	14.14
2140	652.2720	21.92	5	2.0	3.0	5.0	.75	1.5	.15	8.49
2149.7	655.2286	27.34	7	3.0	1.0	1.5	1.01	3.0	.20	13.20
2160	658.3680	26.43	3	1.5	.7	7.0	.45	1.5	.15	8.10
2169.9	661.3855	17.30	3	1.5	5.0	7.0	.76	1.5	.10	16.02
2180.3	664.5554	2.00	5	2.0	3.0	2.0	.76	3.0	.15	2.00
2190.0	667.5120	25.02	10	3.0	2.0	1.5	.74	3.0	.30	5.40
2200	670.5600	25.17	7	3.0	1.5	1.5	.75	3.0	.30	5.30
2210.5	673.7604	21.33	7	3.0	2.0	5.0	.86	3.0	.15	14.04
2220	676.6560	25.55	7	3.0	1.5	2.0	.86	3.0	.20	8.50
2230	679.7040	25.43	10	3.0	1.5	1.5	.85	3.0	.30	5.83
2240	682.7520	25.07	7	3.0	1.5	1.5	.71	3.0	.15	4.14
2250	685.8000	21.03	7	3.0	3.0	5.0	.93	3.0	.15	11.09
2258.5	688.3908	23.00	7	3.0	3.0	2.0	.91	3.0	.15	5.45
2269.7	691.8046	23.31	7	3.0	2.0	3.0	.93	3.0	.15	5.46
2280	694.9440	23.96	10	3.0	2.0	1.5	.81	3.0	.30	7.27
2300	701.0400	22.69	7	3.0	3.0	3.0	1.34	3.0	.15	16.58
2309.3	703.8746	25.04	10	3.0	3.0	1.5	.93	3.0	.20	7.10
2319.5	706.9836	21.79	7	3.0	3.0	3.0	1.06	3.0	.15	12.96
2330	710.1840	24.99	10	3.0	1.5	1.0	.91	3.0	.30	11.95
2340	713.2320	25.74	5	1.5	2.0	3.0	.61	3.0	.15	4.31
2350	716.2800	24.53	3	3.0	2.0	5.0	.65	3.0	.15	4.86
2360.6	719.5109	26.12	7	3.0	2.0	2.0	.73	3.0	.20	5.19
2370	722.3760	24.69	7	3.0	1.0	3.0	1.03	3.0	.20	5.84
2380.3	725.5154	35.11	3	1.5	.5	.7	.70	1.5	.15	2.86
2390.1	728.5025	22.98	7	3.0	3.0	3.0	1.12	3.0	.15	10.62

Garden Gulch Zone (chem)

Sample	% F-elec	% S-x	ppm As-x	ppm B-s	ppm Ba-s	ppm Co-s	ppm Cr-s	ppm Cu-s	ppm Ga-s
2060.8	.140	.5418	7.7	300	700	10	70	70	30
2070	.050	.7277	4.5	100	700	7	50	50	30
2080.3	.100	.4807	7.3	150	500	7	30	70	15
2090.2	.170	.8056	40.0	200	300	10	50	50	20
2100.4	.100	.9299	5.6	150	500	15	50	70	30
2109.6	.120	1.2640	20.0	200	700	15	70	70	30
2130.5	.090	.3771	--	70	300	7	30	70	15
2140	.120	.6857	6.9	150	300	7	50	30	20
2149.7	.120	.7428	12.0	200	300	15	70	70	30
2160	.050	1.1390	12.0	150	300	7	30	30	15
2169.9	.110	.4763	--	150	300	7	50	50	15
2180.3	.028	.1300	--	150	300	7	50	70	20
2190.0	.140	.4876	--	200	300	7	70	70	30
2200	.130	.7620	--	150	700	10	50	100	20
2210.5	.130	1.0220	18.0	200	300	7	70	70	30
2220	.100	.7551	8.7	150	500	10	50	70	30
2230	.120	.7370	--	200	300	10	70	100	30
2240	.120	.3793	--	200	700	15	70	100	30
2250	.120	.8961	--	150	500	15	50	70	30
2258.5	.080	.3036	--	200	500	10	50	70	30
2269.7	.120	.4278	--	150	500	10	70	50	30
2280	.110	.7202	18.0	150	500	15	70	70	30
2300	.080	.5056	--	150	300	10	30	50	20
2309.3	.130	.3278	--	150	300	7	70	70	30
2319.5	.100	.3959	10.0	150	300	7	70	70	20
2330	.160	.5260	--	150	700	15	70	70	30
2340	.090	.2373	--	100	500	7	30	30	20
2350	.060	.3082	9.1	70	700	7	50	30	15
2360.6	.110	.5714	--	150	500	7	70	70	30
2370	.130	.7182	--	150	300	7	50	0	30
2380.3	.040	.1816	21.0	70	300	7	15	20	15
2390.1	.110	.5943	18.0	150	300	7	50	70	30

Table 3 (cont.)

Sample	ppm Hg-a	ppm Li-a	ppm Mn-s	ppm Mo-s	ppm Ni-s	ppm Pb-s	ppm Rb-a	ppm Sb-x	ppm Sn-x
2060.8	.11	80	200	30.0	30	70	130	1.2	2.0
2070	.08	30	300	30.0	20	30	75	.8	1.7
2080.3	.09	50	300	15.0	30	50	95	1.5	.5
2090.2	.16	75	300	30.0	70	70	125	2.8	1.3
2100.4	.08	65	300	30.0	30	30	110	1.0	1.0
2109.6	.09	65	300	20.0	50	70	65	1.6	1.5
2130.5	.07	45	300	15.0	15	30	60	--	--
2140	.06	60	300	10.0	30	30	100	1.2	4.8
2149.7	.12	60	200	30.0	50	30	135	.7	2.4
2160	.07	50	300	15.0	20	20	65	1.5	.9
2169.9	.12	55	200	30.0	15	30	70	--	--
2180.3	.04	70	150	30.0	30	50	110	--	--
2190.0	.06	60	200	30.0	30	70	90	--	--
2200	.13	60	200	30.0	30	50	95	--	--
2210.5	.09	65	500	30.0	30	50	95	1.2	1.3
2220	.06	65	300	20.0	50	30	70	1.2	2.0
2230	.13	65	300	50.0	30	50	130	--	--
2240	.07	60	300	30.0	30	70	115	--	--
2250	.21	80	300	30.0	30	70	110	--	--
2258.5	.06	90	300	30.0	30	70	120	--	--
2269.7	.07	80	200	30.0	30	100	100	--	--
2280	.14	75	300	50.0	50	50	120	.6	1.7
2300	.08	85	300	20.0	50	50	105	--	--
2309.3	.07	90	200	30.0	30	70	135	--	--
2319.5	.10	75	300	15.0	30	70	90	1.1	.5
2330	.16	90	200	20.0	50	50	105	--	--
2340	.07	55	300	7.0	20	20	85	--	--
2350	.06	45	300	7.0	20	30	80	.9	1.5
2360.6	.12	70	300	10.0	30	30	125	--	--
2370	.09	50	300	4.9	30	30	120	--	--
2380.3	.08	40	150	4.9	15	30	70	1.0	.8
2390.1	.08	80	300	10.0	30	30	105	2.2	1.8

Table 3 (cont.)

Garden Gulch Zone (chem)

Sample	ppm Sc-s	ppm Sr-s	ppm V-s	ppm Yb-s	ppm Zn-a	ppm Zr-s	ppm U-n	ppm Th-n
2060.8	15	300	200	3.0	144	150	6.63	12.56
2070	15	300	150	2.0	105	70	9.17	8.14
2080.3	7	500	150	1.4	110	70	5.56	7.39
2090.2	15	300	150	2.0	142	100	6.79	10.62
2100.4	15	300	150	3.0	124	70	10.02	11.07
2109.6	15	300	150	2.0	135	100	8.51	8.70
2130.5	7	300	70	1.4	89	50	2.00	4.00
2140	7	300	150	1.4	103	100	6.06	9.53
2149.7	15	300	150	2.0	148	150	7.71	9.45
2160	7	300	70	1.4	68	70	5.07	5.49
2169.9	7	500	70	1.4	81	50	6.41	8.42
2180.3	7	150	150	1.4	124	70	2.00	4.00
2190.0	15	200	150	3.0	156	100	9.63	13.57
2200	10	300	150	2.0	131	150	9.51	11.58
2210.5	10	300	150	2.0	132	70	6.47	9.67
2220	15	200	150	2.0	140	70	8.11	8.91
2230	15	200	200	2.0	148	150	15.12	18.22
2240	15	300	150	2.0	164	150	8.74	13.07
2250	10	300	150	1.4	113	100	2.00	4.00
2258.5	15	300	150	2.0	129	100	5.44	7.36
2269.7	10	300	150	2.0	134	70	5.91	11.09
2280	15	200	150	2.0	148	100	7.33	14.84
2300	15	300	150	1.4	129	70	5.60	8.07
2309.3	15	300	150	2.0	138	150	6.42	4.00
2319.5	10	300	150	1.4	133	100	7.50	12.53
2330	15	150	200	3.0	149	150	2.00	4.00
2340	7	300	70	1.4	93	100	4.81	8.27
2350	10	500	100	5.0	96	150	8.36	37.06
2360.6	15	300	150	3.0	136	150	10.63	12.56
2370	15	200	100	3.0	117	100	4.61	14.33
2380.3	7	150	70	2.0	70	300	3.04	7.46
2390.1	15	300	100	2.0	117	70	4.22	7.58

TABLE 3 (cont.)

Table 4.--Summary of composition of the interval 229-320 m (Mahogany Zone) of the Parachute Creek Member of the Green River Formation, USGS corehole CR-2, Piceance Creek Basin, Colorado

[Data expressed in parts per million except where noted as percent (%); Ratio, number of samples in which the element was found in measurable concentrations to number of samples analyzed]

Element	Method	Ratio	Observed Range	Geometric Mean	Geometric Deviation
Si, %----	1	74:74	6.7-24	15	1.25
Al, %----	1	74:74	1.6-6.6	3.6	1.34
Fe, %----	1	74:74	1.1-3.9	2.2	1.29
Mg, %----	3	74:74	.32-5.4	2.9	1.45
Ca, %----	1	74:74	6.3-32	11	1.36
Na, %----	3	74:74	.10-3.7	1.4	1.68
K, %-----	1	74:74	.25-5.1	1.7	1.67
Ti, %----	1	74:74	.063-.29	.17	1.31
F, %-----	4	60:74	<.04-.23	.076	1.78
S, %-----	1	71:74	<.03-.88	.23	2.22
Org-C, %-	5	71:74	<.02-16	4.8	2.42
Carb-C, %	5	71:74	<1.9-14	4.7	1.65
As-------	1	42:42	4.3-29	13	1.60
B--------	2	71:74	<13-400	99	1.92
Ba-------	2	74:74	150-690	390	1.34
Co-------	2	74:74	6.3-15	10	1.24
Cr-------	2	74:74	16-72	34	1.42
Cu-------	2	74:74	15-120	45	1.58
Ga-------	2	74:74	3.2-17	5.1	1.54
Ge-------	1	38:42	<.15-1.9	.44	1.92
Hg-------	3	74:74	.030-.23	.11	1.36
La-------	2	74:74	13-85	35	1.48
Li-------	3	71:74	<4.8-140	35	2.24
Mn-------	2	74:74	190-780	310	1.35
Mo-------	2	74:74	3.5-44	14	1.68
Nb-------	2	64:74	<4.0-39	11	1.87
Ni-------	2	74:74	14-47	26	1.26
Pb-------	2	74:74	3.5-170	21	1.71
Rb-------	3	73:74	<8.0-120	68	1.49
Sb-------	1	37:42	<.16-3.9	.97	2.34
Sc-------	2	74:74	2.8-15	6.3	1.47
Sn-------	1	39:42	<.15-16	1.7	2.74
Sr-------	2	72:74	<200-990	540	1.38
V--------	2	74:74	3.7-150	74	1.41
Y--------	2	74:74	7.5-40	14	1.42
Yb-------	2	74:74	.86-3.5	1.4	1.37
Zn-------	3	74:74	47-140	79	1.23
Zr-------	2	74:74	29-210	75	1.44
U--------	6	74:74	2.7-11	4.9	1.35
Th-------	6	60:60	4.9-20	8.3	1.33

Analytical Methods:

1 - X-ray fluorescence
2 - Semiquantitative optical emission spectroscopy
3 - Atomic absorption spectrophotometry
4 - Specific ion electrode
5 - Gasometric
6 - Neutron activation analysis

Table 4

Table 5.--Analysis of logarithmic variance of elemental composition of 74 samples of oil shale from the interval 229-320 m (Mahogany Zone) in the USGS corehole CR-2, Piceance Creek Basin, Colorado

[See figure 5 for analysis-of-variance sampling design.]

[*, component of variance tested to be significantly different from zeroat the 0.05 probability level; values in percent of total logarithmic variance]

Element	Total logarithmic variance	Between 30-meter intervals	Between 3-meter intervals	Between 0.3-meter intervals	Between analyses
Si------	0.0106	27*	23*	49*	1.5
Al------	.0167	12	23*	58*	7.5
Fe------	.0125	8	24*	63*	4.4
Mg------	.0268	0	4	93*	2.5
Ca------	.0187	7	0	90*	2.2
Na------	.0540	0	35*	63*	2.3
K-------	.0569	37*	33*	29*	0.6
Ti------	.0147	22*	28*	41*	9.0
S-------	.1348	31*	35*	22*	12
Org-C---	.1503	0	0	82*	18
Carb-C--	.0502	0	0	44	56
B-------	.0818	5	19	13	63
Ba------	.0166	0	16	39	45
Co------	.0096	0	0	49	51
Cr------	.0242	8	43*	31*	18
Cu------	.0397	0	19	0	81
F-------	.0633	1	2	87*	10
Hg------	.0179	3	1	75*	20
La------	.0299	6	8	21	65
Li------	.1252	4	33*	61*	2.0
Mn------	.0182	13*	26*	26	35
Mo------	.0534	16*	6	50*	28
Nb------	.1163	0	33*	0	67
Ni------	.0105	0	11	52*	37
Pb------	.0546	0	9	52*	40
Rb------	.0304	6	10	79*	5.0
Sc------	.0292	5	21	0	74
Sr------	.0192	1	12	5	82
V-------	.0232	0	8	31	61
Y-------	.0252	18*	0	60*	22
Yb------	.0197	15*	15	53*	17
Zn------	.0085	0	32*	56*	12
Zr------	.0265	13*	2	62*	24
U-------	.0175	12*	7	79*	2

Table 6.--Chemical analyses of 74 samples from the interval 229-320 m (Mahogany Zone), in USGS corehole CR-2, Rio Blanco County, Colorado

[Analyses were by X-ray fluorescence (-x), atomic absorption spectrophotometry (-a), specific ion electrode (-elec), semi-quantitative optical emission spectroscopy (-s), or neutron activation analysis (-n). Values are in percent (%) or parts per million (ppm) dry weight of sample. Leaders (--) indicate no data available.]

CR-2, Mahogany Zone

Sample	Depth-m	% Si-x	% Al-x	% Fe-x	% Mg-aa	% Ca-x	% Na-aa	% K-x	% Ti-x	% F-elec	% S-x	% orgC-c	% crbC-c	ppm As-x	ppm B-s
10111CR2	228.6000	19.7161	4.7653	3.2921	2.1252	10.2493	2.6082	1.8045	.2756	.03	.0962	1.6615	3.7964	9.1770	400.000
10112CR2	228.6000	20.6281	5.4237	3.5100	2.0328	10.3770	2.6136	1.8431	.2840	.03	.0951	1.8876	4.0075	10.6480	55.176
10121CR2	229.8192	23.6579	5.7189	2.6281	1.2681	6.9590	2.3232	2.6136	.2143	.03	.0488	1.3358	2.6717	11.6160	106.480
10211CR2	231.4346	24.4474	6.0135	2.5908	1.3246	6.3329	3.7012	1.5818	.1820	.03	.0200	1.1591	2.4837	14.6100	48.700
10221CR2	233.0806	14.4854	3.2175	1.7529	4.5504	15.2628	1.0144	1.9481	.1837	.03	.0200	2.6639	6.3611	13.2720	93.852
10311CR2	234.6960	17.5664	3.8896	2.5880	4.3608	10.3048	.5878	3.3085	.1915	.03	.0942	2.5880	5.2235	17.0640	274.920
10312CR2	234.6960	17.1389	3.6015	2.4667	4.2964	10.2366	.6071	3.2541	.2017	.03	.1149	2.8674	4.9689	--	242.840
10321CR2	236.2200	21.7123	5.8259	2.8850	2.5974	6.3684	.8177	4.5301	.2428	.03	.0714	1.6258	3.0111	--	173.160
10411CR2	237.4392	17.6181	4.6790	2.3470	3.9780	9.2466	1.2111	2.7413	.2535	.04	.1385	3.7747	5.6664	13.2600	106.080
10421CR2	239.2680	12.5268	3.3704	1.9789	3.9000	11.1462	1.5366	1.2558	.1617	.14	.3685	11.3958	3.6426	7.2540	39.000
10511CR2	240.7920	15.0511	3.5809	2.4594	3.8970	11.5178	1.4722	2.0247	.1991	.11	.2319	6.2612	4.3646	--	44.166
10512CR2	240.7920	14.8520	3.9065	2.3149	3.7752	11.8576	1.5187	2.0781	.1820	.17	.2750	4.1785	6.6409	--	94.380
10521CR2	242.0722	15.0984	3.3315	2.2340	2.9970	10.5867	1.3689	1.7042	.2125	.09	.3158	3.3291	9.7929	--	137.700
10621CR2	245.3640	13.7644	3.1953	2.0786	2.9610	12.9184	1.3028	1.6776	.1738	.03	.1193	4.1031	8.0370	--	135.360
10711CR2	246.9794	14.5337	2.9650	1.7471	3.1228	13.7910	1.7218	1.1723	.1537	.14	.1085	3.8064	8.0686	13.5040	135.040
10712CR2	246.9794	14.3477	3.0413	1.7901	3.2838	13.6488	1.6419	1.0323	.1720	.14	.1162	3.5869	8.3526	--	143.140
10721CR2	248.2596	22.1645	5.1431	2.5135	2.2850	6.4830	2.4678	2.2283	.2131	.03	.1002	2.1845	4.9356	19.1940	109.680
10811CR2	249.8141	15.5923	4.1268	2.4245	2.9898	12.7655	2.2831	1.5284	.2015	.10	.1523	4.4756	4.4213	16.3080	43.488
10821CR2	251.4600	15.1903	3.4037	2.0442	2.6994	10.8794	1.2188	1.5452	.1664	.13	.3240	10.0123	3.1493	22.0860	130.880
10911CR2	252.7402	13.1109	2.3690	1.3781	3.7410	16.4865	1.1136	1.0362	.0979	.07	.1248	4.8285	7.4994	14.7900	139.200
10912CR2	252.7402	14.1173	3.1876	1.7522	3.1600	13.1140	1.6985	1.1471	.1348	.08	.3512	4.2344	7.1653	--	86.900
10921CR2	254.4470	14.0996	3.5350	2.1590	2.9088	12.4109	1.0504	1.2338	.1698	.11	.1470	12.5725	2.9734	--	400.000
11011CR2	256.3368	13.9992	3.0912	1.9777	3.1140	7.8611	1.0518	1.2511	.1657	.14	.4524	14.6912	1.8684	--	45.672
11021CR2	257.5560	14.2845	3.5194	1.9736	3.0408	7.8771	1.1512	1.0809	.1615	.12	.3273	14.4510	2.1430	--	400.000
21111CR2	259.0800	11.2720	3.1648	1.8266	2.5358	15.5911	1.1861	1.0102	.1343	.14	.3163	9.5379	4.2372	24.5400	163.600
21112CR2	259.0800	11.7710	2.8532	1.8765	2.7812	16.0328	1.2597	1.1207	.1378	.13	.3567	4.1227	10.1187	--	253.580
21121CR2	260.6040	13.5673	3.2441	2.0429	3.0420	7.0574	.8044	1.1526	.1709	.07	.2333	15.5548	2.0077	13.5200	243.360
21211CR2	262.2194	9.2934	1.7164	1.1365	2.4960	18.5702	1.0816	.7778	.1043	.08	.2835	5.2499	9.0522	--	91.520
21221CR2	263.6520	14.4612	3.8449	2.5946	2.7378	7.0972	1.2566	1.2117	.1805	.13	.5285	14.8262	2.0639	--	168.480
21311CR2	265.1760	14.2098	4.0767	2.7847	2.4986	10.9132	1.6362	1.5902	.1672	.10	.8810	9.7687	3.4255	--	78.988
21312CR2	265.1760	14.3710	4.2323	2.7871	2.5792	11.2034	1.6604	1.5822	.1888	.09	.8374	10.0669	3.5142	--	73.346
21321CR2	266.5781	11.4548	2.9449	1.6920	2.7072	17.3599	1.4297	.9864	.1393	.14	.3722	9.6021	3.1556	5.4990	53.298
21411CR2	268.2240	14.6308	3.0249	1.8715	3.3180	9.4563	1.9750	1.1368	.1352	.06	.3355	12.0396	3.0178	16.5900	54.510
21421CR2	269.5651	13.3151	3.3253	2.3236	2.8644	14.3480	1.3194	1.6284	.1517	.03	.3073	4.4962	7.0308	16.4920	95.480
21511CR2	271.3330	12.8466	3.0077	1.7090	3.3540	11.9340	1.6068	.9680	.1367	.08	.3523	3.4632	12.5112	14.8200	93.600
21512CR2	271.3330	12.7814	2.8967	1.7289	3.3884	11.9461	1.6784	.9598	.1333	.12	.3885	12.7420	3.4672	16.5480	40.976
21521CR2	272.6436	12.0568	2.9422	1.7319	3.1406	12.1871	1.5320	1.4094	.1415	.09	.4370	2.5584	13.8263	13.7880	84.260
21611CR2	274.2286	9.9176	2.2995	1.4034	2.4304	16.8560	1.4504	.8985	.1196	.09	.4467	12.4891	4.1238	20.3840	38.416
21621CR2	275.9354	12.5360	2.6928	1.7920	3.7600	11.5600	1.8720	1.3000	.1554	.14	.3840	3.4720	11.7280	7.2800	88.000
21711CR2	277.3680	13.1283	3.3325	1.7637	3.2756	16.4297	1.7671	.9335	.1708	.21	.3117	8.2407	4.8013	--	53.444
21712CR2	277.3680	12.0876	2.8829	1.5775	3.2760	15.6576	1.7640	.8929	.1425	.18	.2933	4.8384	7.8540	16.8000	80.640
21721CR2	278.8920	13.1056	2.6928	1.7732	3.9494	12.3399	1.3944	1.2372	.1425	.06	.2990	3.9010	10.8488	29.0160	112.840
21811CR2	279.8369	10.8481	2.5738	1.6832	3.1540	16.1269	1.5521	1.0582	.1343	.12	.3877	9.5118	4.1251	18.2600	48.140
21821CR2	281.7876	6.7382	1.6144	2.3995	.3224	31.7645	.1048	.2499	.0630	.03	.4004	.0242	4.7554	11.2840	12.896
21911CR2	283.7383	14.1869	3.6711	1.9907	4.0608	11.4826	1.9008	1.2865	.1729	.11	.2802	8.2944	3.6374	--	69.984

Table 6

CR-2, Mahogany Zone--continued

Sample	Depth-m	% Si-x	% Al-x	% Fe-x	% Mg-aa	% Ca-x	% Na-aa	% K-x	% Ti-x	% F-elec	% S-x	% orgC-c	% crbC-c	ppm As-x	ppm B-s
21912CR2	283.7383	14.6958	3.4607	2.0369	3.9856	11.7363	1.9504	1.4162	.1701	.09	.3417	3.6973	8.5818	--	101.760
21921CR2	284.9880	19.6874	5.6408	3.2634	2.8992	7.1719	2.4462	2.1662	.2406	.03	.5177	2.5821	4.2310	7.2480	144.960
22011CR2	286.3901	15.3064	4.3044	2.7645	2.5440	10.6424	2.2048	1.6239	.1955	.08	.4733	8.5563	3.1970	--	39.856
22021CR2	287.9446	12.5885	4.1429	2.4913	2.8050	13.9995	1.3430	1.6974	.1680	.08	.3784	8.9590	4.1310	4.3350	56.100
32111CR2	289.5905	11.1172	2.7872	1.5996	2.7522	16.0628	1.3928	1.3110	.1236	.08	.3526	6.0000	6.0000	--	100.080
32111CR2	289.5905	11.4109	2.7371	1.6914	2.8696	16.1795	1.4095	1.3327	.1356	.08	.4455	4.2538	9.8410	--	78.492
32121CR2	291.1450	12.2792	3.2954	1.9864	1.5732	15.8065	1.3662	1.4838	.1595	.19	.4790	10.7143	3.0139	21.5280	57.132
32211CR2	292.6080	13.7172	3.6534	2.1172	2.8968	13.8194	1.7040	1.3777	.1680	.06	.2697	9.7128	3.5784	18.7440	47.712
32221CR2	293.0347	12.8438	3.1928	2.1153	2.8446	15.3781	1.4913	1.3327	.1616	.09	.2991	8.4562	4.1979	20.6880	48.272
32311CR2	296.5704	12.7171	2.4791	1.7527	4.4255	12.7421	1.5197	1.2024	.1558	.03	.0619	5.1019	6.3293	--	91.850
32312CR2	296.5704	13.1584	3.0002	1.7451	4.5315	13.4748	1.5561	1.1919	.1564	.06	.0200	6.0000	6.0000	--*	94.050
32321CR2	296.8752	13.8006	3.1506	2.0257	3.9652	14.0334	1.6981	1.4499	.1910	.13	.1580	4.1204	7.8959	18.1020	103.440
32411CR2	298.5516	18.0541	5.2860	3.2968	2.2300	8.9378	3.3004	2.2612	.2398	.08	.4666	3.0774	6.1548	17.8400	133.800
32421CR2	299.9232	18.6675	5.8720	3.8732	2.2800	8.5063	3.3250	2.5735	.2708	.03	.0698	3.5625	2.3180	--	133.000
32511CR2	301.7520	17.9297	5.4034	3.4410	2.4462	9.1959	2.2650	3.5533	.2655	.11	.3766	5.8981	2.6727	--	144.960
32512CR2	301.7520	17.9841	5.1832	3.4482	2.4462	9.2321	2.3556	3.6068	.2754	.11	.4472	2.7542	5.7350	--	271.800
32611CR2	305.4096	19.4900	5.1330	3.1208	3.1086	7.3853	1.7992	4.3228	.2737	.09	.2499	3.1934	2.5999	7.4418	254.340
32621CR2	306.3240	22.1805	6.6208	3.3285	2.3850	6.3336	2.0034	5.1306	.2914	.08	.2537	2.6712	2.0702	7.1550	171.720
32711CR2	307.2384	19.2230	5.9662	2.5568	4.2300	7.8932	1.3630	4.8184	.2430	.10	.1383	2.7354	3.5344	7.9900	51.700
32712CR2	307.2384	20.3301	5.7090	2.6563	3.3192	8.3893	1.4199	5.1438	.2546	.09	.1423	3.3653	2.8766	5.7164	193.620
32721CR2	309.3110	14.6013	3.2540	2.1235	4.1718	10.3477	.9162	2.7068	.1626	.07	.2134	10.0859	3.5828	8.9980	179.960
32811CR2	310.7741	15.0774	4.4675	2.9580	3.4124	11.6381	.9339	3.1690	.1929	.07	.1334	6.0256	4.1667	6.4656	98.780
32821CR2	312.4200	12.9773	3.4671	2.2380	2.4704	10.8698	.7720	2.4658	.1745	.09	.3374	3.0262	11.9737	--	208.440
32911CR2	313.9440	12.5542	2.7891	1.8909	3.6414	15.5366	.6069	2.0097	.1852	.06	.3324	5.0026	6.7279	--	156.060
32912CR2	313.9440	12.1437	2.6738	1.8948	3.6851	15.2289	.6256	1.9840	.1592	.07	.3425	6.0000	6.0000	--	154.260
32921CR2	315.5594	14.5725	3.9507	2.8432	3.2190	12.3714	.6177	2.7501	.2009	.06	.2580	7.9083	3.6018	6.3510	60.900
33011CR2	315.8642	12.0869	2.9708	1.8926	5.3640	14.9477	.4291	2.3539	.1495	.04	.2153	5.8289	5.0422	--	151.980
33021CR2	318.5160	16.0991	4.4862	3.2950	3.4960	9.0284	1.1974	2.6106	.2091	.10	.7050	6.8871	3.2338	--	44.574

Table 6 (continued)

CR-2, Mahogany Zone

Sample	ppm Ba-s	ppm Co-s	ppm Cr-s	ppm Cu-s	ppm Ga-s	ppm Ge-s	ppm Hg-a	ppm La-s	ppm Li-a	ppm Mn-s	ppm Mo-s	ppm Nb-s	ppm Ni-s
10111CR2	405.72	15.4560	43.470	43.470	4.0000	.9660	.07	34.776	5.796	396.06	17.3880	17.3880	37.674
10112CR2	464.64	10.6480	60.016	15.488	4.0000	1.1616	.08	68.728	4.000	774.40	6.0984	30.0080	26.136
10121CR2	503.36	12.5840	61.952	28.072	6.6792	1.8392	.07	67.760	10.648	600.16	3.4848	25.1680	30.976
10211CR2	331.16	15.5840	61.362	16.558	6.4284	1.5584	.08	84.738	4.000	623.36	5.1622	26.2980	39.934
10221CR2	379.20	6.8256	24.648	22.752	4.0000	.3792	.07	20.856	17.064	246.48	6.5412	9.1956	14.220
10311CR2	407.64	8.1528	36.972	33.180	4.0000	.9480	.12	66.360	11.376	436.08	6.7308	22.7520	31.284
10312CR2	364.26	7.7522	31.756	22.416	4.0000	--	.12	28.020	12.142	373.60	4.2030	4.0000	24.284
10321CR2	548.34	12.5060	37.518	33.670	8.0808	--	.09	57.720	4.000	500.24	6.5416	9.6200	25.012
10411CR2	318.24	8.3096	39.780	76.908	8.2212	.1500	.10	25.636	25.636	309.40	7.1604	8.3096	23.868
10421CR2	499.20	10.9200	29.640	35.100	4.0000	.8580	.17	28.860	75.660	226.20	20.2800	5.4600	23.400
10511CR2	588.88	11.2580	27.712	37.238	4.0000	--	.09	44.166	26.846	320.42	10.3920	22.5160	21.650
10512CR2	549.12	11.1540	42.042	44.616	5.1480	--	.10	36.036	22.308	308.88	12.0120	7.3788	28.314
10521CR2	526.50	13.7700	44.550	73.710	7.2090	--	.14	41.310	76.140	267.30	39.6900	12.1500	30.780
10621CR2	431.46	10.1520	40.608	68.526	6.1758	--	.11	32.148	29.610	431.46	10.9980	9.3060	27.072
10711CR2	413.56	9.2840	39.668	49.796	4.8108	.3376	.08	31.228	143.480	337.60	9.2840	11.8160	27.008
10712CR2	421.00	7.5780	40.416	49.678	5.8098	--	.08	23.576	130.510	429.42	7.4938	12.6300	26.944
10721CR2	484.42	10.0540	51.184	100.540	15.5380	.1500	.15	52.098	21.022	420.44	7.4034	21.9360	33.818
10811CR2	298.98	9.0600	30.804	77.916	4.0000	.4530	.10	26.274	26.274	335.22	8.0634	16.3080	19.932
10821CR2	441.72	10.6340	31.084	38.446	4.0000	.3272	.11	29.448	64.622	261.76	13.9060	26.1760	23.722
10911CR2	278.40	6.2640	28.710	30.450	4.0000	.1500	.08	15.660	40.890	374.10	17.4000	8.0040	22.620
10912CR2	276.50	11.0600	34.760	67.150	4.1080	--	.14	33.970	62.410	229.10	29.2300	4.5820	29.230
10921CR2	428.24	11.3120	29.088	61.408	4.0000	--	.10	38.784	79.184	266.64	20.2000	11.3120	24.240
11011CR2	408.28	12.4560	31.832	47.056	3.1832	--	.11	39.444	53.284	290.64	15.2240	15.9160	22.836
11021CR2	217.20	10.1360	27.512	32.580	4.0000	--	.16	28.960	57.196	238.92	20.2720	9.4120	26.064
21111CR2	384.46	9.8160	22.904	50.716	4.0000	.6544	.14	49.080	48.262	286.30	13.0880	11.4520	23.722
21112CR2	310.84	8.9980	30.266	62.986	4.0000	--	.11	30.266	46.626	269.94	15.5420	4.0000	29.448
21121CR2	250.12	13.5200	28.392	55.432	4.0000	.3380	.09	25.688	54.756	270.40	22.9840	6.0164	23.660
21211CR2	366.08	7.2384	23.296	36.608	4.0000	--	.10	13.312	20.800	282.88	12.4800	4.9920	25.792
21221CR2	273.78	14.0400	32.292	45.630	4.0716	--	.23	35.100	57.564	252.72	18.9540	7.0200	31.590
21311CR2	346.58	12.8960	32.240	66.092	4.1106	--	.14	29.016	33.046	298.22	16.1200	13.7020	25.792
21312CR2	386.88	12.0900	29.016	47.554	4.0000	--	.15	38.688	37.076	265.98	12.8960	7.8182	23.374
21321CR2	499.14	8.1216	16.074	20.304	4.0000	1.9458	.12	43.146	34.686	262.26	15.2280	10.1520	20.304
21411CR2	284.40	10.2700	24.490	50.560	4.0000	.3950	.11	22.910	60.830	244.90	20.5400	17.3800	26.860
21421CR2	520.80	11.2840	38.192	78.988	7.0308	.3472	.11	27.776	26.908	355.88	17.3600	11.2840	26.908
21511CR2	249.60	9.3600	31.200	56.940	3.8220	.1500	.10	29.640	63.180	226.20	32.7600	4.0000	26.520
21512CR2	338.84	9.4560	25.216	58.312	4.0000	.3940	.10	26.004	66.192	236.40	18.1240	18.1240	23.640
21521CR2	268.10	9.9580	38.300	55.918	3.6002	.2298	.12	33.704	60.514	222.14	21.4480	4.0000	26.810
21611CR2	439.04	8.6240	20.384	27.440	4.0000	.3920	.12	17.248	32.928	235.20	11.7600	13.3280	19.600
21621CR2	280.00	10.4000	40.800	55.200	5.2000	.4000	.12	23.200	28.000	312.00	24.8000	6.8800	46.400
21711CR2	448.24	8.6200	26.722	34.480	4.0000	--	.09	24.136	80.166	267.22	14.6540	13.7920	23.274
21712CR2	378.00	9.2400	33.600	41.160	4.1160	.2520	.09	24.360	78.960	210.00	15.9600	4.0000	24.360
21721CR2	241.80	10.4780	33.852	48.360	3.8688	.5642	.18	24.986	55.614	193.44	43.5240	4.0000	34.658
21811CR2	439.90	9.1300	22.410	34.860	4.0000	.4150	.13	19.920	95.450	224.10	12.4500	14.1100	19.920
21821CR2	290.16	11.2840	16.120	19.344	4.0000	.2418	.03	54.808	12.896	362.70	9.6720	9.6720	33.046
21911CR2	492.48	12.9600	40.608	34.560	4.0000	--	.11	47.520	83.808	285.12	23.3280	22.4640	27.648

Table 6 (continued)

CR-2, Mahogany Zone--continued

Sample	ppm Ba-s	ppm Co-s	ppm Cr-s	ppm Cu-s	ppm Ga-s	ppm Ge-s	ppm Hg-a	ppm La-s	ppm Li-a	ppm Mn-s	ppm Mo-s	ppm Nb-s	ppm Ni-s
21912CR2	330.72	11.0240	36.464	93.280	5.7664	--	.09	24.592	74.624	237.44	23.7440	11.8720	27.136
21921CR2	462.06	12.6840	70.668	117.780	15.4020	.6342	.08	59.796	76.104	516.42	10.8720	26.2740	31.710
22011CR2	508.80	12.7200	29.680	71.232	4.8336	--	.09	33.072	35.616	313.76	15.2640	8.4800	25.440
22021CR2	391.00	10.2000	22.950	45.050	4.0000	1.2750	.12	30.600	22.100	272.00	12.7500	16.1500	17.850
32111CR2	458.70	10.0080	31.692	43.368	3.9198	--	.13	29.190	25.020	258.54	25.8540	4.9206	23.352
32111CR2	354.48	7.5116	24.476	53.172	4.0000	--	.12	35.448	27.008	202.56	21.9440	4.0000	22.788
32121CR2	687.24	9.9360	22.356	28.980	4.0000	.3312	.14	59.616	18.216	256.68	9.9360	4.0000	21.528
32211CR2	485.64	9.3720	22.152	21.300	4.0000	.3408	.10	30.672	24.708	255.60	25.5600	8.5200	19.596
32221CR2	508.58	9.4820	23.274	35.342	4.0000	.5172	.12	27.584	33.618	241.36	14.6540	11.2060	18.102
32311CR2	233.80	7.0140	25.885	55.110	3.7575	--	.08	40.080	11.690	233.80	11.6900	4.6760	20.875
32312CR2	444.60	8.5500	27.360	49.590	4.1040	--	.08	24.795	11.970	273.60	12.8250	12.8250	24.795
32321CR2	275.84	9.4820	31.894	44.824	5.0858	.5172	.06	23.274	56.030	387.90	17.2400	6.7236	20.688
32411CR2	321.12	15.1640	72.252	76.712	16.9480	.4460	.06	66.008	40.140	472.76	36.5720	8.9200	42.816
32421CR2	152.00	11.4000	59.850	95.000	16.1500	--	.07	36.100	7.600	427.50	13.3000	7.1250	28.500
32511CR2	434.88	13.5900	50.736	56.172	8.4258	--	.11	63.420	87.882	380.52	14.4960	19.0260	31.710
32512CR2	271.80	12.6840	67.044	69.762	11.7780	--	.08	50.736	85.164	362.40	22.6500	26.2740	45.300
32611CR2	263.76	14.1300	66.882	68.766	15.0720	.2826	.08	36.738	61.230	480.42	8.8548	31.0860	47.100
32621CR2	267.12	15.2640	68.688	71.550	15.2640	.3816	.13	47.700	38.160	477.00	7.0596	14.3100	34.344
32711CR2	385.40	10.3400	58.280	15.980	4.0000	.4700	.10	59.220	61.100	639.20	5.8280	38.5400	27.260
32712CR2	378.02	13.8300	61.774	64.540	13.8300	.2766	.10	46.100	50.710	525.54	7.7448	17.5180	34.114
32721CR2	629.86	13.0880	34.356	65.440	4.0000	.2454	.11	44.172	85.890	278.12	26.1760	15.5420	26.994
32811CR2	682.48	12.5720	39.512	34.124	5.1186	.6286	.09	53.880	52.982	377.16	15.2660	33.2260	24.246
32821CR2	447.76	11.5800	38.600	64.076	7.1024	--	.12	45.548	38.600	277.92	17.7560	12.3520	31.652
32911CR2	398.82	7.8897	23.409	37.281	4.0000	--	.07	17.340	37.281	234.09	15.6060	4.0000	19.074
32912CR2	548.48	6.7703	23.139	36.851	4.0000	--	.06	15.426	42.850	231.39	15.4260	4.0000	19.711
32921CR2	565.50	12.1800	27.840	33.060	4.0000	.3480	.08	35.670	26.970	252.30	13.9200	8.0910	21.750
33011CR2	607.92	7.2414	30.396	42.018	4.2912	--	.07	34.866	22.350	321.84	9.8340	11.6220	21.456
33021CR2	375.82	12.2360	32.338	52.440	4.3700	--	.10	43.700	70.794	314.64	15.7320	14.8580	20.102

Table 6 (continued)

CR-2, Mahogany Zone

Sample	ppm Pb-s	ppm Rb-a	ppm Sb-s	ppm Sc-s	ppm Sn-x	ppm Sr-s	ppm V-s	ppm Y-s	ppm Yb-s	ppm Zn-s	ppm Zr-s	ppm U-n	ppm Th-n
10111CR2	28.0140	62.79	1.0626	8.7906	2.3184	531.30	115.920	16.4220	1.8354	70.518	135.240	3.30	11.27
10112CR2	17.4240	67.76	.1600	14.5200	3.0008	532.40	62.920	17.4240	2.3232	71.632	116.160	3.43	9.10
10121CR2	19.3600	87.12	1.0648	9.0024	16.4560	454.96	51.304	21.2960	2.0328	80.344	212.960	3.11	10.99
10211CR2	17.5320	14.61	.1600	11.6880	2.4350	428.56	48.700	20.4540	2.0454	80.842	185.060	3.26	8.63
10221CR2	7.7736	80.58	1.2324	6.5412	5.1192	616.20	43.608	11.3760	1.1376	64.464	60.672	3.88	7.24
10311CR2	17.0640	85.32	.6636	9.4800	1.9908	578.28	92.904	17.0640	1.8960	79.632	94.800	4.07	8.22
10312CR2	10.2740	93.40	--	8.4060	--	495.02	78.456	16.8120	1.7746	75.654	86.862	4.06	9.11
10321CR2	22.1260	91.39	--	14.4300	--	663.78	58.682	23.0880	2.4050	95.238	125.060	3.06	8.47
10411CR2	20.3320	106.08	.8840	3.5360	.1500	380.12	86.632	11.4920	1.2376	79.560	42.432	4.20	8.74
10421CR2	21.8400	58.50	.5460	6.7080	4.2900	624.00	55.380	11.7000	1.1700	74.880	85.800	4.47	6.92
10511CR2	14.7220	82.27	--	7.5342	--	623.52	54.558	16.4540	1.4722	72.744	103.920	4.86	7.72
10512CR2	24.0240	77.22	--	5.2338	--	471.90	84.084	15.4440	1.4586	75.504	72.072	5.17	--
10521CR2	52.6500	85.05	--	6.3990	--	607.50	129.600	13.7700	1.2960	84.240	79.380	5.40	8.16
10621CR2	24.5340	67.68	--	4.9914	--	566.82	93.060	15.2280	1.6074	76.140	71.064	4.15	9.59
10711CR2	16.0360	54.86	1.5192	5.3172	.6752	607.68	70.896	15.1920	1.3504	62.456	84.400	5.18	10.58
10712CR2	16.8400	58.94	--	4.6310	--	530.46	69.044	10.1040	1.3472	63.150	67.360	5.63	--
10721CR2	33.8180	91.40	1.5538	7.2206	.7312	383.88	81.346	40.2160	3.4732	82.260	91.400	4.82	13.10
10811CR2	16.3080	67.95	1.5402	6.5232	4.3488	498.30	67.950	13.5900	1.3590	77.916	77.010	4.71	12.36
10821CR2	17.1780	69.53	1.5542	6.7076	2.6994	580.78	76.074	15.5420	1.5542	71.166	98.160	4.94	8.60
10911CR2	7.3950	47.85	.4350	4.9590	1.1310	582.90	53.940	9.5700	.9570	46.980	50.460	3.54	7.15
10912CR2	24.4900	63.20	--	4.0290	--	513.50	102.700	11.0600	1.1850	69.520	73.470	3.83	4.91
10921CR2	29.0880	68.68	--	8.8880	--	509.04	79.184	16.1600	1.4544	81.608	88.880	5.42	10.27
11011CR2	34.6000	69.20	--	8.3040	--	512.08	89.960	14.5320	1.3840	136.324	61.588	5.06	8.13
11021CR2	22.4440	72.40	--	5.5024	--	333.04	79.640	7.9640	1.0860	128.872	68.780	5.75	7.02
21111CR2	17.9960	57.26	1.9632	6.5440	1.3088	588.96	53.170	11.4520	1.1452	83.436	63.804	3.52	6.86
21112CR2	21.2680	65.44	--	3.5992	--	564.42	69.530	10.6340	1.0634	79.346	48.262	3.69	7.71
21121CR2	27.0400	64.22	1.8928	5.9488	1.9604	365.04	87.880	10.1400	1.0816	98.696	74.360	5.31	8.58
21211CR2	11.6480	41.60	--	2.8288	--	648.96	44.928	7.4880	.9152	54.080	29.952	2.74	--
21221CR2	31.5900	70.20	--	6.6690	--	343.98	91.260	12.6360	1.4040	94.770	91.260	7.72	--
21311CR2	30.6280	56.42	--	8.8660	--	507.78	88.660	15.3140	1.6926	94.302	88.660	5.31	7.72
21312CR2	26.5980	72.54	--	7.8988	--	580.32	88.660	14.5080	1.4508	94.302	88.660	5.29	6.27
21321CR2	12.6900	50.76	.5922	4.8222	3.2994	727.56	49.068	9.3060	.9306	66.834	58.374	3.90	7.77
21411CR2	23.7000	67.15	3.7130	6.6360	2.5280	458.20	86.900	10.2700	1.4220	80.580	86.900	6.21	--
21421CR2	30.3800	73.78	1.2152	5.8156	1.9964	624.96	85.064	14.7560	1.3888	78.988	64.232	3.26	8.08
21511CR2	28.0800	58.50	2.5740	3.5100	.1500	436.80	93.600	9.3600	1.0140	70.200	56.940	6.23	--
21512CR2	17.3360	63.04	.7092	6.2252	2.0488	559.48	63.040	9.4560	1.1820	67.768	63.040	6.21	--
21521CR2	23.7460	80.43	.7660	3.7534	.3830	520.88	99.580	11.4900	1.0724	70.472	50.556	5.69	8.63
21611CR2	9.4080	50.96	1.2544	5.2528	3.9200	744.80	43.120	7.8400	.8624	54.880	47.824	3.13	4.96
21621CR2	24.0000	68.00	.5600	3.9200	.3200	568.00	112.000	9.6000	1.1200	76.800	67.200	4.81	7.34
21711CR2	9.4820	47.41	--	5.8616	--	862.00	47.410	12.0680	1.0344	65.512	66.374	3.40	--
21712CR2	18.4800	46.20	.8400	3.8640	.1500	772.80	59.640	9.2400	1.0920	63.840	58.800	3.72	--
21721CR2	26.5980	68.51	2.1762	4.3524	.4836	499.72	96.720	11.2840	1.0478	78.988	67.704	5.86	8.68
21811CR2	11.6200	58.10	2.0750	5.8100	3.3200	688.90	37.350	9.1300	.9130	59.760	58.100	4.24	9.46
21821CR2	3.4658	8.00	.1600	5.7226	1.8538	967.20	145.080	11.2840	1.3702	85.436	62.062	8.75	--
21911CR2	26.7840	77.76	--	11.2320	--	838.08	95.040	15.5520	1.9872	80.352	75.168	6.70	9.09

Table 6 (continued)

CR-2, Mahogany Zone--continued

Sample	ppm Pb-s	ppm Rb-a	ppm Sb-s	ppm Sc-s	ppm Sn-x	ppm Sr-s	ppm V-s	ppm Y-s	ppm Yb-s	ppm Zn-s	ppm Zr-s	ppm U-n	ppm Th-n
21912CR2	36.4640	76.32	--	3.9856	--	568.16	101.760	9.3280	1.2720	80.560	65.296	6.73	9.65
21921CR2	67.9500	104.19	1.6308	8.6976	.9060	416.76	117.780	25.3680	2.6274	110.532	99.660	4.49	7.55
22011CR2	26.2880	80.56	--	8.2256	--	720.80	93.280	16.1120	1.6112	83.952	80.560	7.26	11.64
22021CR2	19.5500	68.00	2.8900	6.1200	2.8050	586.50	51.850	10.2000	1.1050	81.600	51.000	4.38	9.34
32111CR2	18.3480	58.38	--	4.7538	--	717.24	73.392	13.3440	1.5012	60.882	60.882	4.33	5.64
32111CR2	15.1920	63.30	--	4.5576	--	200.00	59.924	10.1280	1.1816	61.612	57.392	4.26	5.82
32121CR2	9.9360	57.96	3.8916	7.1208	5.9616	993.60	46.368	13.2480	1.5732	70.380	76.176	6.02	--
32211CR2	17.8920	63.90	1.1928	6.0492	1.9596	749.76	50.268	14.4840	1.6188	73.272	71.568	5.70	6.94
32221CR2	15.5160	56.03	.1600	7.2408	1.6378	724.08	45.686	14.6540	1.2930	74.132	57.754	4.70	6.28
32311CR2	14.1950	50.10	--	3.5905	--	551.10	55.945	10.8550	1.0020	65.130	48.430	5.43	--
32312CR2	16.2450	42.75	--	3.2490	--	598.50	51.300	10.2600	1.1115	66.690	29.070	6.37	--
32321CR2	19.8260	51.72	1.2068	5.1720	1.0344	706.84	68.098	18.1020	2.0688	75.856	70.684	8.55	8.81
32411CR2	49.9520	71.36	2.3192	9.8120	2.1408	446.00	133.800	33.0040	3.1220	105.256	151.640	8.13	16.53
32421CR2	39.9000	66.50	--	5.2250	--	228.00	114.000	17.1000	1.9000	105.450	51.300	6.32	13.24
32511CR2	22.6500	104.19	--	14.4960	--	588.90	82.446	30.8040	2.8992	104.190	108.720	10.63	18.85
32512CR2	29.8980	99.66	--	5.2548	--	380.52	144.960	19.0260	2.1744	101.472	67.950	10.75	19.52
32611CR2	39.5640	98.91	1.0362	8.1954	1.3188	263.76	141.300	17.8980	1.9782	100.794	87.606	4.58	5.98
32621CR2	34.3440	104.94	1.5264	8.7768	2.1942	200.00	133.560	25.7580	2.0034	110.664	133.560	5.97	8.11
32711CR2	18.8000	103.40	.9400	11.2800	2.5380	526.40	61.100	19.7400	1.9740	93.060	131.600	2.84	5.28
32712CR2	29.5040	101.42	.8298	11.9860	1.5674	313.48	129.080	23.0500	2.0284	94.966	138.300	2.92	6.16
32721CR2	171.7800	85.89	.4908	7.9346	2.6994	703.48	89.980	13.9060	1.6360	75.256	89.980	5.77	8.07
32811CR2	26.9400	107.76	2.0654	10.7760	1.4368	781.26	70.942	19.7560	1.7062	133.802	89.800	5.39	6.93
32821CR2	33.9680	96.50	--	5.2496	--	532.68	92.640	10.8080	1.1580	92.640	61.760	6.38	8.59
32911CR2	21.6750	78.03	--	3.2946	--	589.56	42.483	7.9764	.8583	62.424	44.217	5.17	5.73
32912CR2	15.4260	77.13	--	3.0852	--	702.74	50.563	8.5700	.9427	61.704	53.991	5.13	--
32921CR2	22.6200	117.45	.1600	7.1340	5.5680	696.00	53.070	15.6600	1.5660	82.650	68.730	5.38	7.46
33011CR2	16.9860	80.46	--	5.7216	--	724.14	63.474	11.6220	1.2516	59.004	55.428	5.99	7.49
33021CR2	35.8340	109.25	--	8.1282	--	524.40	81.282	14.8580	1.6606	97.014	82.156	4.33	6.75

Table 6 (continued)

Table 7.--Summary of composition of the interval 320-625 m of the Parachute Creek Member of the Green River Formation in USGS corehole CR-2, Piceance Creek Basin, Colorado

[Data expressed in parts per million except where noted as percent (%); Ratio, number of samples in which the element was found in measurable concentrations to number of samples analyzed; leaders (--) indicate no data available]

Element	Method	Ratio	Observed Range	Geometric Mean	Geometric Deviation
Si, %---	1	51:51	4.9-22	14	1.30
Al, %---	1	51:51	.74-6.8	3.8	1.39
Fe, %---	1	51:51	.54-2.4	1.5	1.34
Mg, %---	3	53:53	1.1-7.8	4.2	1.44
Ca, %---	1	51:51	0.8-7.5	4.1	1.55
Na, %---	3	53:53	.69-25	3.3	1.64
K, %----	1	51:51	.27-3.0	1.2	1.52
Ti, %---	1	51:51	.049-.45	.14	1.39
F, %----	4	53:53	.020-1.1	.074	2.49
S, %----	1	51:51	.049-.71	.21	1.75
Org-C, %	5	51:51	3.0-23	8.5	1.61
Carb-C %	5	51:51	.78-7.9	3.5	1.57
As------	1	48:48	1.7-29	11	1.87
B-------	2	32:53	<10-230	24	3.24
Ba------	2	53:53	36-810	280	1.63
Co------	2	53:53	1.1-41	9.4	1.76
Cr------	2	53:53	7.0-410	38	2.26
Cu------	2	53:53	1.5-520	40	2.85
Ga------	2	10:53	<4-5.8	--	--
Ge------	1	9:53	<.9-2.8	--	--
Hg------	3	51:51	.05-.21	.10	1.34
La------	2	53:53	15-66	32	1.40
Li------	3	53:53	13-190	65	1.75
Mn------	2	53:53	64-420	220	1.44
Mo------	2	52:53	<2-27	8.7	1.79
Nb------	2	48:53	<4-30	10	1.54
Ni------	2	53:53	1.5-190	25	2.42
Pb------	2	52:53	<4-53	14	1.91
Rb------	3	53:53	40-170	100	1.30
Sb------	1	47:48	<.2-2.9	.96	1.65
Sc------	2	53:53	2.0-11	6.3	1.37
Sn------	1	48:48	.40-21	1.6	2.19
Sr------	2	53:53	170-790	340	1.37
V-------	2	53:53	15-180	91	1.50
Y-------	2	52:53	<2-29	13	1.61
Yb------	2	52:53	<.9-2.3	1.3	1.32
Zn------	3	53:53	30-200	91	1.37
Zr------	2	53:53	9.8-210	88	1.67
U-------	6	47:53	<1.6-12	4.3	1.48
Th------	6	43:53	<4.4-23	8.7	1.35

Analytical Methods:

1 - X-ray fluoresence
2 - Semiquantitative optical emission spectroscopy
3 - Atomic absorption spectrophotometry
4 - Specific ion electrode
5 - Gasometric
6 - Neutron activation analysis

Table 7

Table 8.--Analysis of logarithmic variance of elemental composition of 53 samples of oil shale from the interval 320 to 625 meters in the USGS corehole CR-2, Piceance Creek Basin, Colorado

[See figure 7 for analysis-of-variance sampling design.]

[*, component of variance tested to be significantly different from zero at the 0.05 probability level; values in percent of total logarithmic variance]

Element	Total logarithmic variance	Between 30-meter intervals	Between 3-meter intervals	Between 0.3-meter intervals	Between analyses
Si------	0.0149	0	14	84*	2.0
Al------	.0206	1	25	71*	2.4
Fe------	.0170	29	32*	36*	2.2
Mg------	.0259	0	2.6	96*	1.7
Ca------	.0374	0	61*	37*	2.7
Na------	.0473	13	21	65*	0.73
K-------	.0342	20	29	51*	0.23
Ti------	.0219	0	31	67*	1.7
S-------	.0603	17	36*	12	35
Org-C---	.0473	0	25	70*	5.2
Carb-C--	.0471	0	54*	32*	14
As------	.0752	1.3	35	45*	19
B-------	.2719	30	47*	18*	5.2
Ba------	.0470	40*	8	24	28
Co------	.0618	19	38*	35*	7.2
Cr------	.1318	57*	26*	13*	3.7
Cu------	.2139	25	44*	25*	5.5
F-------	.1798	13	0	85*	2.3
Hg------	.0165	4.3	1.9	66*	28
La------	.0219	17	7.7	9.5	66
Li------	.0789	8.7	0	91*	.55
Mn------	.0297	0	0	47	53
Mo------	.0813	0	55*	30*	14
Nb------	.1089	8.7	0	59*	32
Ni------	.1551	41	40*	16*	3.5
Pb------	.0860	0	56*	10	34
Rb------	.0197	0	42*	55*	3.0
Sb------	.0543	0	6.8	75*	18
Sc------	.0215	0	36	39*	25
Sn------	.1576	26*	8.1	0	66
Sr------	.0207	57*	0	29*	13
V-------	.0347	0	42*	32	26
Y-------	.0505	0	30	48*	22
Yb------	.0152	0	26	49*	25
Zn------	.0212	0	67*	31*	2.4
Zr------	.0551	0	37	36	28

Table 9.--Chemical analyses of 53 samples of oil shale from the interval 320 to 625 meters of the Parachute Creek Member of the Green River Formation in USGS corehole CR-2, Piceance Creek Basin, Colorado

[Analyses are by X-ray fluorescence (-x), atomic absorption spectrophotometry (-a), specific ion electrode (-elec), semi-quantitative optical emission spectroscopy (-s), or neutron activation analysis (-n). Values are in percent (%), or parts per million (ppm) dry weight of sample. Leaders (--) indicate no data available. < = concentration less than the value indicated. > = concentration greater than the value indicated.]

Cr-2 Middle Zone

Sample	Depth-m	% Si-x	% Al-x	% Al-s	% Fe-x	% Fe-s	% Mg-a	% Ca-x	% Na-a	% K-x
01111	320.0400	11.1484	3.1557	6.9960	1.3901	2.0670	5.5667	6.2501	3.8057	.9900
01112	320.0400	12.1759	3.5757	2.6862	1.4803	1.4652	5.5365	6.3994	3.7093	1.0136
01121	321.5945	10.1850	2.9043	6.2139	1.1853	1.7754	5.6752	7.4979	2.6559	1.1389
01221	335.0971	13.5221	3.6840	7.2320	1.4543	1.9888	3.3533	7.1070	2.9378	1.4259
01211	336.8040	14.4411	4.1307	5.9349	1.8196	1.6260	5.5425	4.0674	3.2122	1.4173
02111	350.5200	16.5165	5.2745	6.3420	2.2813	1.8120	4.3906	4.7269	3.4719	1.5795
02112	350.5200	15.2226	4.5357	8.0558	2.0380	3.0852	4.9455	4.4100	3.8057	1.4940
02121	352.1354	13.9919	4.2816	2.8315	2.2634	2.2652	3.7513	3.5270	2.8413	2.0148
02211	365.7600	21.5256	6.8241	9.2100	2.3835	3.0393	1.9360	2.3038	3.9541	1.9114
02221	367.3450	12.6349	3.9130	7.0755	1.7238	2.5440	4.6861	4.2046	3.4125	1.4520
03111	381.7620	10.4786	3.3138	5.1791	1.6220	1.5460	4.1916	5.5246	3.5832	1.0909
03112	381.7620	10.8820	3.1624	5.4320	1.6283	1.4744	4.1011	5.5461	3.5016	1.0951
03121	383.7432	16.4071	4.7156	8.1000	1.9514	2.7900	3.4317	5.0172	3.0713	2.0920
03211	396.5143	19.1070	5.4084	8.4539	2.1443	3.2515	3.6488	4.5149	2.5075	3.0078
03221	397.4592	16.5712	5.2920	7.1811	2.1617	2.3634	4.4690	4.3527	2.9526	2.1884
04111	413.0954	18.4115	5.3327	8.4272	2.2424	2.9312	3.7031	4.1899	3.7983	1.9771
04112	413.0954	17.9244	5.3153	8.7648	2.2989	2.9216	3.6066	4.3066	3.7761	1.8948
04121	413.8574	17.7477	5.7413	8.6784	2.2130	2.9832	4.1252	3.6181	3.0416	2.2514
04211	429.7375	16.1701	4.6006	7.8943	2.1714	2.6610	4.7826	4.5010	2.7597	1.8409
04221	431.4444	16.3791	4.4508	3.0660	1.8381	1.8396	4.9636	4.2573	1.3576	2.6180
05111	441.9600	14.1569	3.8807	7.2527	1.5609	2.1519	4.3001	3.9873	4.0505	1.1909
05121	443.4535	13.3276	3.8982	5.7816	1.4403	.9504	4.3001	3.9057	3.8428	1.2492
05122	443.4535	13.8016	3.5477	2.6334	1.4512	1.5162	4.1795	3.9353	3.9393	1.2587
05211	457.2914	13.2192	3.6777	5.4944	1.2433	1.6160	5.4219	5.2551	4.2954	.9391
05221	458.7545	14.3167	3.7112	6.6092	1.4094	1.6926	3.7754	4.8964	3.4348	1.4720
06111	472.4400	12.2534	3.1012	2.3130	1.0785	1.3878	6.0310	5.5103	4.0580	.8321
06112	472.4400	--	--	2.5542	--	1.2384	5.9165	--	4.0135	--
06121	474.2688	12.8494	3.7914	6.2475	1.4566	1.7493	5.1867	5.9535	4.0283	.8298
06211	487.3752	14.9562	4.1443	2.9470	1.3545	1.3472	5.2410	4.3930	3.7167	1.1883
06221	489.2040	15.4470	4.2231	6.0450	1.4094	1.5314	4.6680	3.3411	4.4215	1.2044
07111	502.9200	15.7920	4.3610	5.8504	1.7290	1.4008	3.7694	3.1801	2.9155	1.9153
07112	502.9200	15.0702	4.6923	6.5286	1.6912	1.8538	4.0348	3.0531	2.8562	1.8735
07121	504.4440	13.5969	4.7040	2.6664	1.8085	1.2120	3.7935	2.9451	4.8592	.9391
07211	518.1600	11.9833	3.1525	2.3374	1.3184	1.5080	5.3857	4.3111	4.2138	.9389
07221	519.6840	12.8733	3.4724	2.5110	1.1331	1.2150	4.8248	5.0944	3.6574	.8742
08111	533.4914	10.3463	2.9286	4.4268	1.3205	.9765	4.6318	3.7222	4.4215	.8647
08112	533.4914	--	--	5.8064	--	1.7572	3.9021	--	3.7983	--
08121	534.7716	9.1151	2.3816	1.4250	.9967	1.0500	6.5738	5.3603	2.8191	.8094
08211	548.7009	10.9381	2.7659	1.4820	1.0366	1.0920	6.6342	5.5747	3.3458	.8418
08221	550.1030	11.7467	3.4960	5.8158	1.2555	1.7232	4.6982	3.1816	4.6589	1.0729
09111	565.4345	22.0930	4.4222	7.0896	1.8300	2.1100	1.1761	.8445	1.7434	1.6115
09112	565.4345	22.2763	4.3688	7.4888	1.7261	2.3828	1.1399	.8515	1.7953	1.5542
09121	566.8365	10.0574	3.1401	5.5420	1.3225	1.6300	4.3966	1.6309	4.7331	.8119
09211	579.1200	11.9964	3.0137	2.2456	1.0097	1.2832	4.3363	6.8783	3.7464	.7324
09221	580.5526	4.9151	.7420	.2524	.5393	.3295	5.8742	4.0581	25.0748	.2735

Table 9

Cr-2 Middle Zone

Sample	% K-s	% Ti-x	% Ti-s	% F-elec	T-S	% Org-c	% Carb-c	ppm As-x	ppm B-s	ppm Ba-s
01111	1.1130	.1287	.1590	.33	.2703	9.75	4.78	3.8955	47.700	707.550
01112	.9768	.1366	.0692	.32	.4070	11.42	3.11	4.7212	35.816	529.100
01121	1.3719	.0968	.1211	.18	.2098	10.34	5.63	3.8736	40.350	807.000
01221	1.4464	.1355	.1446	.04	.2893	5.49	5.59	10.8480	31.640	515.280
01211	1.6260	.1560	.0976	.18	.3008	9.39	3.73	13.0080	68.292	333.330
02111	1.8120	.1847	.1087	.03	.1721	3.51	4.68	--	14.496	190.260
02112	1.7997	.1850	.1971	.02	.1457	3.28	4.87	--	31.709	351.370
02121	1.8607	.1552	.0744	.03	.4207	12.50	2.80	12.1350	50.158	234.610
02211	2.0262	.2706	.2671	.03	.1750	3.97	2.09	12.8940	34.077	469.710
02221	1.3515	.1477	.1590	.10	.1510	13.87	2.18	14.3100	54.060	532.650
03111	1.1595	.1205	.0765	.05	.2783	16.78	3.37	7.7300	32.466	394.230
03112	1.1640	.1303	.0737	.04	.3182	16.26	3.51	12.4160	29.488	395.760
03121	2.3400	.1834	.2070	.04	.3510	7.57	3.39	6.2100	75.600	432.000
03211	2.6941	.2228	.1765	.03	.3623	2.96	3.59	7.1533	76.178	371.600
03221	1.8180	.2125	.1727	.08	.3000	5.00	3.52	5.4540	79.992	345.420
04111	2.3816	.1812	.1557	.02	.7145	5.02	3.02	8.4272	58.624	384.720
04112	1.9173	.1970	.2009	.02	.5478	4.88	3.27	3.8346	49.302	365.200
04121	2.2600	.1843	.1718	.08	.6509	6.43	2.55	7.0512	90.400	587.600
04211	1.8627	.1755	.1419	.05	.2572	6.56	3.76	5.6768	54.994	363.670
04221	2.1024	.1576	.1051	.07	.1752	5.90	3.54	6.2196	83.220	315.360
05111	1.1158	.1481	.1275	.04	.1435	12.16	3.71	--	28.692	278.950
05121	1.6632	.1424	.1188	.06	.1584	11.46	3.58	29.3040	10.296	205.920
05122	1.3566	.1387	.0670	.06	.1995	11.88	3.55	20.7480	25.536	175.560
05211	1.0504	.1453	.1212	.04	.0808	3.20	5.67	4.7672	9.696	242.400
05221	1.2090	.1305	.0887	.06	.0806	8.73	3.47	5.7226	<8.060	233.740
06111	1.3878	.1156	.0571	.08	.0617	9.88	5.19	--	<7.710	269.850
06112	.7740	--	.0851	.10	--	--	--	11.6100	<7.740	263.160
06121	.9996	.1298	.0833	.17	.1916	7.18	5.34	6.9972	<8.330	349.860
06211	1.3472	.1514	.1095	.03	.1684	4.12	5.00	11.7880	<8.420	210.500
06221	1.5314	.1546	.1290	.06	.0806	7.43	4.05	13.7020	9.672	233.740
07111	1.8952	.1334	.0610	.95	.1895	8.45	3.00	23.8960	<8.240	222.480
07112	2.1762	.1450	.0887	1.10	.2418	7.70	3.34	14.5080	<8.060	249.860
07121	1.2120	.1453	.0711	.02	.2424	5.16	4.51	7.1104	<8.080	137.360
07211	.9802	.1220	.0905	.11	.1508	11.54	4.37	14.3260	<7.540	226.200
07221	.8910	.1360	.0697	.06	.1458	10.81	4.41	12.1500	<8.100	137.700
08111	.9114	.1210	.0716	.17	.2669	11.70	3.98	--	<6.510	136.710
08112	.9168	--	.1222	.24	--	--	--	19.1000	<7.640	229.200
08121	.9000	.0899	.0443	.14	.1500	13.43	5.16	21.7500	<7.500	187.500
08211	1.0140	.0935	.0351	.23	.2340	10.82	5.18	19.5000	<7.800	265.200
08221	1.0052	.1205	.1221	.02	.1867	15.43	2.35	1.7232	<7.180	215.400
09111	1.6880	.2024	.2026	.09	.3376	9.02	.78	12.6600	135.040	211.000
09112	1.6169	.1786	.1787	.10	.2468	9.53	.81	20.4240	153.180	229.770
09121	1.2388	.1173	.1630	.07	.1956	22.90	2.00	29.3400	61.940	208.640
09211	.9624	.0962	.0714	.08	.1524	10.04	5.11	18.4460	<8.020	264.660
09221	<.2243	.0294	.0047	.02	.0491	6.15	7.91	4.2761	<7.010	36.452

Table 9

Sample	ppm Be-s	ppm Co-s	ppm Cr-s	ppm Cu-s	ppm Ga-s	ppm Ge-s	ppm Hg-a	ppm La-s	ppm Li-a	ppm Mn-s
01111	<1.590	10.3350	34.185	62.0100	<3.4185	1.1130	.10	47.700	125	302.100
01112	<1.628	8.1400	21.164	38.2580	<3.5002	<.7489	.08	24.420	125	154.660
01121	<1.614	8.8770	32.280	42.7710	<3.4701	<.7424	.09	37.929	84	169.470
01221	<1.808	9.0400	34.352	23.5040	<3.8872	<.8317	.10	47.912	43	198.880
01211	<1.626	8.1300	24.390	45.5280	<3.4959	.8943	.09	30.894	185	130.080
02111	<1.812	7.7010	31.710	22.6500	<3.8958	<.8335	.11	35.334	55	199.320
02112	<1.714	10.2840	47.135	20.5680	4.1993	1.3712	.10	51.420	58	239.960
02121	<1.618	9.7080	25.079	58.2480	<3.4787	<.7443	.17	29.933	21	121.350
02211	<1.842	12.8940	55.260	60.7860	5.5260	<.8473	.13	66.312	14	303.930
02221	<1.590	9.5400	39.750	21.4650	<3.4185	1.1130	.15	50.085	115	222.600
03111	<1.546	15.4600	177.790	123.6800	<3.3239	<.7112	.15	27.828	52	200.980
03112	<1.552	13.9680	147.440	108.6400	<3.3368	1.0864	.14	34.144	50	240.560
03121	<1.800	40.5000	414.000	459.0000	4.1400	<.8280	.05	44.100	33	306.000
03211	<1.858	35.3020	213.670	195.0900	4.3663	1.4864	.09	34.373	13	269.410
03221	<1.818	23.6340	199.980	281.7900	<3.9087	<.8363	.08	36.360	67	199.980
04111	<1.832	25.6480	247.320	412.2000	5.7708	<.8427	.08	43.968	24	283.960
04112	<1.826	25.5640	219.120	520.4100	4.3824	<.8400	.06	52.954	24	246.510
04121	<1.808	22.6000	207.920	361.6000	5.5144	2.8024	.08	52.432	160	289.280
04211	<1.774	9.7570	42.576	39.0280	<3.8141	1.7740	.13	37.254	67	212.880
04221	<1.752	7.7964	30.660	39.4200	<3.7668	<.8059	.10	27.156	135	332.880
05111	<1.594	9.5640	35.068	42.2410	<3.4271	<.7332	.21	31.880	50	215.190
05121	<1.584	9.5040	29.304	37.2240	<3.4056	<.7286	.10	27.720	88	380.160
05122	<1.596	7.6608	29.526	35.1120	<3.4314	<.7342	.13	24.738	94	143.640
05211	<1.616	7.1912	26.664	16.1600	<3.4744	<.7434	.07	29.088	90	420.160
05221	<1.612	8.8660	31.434	23.3740	<3.4658	<.7415	.08	26.598	67	120.900
06111	<1.542	7.0161	23.901	38.5500	<3.3153	<.7093	.08	19.275	99	169.620
06112	<1.548	6.1146	21.672	15.4800	<3.3282	<.7121	--	27.864	92	154.800
06121	<1.666	7.4137	27.489	24.9900	<3.5819	<.7664	.09	29.988	73	249.900
06211	<1.684	6.9044	25.260	16.8400	<3.6206	<.7746	.09	31.154	84	319.960
06221	<1.612	6.5286	37.076	23.3740	<3.4658	<.7415	.07	33.046	110	193.440
07111	<1.648	8.2400	29.664	45.3200	<3.5432	<.7581	.09	23.896	56	247.200
07112	<1.612	9.6720	29.822	38.6880	<3.4658	<.7415	.10	26.598	53	298.220
07121	<1.616	8.8880	30.704	66.2560	<3.4744	<.7434	.10	23.432	93	290.880
07211	<1.508	6.7106	26.390	24.8820	<3.2422	<.6937	.18	24.128	82	173.420
07221	<1.620	6.0750	23.490	13.7700	<3.4830	<.7452	.11	23.490	67	186.300
08111	<1.302	6.5100	21.483	31.2480	<2.7993	<.5989	.13	24.738	65	143.220
08112	<1.528	9.1680	28.268	33.6160	<3.2852	<.7029	--	40.492	55	183.360
08121	<1.500	5.4750	15.750	12.7500	<3.2250	<.6900	.09	16.500	53	247.500
08211	<1.560	4.9920	21.060	21.0600	<3.3540	<.7176	.11	14.820	49	280.800
08221	<1.436	8.6160	30.874	33.0280	<3.0874	<.6606	.10	31.592	64	165.140
09111	<1.688	14.3480	40.512	64.1440	<3.6292	<.7765	.13	46.420	125	295.400
09112	<1.702	12.7650	39.146	62.1230	<3.6593	<.7829	.13	45.103	130	195.730
09121	<1.304	11.0840	35.860	48.2480	3.3904	<.5998	.18	31.948	98	306.440
09211	<1.604	6.4962	24.862	16.8420	<3.4486	1.3634	.17	21.654	50	320.800
09221	<1.402	1.1216	7.010	1.4721	<3.0143	<.6449	.09	22.432	31	63.791

Table 9

Cr-2 Middle Zone

Sample	ppm Mo-s	ppm Nb-s	ppm Ni-s	ppm Pb-s	ppm Rb-a	ppm Sb-x	ppm Sc-s	ppm Sn-x	ppm Sr-s
01111	11.9250	19.0800	19.0800	23.0550	95	1.1130	7.3935	2.1465	771.15
01112	6.3492	9.7680	13.8380	16.2800	100	.6512	4.7212	1.0582	626.78
01121	12.1050	20.9820	16.1400	16.1400	100	<.1614	5.4069	.9684	790.86
01221	15.3680	18.9840	18.0800	11.7520	80	1.1752	8.0456	2.3504	741.28
01211	11.3820	12.1950	17.8860	13.0080	125	1.1382	5.8536	4.6341	382.11
02111	5.9796	8.9694	16.3080	12.6840	105	--	7.1574	--	317.10
02112	11.1410	16.2830	24.8530	17.1400	120	--	9.4270	--	411.36
02121	12.9440	9.7080	20.2250	27.5060	115	1.2944	6.2293	1.6180	258.88
02211	9.2100	23.0250	30.3930	28.5510	100	1.2894	11.0520	2.3025	285.51
02221	15.1050	30.2100	23.0550	14.3100	115	.9540	10.3350	1.1130	421.35
03111	12.3680	3.6331	139.1400	13.1410	95	1.1595	5.2564	1.7779	332.39
03112	10.8640	16.2960	124.1600	13.1920	95	1.0088	4.8888	4.8112	372.48
03121	9.9000	18.0000	171.0000	35.1000	90	1.7100	9.9000	18.0000	405.00
03211	8.4539	18.5800	167.2200	25.0830	95	1.2077	7.9894	13.0060	325.15
03221	9.9990	7.4538	154.5300	52.7220	115	.9999	8.6355	9.9990	409.05
04111	13.7400	20.1520	192.3600	37.5560	85	.9160	9.1600	21.0680	403.04
04112	14.6080	26.4770	164.3400	31.9550	85	.7304	10.0430	1.3695	410.85
04121	17.1760	23.5040	135.6000	29.8320	130	1.4464	8.9496	2.3504	361.60
04211	10.6440	16.8530	24.8360	13.3050	125	.9757	7.5395	2.3062	408.02
04221	8.6724	21.9000	18.3960	9.6360	115	.7884	5.4312	.4380	297.84
05111	11.1580	17.5340	23.9100	12.7520	110	--	6.1369	--	422.41
05121	9.5040	7.7616	21.3840	15.8400	115	1.1880	5.4648	2.2176	356.40
05122	7.5012	4.3092	21.5460	11.9700	125	.8778	5.4264	.7980	303.24
05211	3.2320	8.8880	14.5440	5.3328	75	.8888	5.5752	1.6968	379.76
05221	5.8032	21.7620	13.7020	12.0900	135	.7254	6.5286	1.2090	370.76
06111	5.9367	7.2474	19.2750	33.1530	85	--	4.5489	--	339.24
06112	5.1858	5.7276	17.0280	6.4242	75	1.1610	5.4180	.8514	332.82
06121	6.0809	12.4950	17.4930	8.3300	75	1.0829	6.4974	1.4161	491.47
06211	3.3680	<3.6206	16.8400	40.4160	85	.7578	5.5572	1.1788	328.38
06221	8.0600	14.5080	18.5380	22.5680	110	1.2090	6.6898	1.6120	290.16
07111	8.2400	14.0080	21.4240	13.1840	170	1.8952	5.4384	1.6480	263.68
07112	10.4780	14.5080	27.4040	22.5680	160	1.1284	7.0122	2.0956	274.04
07121	8.8880	<3.4744	21.8160	18.5840	70	1.2120	6.1408	1.2928	266.64
07211	4.6748	9.8020	16.5880	7.1630	95	.3016	4.9010	.8294	256.36
07221	3.8070	<3.4830	14.5800	5.4270	80	.9720	5.5890	.9720	291.60
08111	5.3382	11.0670	16.9260	7.1610	120	--	5.5335	--	227.85
08112	9.1680	10.6960	23.6840	8.4040	105	1.0696	8.4040	1.6044	290.32
08121	5.7750	<3.2250	13.5000	5.7750	100	1.2750	4.2750	1.0500	315.00
08211	4.8360	10.9200	13.2600	5.1480	90	.7800	4.5240	1.0140	335.40
08221	11.4880	18.6680	22.9760	10.7700	135	.2154	5.6004	1.5078	280.02
09111	25.3200	11.8160	33.7600	22.7880	160	1.7724	9.2840	1.9412	202.56
09112	27.2320	24.6790	32.3380	26.3810	165	1.4467	8.5100	1.1063	170.20
09121	14.3440	6.5200	27.3840	20.8640	145	.5216	7.8240	.7172	228.20
09211	5.2932	6.9774	16.0400	8.8220	65	.9624	5.1328	1.4436	417.04
09221	<1.4020	<3.0143	1.4721	<3.0143	40	.6309	1.9628	1.0515	203.29

Table 9

Cr-2 Middle Zone

Sample	ppm V-s	ppm V-s	ppm Yb-s	ppm Zn-a	ppm Zn-s	ppm Zr-s	ppm U-n	ppm Th-n
01111	127.200	19.0800	1.5900	73	72.345	151.050	5.83	11.00
01112	77.330	10.5820	1.1396	72	65.120	81.400	6.43	6.70
01121	96.840	13.7190	1.2912	65	73.437	121.050	5.90	9.00
01221	90.400	16.2720	1.6272	103	117.520	126.560	5.99	11.00
01211	97.560	12.1950	1.3008	120	113.820	71.544	5.71	10.00
02111	83.352	11.7780	1.2684	101	78.822	99.660	2.72	9.10
02112	145.690	21.4250	1.7140	97	111.410	137.120	3.04	11.00
02121	97.080	14.5620	1.2944	111	79.282	72.001	6.77	8.60
02211	184.200	29.4720	2.3025	118	92.100	165.780	7.51	12.10
02221	127.200	19.0800	1.5900	91	71.550	135.150	6.39	11.00
03111	85.030	13.1410	1.2368	94	75.754	54.110	6.54	--
03112	77.600	14.7440	1.2416	100	85.360	68.288	6.39	9.55
03121	126.000	19.8000	1.8000	146	144.000	135.000	4.04	6.95
03211	120.770	13.9350	1.4864	124	120.770	148.640	3.48	4.40
03221	118.170	17.2710	1.5453	135	136.350	118.170	3.15	6.46
04111	137.400	18.3200	1.7404	180	128.240	119.080	3.57	9.23
04112	127.820	20.0860	1.9173	195	219.120	155.210	4.05	--
04121	180.800	21.6960	2.0792	146	126.560	189.840	4.03	8.15
04211	124.180	17.7400	1.6853	92	88.700	124.180	3.73	7.30
04221	87.600	11.3880	1.4016	94	77.964	96.360	--	--
05111	111.580	16.7370	1.5940	65	62.166	119.550	--	--
05121	87.120	13.4640	1.3464	82	74.448	102.960	--	--
05122	87.780	10.3740	1.1172	81	45.486	87.780	4.59	10.20
05211	80.800	10.5040	1.2120	76	77.568	96.960	--	--
05221	88.660	15.3140	1.4508	110	74.152	80.600	3.50	7.40
06111	66.306	8.4810	1.0023	60	58.596	50.115	3.35	9.30
06112	72.756	10.0620	1.0062	60	48.762	65.790	--	--
06121	79.135	13.3280	1.4161	79	73.304	83.300	2.71	7.10
06211	69.886	13.4720	1.1788	76	53.888	78.306	--	--
06221	88.660	13.7020	1.2896	85	65.286	104.780	4.20	7.26
07111	90.640	10.7120	1.0712	87	56.856	48.616	4.09	8.99
07112	104.780	12.8960	1.4508	93	76.570	67.704	--	--
07121	96.960	9.6960	1.2928	101	96.960	38.784	--	--
07211	82.940	10.5560	1.1310	66	52.780	61.074	4.26	10.30
07221	63.990	9.7200	1.0530	62	46.170	62.370	3.59	8.60
08111	84.630	9.7650	1.0416	77	54.033	52.080	4.73	17.00
08112	137.520	15.2800	1.2988	91	63.412	114.600	--	--
08121	56.250	8.2500	.8250	69	45.000	55.500	--	--
08211	67.080	7.4880	.9360	73	63.960	46.020	--	--
08221	122.060	12.9240	1.3642	89	61.030	93.340	4.85	10.00
09111	126.600	19.4120	1.8568	104	76.804	118.160	--	--
09112	110.630	18.7220	1.7020	99	74.888	161.690	6.85	12.00
09121	97.800	14.3440	1.3692	156	71.720	110.840	--	--
09211	44.110	9.6240	1.0426	59	55.338	54.536	1.60	7.70
09221	15.422	<1.4020	<.6449	30	21.030	9.814	--	--

Table 9

Sample	Depth-m	% Si-x	% Al-x	% Al-s	% Fe-x	% Fe-s	% Mg-a	% Ca-x	% Na-a	% K-x
10111	594.3600	12.4830	3.1498	5.2647	1.1741	1.4497	4.9816	4.4716	4.2583	.8868
10112	594.3600	12.6466	3.2729	1.9325	1.1354	1.1595	4.9394	4.5302	4.1544	.8984
10121	595.8840	11.6654	2.9912	5.7252	1.2835	1.6148	5.1505	3.9869	4.4289	.9140
10211	609.6000	14.4411	4.7331	7.1544	1.9334	2.4390	2.6476	4.6484	3.7538	1.3498
10221	612.1603	11.7084	3.3355	2.3432	1.2998	1.2928	6.2723	6.3523	1.2760	.8720
11111	624.7790	19.4305	5.5000	8.3136	2.4228	3.1176	2.5934	2.3519	1.2241	1.4378
11112	624.7790	19.6549	5.5635	7.0080	2.3895	1.7520	2.5813	2.3165	1.1425	1.4544
11121	626.2421	8.3859	2.3943	1.3260	1.3093	1.1700	7.7801	6.6896	.6899	.6475

Table 9

Cr-2 Middle Zone--continued

Sample	% K-s	% Ti-x	% Ti-s	% F-elec	T-S	% Org-c	% Carb-c	ppm As-x	ppm B-s	ppm Ba-s
10111	.8393	.1281	.1068	.05	.0763	13.86	4.15	21.3640	<7.630	358.610
10112	1.0049	.1251	.0448	.04	.1469	15.87	2.05	23.1900	<7.730	154.600
10121	.8074	.1188	.1028	.09	.1762	14.95	4.19	25.6900	<7.340	227.540
10211	1.5447	.1755	.1626	.09	.3902	8.27	3.84	8.9430	27.642	284.550
10221	1.0504	.0969	.0574	.12	.1616	10.72	4.80	18.5840	>404.000	266.640
11111	1.7320	.2077	.1905	.15	.4590	8.53	1.64	23.3820	233.820	277.120
11112	1.4016	.2101	.1402	.14	.2628	7.83	1.50	19.2720	175.200	219.000
11121	.7644	.0935	.0367	.05	.1560	15.00	5.19	17.9400	49.920	413.400

Table 9

Sample	ppm Be-s	ppm Co-s	ppm Cr-s	ppm Cu-s	ppm Ga-s	ppm Ge-s	ppm Hg-a	ppm La-s	ppm Li-a	ppm Mn-s
10111	<1.526	5.8751	21.364	11.4450	<3.2809	<.7020	.09	32.809	65	167.860
10112	<1.546	4.3288	20.098	17.0060	<3.3239	<.7112	.07	15.460	69	170.060
10121	<1.468	7.1198	27.892	20.5520	<3.1562	<.6753	.13	31.562	100	176.160
10211	<1.626	11.3820	35.772	39.0240	<3.4959	<.7480	.13	46.341	43	211.380
10221	<1.616	6.6256	21.008	16.1600	<3.4744	<.7434	.09	25.048	84	404.000
11111	<1.732	16.4540	39.836	81.4040	4.9362	<.7967	.10	49.362	83	251.140
11112	<1.752	13.1400	32.412	70.0800	3.8544	<.8059	.07	40.296	82	332.880
11121	<1.560	6.8640	15.600	23.4000	<3.3540	<.7176	.08	18.720	52	421.200

Table 9

Sample	ppm Mo-s	ppm Nb-s	ppm Ni-s	ppm Pb-s	ppm Rb-a	ppm Sb-x	ppm Sc-s	ppm Sn-x	ppm Sr-s
10111	5.6462	5.3410	14.4970	6.0277	95	.9919	4.7306	.7630	366.24
10112	4.1742	5.2564	10.8220	7.2662	100	1.0822	3.7877	2.2417	278.28
10121	13.2120	7.2666	16.1480	9.5420	110	.9542	5.4316	.5872	344.98
10211	13.8210	21.1380	26.8290	15.4470	115	.9756	7.4796	1.4634	317.07
10221	5.4136	6.3832	13.7360	6.5448	80	.7272	5.4136	.7272	404.00
11111	21.6500	20.7840	31.1760	22.5160	115	2.9444	9.5260	2.2516	225.16
11112	19.2720	16.6440	26.2800	21.0240	115	1.5768	8.7600	1.2264	236.52
11121	10.9200	5.3040	15.6000	11.7000	65	.8580	4.2120	.7800	343.20

Table 9

Cr-2 Middle Zone--continued

Sample	ppm V-s	ppm V-s	ppm Yb-s	ppm Zn-a	ppm Zn-s	ppm Zr-s	ppm U-n	ppm Th-n
10111	74.011	12.2080	1.0682	82	56.462	83.930	--	--
10112	47.153	7.4981	.8503	78	61.067	51.791	2.78	6.60
10121	80.740	13.2120	1.2478	101	72.666	117.440	3.93	--
10211	121.950	20.3250	1.7073	92	89.430	211.380	12.20	--
10221	53.328	9.6960	1.0504	87	88.880	77.568	--	--
11111	147.220	17.3200	1.7320	112	103.920	138.560	7.94	23.00
11112	148.920	16.6440	1.6644	124	140.160	140.160	--	--
11121	59.280	7.0980	.8580	83	58.500	56.940	--	--

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Table 9