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AERIAL RADIOMETRIC AND MAGNETIC RECONNAISSANCE SURVEY OF PORTIONS OF NORTH CAROLINA AND TENNESSEE

FINAL REPORT
VOLUME 2J

CHATTANOOGA QUADRANGLE

CARSON HELICOPTERS INCORPORATED
Perkasie, Pennsylvania

MARCH 1980

WORK PERFORMED UNDER
BENDIX FIELD ENGINEERING CORPORATION
GRAND JUNCTION OPERATIONS, GRAND JUNCTION, COLORADO
Subcontract No. 79-319-L and Bendix Contract EY-76-C-13-1664

Report prepared by
Texas Instruments Incorporated
Dallas, Texas

PREPARED FOR
U.S. DEPARTMENT OF ENERGY
Grand Junction Office
Grand Junction, Colorado 81501

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ABSTRACT

The results of a high-sensitivity, aerial, gamma-ray spectrometer and magnetometer survey of the Chattanooga Quadrangle, North Carolina and Tennessee, are presented. Instrumentation and methods are described in Volume 1 of this final report. This work was done by Carson Helicopters Incorporated under Bendix Field Engineering Corporation Subcontract No. 79-319-L as part of the U.S. Department of Energy National Uranium Resource Evaluation (NURE) Program.

Statistical and geological analysis of the radiometric data revealed 40 anomalies worthy of field checking as possible prospects. Seven anomalies coincide with cultural features that may be major contributors to their anomalous values. Most of the anomalies are located in clusters that have no apparent correlation with either geologic structure or rock type.

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SECTION I

INTRODUCTION

A. GENERAL

This volume contains information and survey results pertaining specifically to the Chattanooga NTMS 1:250,000 scale Quadrangle, North Carolina and Tennessee, one of 11 such quadrangles, portions of Alabama, Georgia, Kentucky, Maryland, North Carolina, Ohio, Pennsylvania, Virginia, and West Virginia, included in an aerial radiometric and magnetic reconnaissance survey. General information concerning the instrumentation and methods used in data acquisition, processing, and interpretation is presented in Volume 1 of this final report.

The survey was conducted by Carson Helicopters Incorporated under Bendix Field Engineering Corporation Subcontract No. 79-319-L as part of the U.S. Department of Energy National Uranium Resource Evaluation (NURE) Program.

B. URANIUM GEOLOGY AND OCCURRENCES

1. Uranium Occurrences

There are no reported uranium occurrences that have been studied in the Chattanooga Quadrangle (DOE, 1979; Southern Interstate Nuclear Board, 1969; Finch, 1967; and Butler et al., 1962).

2. Geologic Mapping

The geologic map used for the survey of the Chattanooga Quadrangle was the 1:250,000-scale map produced by Martel Laboratories, Inc. Table T-1 is a listing of the mapped geologic units.

3. Potential Uranium-Bearing Units

The Chattanooga Quadrangle lies in four physical divisions, which from southeast to northwest are Blue Ridge, Valley and Ridge, Appalachian Plateaus, and Interior Low Plateaus (Fenneman, 1928).

DOE (1979) maps and describes the Mississippian and Pennsylvanian sedimentary rocks, undivided, located in the western half of the Chattanooga Quadrangle as favorable but with insufficient basis for estimation of potential uranium resources.

The Chattanooga Shale of Mississippian-Devonian age (Table T-1) occurs extensively in the western half of the Chattanooga Quadrangle and contains trace amounts of uranium throughout its extent. Large areas of Chattanooga Shale of higher-than-average uranium content are restricted to the Eastern Highland Rim and Cumberland Plateau areas located principally in the northwest portion of the Chattanooga Quadrangle.

The largest area of higher-than-average uranium mineralization and thicker-than-normal sections of the Gassaway Member of the Chattanooga Shale is in the vicinity of Smithville, Tennessee (Southern Interstate Nuclear Board, 1969).

The Southern Interstate Nuclear Board (1969) summarized the uranium possibilities of this area as follows:

> "Uraniferous veins are known in North Carolina and can be expected in other parts of the Piedmont and Blue Ridge provinces. However, though locally rich, they are not expected to contribute as much uranium as deposits in sandstone.
>
> "Moderate- to low-temperature limestone replacements, known in New Mexico and Mexico, might be expected in the Valley and Ridge provinces but are as yet unknown."

The greatest possibilities for economic uranium deposits, and the bulk of presently known occurrences, are in the upper Paleozoic fluviatile sandstone of the Appalachian-Allegheny-Cumberland basins, not uplifted as plateaus. These occurrences resemble those in similar rocks of the western United States, which contain 95 percent of domestic reserves.

Appalachian uranium deposits are known or expected to be of Paleozoic age. In comparison with Cenozoic deposits of the western United States, they would be found in a much older and more eroded region and would therefore probably be more leached and of less apparent promise at the surface. However, if adequately protected below the reach of meteoric or underground water and oxygen, there is no reason that they should not be as large or rich as those in the West.

SECTION II

RADIOMETRIC DATA INTERPRETATION

A. SELECTION OF URANIUM ANOMALIES

1. Statistical Considerations

Each of the equivalent uranium, equivalent uranium/equivalent thorium, and equivalent uranium/potassium data sets was computer-processed to identify and outline all individual or groups of statistically high data points on the following basis. If a single statistically high point is considered in terms of multiples of the standard deviation above the mean (i.e., significance factor), the probability that its value was caused by random variation of the background is shown in Table 2-1.

Table 2-1

Probability That a Single Statistically High Point Is Caused by Random Deviations*

Point Value	Probability
Mean + 1 standard deviation	0.1587 or 1:6.3
Mean + 2 standard deviations	0.0228 or 1:44
Mean + 3 standard deviations	0.0013 or 1:768
Mean + 4 standard deviations	0.00003 or 1:33,300

*A probability is determined as the area under the standardized normal distribution curve above the indicated value.

The maximum probability of 1:33,300 was used to judge the reliability of single, isolated, statistically high points in the data interpretation.

Spatial groupings of statistically high values are less probable than is a scattering of the same values over the map unit. If a spatial grouping consists of adjacent statistically high points, the probability (P) that all the points were caused by random fluctuations is:

$$P = P_1 \cdot P_2 \cdot P_3 \cdots P_n$$

where

$P_1, P_2, \ldots P_n$ represent the single-point probabilities for n points.

Assuming the same certainty criterion of 1:33,300, Table 2-2 gives the minimum requirements for all adjacent points in a reliable anomaly. This allows groupings of statistically high (or low) points more than 1.45 standard deviations from the mean to be evaluated.

Table 2-2

Minimum Deviation from the Mean for All Points for Limiting Probability of 1:33,300 (Elkins, 1940)

Number of Points Supporting Anomaly	Minimum Deviation
1	4.00 standard deviations
2	2.54 standard deviations
3	1.87 standard deviations
4	1.45 standard deviations

2. Uranium Anomalies

Data for the Chattanooga Quadrangle, including eU,* eU/eTh,* and eU/K,* were searched by the computer, and all acceptable significant anomalies were identified. These were printed out on the "preferred-anomaly" map (Figure 2-1) as asterisk symbols for each data point constituting a valid anomaly. The eU anomalies are indicated by asterisks along the flight line, and eU/eTh anomalies are shown by asterisks north of E-W flight lines and east of N-S flight lines. The eU/K anomalies are indicated by asterisks south of E-W flight lines and west of N-S flight lines.

*eU = Equivalent uranium measured by bismuth-214.
eTh = Equivalent thorium measured by thallium-208.
K = Potassium measured by potassium-40.

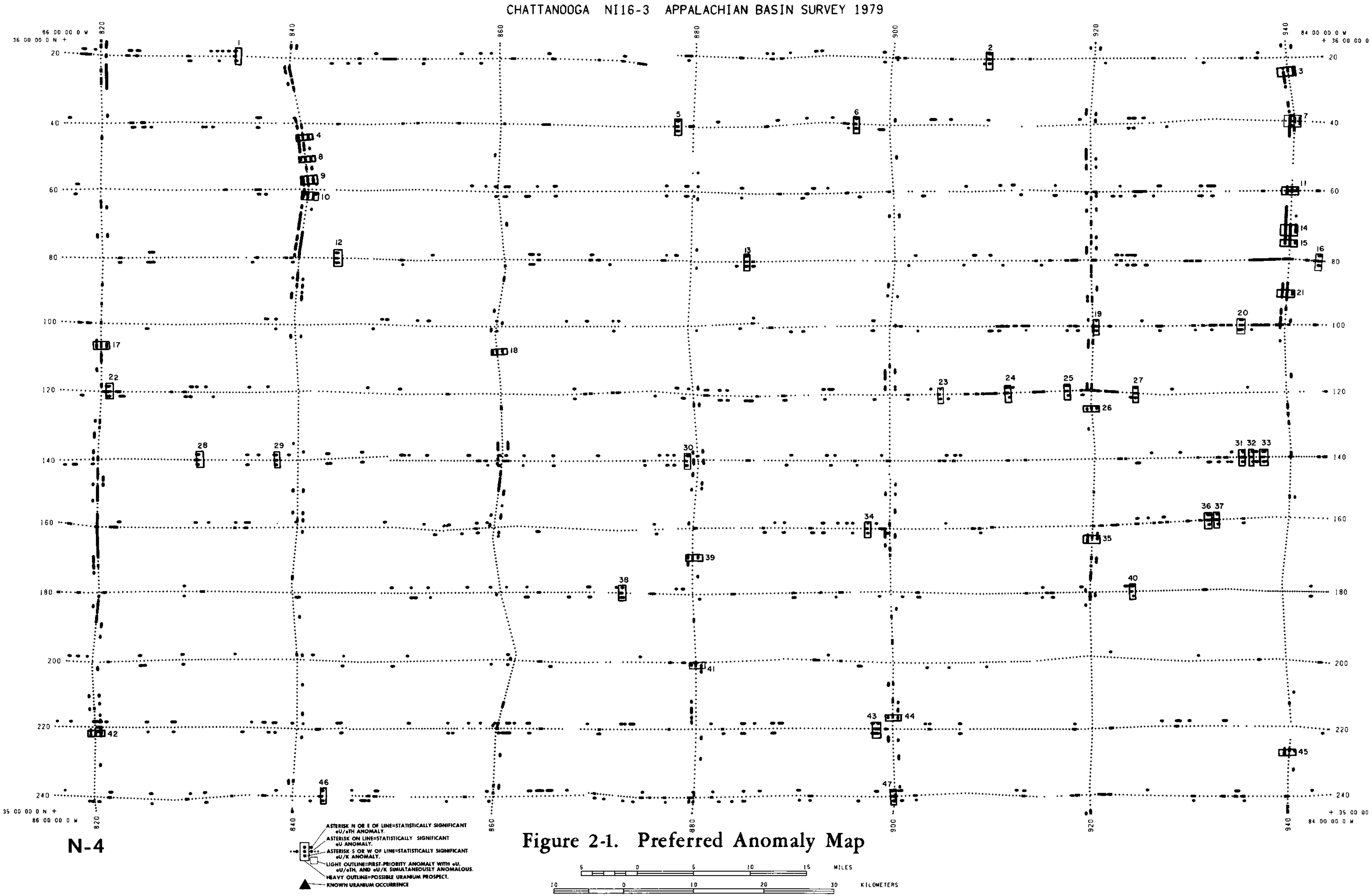

Figure 2-1. Preferred Anomaly Map

Table 2-3

eU Anomalies

Anomaly No.	Line No.	Geologic Unit(s)	Highest eU S.F.*	No. of Anomalous Records	Remarks
1	20	Mfp	2.4	4	Possible uranium prospect.
2	20	Pcf/Pr	1.5	7	Possible uranium prospect.
3	940	Onc/Єcr	1.7	11	Possible uranium prospect.
4	840	Msw	2.0	8	Possible uranium prospect.
5	40	Pr	3.0	5	Possible uranium prospect.
6	40	Pcf	1.8	5	Possible uranium prospect.
7	940	Oo/Єcr	2.4	16	Possible railroad and highway fill.
8	840	Mm/Msw	2.3	3	Possible uranium prospect.
9	840	Mm/Msw	2.3	12	Possible uranium prospect.
10	840	Msw	2.1	13	Possible railroad and highway fill.
11	940	Oo	3.4	9	Possible uranium prospect.
12	80	Mm	1.6	7	Possible uranium prospect.
13	80	Pr	2.4	6	Possible uranium prospect.
14	940	OЄk	3.8	13	Possible uranium prospect near major power line.
15	940	OЄk	3.2	6	Possible uranium prospect on thrust fault.
16	80	Єcl	2.9	7	Possible highway fill.
17	820	Msw	1.8	7	Possible uranium prospect.
18	860	Pco	1.6	5	Possible uranium prospect.
19	100	Onc	3.0	3	Possible uranium prospect.
20	100	OЄk	1.5	6	Possible road fill.
21	940	Ccl	2.7	7	Possible uranium prospect.
22	120	Msw	2.4	7	Possible uranium prospect.
23	120	Єcr	1.7	2	Possible road fill.
24	120	Єcl	2.8	2	Possible uranium prospect.
25	120	Oh	1.5	3	Possible uranium prospect.
26	920	OЄk	2.0	2	Possible uranium prospect on outskirts of town.
27	120	Ccl	1.6	6	Possible uranium prospect.
28	140	Pco	2.0	7	Possible uranium prospect.
29	140	Pco	1.5	6	Possible uranium prospect.
30	140	Oc	1.9	6	Possible highway fill.
31	140	pЄw	1.9	5	Possible uranium prospect on thrust fault.
32	140	pЄw	1.8	4	Possible uranium prospect.
33	140	pЄw	1.9	6	Possible uranium prospect.
34	160	Єcl	1.5	3	Possible uranium prospect.
35	920	OЄk	1.5	5	Possible uranium prospect.
36	160	pЄw	2.9	4	Possible uranium prospect.
37	160	pЄw	2.7	1	Possible uranium prospect.
38	180	Ol	1.5	5	Possible uranium prospect near secondary road.
39	880	OЄk/Cmn	1.9	6	Possible uranium prospect near secondary road.
40	180	pЄw	1.5	1	Possible uranium prospect near secondary road.
41	880	Mfp/Sr	1.9	3	Possible railroad and highway fill.
42	820	Msw	1.5	3	Possible uranium prospect.
43	220	OЄk	2.0	6	Possible uranium prospect.
44	900	Oa/OЄk	1.5	3	Possible uranium prospect.
45	940	Tg/vt	2.8	3	Possible uranium prospect.
46	240	Mm	1.6	6	Possible uranium prospect.
47	240	pЄs	1.5	4	Possible uranium prospect.

*Significance factor

○ = Preferred anomaly.

Next, eU anomalies that showed a geochemical enrichment of eU over the eTh and/or K present were identified. Preferred anomalies are those showing simultaneous statistically valid eU, eU/eTh, and eU/K anomalies. The preferred-anomaly map (Figure 2-1) is marked to indicate the locations of all first-priority anomalies, and they are described in Table 2-3.

The data user can outline these anomalies on the appropriate profile maps to evaluate more quantitatively the relative magnitudes of the anomalies. The profile maps are also useful in delineating areas relatively depleted of uranium that was removed by geochemical activity and concentrated in nearby deposits. Recent study has shown that the Gas Hills and Shirley Basin uranium districts are accompanied by uranium-barren altered areas detectable by aerial gamma-ray spectrometry (Texas Instruments, 1977).

Second-priority anomalies that under special circumstances may indicate potential uranium prospects are those showing only a combination of two statistically valid anomalies out of the three parameters, eU, eU/eTh, and eU/K. These are easily identifiable on the preferred-anomaly map. Examples of special situations where second-priority anomalies can be important indicators of uranium prospects are given in Table 2-4.

Table 2-4

Examples of Potentially Important Second-Priority Anomalies (Texas Instruments, 1977)

Valid Anomalies	No Anomaly	Locality Description
eU + eU/K	eU/eTh	Shirley Basin, Wyoming; high thorium due to surface layer of monazite yields normal eU/eTh even in areas where eU is anomalously high.
eU +eU/eTh	eU/K	Regions with surface evaporite deposits rich in potash yield normal eU/K even when eU is anomalously high.
eU/eTh + eU/K	eU	Areas of water-saturated surface material or heavy vegetation can shield eU, eTh, and K radiations simultaneously, but the ratios will still reflect the hidden relative eU enrichment.

B. DATA TABLES AND HISTOGRAMS

1. General

The flight-line numbers in the order they appear on each of the four types of data tapes (see Volume 1 for a description of these tapes) are as follows: E-W flight lines 20 through 240 followed by N-S flight lines S20 through 940.

Microfiche copies of the single-record and averaged-record data listings are attached to the inside back cover of this report. Statistical summary tables, flight-line mean values, and histograms for the gamma-ray parameters are presented by geologic unit in this volume. Further explanatory details are given in Volume 1.

2. Statistical Summary Tables

Tables showing the distribution types, statistical parameters, and number of samples for each geologic formation are presented for eU, eTh, K, eU/K, eU/eTh, and eTh/K as microfiche copies. These are useful in studying the magnitudes and variations of the radioactivity of the formations relative to one another and to the normal U, Th, and K abundances in the lithologic types represented.

3. Flight-Line Averages

Mean values for eU, eTh, K, eU/eTh, eU/K, and eTh/K by geologic unit for each flight line in the Chattanooga Quadrangle are given as microfiche copies. These may be used to study the variation in gamma-ray parameters within a formation as one crosses the quadrangle from north to south or east to west.

4. Histograms

Histograms for each radiometric parameter are presented for each geologic unit in the Histograms section. Several histograms showed multimodal distributions that indicated the presence of more than one distinct lithology in that geologic unit. In situations where the multimodal characteristic of a histogram was obvious, the unit was divided into two or more populations by splitting the histogram based on eTh or K but not eU. For example, in the case of Mn (Newman Limestone), the K histogram could be reasonably split at one point. The distributions of the split and unsplit units are shown in the Histograms section. New means and standard deviations were calculated before computerized geologic analysis of the data. Table 2-5 summarizes all the histogram splits for the quadrangle. The eU, eTh, and K medians for the resulting subunits are given in concentration units computed from the Statistical Summary Tables. Comparing the values in Table 2-5 with the estimated crustal averages for various rock types (Table 2-6) compiled by Kogan, et al. (1971; see also Saunders and Potts, 1978) allows at least a reasonable estimate of the probable average lithology of the units. In Table 2-5 eTh/eU is used for comparisons with Table 2-6.

C. MAPS AND PROFILES

1. General

Explanatory details concerning the generation and presentation of maps and profiles are given in Volume 1.

2. Profile Maps

Profile maps showing the significance-factor levels for eU, eTh, K, eU/eTh, eU/K, and eTh/K on geologic bases are presented in the Maps section, along with a map showing the record locations and geology. These may be compared directly with the preferred-anomaly map (Figure 2-1) to determine the relative strengths of the eU, eU/eTh, and eU/K anomalies and their geologic locations. They are also useful in studying the geographic variations in the other radiometric parameters.

3. Printer Plot Contour Maps

Printer plot contour maps showing smoothed absolute magnitude of eU, eTh, K, eU/eTh, eU/K, eTh/K and residual magnetics are presented in the Maps section (M-8 through M-14). This presentation is a convenient way of examining each quadrangle for broad regional changes in magnitude that may be associated with geology or may indicate uraniferous geochemical provinces.

Table 2-5

Radiometric Analysis of Geologic Units

Computer Units	Map Units	Split on ppm/%	eTh (ppm)	eU (ppm)	K (%)	eTh/eu	Probable Lithology
PCF	Pcf		5.42	1.76	0.49	3.12	Sandstone, siltstone
PCO	Pco		4.78	1.48	0.43	3.23	
PR	Pr		4.71	1.46	0.43	3.23	Conglomeratic sandstone
PCG-1	Pcg	Th = 7.0	6.03	1.80	0.83	3.33	
PCG-2	Pcg	Th = 12.0	8.89	2.13	1.51	4.17	
PCG-3	Pcg		13.10	2.58	1.91	5.00	
MP	Mp		4.45	1.46	0.43	3.00	Shale, siltstone
MBH	Mbh		4.65	1.64	0.44	2.86	Limestone, sandstone
MM	Mm		5.11	1.94	0.44	2.63	Limestone
MSW	Msw		6.30	2.28	0.42	2.78	Limestone
MN-1	Mn	K = 1.1	5.45	1.69	0.50	3.23	Limestone
MN-2	Mn		8.26	2.11	1.24	3.85	Shale, sandstone
MG	Mg		10.10	2.97	0.95	3.45	Shale, sandstone
MFP-1	Mfp	Th = 8.5	5.30	2.04	0.46	2.63	Limestone
MFP-2	Mfp		9.13	2.33	0.88	3.85	Dolomite, chert
MDC	Mdc		8.12	2.78	0.77	2.94	Shale
S	S		4.50	1.88	0.42	2.38	Limestone, shale
SR-1	Sr	Th = 7.0	4.79	1.72	0.41	2.78	Sandstone, siltstone
SR-2	Sr		8.51	2.31	0.76	3.70	Shale
OS-1	Os	Th = 7.0	4.81	1.65	0.57	2.94	Limestone
OS-2	Os		8.05	2.50	0.98	3.23	Shale
OU	Ou		4.40	2.40	0.61	1.82	Limestone, shale
OBH	Obh		6.16	2.04	0.81	3.00	Limestone
OCA	Oca		7.99	2.20	0.90	3.57	Limestone
OLB	Olb		6.47	1.89	0.50	3.45	Dolomitic limestone
ORD-1	Ord	Th = 6.5	5.40	2.05	0.38	2.63	Dolomitic limestone
ORD-2	Ord		8.86	2.36	0.68	3.70	Calcareous shale
OPM	Opm		6.93	2.21	0.60	3.12	Limestone
OCH	Och		7.61	2.16	0.70	3.57	Shale, limestone
OMLC	Omlc		8.69	2.23	1.16	3.85	Limestone
OB	Ob		7.97	2.20	0.93	3.57	Claystone, siltstone
OO	Oo		7.86	2.11	0.69	3.70	Shale, limestone
OH	Oh		6.57	1.88	0.51	3.45	Limestone
OL-1	Ol	Th = 6.0	4.54	1.47	0.38	3.12	Limestone
OL-2	Ol		7.81	2.08	0.79	3.70	Conglomerate, sandstone
OA	Oa		6.74	1.88	0.70	3.57	Shale
OSV	Osv		8.59	1.87	1.35	4.55	Shale
ONC	Onc		6.69	2.18	0.49	3.00	Limestone
ON	On		4.78	1.57	0.42	3.00	
OMA	Oma		10.97	2.80	1.32	3.85	Dolomite
OLC	Olc		6.23	2.17	0.42	2.86	Dolomite
OCK	OЄk		5.84	2.06	0.39	2.86	
CCR	Єcr		5.94	2.17	0.37	2.78	Dolomite
CC-1	Єc	K = 0.6	5.12	1.84	0.33	2.78	
CC-2	Єc		8.13	2.06	1.22	4.00	
CMN	Єmn		6.14	2.08	0.43	2.94	Limestone
CCL-1	Єcl	K = 1.0	6.82	2.09	0.51	3.23	
CCL-2	Єcl		9.19	2.19	1.40	4.17	
CR-1	Єr	K = 0.6	6.15	2.17	0.37	2.86	Shale, siltstone
CR-2	Єr		7.88	2.14	1.24	3.70	Sandstone
CS	Єs		7.97	2.32	1.33	3.45	Dolomite
CH	Єh		6.50	1.55	1.28	4.17	Sandstone
CM	Єm		6.67	1.55	1.01	4.35	Shale
CNB	Єnb		5.33	1.89	0.55	2.86	Sandstone
CNI	Єni		5.67	1.72	0.63	3.33	Shale
CCH	Єch		6.07	1.52	0.94	4.00	Conglomerate
PCW-1	pЄw	K = 0.5	5.40	1.89	0.34	2.86	
PCW-2	pЄw	K = 1.0	7.67	2.05	0.78	3.70	
PCW-3	pЄw		10.04	2.68	1.52	3.70	
PCS-1	pЄs	K = 1.2	5.99	1.63	0.72	3.70	Shale
PCS-2	pЄs		10.99	2.84	1.54	3.85	Conglomerate, sandstone
PCG2	pЄg2		8.48	2.18	1.26	3.85	Sandstone
PCA	pЄa		8.69	2.11	1.35	4.17	Sandstone, slate
NY	ny		12.36	2.95	1.66	4.17	Quartzite
AD	ad		11.82	3.39	1.55	3.45	Schist
VT-1	vt	Th = 10.5	8.26	2.23	1.07	3.70	
VT-2	vt		11.46	3.15	1.44	3.70	
BT-1	bt	Th = 8.0	5.72	1.58	0.87	3.57	Quartzite
BT-2	bt		10.25	2.44	1.53	4.17	Schist
TG	tg		9.92	2.38	1.52	4.17	Quartzite
NT	nt		8.62	2.12	1.29	4.00	Slate
PG	Pg		4.29	1.42	0.40	3.00	
OC	Oc		4.36	1.72	0.27	2.56	
TA	Ta		9.05	2.63	1.41	3.45	

Table 2-6

Average U, Th, K Content of Rocks (after Kogan et al., 1971)

Rock Type	U (ppm)	Th (ppm)	K (%)	Th/U
Continental Crust	2.5	13.0	2.5	5.2
Igneous Rocks				
Acidic (granites)	3.5	18.0	3.34	5.1
Intermediate (diorites)	1.8	7.0	2.31	4.0
Basic (basalt-gabbro)	0.5	3.0	0.83	6.0
Ultrabasic (dunite-peridotite)	0.003	0.005	0.03	1.7
Sediments				
Shale, clay	4.0	11.0	3.2	2.8
Sandstone	3.0	10.0	1.2	3.3
Limestone	1.4	1.8	0.3	1.3
Evaporite	0.1	0.4	0.1	4.0

The contour interval and minimum contour value for the residual magnetics printer plot contour maps are indicated on each individual sheet as are the map scale and quadrangle identification. For the six radiometric printer plot contour maps, the levels of response for each band are as shown on the following page.

4. Radiometric Stacked Profiles

Stacked profiles showing the variation in absolute magnitudes of eU, eTh, K, eU/eTh, eU/K, and eTh/K, as well as gross count, residual magnetic field, terrain clearance, eU-air values, and geology along each flight line are presented in the Profiles section (P-1 through P-19). This presentation provides a convenient way of examining simultaneously all the data at each averaged-record location. The data, as shown, are not corrected for geology (as are the profile maps) and provide an opportunity to study the relative differences in counting rates among the geologic units.

The altitude (terrain-clearance) trace allows identification of portions of flight lines where terrain-clearance requirements were exceeded and the data were discarded in the statistical processing. The averaged-record locations are flagged along the baseline. The eU, eTh, and K traces are similarly flagged for data discarded because of Currie significance test failure. The discarded data points are included in the stacked profiles and may be examined, keeping in mind that they are generally statistically unreliable. If the rock types are sufficiently radioactive, normal terrain clearance may be exceeded somewhat with reasonable reliable statistics, and the added information may be useful.

Symbol	eTh ppm (TI-208)	eU ppm (Bi-214)	K % (K-40)	eU/eTh, eTh/K, eU/K
Blank	<2.8	<1.4	<0.05	<0.1
A	2.8-4.0	1.4-2.0	0.05-0.1	0.1-0.2
Blank	4.0-5.6	2.0-2.8	0.1-0.2	0.2-0.3
B	5.6-8.0	2.8-4.0	0.2-0.3	0.3-0.4
Blank	8.0-11.0	4.0-5.6	0.3-0.4	0.4-0.6
C	11-16	5.6-8.0	0.4-0.6	0.6-0.8
Blank	16-22	8.0-11.0	0.6-0.8	0.8-1.1
O	22-31	11-16	0.8-1.1	1.1-1.6
Blank	31-44	16-22	1.1-1.6	1.6-2.2
E	44-64	22-31	1.6-2.2	2.2-3.1
Blank	64-90	31-44	2.2-3.1	3.1-4.4
F	90-125	44-64	3.1-4.4	4.4-6.4
Blank	125-180	64-90	4.4-6.4	6.4-9.0
G	180-250	90-125	6.4-9.0	9.0-13
Blank	250-350	125-180	9.0-12.5	13-18
H	350-500	180-250	12.5-18	18-25
Blank	500-700	250-350	18-25	25-35
I	700-1000	350-500	25-35	35-50
Blank	1000-1400	500-700	35-50	50-70
J	1400-2000	700-1000	50-70	70-100
Blank	>2000	>1000	>70	>100

5. Magnetic Stacked Profiles

The single-record (unaveraged) data on flight-level air temperature, flight-level barometric pressure, average terrain clearance, diurnal magnetics, residual total magnetic field, and geology are shown for each flight line (P-20 through P-38).

D. CONCLUSIONS

1. General

Table 2-7 lists for each formation:

- Total number of eU records or samples
- Number of anomalies.
- Number of anomalies per 1000 eU records.

The number of anomalies in a formation as shown in column 4 of Table 2-7 is not particularly significant unless the outcrop area and/or the number of eU samples are approximately equal. Because of the natural wide variation in outcrop area, and therefore in the number of eU samples, a more useful value was calculated and listed in column 5 of Table 2-7. This value represents the number of anomalies per 1000 eU samples and provides a comparison of the uranium potential for formations that have sufficient eU samples to be statistically reliable.

Forty of the 47 anomalies in Table 2-3 have been classified as preferred, with possible uranium prospects based on their geologic location and eU anomaly characteristics. The remaining anomalies in Table 2-3 coincide with cultural features such as railroads and roads that may be the major contributors to their anomalous values.

2. Uraniferous Provinces

Pennsylvanian and Mississippian sedimentary rocks considered favorable for potential uranium resources, outcrop over a major portion of the west half of the Chattanooga Quadrangle. These units were sampled 22,610 times, with a preferred-anomaly density of 0.77 per 1000 eU samples. Preferred anomalies 4, 8, 9, 10, 12, 17, 22, 28, and 29 are in this broad area.

The Cumberland Plateau, which forms a topographic high trending NE-SW through the center of the quadrangle, has been identified as a significant geologic feature (DOE, 1979). Preferred anomalies 2, 6, 13, 18, 42, and 46 are in this broad feature.

Table 2-7

Geologic Units with eU Anomalies

Computer Units	Map Units	Total No. of eU Records	Anomalies	Anomalies per 1000 eU Samples
PCF	Pcf	635	1.5	2.36
PCO	Pco	8731	3.0	0.34
PR	Pr	1562	2.5	1.60
PCG-1	Pcg	143		
PCG-2	Pcg	472		
PCG-3	Pcg	126		
MP	Mp	1993		
MBH	Mbh	1331		
MM	Mm	1711	3.0	1.75
MSW	Msw	4031	6.0	1.49
MN-1	Mn	561		
MN-2	Mn	48		
MG	Mg	12		
MFP-1	Mfp	1154	1.5	1.33
MFP-2	Mfp	73		
MDC	Mdc	27		
S	S	47		
SR-1	Sr	413	0.5	0.77
SR-2	Sr	239		
OS-1	Os	257		
OS-2	Os	98		
OU	Ou	285		
OBH	Obh	120		
OCA	Oca	147		
OLB	Olb	50		
ORD-1	Ord	34		
ORD-2	Ord	111		
OPM	Opm	105		
OCH	Och	1361		
OMLC	Omlc	85		
OB	Ob	106		
OO	Oo	687	1.5	2.18
OH	Oh	410	1.0	2.43
OL-1	Ol	197 }	1.0	2.57
OL-2	Ol	191 }		
OA	Oa	1278	0.5	0.39
OSV	Osv	38		

Computer Units	Map Units	Total No. of eU Records	Anomalies	Anomalies per 1000 eU Samples
ONC	Onc	3063	1.5	0.49
ON	On	326		
OMA	Oma	5		
OLC	Olc	28		
OCK	OЄk	3272	7.0	1.99
CCR	Єcr	1356	2.0	1.47
CC-1	Єc	140		
CC-2	Єc	371		
CMN	Єmn	498	0.5	1.00
CCL-1	Єcl	1739	5.0	2.88
CCL-2	Єcl	1388		
CR-1	Єr	161		
CR-2	Єr	846		
CS	Єs	60		
CH	Єh	15		
CM	Єm	43		
CNB	Єnb	68		
CNI	Єni	60		
CCH	Єch	76		
PCW-1	pЄw	107 }		
PCW-2	pЄw	393 }	6.0	3.09
PCW-3	pЄw	1439 }		
PCS-1	pЄs	214	1.0	4.67
PCS-2	pЄs	358		
PCG2	pЄg2	3934		
PCA	pЄa	206		
NY	ny	9		
AD	ad	20		
VT-1	vt	94 }	0.5	3.93
VT-2	vt	33 }		
BT-1	bt	39		
BT-2	bt	280		
TG	tg	60	0.5	8.33
NT	nt	202		
PG	Pg	2322		
OC	Oc	248	1.0	4.03
TA	Ta	16		

The Cambrian undifferentiated Nolichucky, Marysville, Rogersville, and Rutledge formations have more than 3000 eU samples or records and 2.88 preferred anomalies per 1000 samples. The Precambrian Walden Creek group has more than 1500 eU samples or records and 3.09 preferred anomalies per 1000 samples.

3. Suggestions for Further Work

The primary objective of the survey is to locate areas favorable for the occurrence of uranium. The probability of encountering individual deposits in this type of survey is relatively low. Further work in the Chattanooga Quadrangle could be done to determine the origin of high airborne gamma-ray readings along the east edge of the quadrangle, especially on flight line 940 and to a lesser degree on flight lines 80, 100, and 120.

SECTION III
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APPENDIX A
PRODUCTION SUMMARY — CHATTANOOGA

Operation	Start	Completion
Data Collection	10 September 1979	19 September 1979
Data Processing	10 October 1978	30 January 1980
Data Interpretation	30 January 1980	6 February 1980

Flight-Line Miles 1833.7

Note: Additional production summary data are in Appendix A of Volume 1.

Table T-1. Geologic Map Units — Chattanooga Quadrangle

Computer Symbol	Map Symbol	Description
SEDIMENTARY ROCKS		
PENNSYLVANIAN		
PCF	Pcf	Undifferentiated Crooked Fork Group.
		Wartburg: Gray to brown, fine- to medium-grained, locally conglomeratic sandstone.
		Glenmary: Dark gray to light brown shale with minor siltstone and sandstone.
		Coalfield: Gray to brown, fine- to medium-grained sandstone. Thickness, 0.24 meters.
		Burnt Mill: Dark gray to light brown shale; minor siltstone; thin sandstone locally near base.
		Crossville: Gray to brown or pink, fine- to medium-grained, thinly and evenly bedded sandstone.
		Dorton: Dark gray to light brown shale; minor siltstone and sandstone; thin coal near top.
PCO	Pco	Undifferentiated Crab Orchard Mountains Group.
PR	Pr	Rockcastle: Gray to brown, fine- to coarse-grained, conglomeratic sandstone and sandstone. Thin, coal-bearing shale near middle.
		Vandever: Shale and siltstone; dark gray to light brown; conglomerate or sandstone in middle to south. Thickness, up to 137 meters.
		Whitwell: Dark gray to light brown shale; minor siltstone; locally, middle is sandstone.
		Sewanee: Gray to brown, fine- to coarse-grained, conglomeratic sandstone and sandstone. Thickness, up to 61 meters.
PGG	Pgg	Undifferentiated Gizzard Group.
		Signal Point: Dark gray to light brown shale with minor siltstone. Thickness, 0-55 meters.
		Warren Point: Sandstone and conglomeratic sandstone; gray to brown; fine- to medium-grained. Locally interbedded with shale and coal. Thickness, 0-91 meters.
		Raccoon Mountain: Shale, siltstone, sandstone. Thickness, 0-79 meters.
PCG	Pcg	Undifferentiated Crab Orchard Mountains and Gizzard Group.
MISSISSIPPIAN-DEVONIAN		
MP	Mp	Pennington Formation: Shale and siltstone; red to green; fine-grained dolomite; dark gray limestone; thin-bedded sandstone.
MBH	Mbh	Undifferentiated Bangor Limestone and Hartselle Formation: Dark brownish-gray, thick-bedded limestone. Thickness, 21-122 meters. Thin-bedded, fine-grained sandstone interbedded with gray shale and oolitic, coarse-grained limestone beds.
MM	Mm	Monteagle Limestone: Light gray, mainly fragmental and oolitic. Blocky bryozoan chert weathers from base. Thickness, 55-91 meters.
MSW	Msw	Undifferentiated St. Louis and Warsaw limestones.
		St. Louis: Brownish-gray, fine-grained, dolomitic and cherty. Thickness, 30-40 meters.
		Warsaw: Medium- to coarse-grained, gray, cross-bedded. Includes much calcareous sandstone and shale to the north. Thickness, 30-40 meters.
MN	Mn	Newman: Gray limestone sequence near Cumberland Plateau and on Whiteoak Mountain. Shaly limestone, shale, siltstone, and sandstone on Chilhowee Mountain. Thickness, about 213 meters.
*	*	Greasy Cove Formation: Gray, argillaceous limestone; carbonaceous shale; siltstone; and fine-grained sandstone. Thickness, up to 122 meters.
MG	Mg	Grainger Formation: Gray to green shale, siltstone, and fine-grained glauconitic sandstone. In some areas, quartz pebble conglomerate.
MGG	Mgg	Undifferentiated Greasy Cove and Grainger formations.
MFP	Mfp	Ft. Payne Formation: Silicastone; calcareous and dolomitic, bedded chert; cherty limestone; scattered crinoidal limestone lenses.
MDC	MDc	Chattanooga: Black, carbonaceous, fissile shale. Thickness, 6-9 meters in most areas, increasing to 30 meters near eastern edge of sheet.
*	*	Undifferentiated Ft. Payne and Chattanooga.

*Not appearing in legend.

Computer Symbol	Map Symbol	Description
SILURIAN		
S	S	Undifferentiated Laurel, Osgood, Brassfield formations.
		Laurel Limestone: Dolomitic; mottled yellowish-gray to yellowish-green; fine-grained.
		Osgood Formation: Grayish-green shale.
		Brassfield Formation: Limestone; olive gray, fine-grained, cherty in the north, merging to olive gray, calcareous shale in the south. Thickness, 18-40 meters. (Present only in Sequatchie Valley.)
SR	Sr	Rockwood Formation: Shale; brown to maroon, thin, gray siltstone and sandstone and thin, lenticular layers of oolitic and fossiliferous red hematite. Thickness, 61-244 meters.
MISSISSIPPIAN-DEVONIAN-SILURIAN-ORDOVICIAN		
MDSO	MDSO	Undifferentiated Mississippian, Devonian, Silurian, and Ordovician formations: Structurally complex area containing all or portions of the Newman, Ft. Payne, Chattanooga, Rockwood, and Sequatchie formations.
ORDOVICIAN		
OS	Os	Sequatchie Formation: Maroon to gray, shaly limestone mottled greenish, with interbedded calcareous, olive to maroon, shale and siltstone, some sandy and laminated. Thickness, 0-61 meters.
OU	Ou	Undifferentiated Sequatchie, Leiper, Inman, and Catheys formations.
		Leiper Formation: Nodular, shaly, fine- to coarse-grained limestone. Thickness, 0-46 meters.
		Inman Formation: Thin-bedded limestone with red and green calcareous shale. Thickness, 0-15 meters.
		Catheys Formation: Nodular, shaly, thin- to medium-bedded and fine- to coarse-grained limestone. Thickness, 38-122 meters.
OBH	Obh	Bigby-Cannon Limestone and Hermitage Formation: Dark to light gray, dense to medium-grained, medium- and even-bedded limestone. Thickness, 24-46 meters. Gray, fine-grained, thin-bedded to laminated, sandy, argillaceous limestone. Shale weathers yellowish brown. Also, nodular, shaly limestone.
OCA	Oca	Carters: Fine-grained, yellowish brown limestone. Thin-bedded in upper part; thicker-bedded and very slightly cherty with scattered mottlings of magnesian limestone in lower part. Contains thin bentonite beds. Thickness, 18-76 meters.
OLB	Olb	Lebanon: Thin-bedded, gray to yellowish brown, slightly dolomitic limestone with thin, calcareous shale partings. Thickness, 30 meters.
ORD	Ord	Ridley: Medium- to very thick-bedded, fine- to medium-grained, gray, dolomitic limestone with prominent greenish-gray, calcareous shale and shaly limestone in middle. Thickness, 61-84 meters.
OPM	Opm	Pierce and Murfreesburg. Medium- to very thick-bedded, fine-grained, gray limestone. Thin-bedded, nodular, shaly, greenish-gray limestone locally.
OCH	Och	Undifferentiated Chickamauga Group.
		Reedsville: Greenish-gray, calcareous shale. Thickness, 0-122 meters.
		Unnamed limestone: Gray, medium-grained fossiliferous; shaly in part.
OMLC	Omlc	Middle and Lower Chickamauga Group.
OB	Ob	Bays: Claystone and siltstone; maroon, well-jointed, commonly mottled greenish, evenly-bedded. Light gray sandstone and metabentonite in upper part. Thickness, up to 305 meters.
*	*	Moccasin: Maroon, calcareous shale, siltstone, and limestone. Thin metabentonite in upper part. Thickness, 244-305 meters.
OO	Oo	Ottosee: Bluish-gray, calcareous shale. Weathers yellow. Reef lenses of coarsely crystalline reddish, fossiliferous limestone.
OH	Oh	Holston: Pink, gray, coarsely crystalline limestone. In many areas, upper part is sandy, cross-bedded, ferruginous limestone and brown to green calcareous shale. Thickness, 61-183 meters.
OL	Ol	Lenoir: Nodular, argillaceous, gray limestone. In places, basal sedimentary breccia conglomerate, quartz sand. Thickness, 8-152 meters.
OA	Oa	Athens: Medium to dark gray, calcareous, graptolitic shale. Calcareous, gray sandstone, siltstone, and locally fine pebble quartz conglomerate. Nodules of shaly limestone near base. Thickness, up to 457 meters.

*Not appearing in legend.

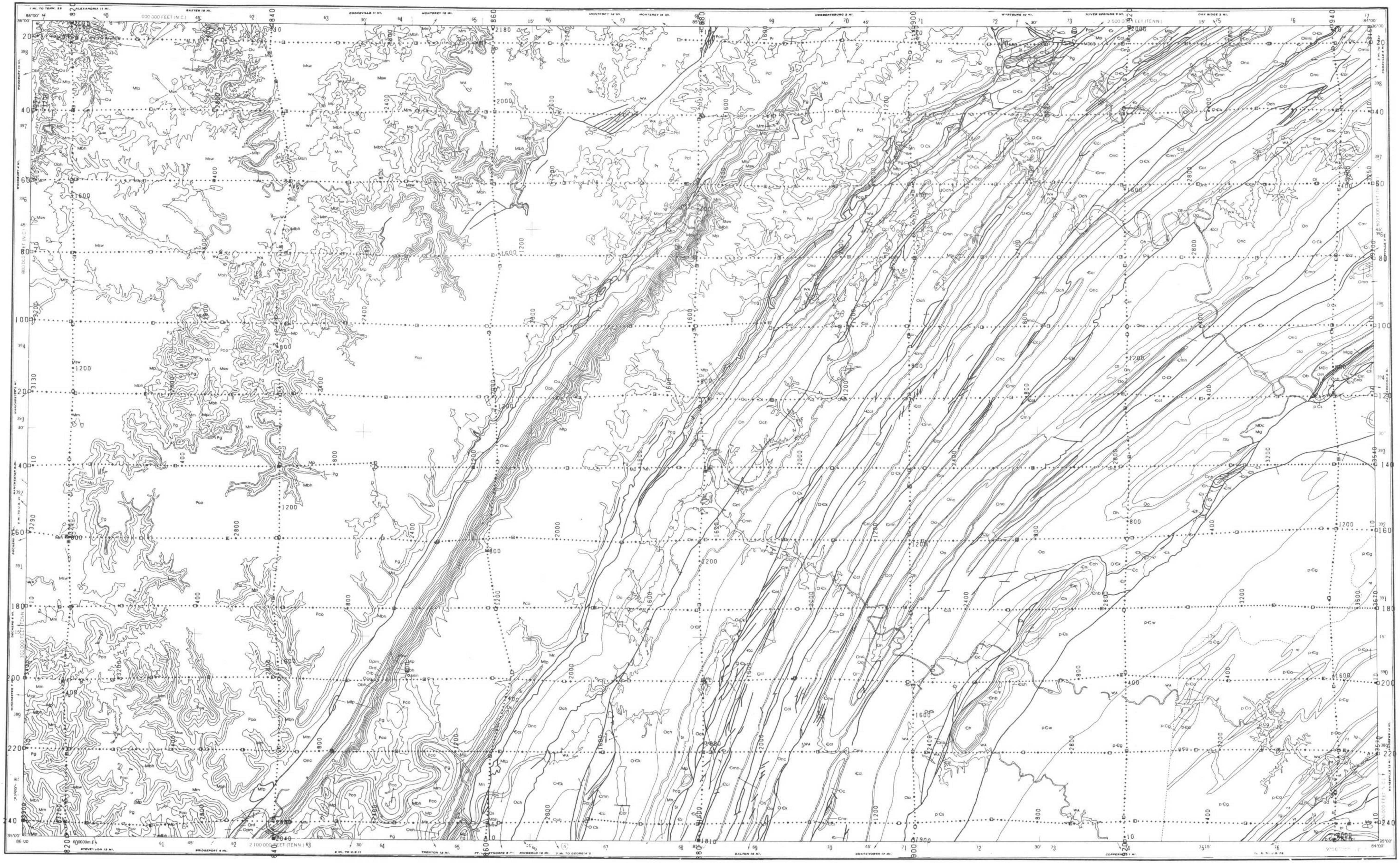
Table T-1. (continued)

Computer Symbol	Map Symbol	Description
ORDOVICIAN (CONTD)		
OSV	Osv	Sevier: Calcareous, bluish-gray shale. Weathers yellowish brown. Thin, gray limestone layers. Sandstone, siltstone, and locally conglomerate to the east. Thickness, 610-2134 meters.
ONC	Onc	Undifferentiated Upper Knox Group.
		Wells Creek: Limestone and dolomite with angular chert blocks and fragments; minor shale; mottled red and green; calcareous. Thickness, 0-15 meters. (Present only in Sequatchie Valley.)
ON	On	Undifferentiated Newala Formation.
OMA	Oma	Mascot: Light gray, fine-grained, well-bedded, cherty dolomite mottled red and green. Interbedded with bluish-gray limestone in upper part; chert matrix quartz sandstone at base.
		Kingsport: Gray, fine-grained, sparingly cherty dolomite; basal dense, gray limestone sequence. Thickness, 76 meters.
		Longview: Siliceous, gray, fine-grained, medium-bedded dolomite interbedded with gray limestone in upper part. Thickness, 91 meters.
		Chepultepec: Light gray, fine-grained, well-bedded dolomite; moderately cherty. Fine-grained limestone locally in upper part; quartz sandstone beds at base. Thickness, 244 meters.
OLC	Olc	Undifferentiated Longview and Chepultepec dolomites.
ORDOVICIAN-CAMBRIAN		
O€K	O€k	Undifferentiated Knox Group.
CAMBRIAN		
€CR	€cr	Lower Knox Group-Copper Ridge: Coarse, dark gray, knotty dolomite, asphaltic in places, with much gray, medium-grained, well-bedded dolomite. Abundant chert; cryptozoons typical.
€C	€c	Undifferentiated Consauga Group.
€MN	€mn	Maynardsville Limestone: Thick-bedded, bluish-gray, ribboned (silt and dolomite), nodular; light gray, fine-grained, laminated to thin-bedded. Noncherty dolomite in upper part. Thickness, 46-122 meters.
€N	€n	Nolichucky: Pink, green, olive, flaky, clay shale; gray, commonly oolitic, shaly limestone lenses; locally stromatolitic limestone layers. Thin, blocky siltstone near middle.
€MR	€mr	Maryville, Rogersville, and Rutledge formations: Gray, locally oolitic limestone with gray dolomite. Rogersville is green clay shale. Thickness, 125-305 meters.
*	*	Pumpkin Valley: Dull brown to maroon shale with numerous interbeds of thin, blocky, sandy siltstone. Thickness, 30-183 meters.
€CL	€cl	Undifferentiated Nolichucky, Maryville, Rogersville, Rutledge and Pumpkin Valley.
€R	€r	Rome Formation: Variegated red, green, yellow shale and siltstone with beds of fine-grained sandstone. Thickness, up to 457 meters.
€S	€s	Shady: Light gray dolomite; thinly bedded limestone with much shaly gray limestone and calcerous gray shale. Thickness, 305 meters.
€H	€h	Hesse: Sandstone; white, vitreous, quartzite. Medium- to coarse-grained in massive ledges. Greenish sandstone and shale near base.
€M	€m	Murray: Silty, sandy, dull green to brown, micaceous shale. Thickness, 152 meters.
€NB	€nb	Nebo: Sandstone; medium-bedded, fine-grained, white vitreous quartzite. In part, feldspathic.
€NI	€ni	Nichols: Olive gray to green, silty and sandy, micaceous shale and siltstone. Local lenses of fine-grained feldspathic quartzite. Thickness, 213 meters.
€CH	€ch	Cochran: Conglomerate; quartz pebble; gray pebble arkose; siltstone and shale. Irregular bedding, scour features, and cross-bedding common. Maroon micaceous arkose and shale near middle and base.
PRECAMBRIAN		
P€W	p€w	Walden Creek Group.
P€S	p€s	Sandsuck: Olive green and gray, argillaceous, micaceous shale with coarse feldspathic sandstone and quartz pebble conglomerate. Thickness, 610 meters.
		Shield: Conglomerate; sandstone; slate; massive; argillaceous. Pebbles of various rock types. Thickness, 457 meters.

*Not appearing in legend.

Computer Symbol	Map Symbol	Description
PRECAMBRIAN (CONTD)		
P€G	p€g	Great Smoky Group.
		Licklog: Sandstone; feldspathic; greenish phyllite; bluish-gray slate. Thickness, 457 meters.
P€A	p€a	Anakeesta: Dark to bluish-gray and black slate with interbedded fine-grained sandstone.
		Thunderhead: Coarse, gray, feldspathic sandstone, graywacke, and conglomerate. Occurs in massive ledges; graded bedding and blue quartz are characteristic. Thickness, 1676-1920 meters.
		Elkmont: Coarse to fine, gray, feldspathic sandstone, graywacke, and fine conglomerate. Fine-grained beds in lower part. Graded bedding typical. Thickness, 305-2438 meters.
METAMORPHIC ROCKS		
AGE UNKNOWN		
NY	ny	Nottley: Quartzite.
AD	ad	Andrews: Schist; calcareous cross-biotite.
MP	mp	Murphey: Calcareous, dolomitic marble with lenses of talc.
VT	vt	Valley Formation.
BT	bt	Brasstown: Schist; greenish gray to dark gray, thin-bedded cross-biotite; micaceous quartzite.
TG	tg	Tusquitee: Quartzite; white to light buff, feldspathic, with numerous thin layers of black argillite.
NT	nt	Nantahala: Dark-colored slate laminated to thin-bedded, sulphidic argillite and metasiltstone.
HI	hi	Hiwassee: Slate. Contains Citico conglomerate as lenses toward the northwest.

*Not appearing in legend.



RECORD LOCATION MAP

LEGEND: □ = PHOTO-RECOVERED POINT

5 0 5 10 15 MILES

10 0 10 20 30 KILOMETERS

AERIAL RADIOMETRIC AND MAGNETIC RECONNAISSANCE SURVEY

PREPARED BY

TEXAS INSTRUMENTS INCORPORATED

DALLAS, TEXAS

1979

WORK PERFORMED UNDER

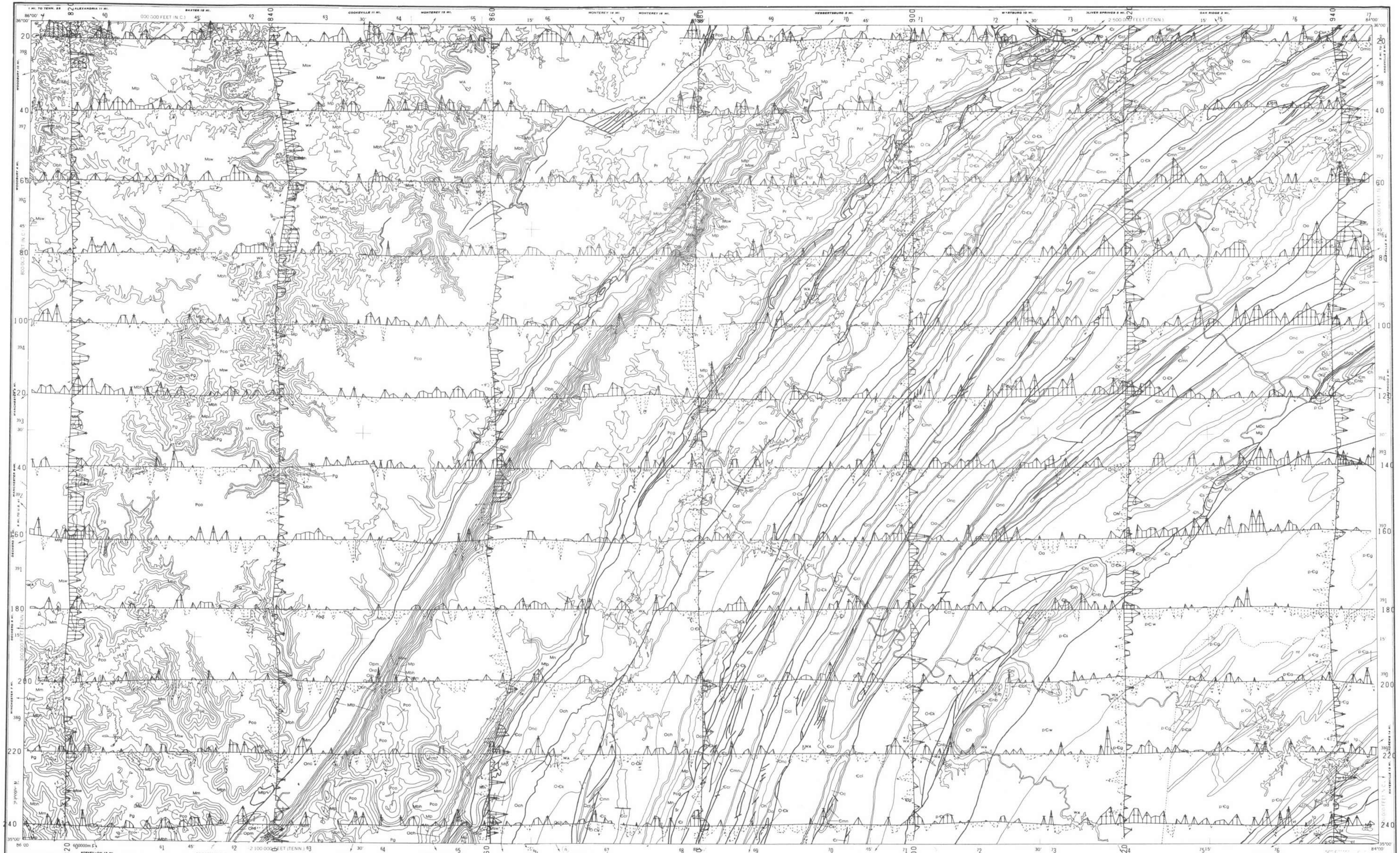
BENDIX FIELD ENGINEERING CORPORATION

SUBCONTRACT NO. 79-319-L

PREPARED FOR

U.S. DEPARTMENT OF ENERGY

CHATTANOOGA NI16-3 APPALACHIAN BASIN SURVEY 1979



PROFILE MAP URANIUM 1.0 S.D./DIV TEXAS INSTRUMENTS

LEGEND: POSITIVE SIGNIFICANCE FACTORS—SOLID LINES
NEGATIVE SIGNIFICANCE FACTORS—DOTTED LINES

5 0 5 10 15 MILES

10 0 10 20 30 KILOMETERS

AERIAL RADIOMETRIC AND MAGNETIC RECONNAISSANCE SURVEY
PREPARED BY
TEXAS INSTRUMENTS INCORPORATED
DALLAS, TEXAS
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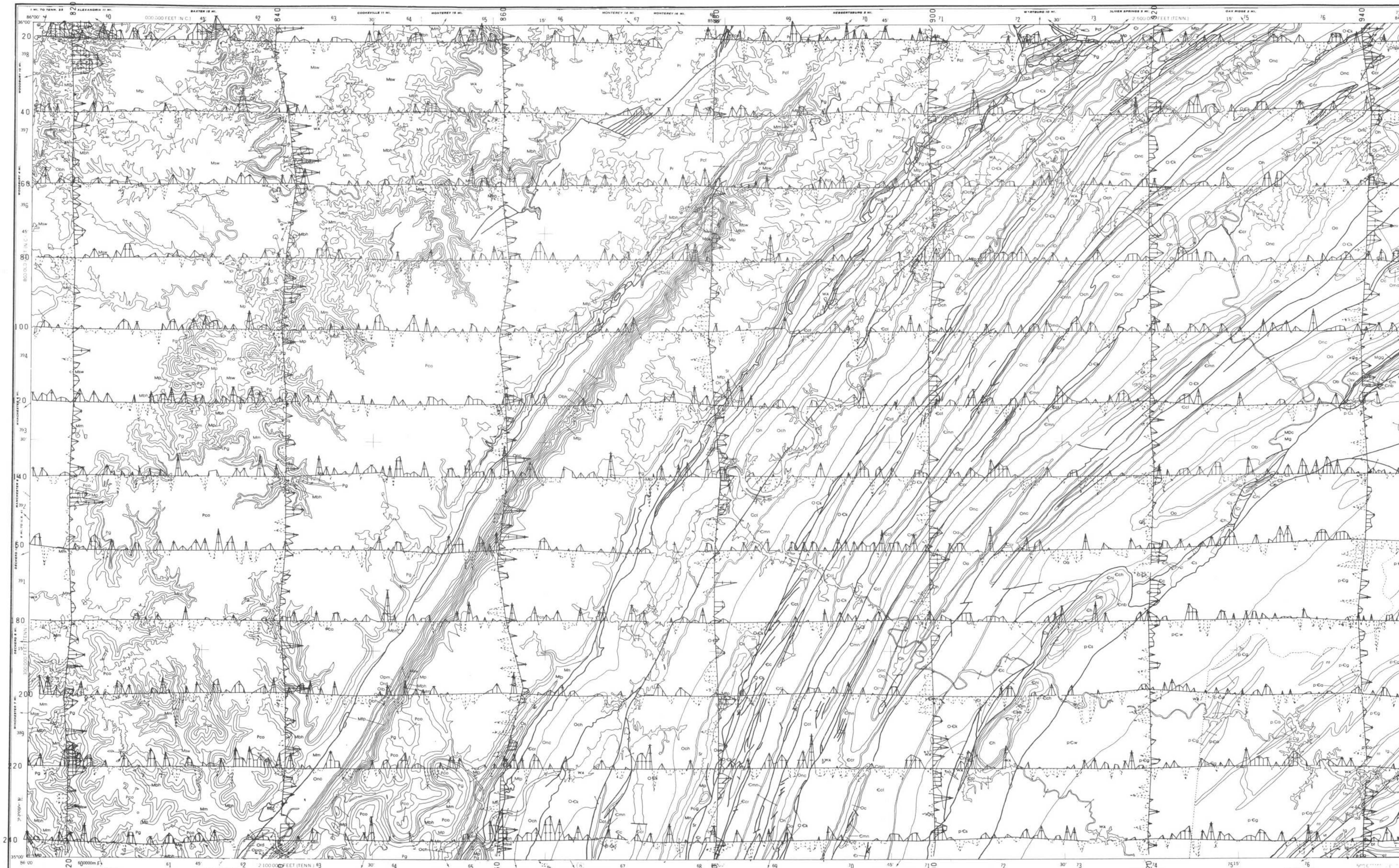
CHATTANOOGA NI16-3 APPALACHIAN BASIN SURVEY 1979



PROFILE MAP U/TH 1.0 S.D./DIV. TEXAS INSTRUMENTS

5 0 5 10 15 MILES

10 0 10 20 30 KILOMETERS

LEGEND: POSITIVE SIGNIFICANCE FACTORS—SOLID LINES
NEGATIVE SIGNIFICANCE FACTORS—DOTTED LINES

AERIAL RADIOMETRIC AND MAGNETIC RECONNAISSANCE SURVEY

PREPARED BY
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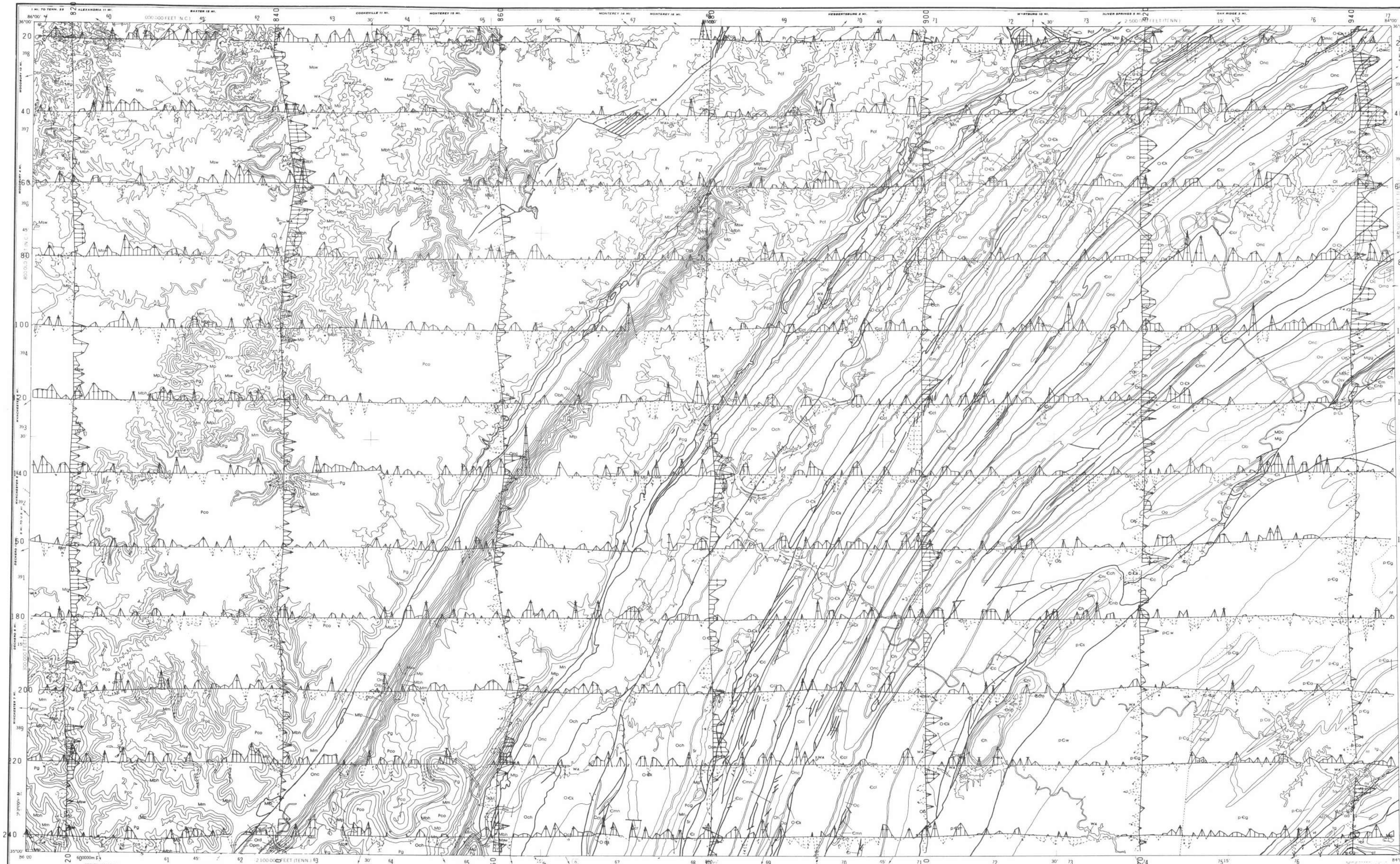
M-3

CHATTANOOGA NI16-3 APPALACHIAN BASIN SURVEY 1979



PROFILE MAP U/K 1.0 S.D./DIV. TEXAS INSTRUMENTS

5 0 5 10 15 MILES

10 0 10 20 30 KILOMETERS

LEGEND: POSITIVE SIGNIFICANCE FACTORS—SOLID LINES
NEGATIVE SIGNIFICANCE FACTORS—DOTTED LINES

AERIAL RADIOMETRIC AND MAGNETIC RECONNAISSANCE SURVEY

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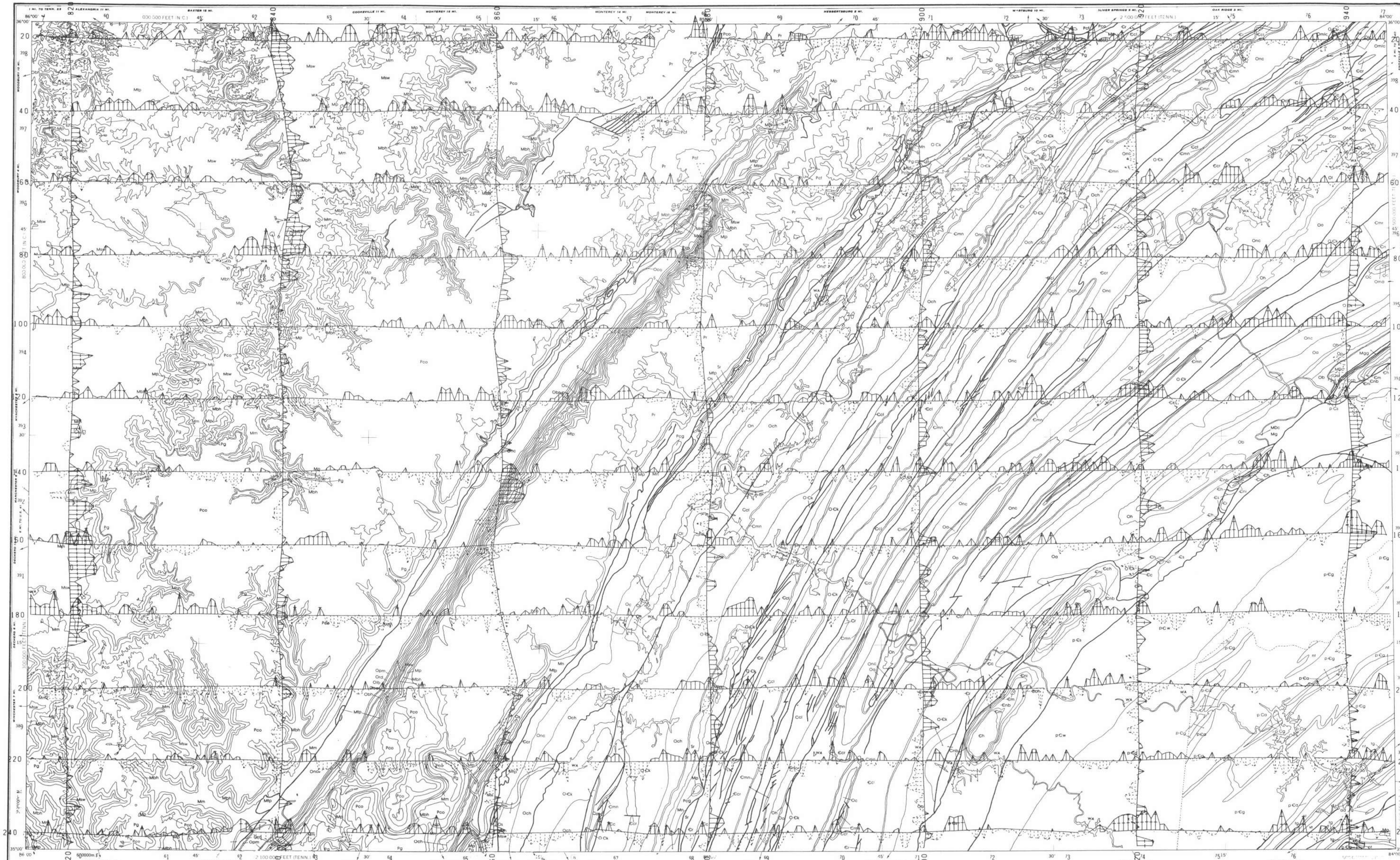
CHATTANOOGA NI16-3 APPALACHIAN BASIN SURVEY 1979



PROFILE MAP THORIUM 1.0 S.D./DIV. TEXAS INSTRUMENTS

5 0 5 10 15 MILES

10 0 10 20 30 KILOMETERS

LEGEND: POSITIVE SIGNIFICANCE FACTORS—SOLID LINES
NEGATIVE SIGNIFICANCE FACTORS—DOTTED LINES

AERIAL RADIOMETRIC AND MAGNETIC RECONNAISSANCE SURVEY
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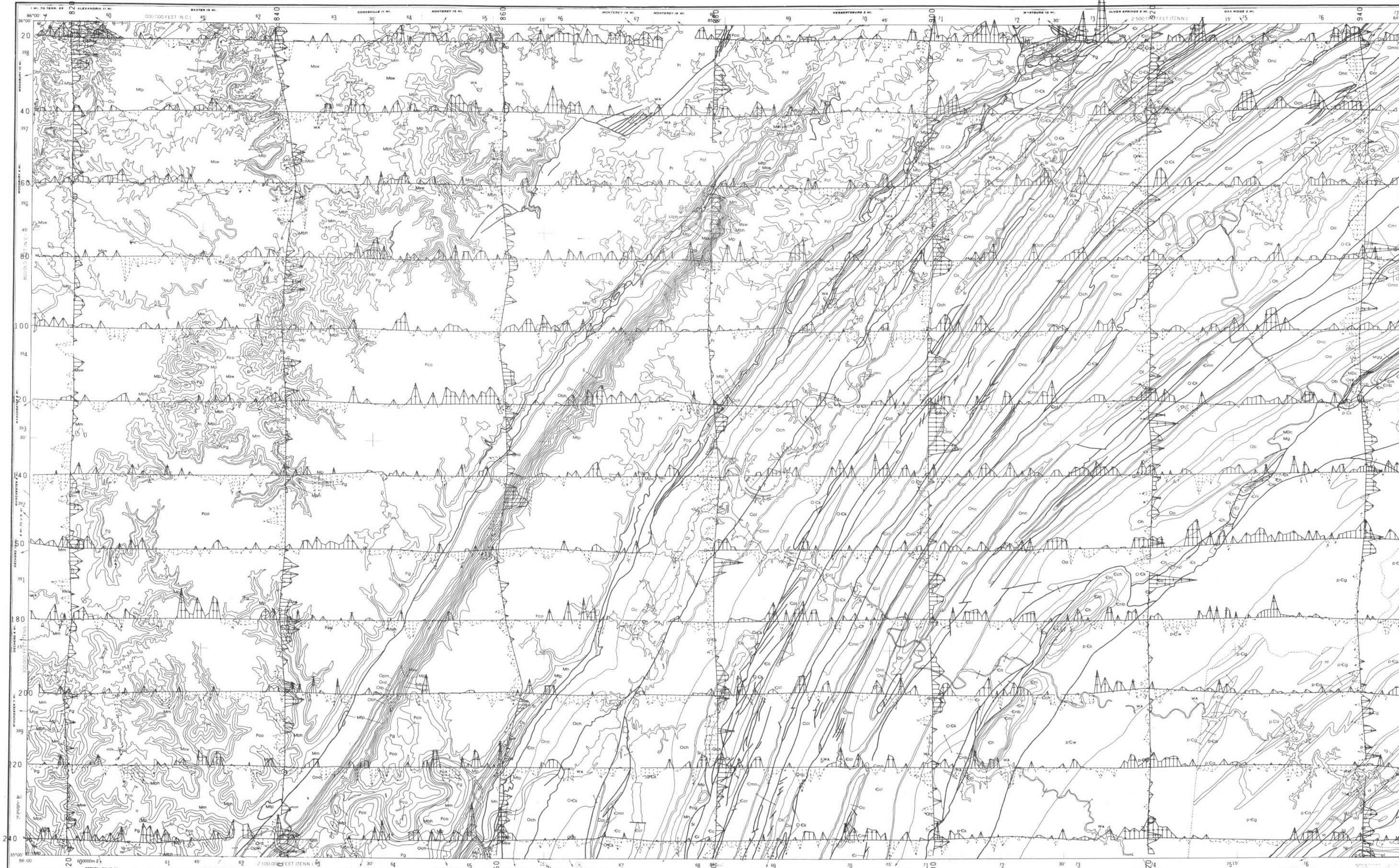
CHATTANOOGA NI16-3 APPALACHIAN BASIN SURVEY 1979



PROFILE MAP POTASSIUM 1.0 S.D./DIV. TEXAS INSTRUMENTS

5 0 5 10 15 MILES

10 0 10 20 30 KILOMETERS

LEGEND: POSITIVE SIGNIFICANCE FACTORS—SOLID LINES
NEGATIVE SIGNIFICANCE FACTORS—DOTTED LINES

AERIAL RADIOMETRIC AND MAGNETIC RECONNAISSANCE SURVEY

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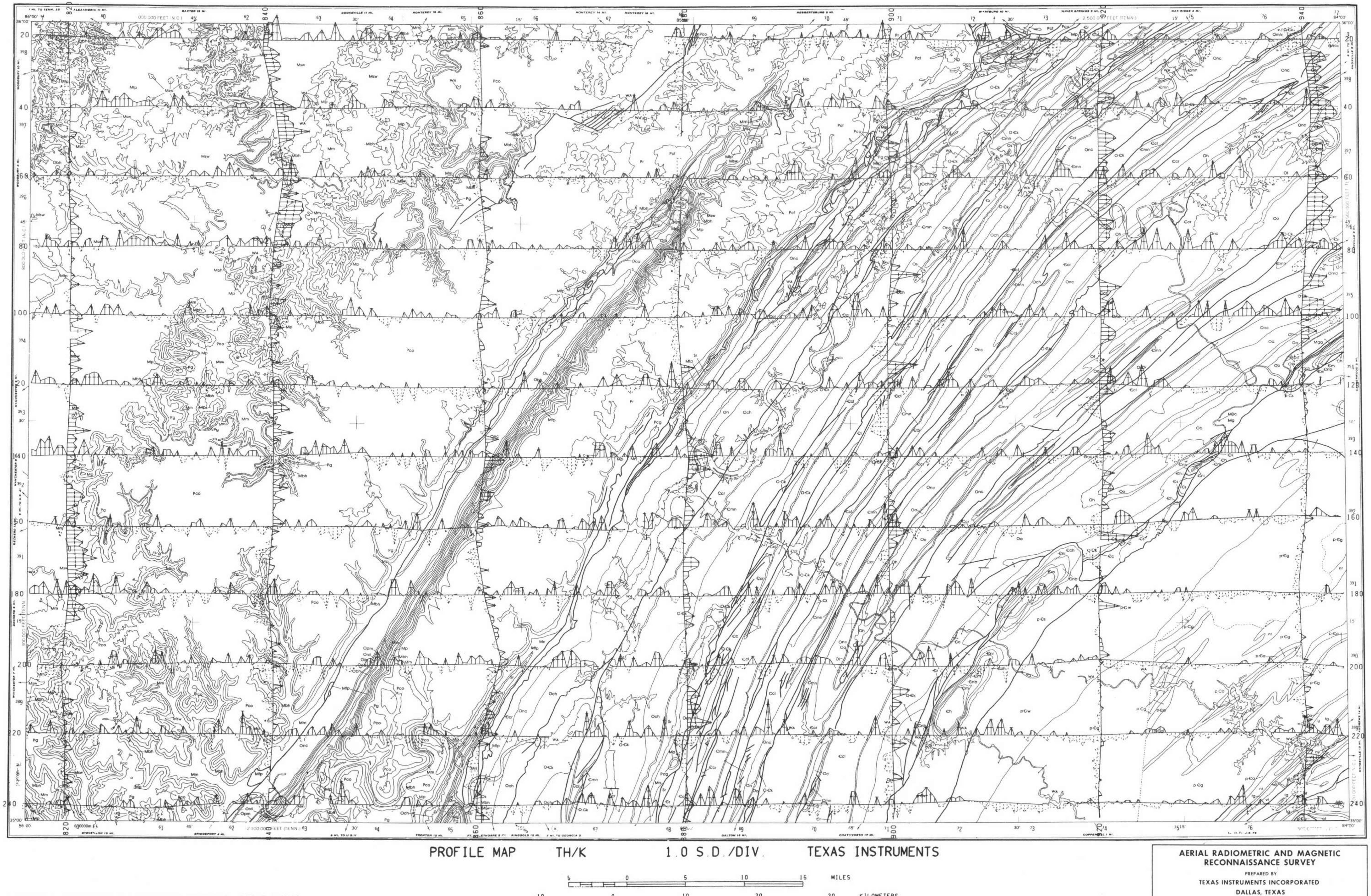
CHATTANOOGA NI16-3 APPALACHIAN BASIN SURVEY 1979



PROFILE MAP TH/K 1.0 S.D./DIV. TEXAS INSTRUMENTS

LEGEND: POSITIVE SIGNIFICANCE FACTORS—SOLID LINES
NEGATIVE SIGNIFICANCE FACTORS—DOTTED LINES

AERIAL RADIOMETRIC AND MAGNETIC RECONNAISSANCE SURVEY
PREPARED BY
TEXAS INSTRUMENTS INCORPORATED
DALLAS, TEXAS
1979
WORK PERFORMED UNDER
BENDIX FIELD ENGINEERING CORPORATION
SUBCONTRACT NO. 79-319-L
PREPARED FOR
U.S. DEPARTMENT OF ENERGY

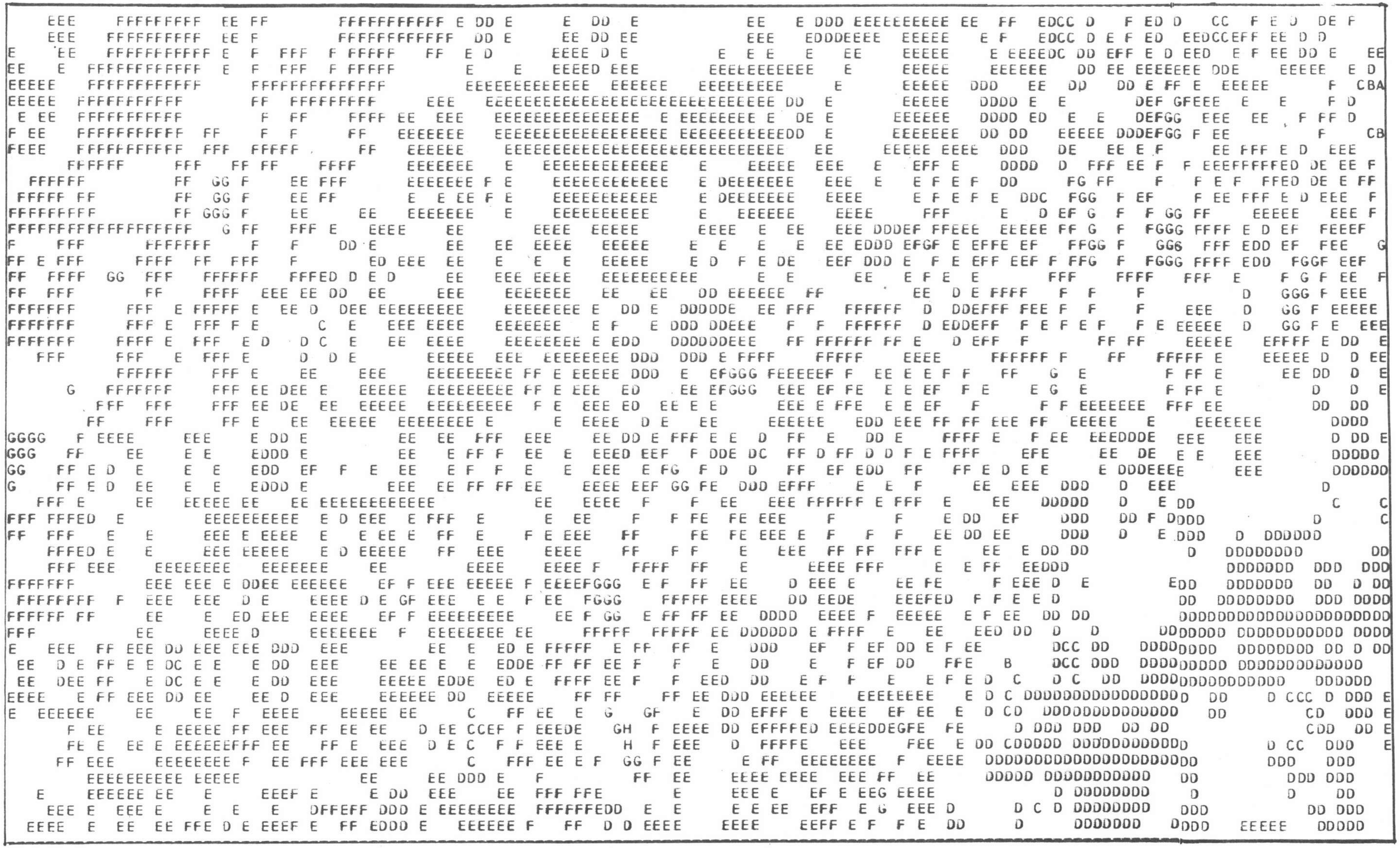
CHATTANOOGA NI16-3 APPALACHIAN BASIN SURVEY

URANIUM PRINTER PLOT CONTOUR MAP 1:500,000 SCALE TEXAS INSTRUMENTS

CHATTANOOGA NI16-3 APPALACHIAN BASIN SURVEY

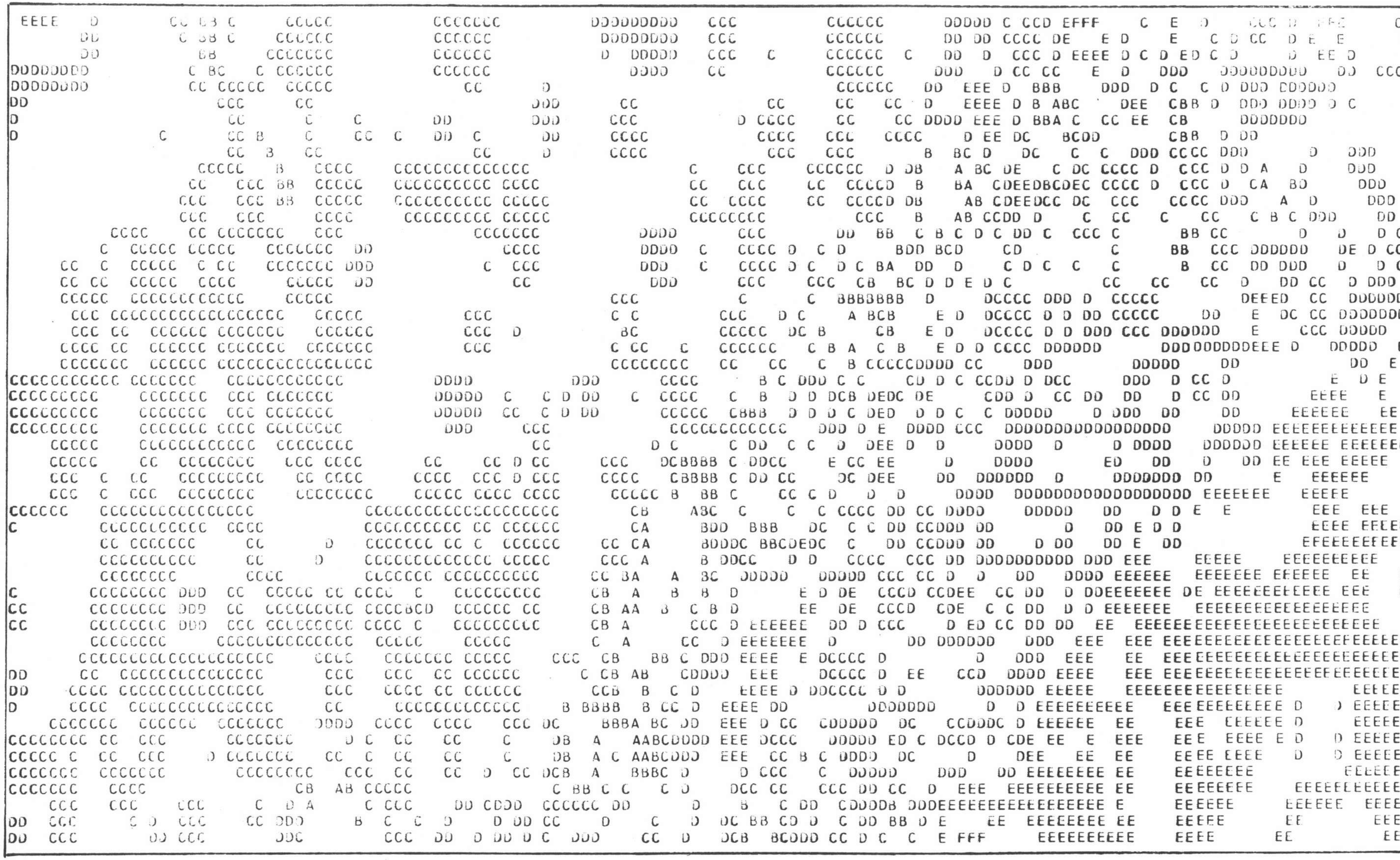
U/Th PRINTER PLOT CONTOUR MAP 1:500,000 SCALE TEXAS INSTRUMENTS

CHATTANOOGA NI16-3 APPALACHIAN BASIN SURVEY



U/K PRINTER PLOT CONTOUR MAP 1:500,000 SCALE TEXAS INSTRUMENTS

THORIUM PRINTER PLOT CONTOUR MAP 1:500,000 SCALE TEXAS INSTRUMENTS



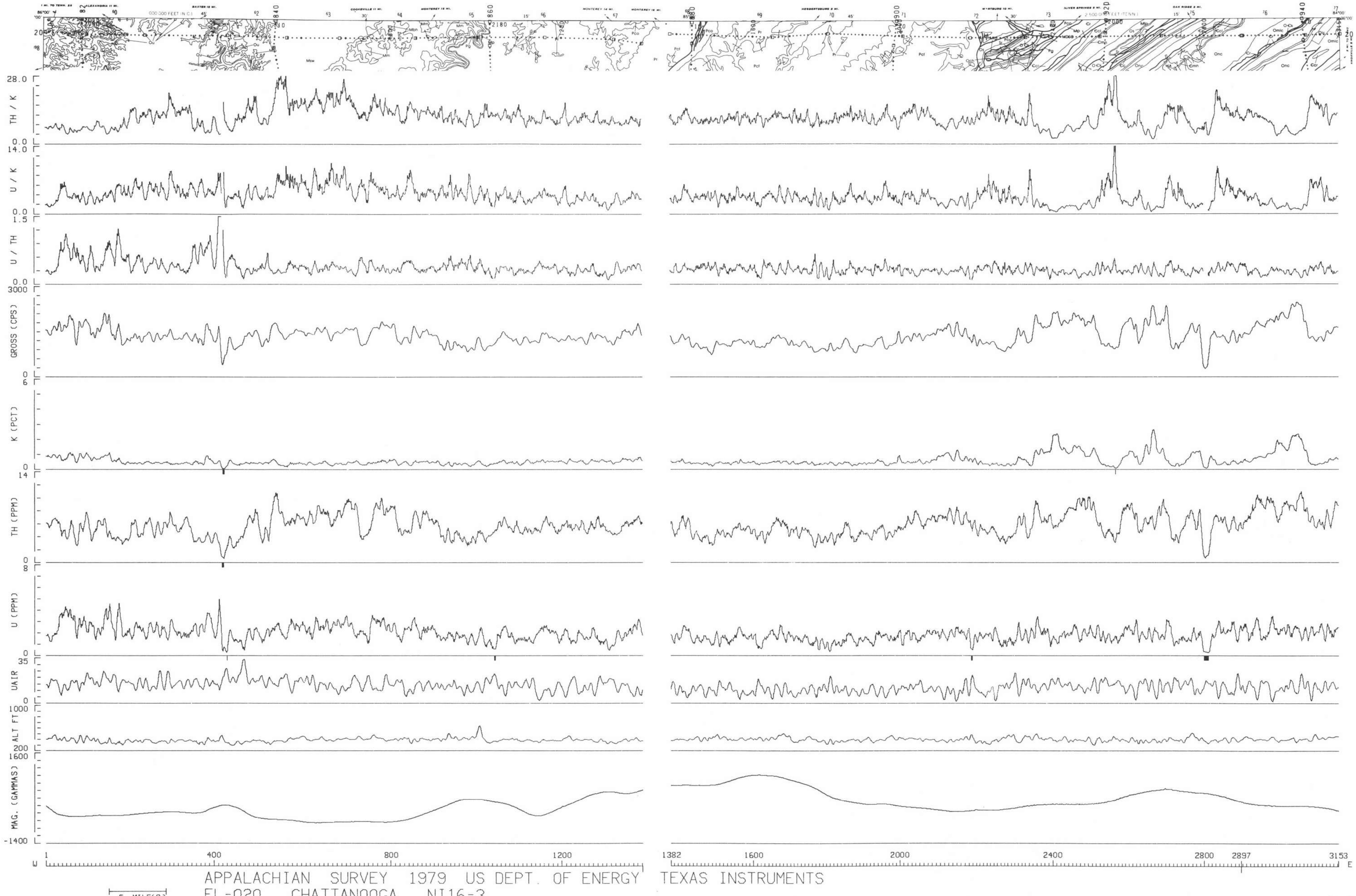
POTASSIUM PRINTER PLOT CONTOUR MAP 1:500,000 SCALE TEXAS INSTRUMENTS

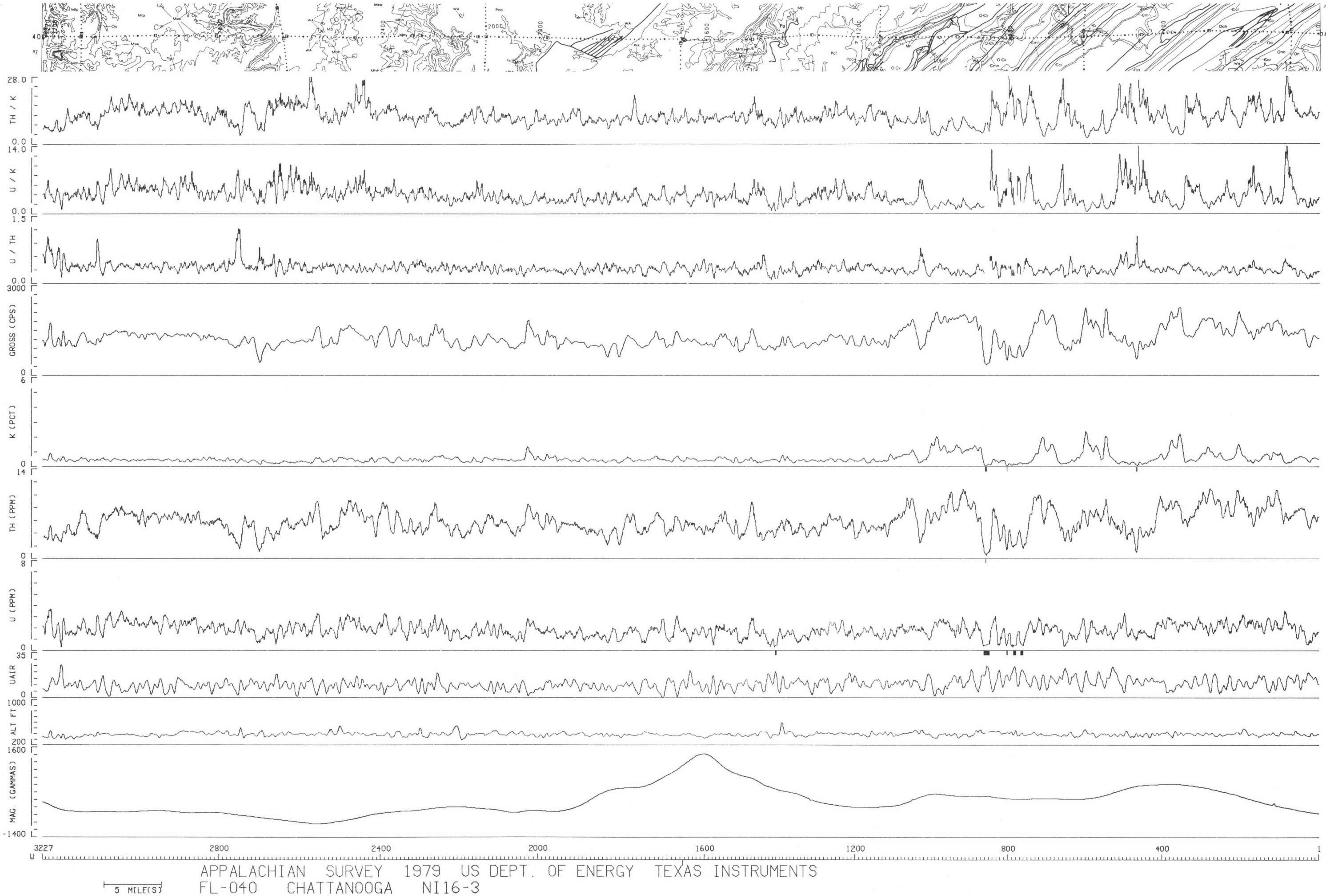
Th/K PRINTER PLOT CONTOUR MAP 1:500,000 SCALE TEXAS INSTRUMENTS

CHATTANOOGA NI16-3 APPALACHIAN BASIN SURVEY

CONTOUR INTERVAL 100 GAMMAS
MINIMUM CONTOUR -1500 GAMMAS
MAXIMUM CONTOUR 1800 GAMMAS

RESIDUAL MAGNETIC PRINTER PLOT CONTOUR MAP 1:500,000 SCALE TEXAS INSTRUMENTS


TH / K
U / K
U / TH
GROSS (CPS)
K (PCT)
TH (PPM)
U (PPM)
UAIR
ALT FT
MAG. (GAMMAS)
W
E
APPALACHIAN SURVEY 1979 US DEPT. OF ENERGY TEXAS INSTRUMENTS
5 MILE(S)
FL-020 CHATTANOOGA NI16-3



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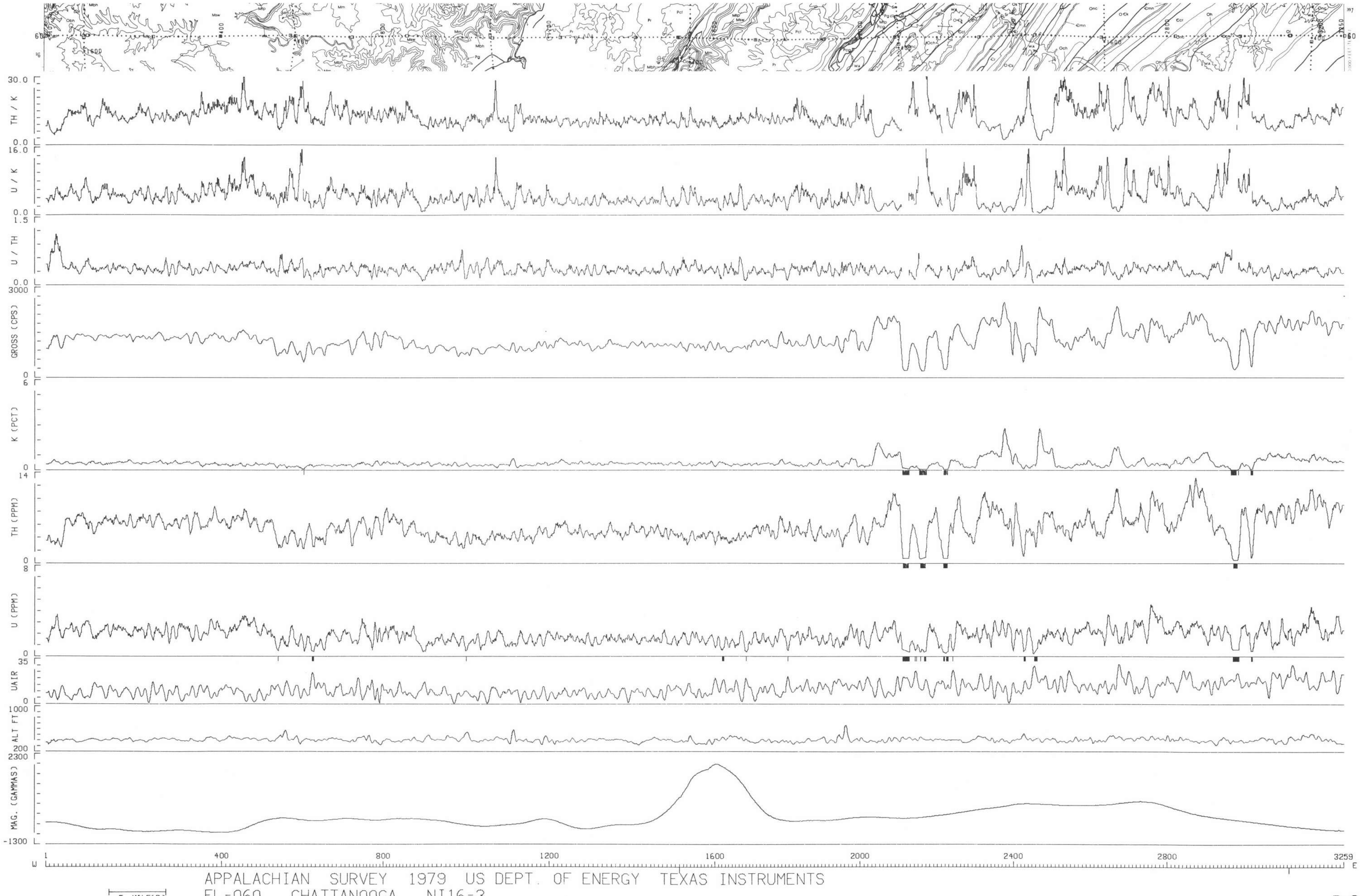
FL-040 CHATTANOOGA NI16-3



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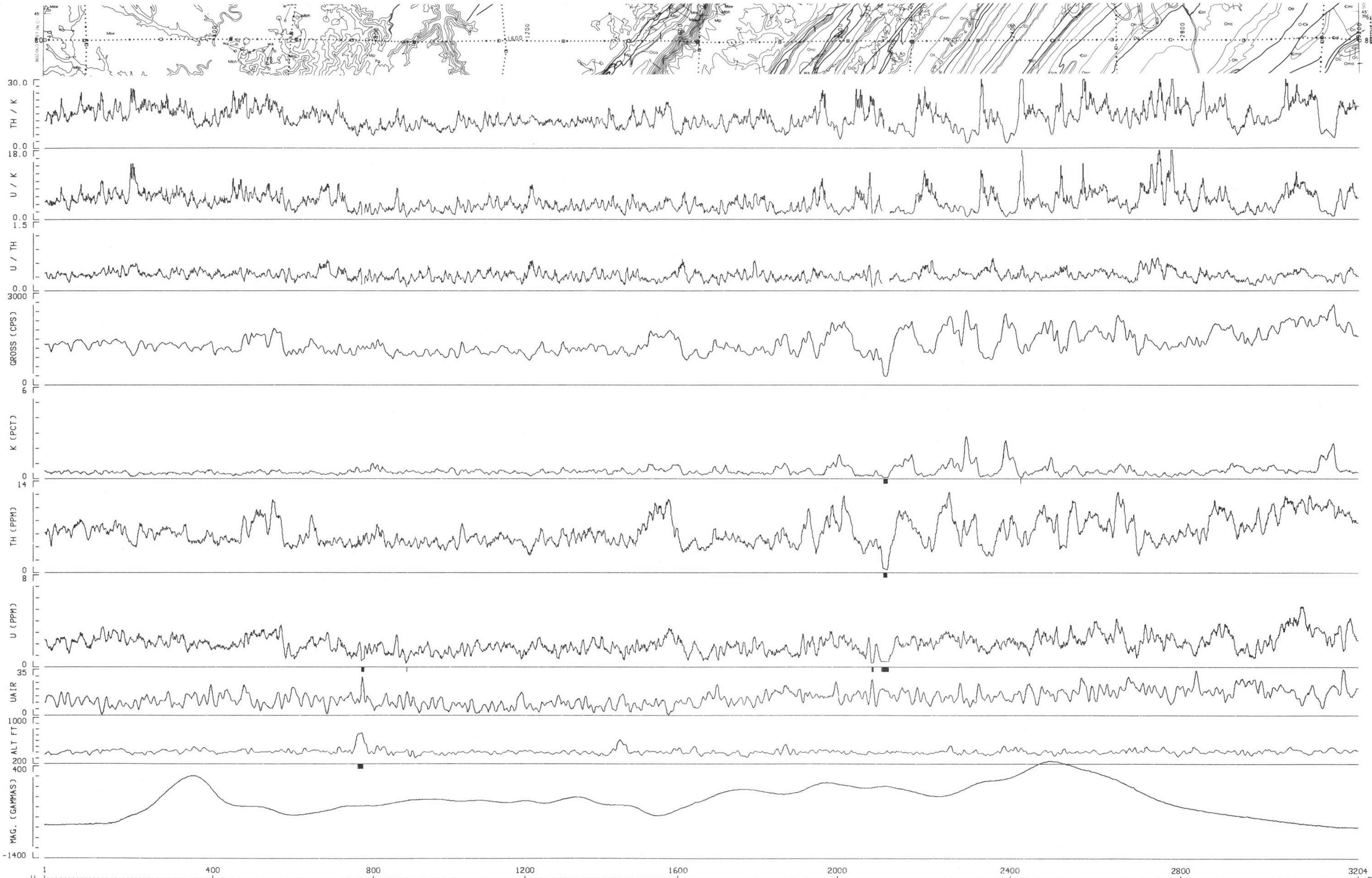
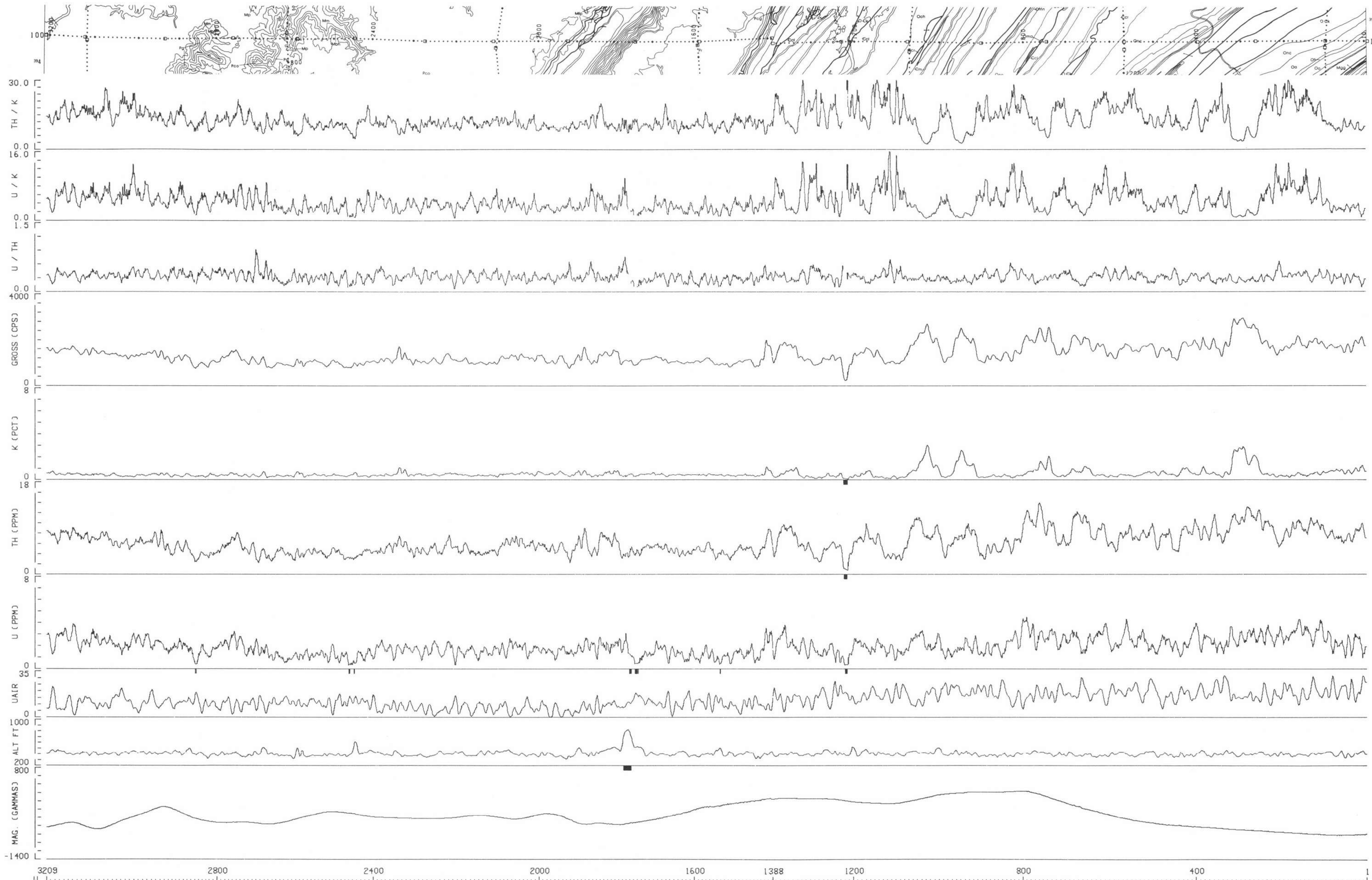
FL-060 CHATTANOOGA NI16-3



5 MILE(S)

APPALACHIAN SURVEY 1979 US DEPT. OF ENERGY TEXAS INSTRUMENTS

FL-080 CHATTANOOGA NI16-3



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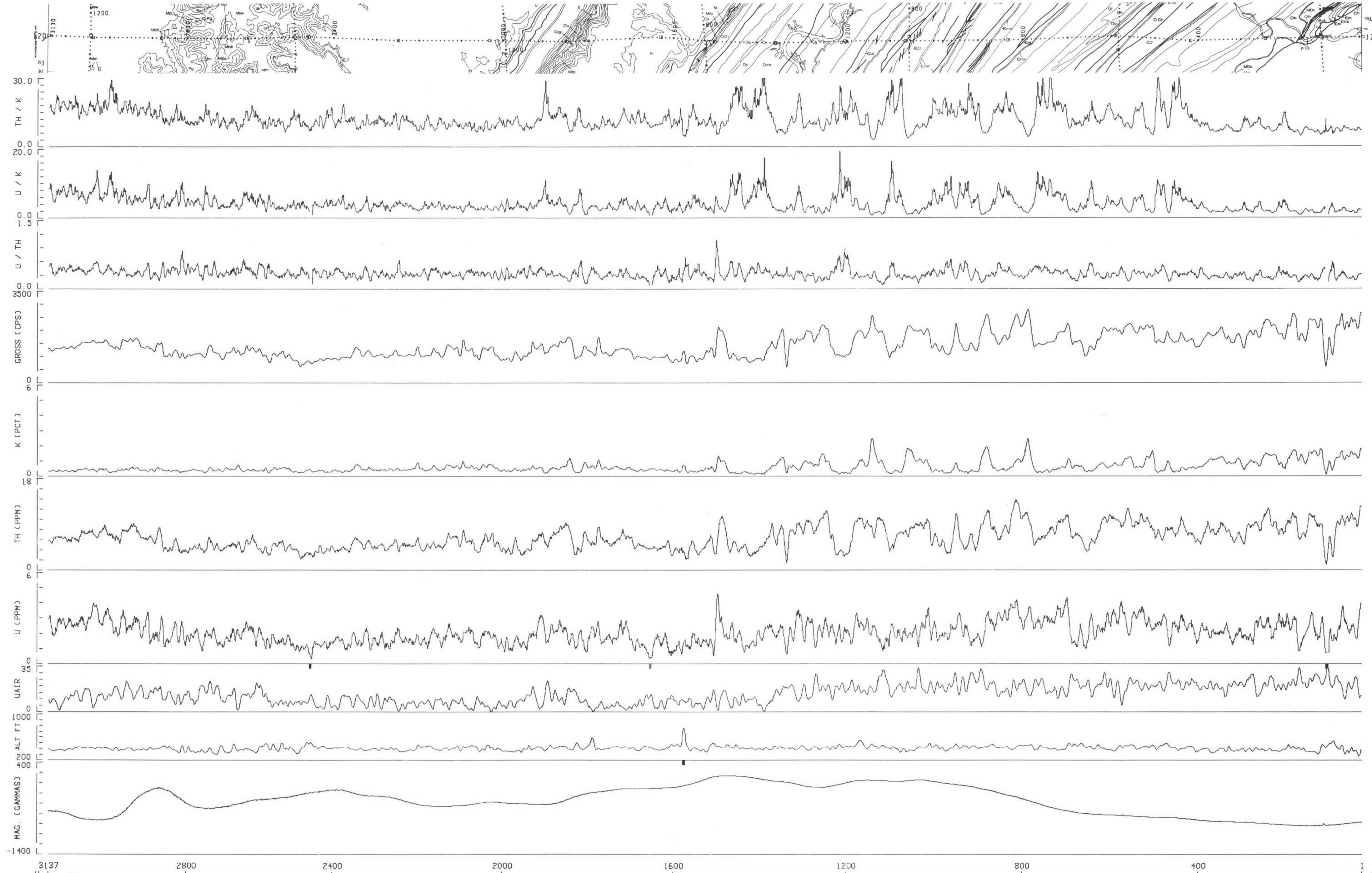
5 MILE(S) FL-100 CHATTANOOGA NI16-3



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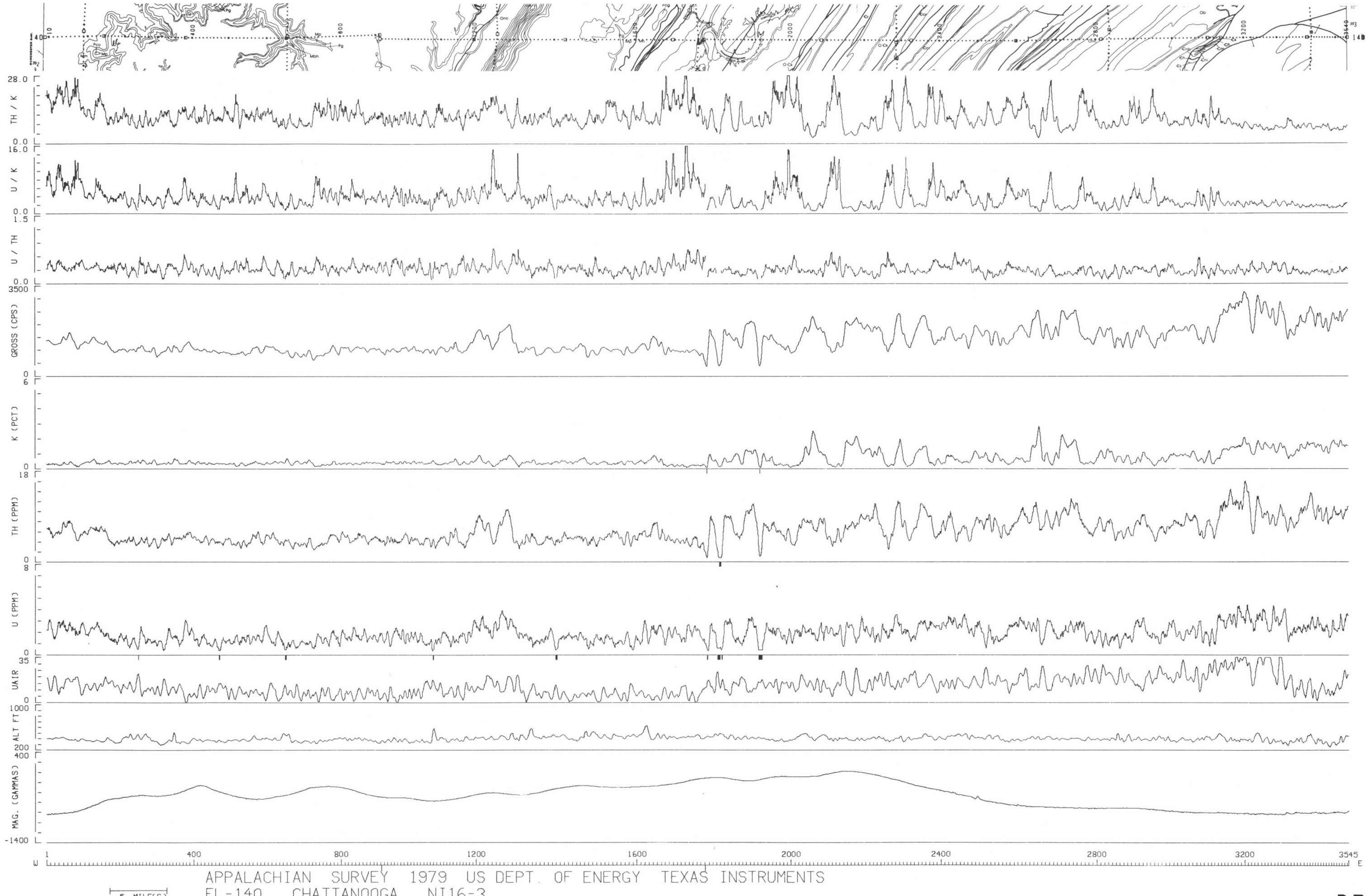
FL-120 CHATTANOOGA NI16-3



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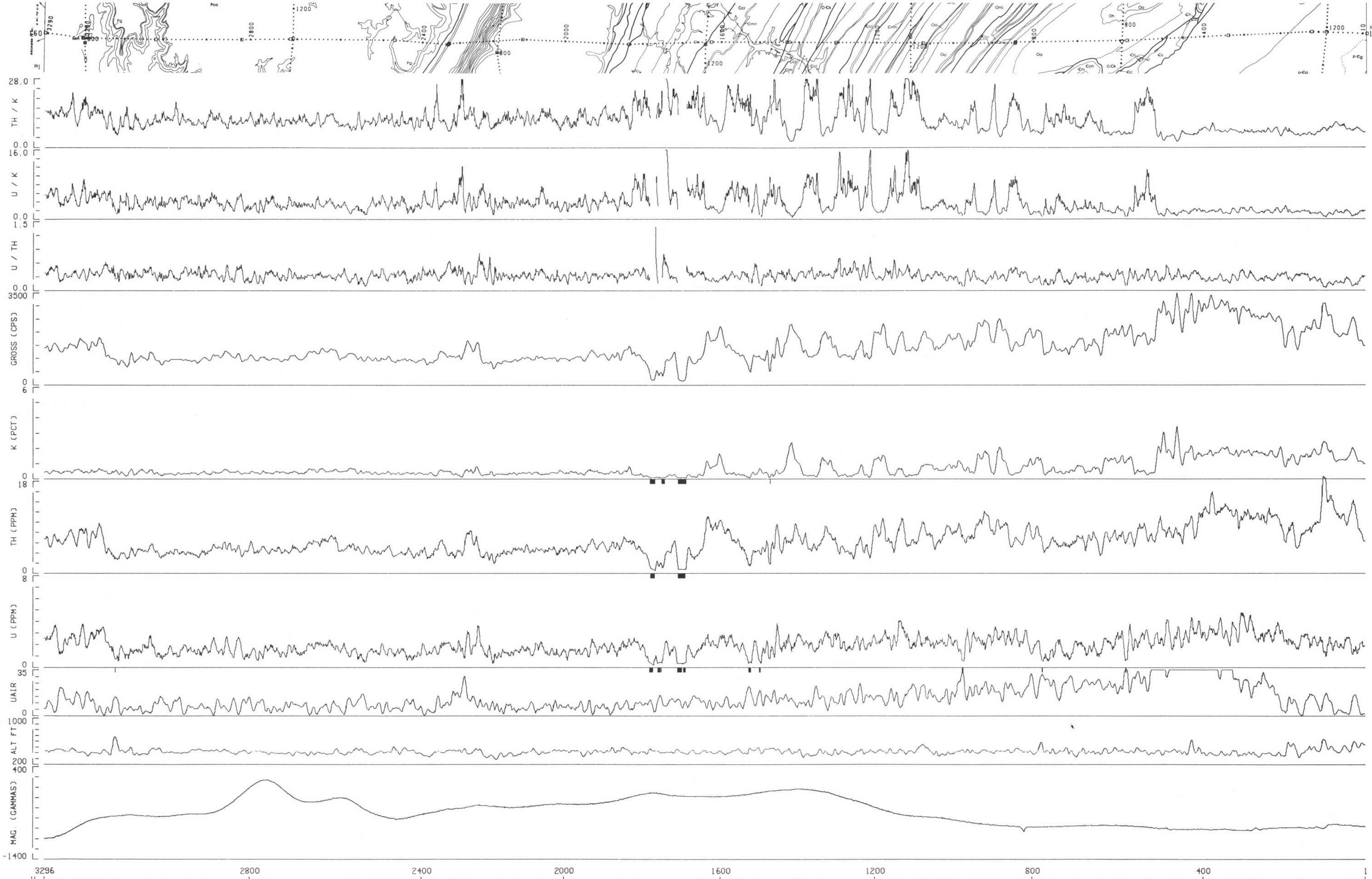
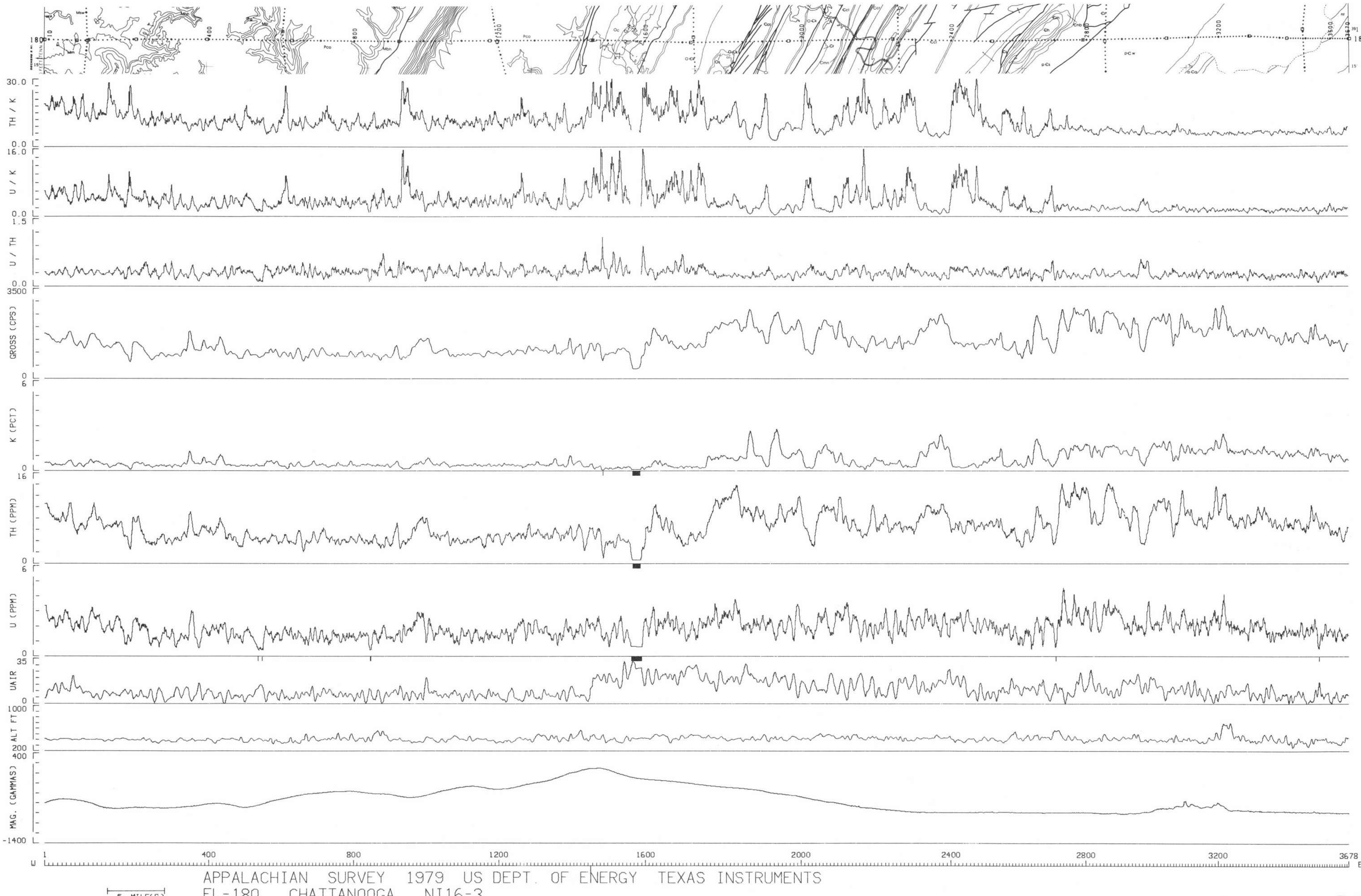
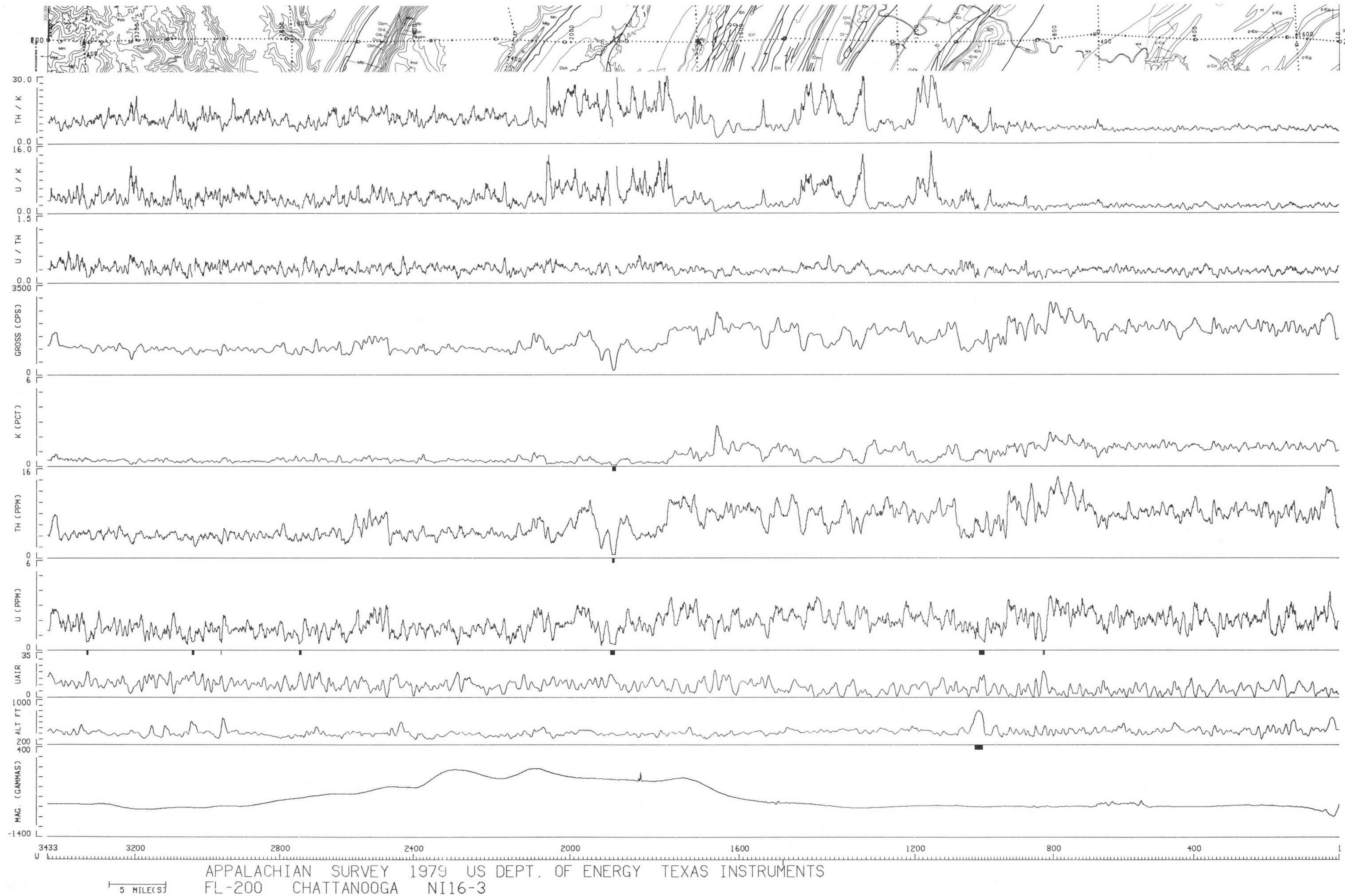
FL-140 CHATTANOOGA NI16-3



APPALACHIAN SURVEY 1979 US DEPT. OF ENERGY TEXAS INSTRUMENTS

FL-160 CHATTANOOGA NI16-3


TH / K
U / K
U / TH
GROSS (CPS)
K (PCT)
TH (PPM)
U (PPM)
UAIR
ALT FT
MAG. (GAMMAS)
W
E
APPALACHIAN SURVEY 1979 US DEPT. OF ENERGY TEXAS INSTRUMENTS
FL-180 CHATTANOOGA NI16-3
5 MILE(S)



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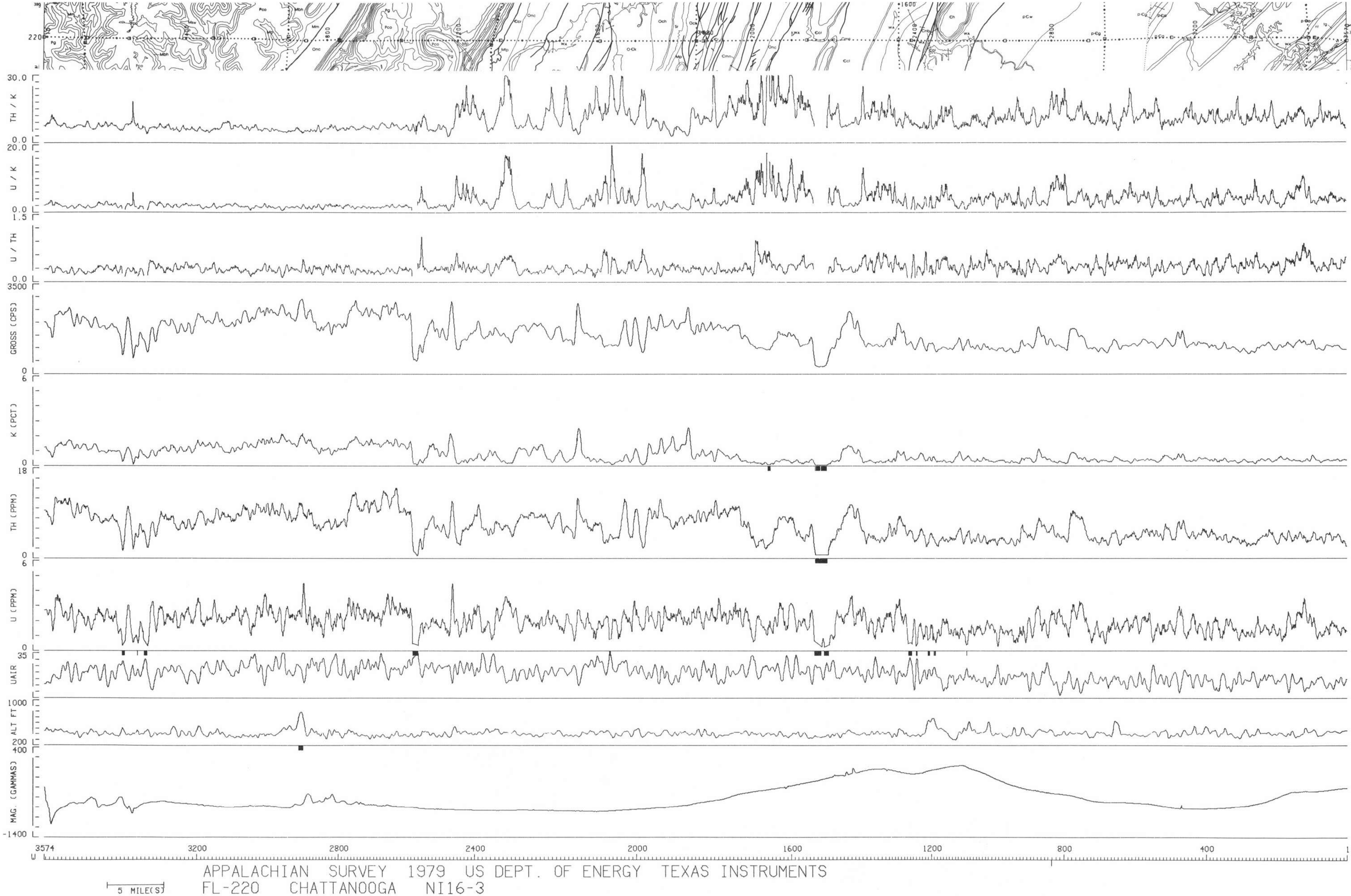
FL-200 CHATTANOOGA NI16-3



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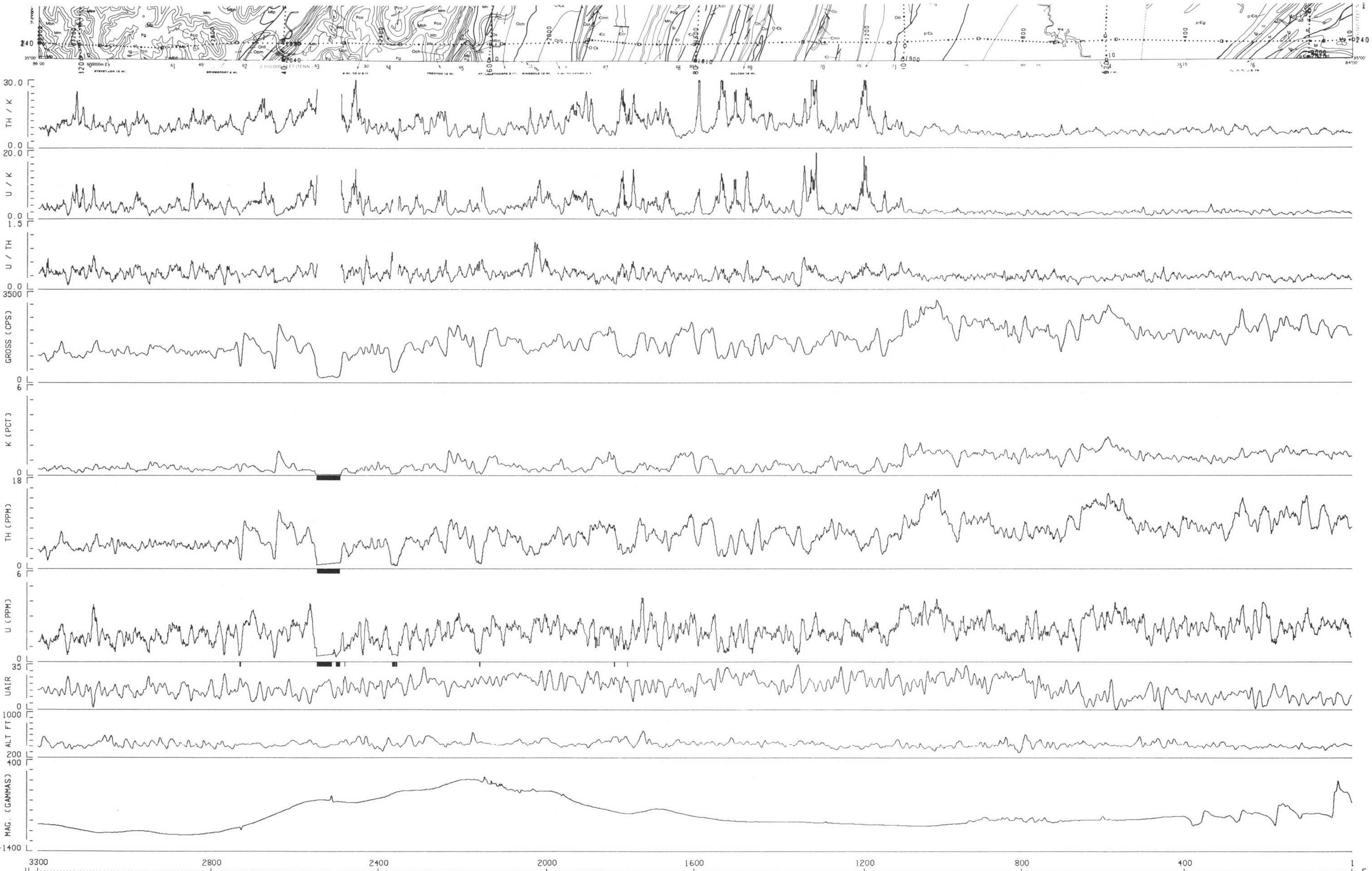
FL-220 CHATTANOOGA NI16-3



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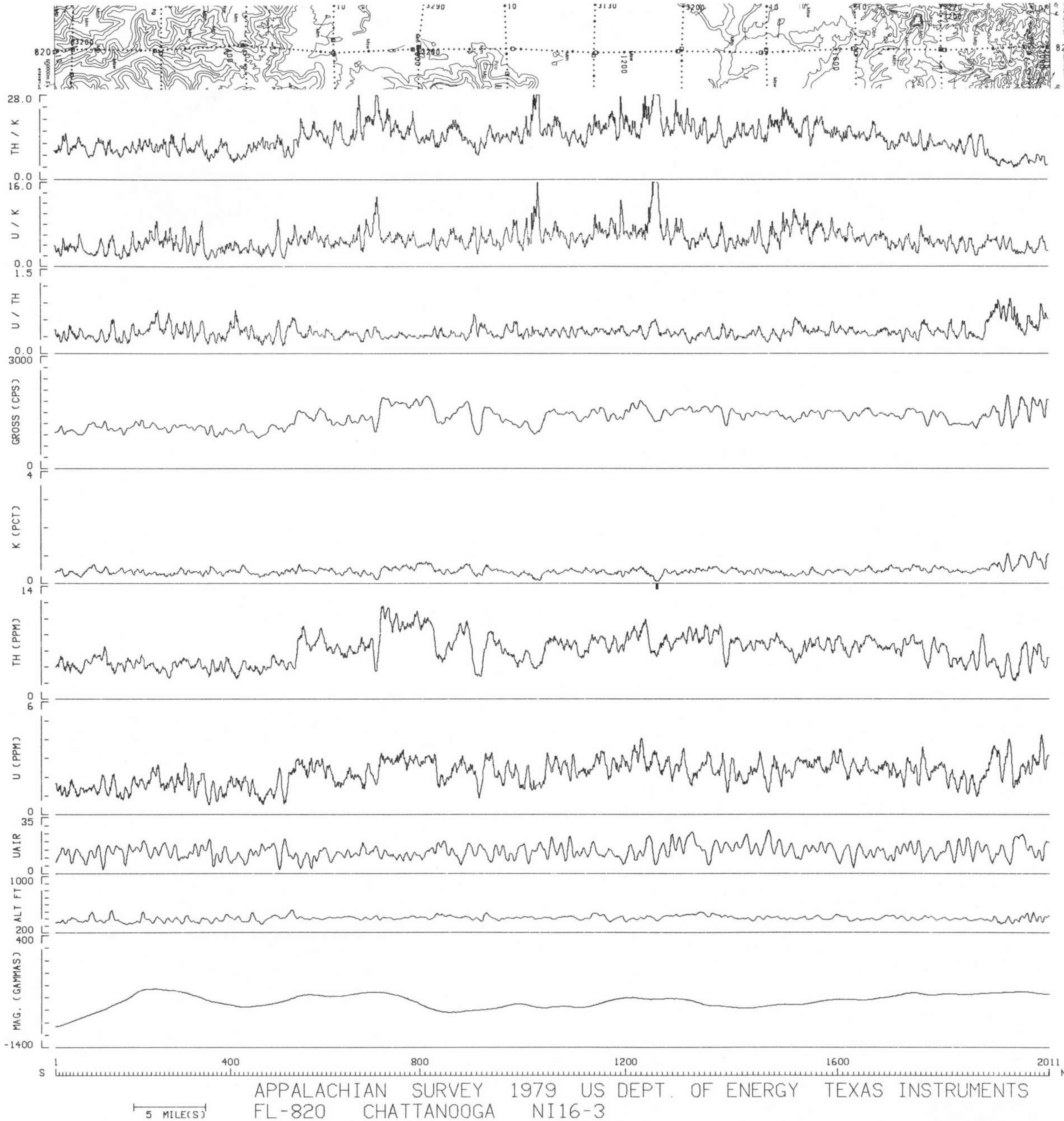
FL-240 CHATTANOOGA NI16-3



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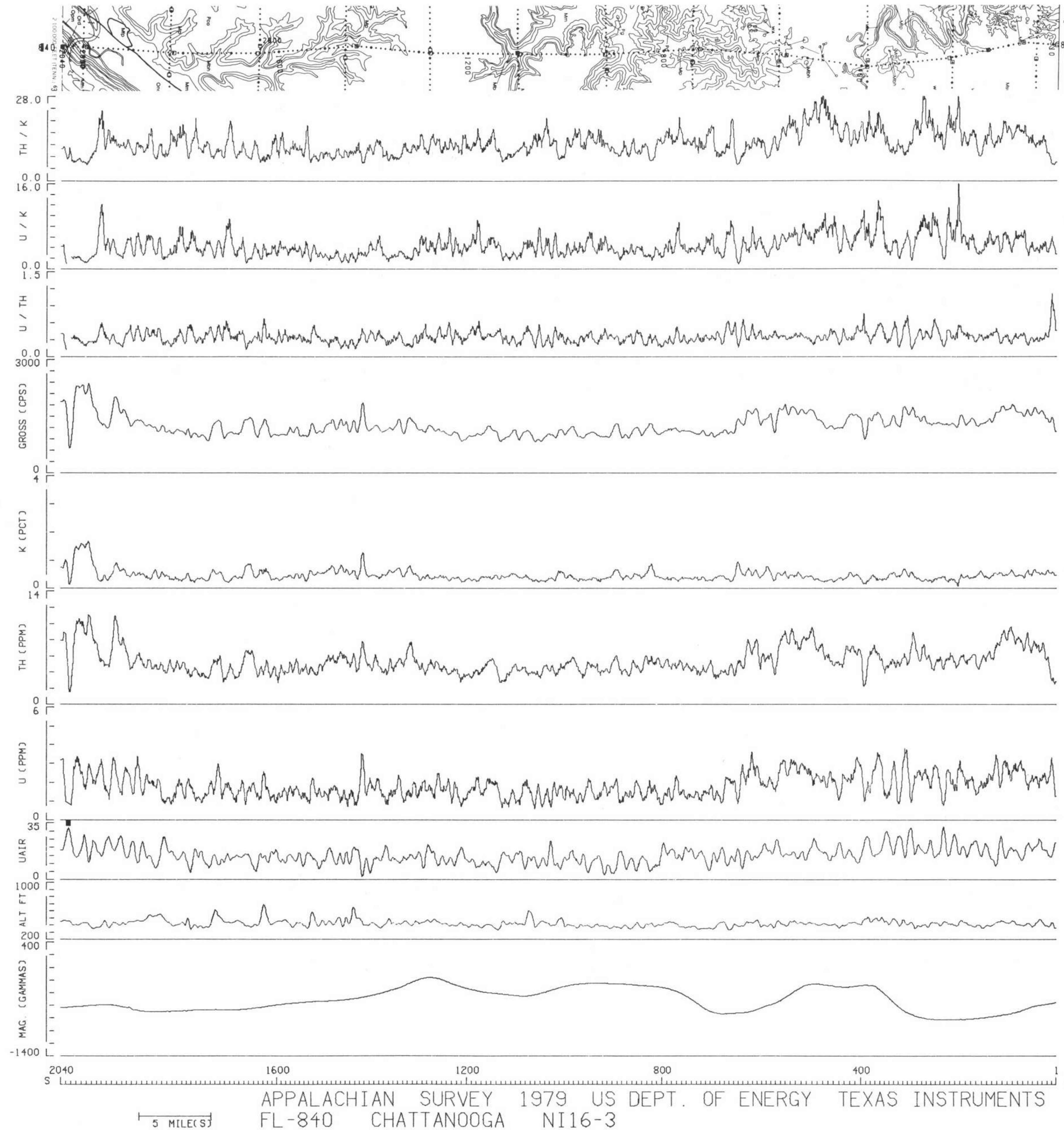
FL-820 CHATTANOOGA NI16-3



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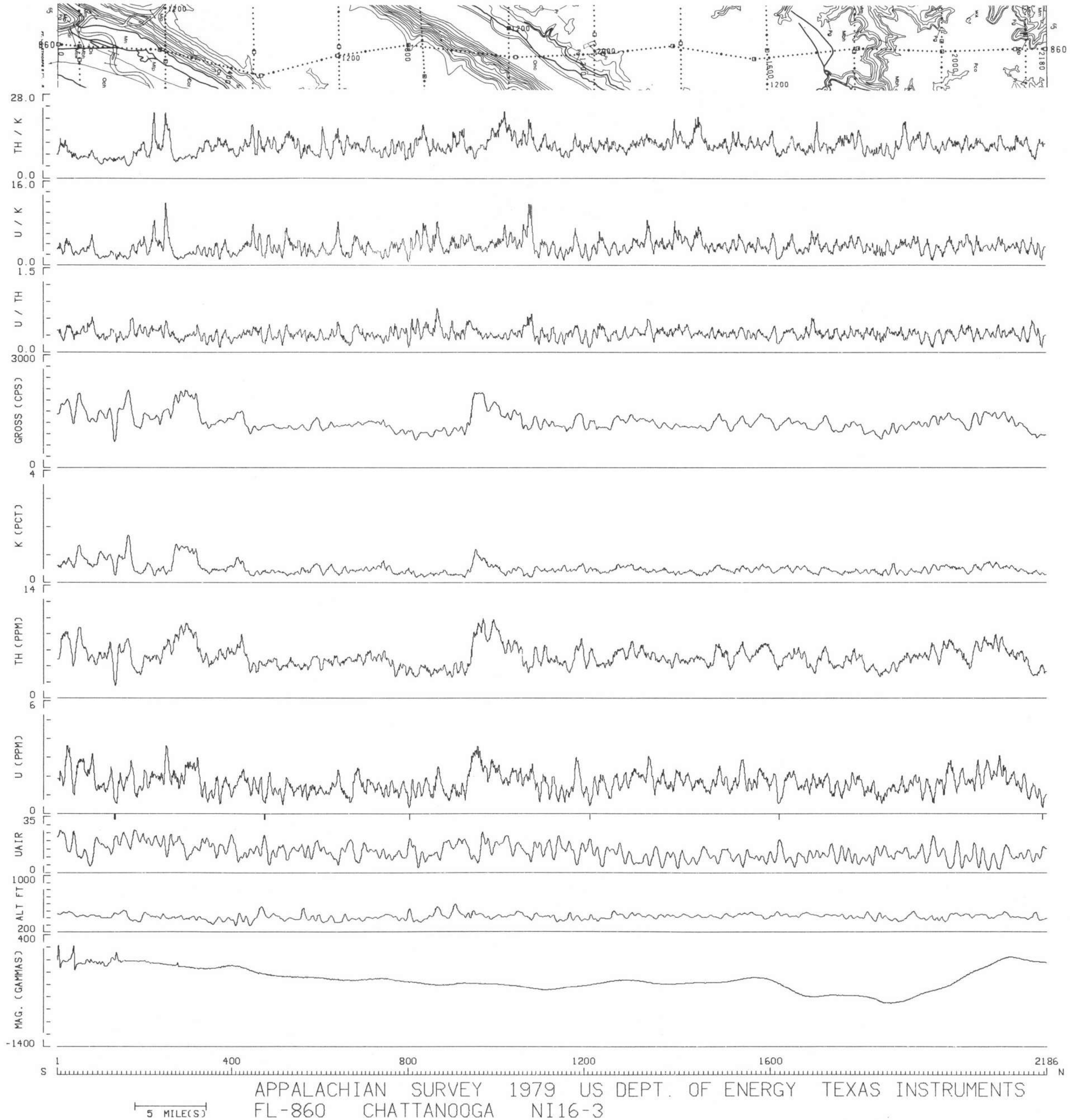
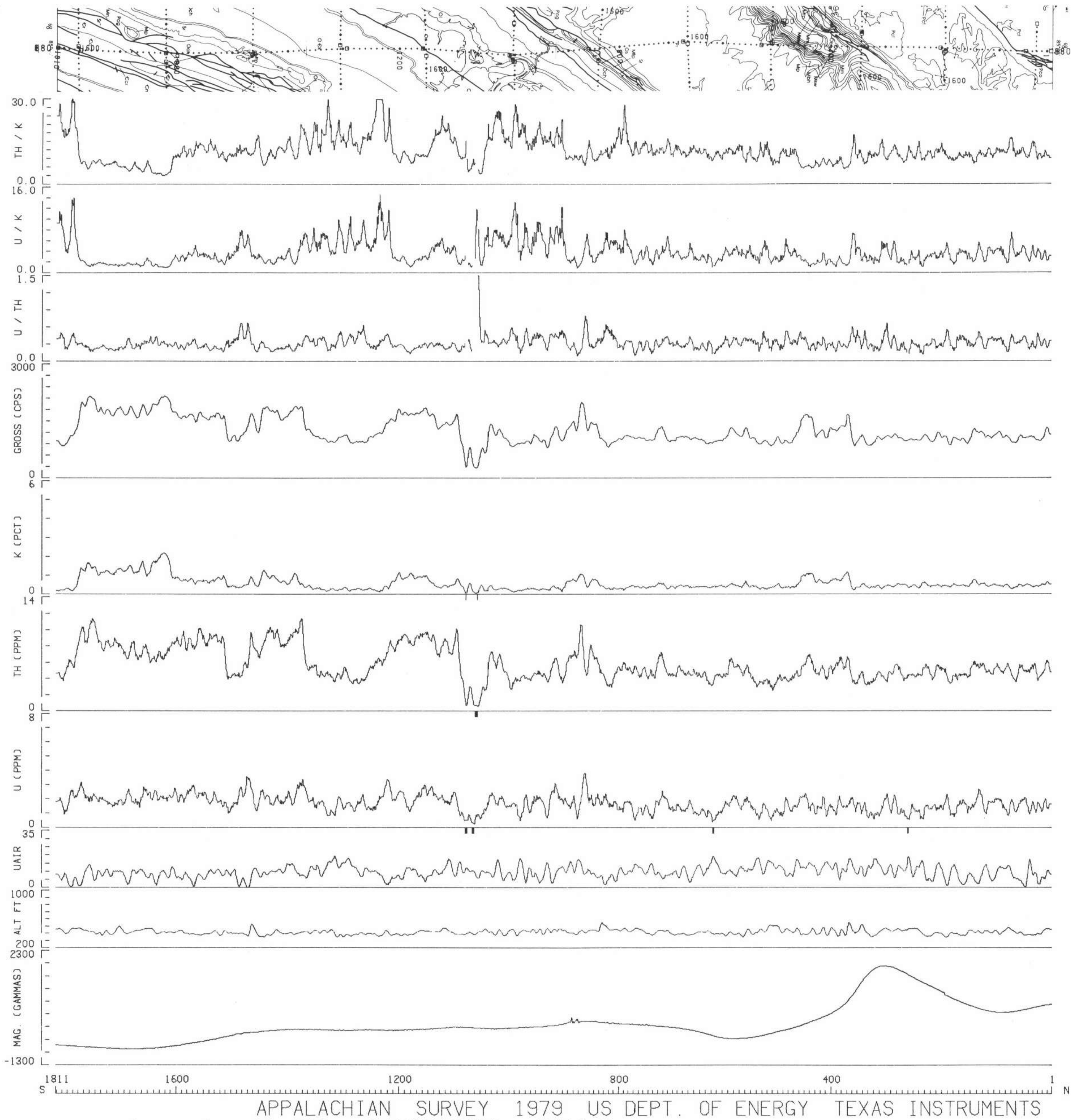
FL-840 CHATTANOOGA NI16-3



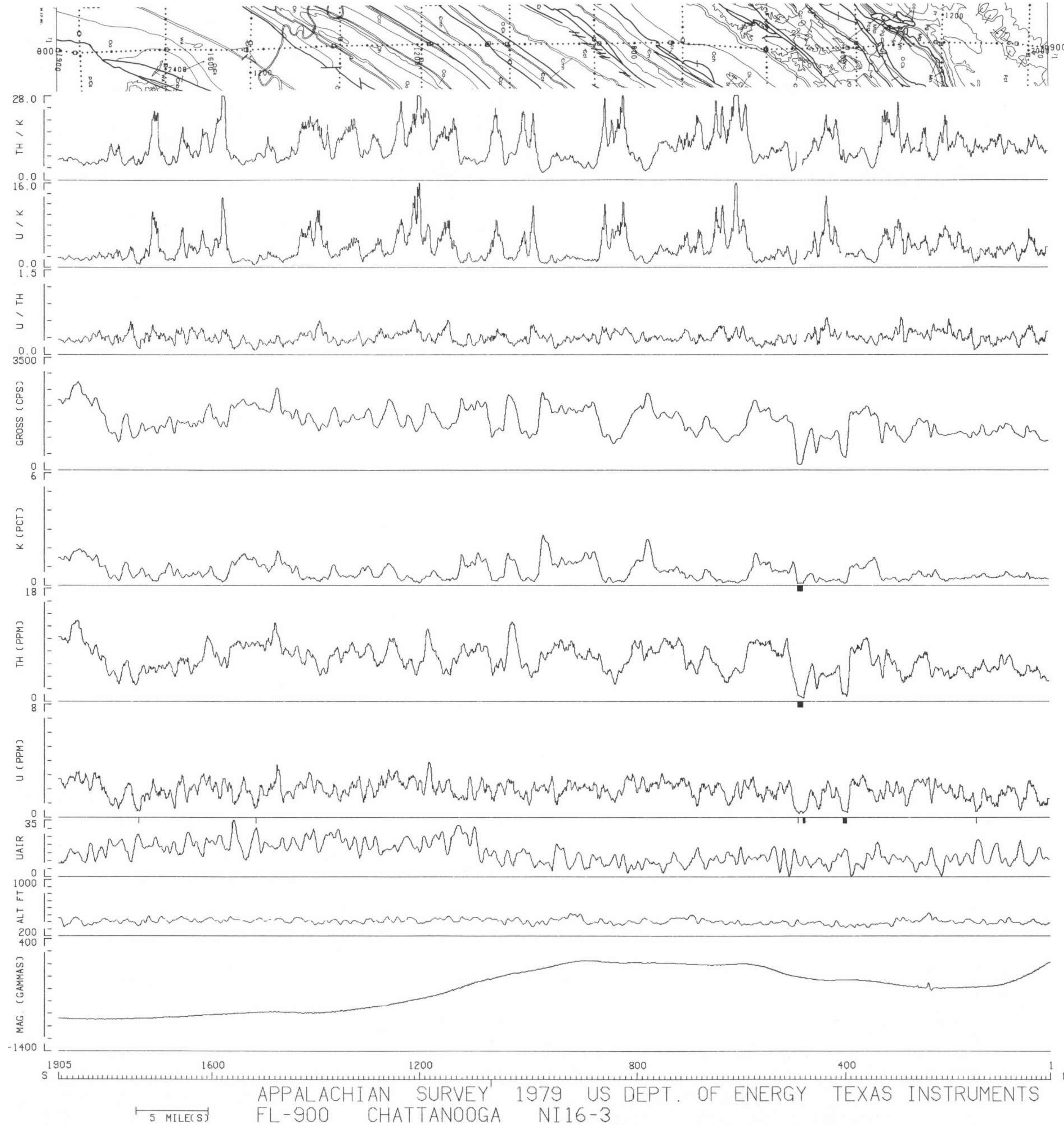
APPALACHIAN SURVEY 1979 US DEPT. OF ENERGY TEXAS INSTRUMENTS

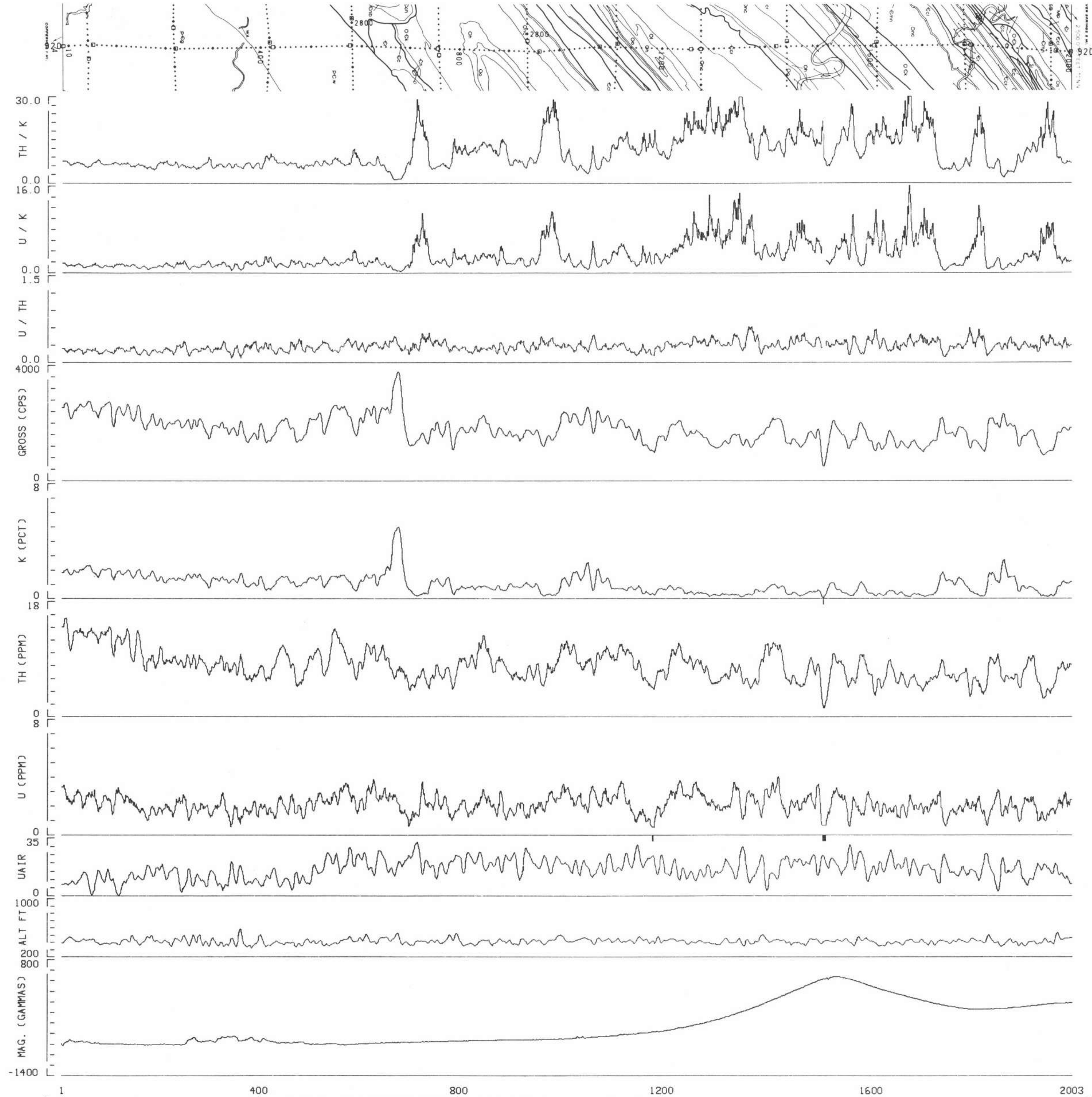
FL-860 CHATTANOOGA NI16-3



APPALACHIAN SURVEY 1979 US DEPT. OF ENERGY TEXAS INSTRUMENTS

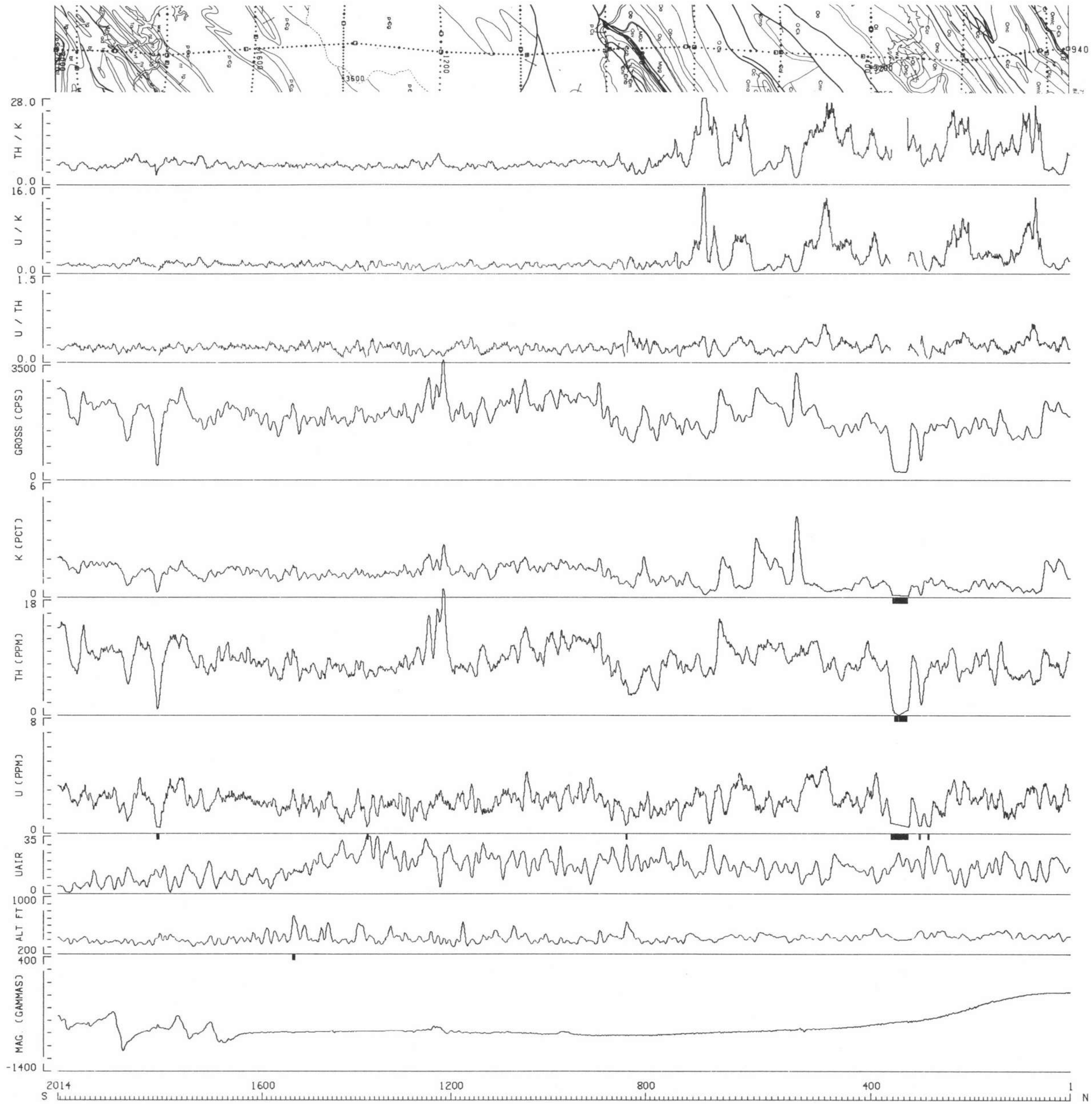
FL-880 CHATTANOOGA NI16-3


TH / K
U / K
U / TH
GROSS (CPS)
K (PCT)
TH (PPM)
U (PPM)
UAIR
ALT FT
MAG. (GAMMAS)
1905
1600
1200
800
400
1
S
N
5 MILE(S)
APPALACHIAN SURVEY 1979 US DEPT. OF ENERGY TEXAS INSTRUMENTS
FL-900 CHATTANOOGA NI16-3



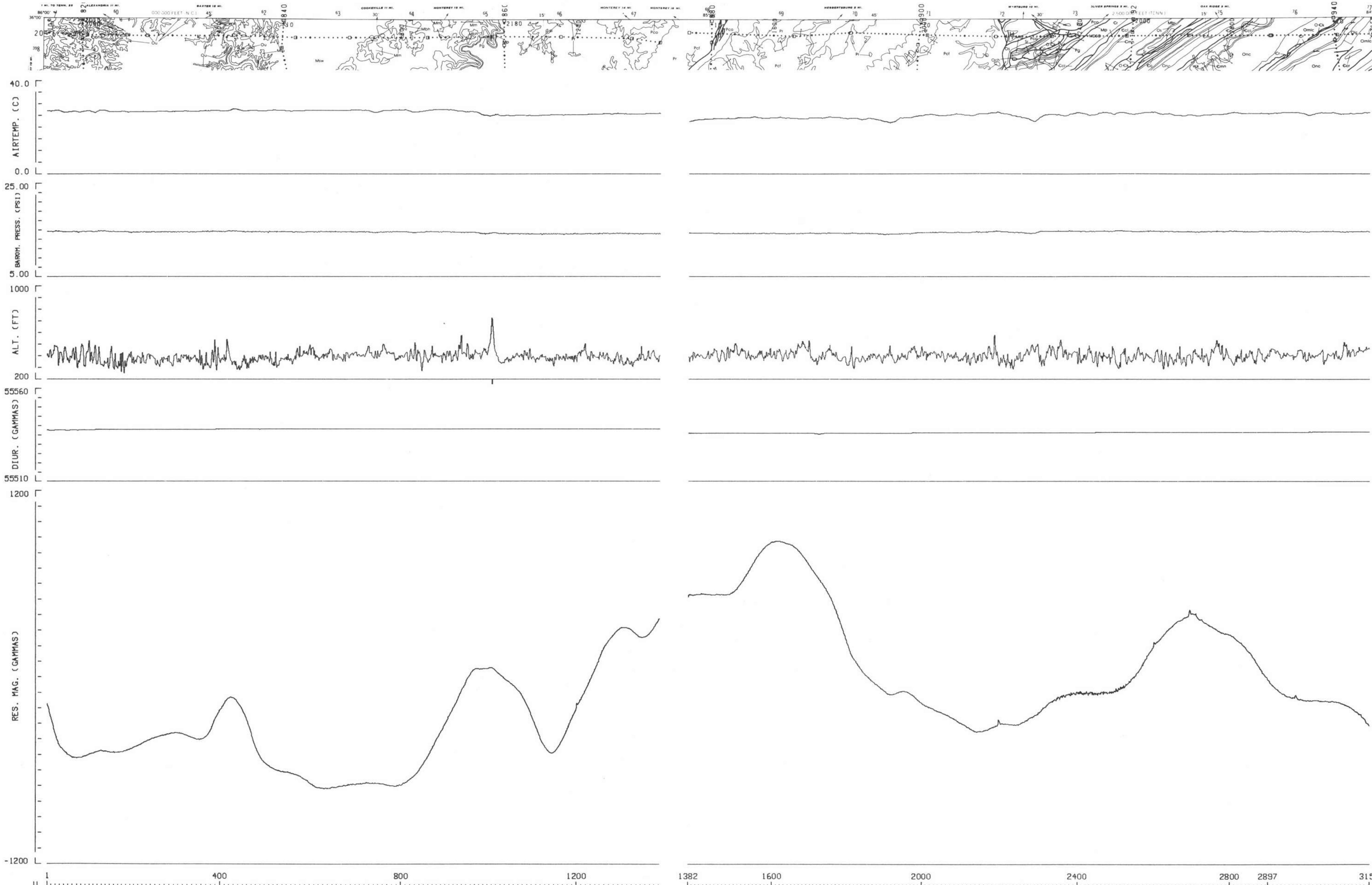
APPALACHIAN SURVEY 1979 US DEPT. OF ENERGY TEXAS INSTRUMENTS

5 MILE(S) FL-920 CHATTANOOGA NI16-3



APPALACHIAN SURVEY 1979 US DEPT. OF ENERGY TEXAS INSTRUMENTS

5 MILE(S) FL-940 CHATTANOOGA NI16-3



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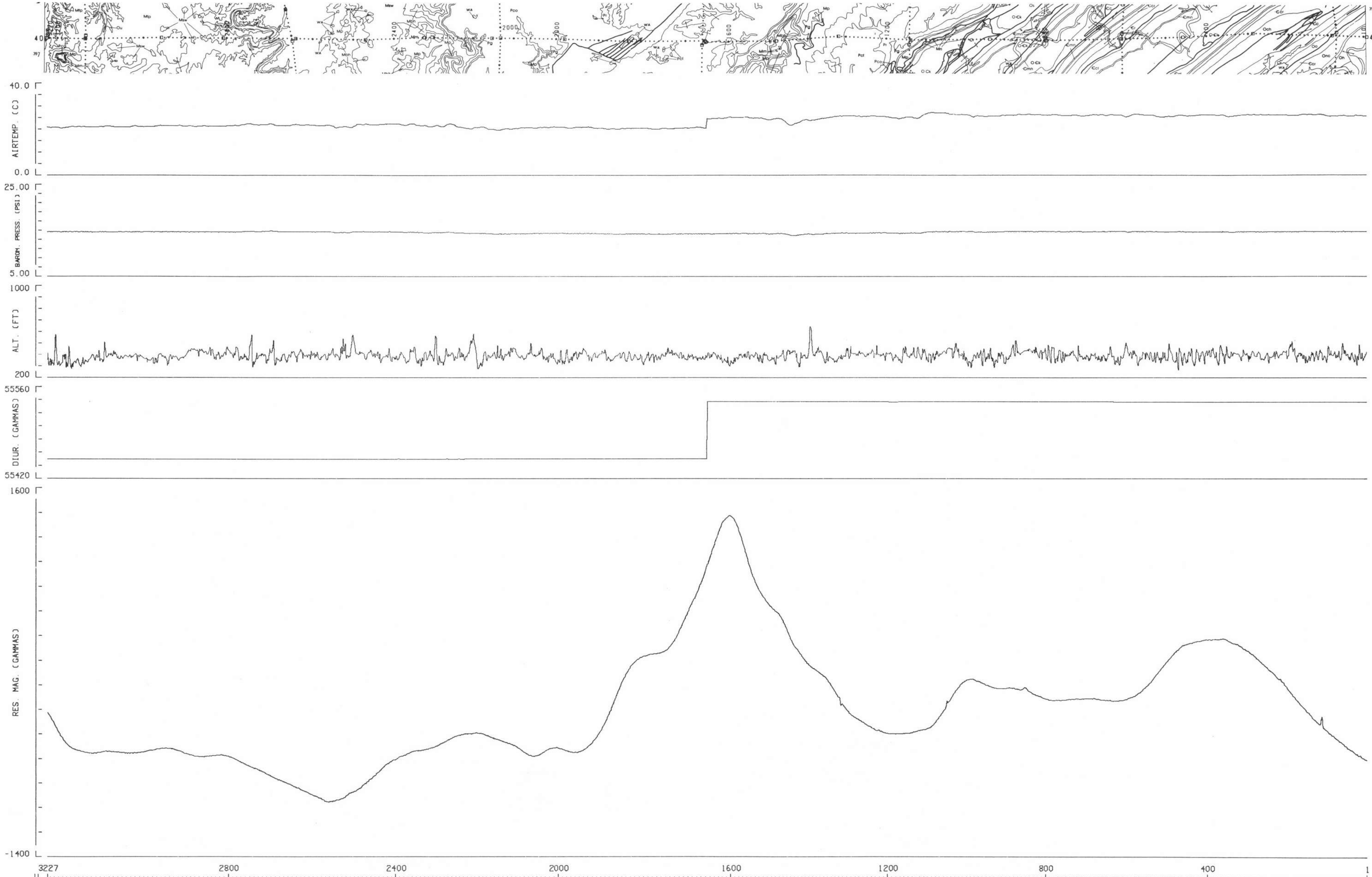
5 MILE(S) FL-020 CHATTANOOGA NI16-3



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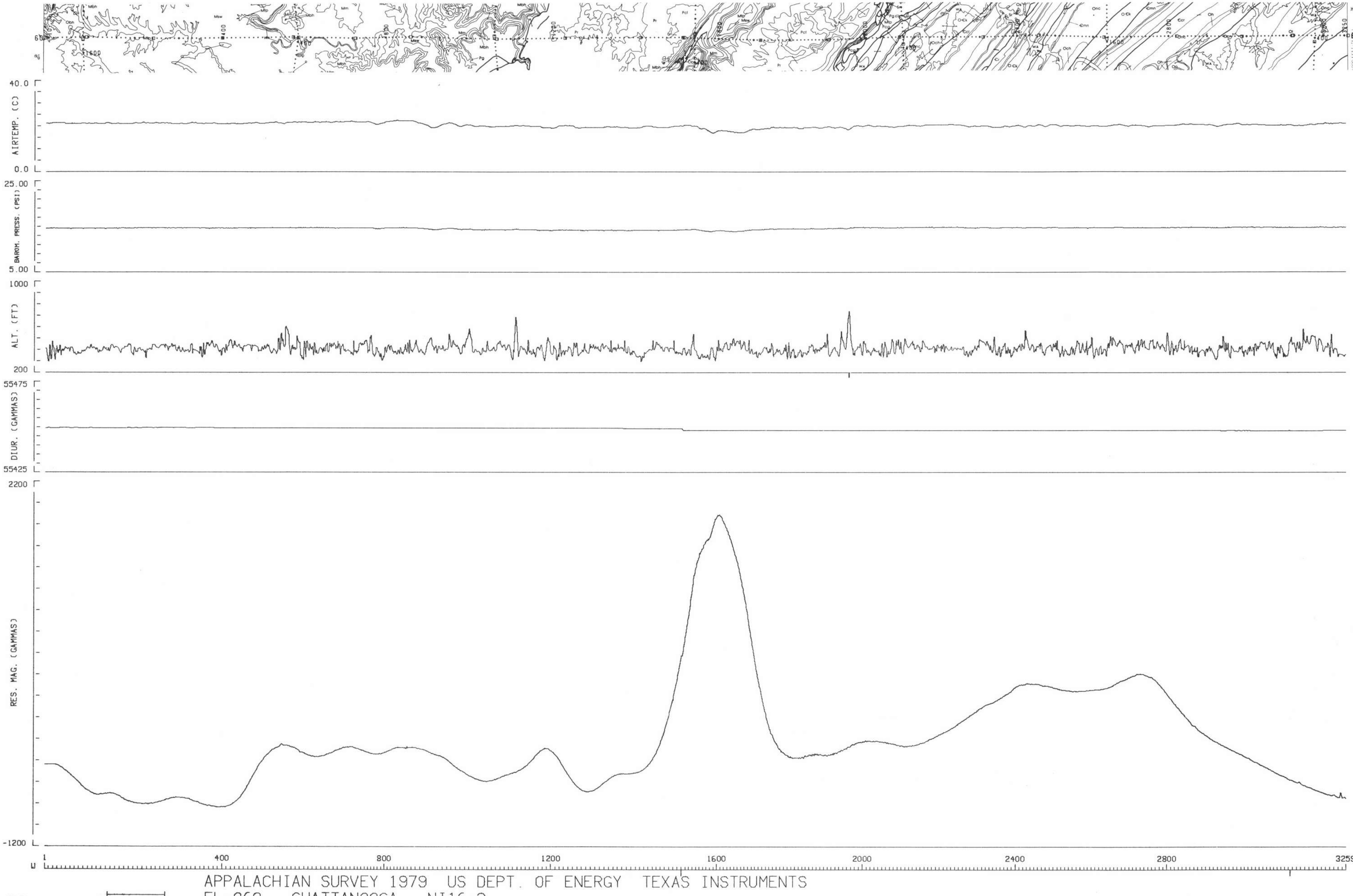
FL-040 CHATTANOOGA NI16-3



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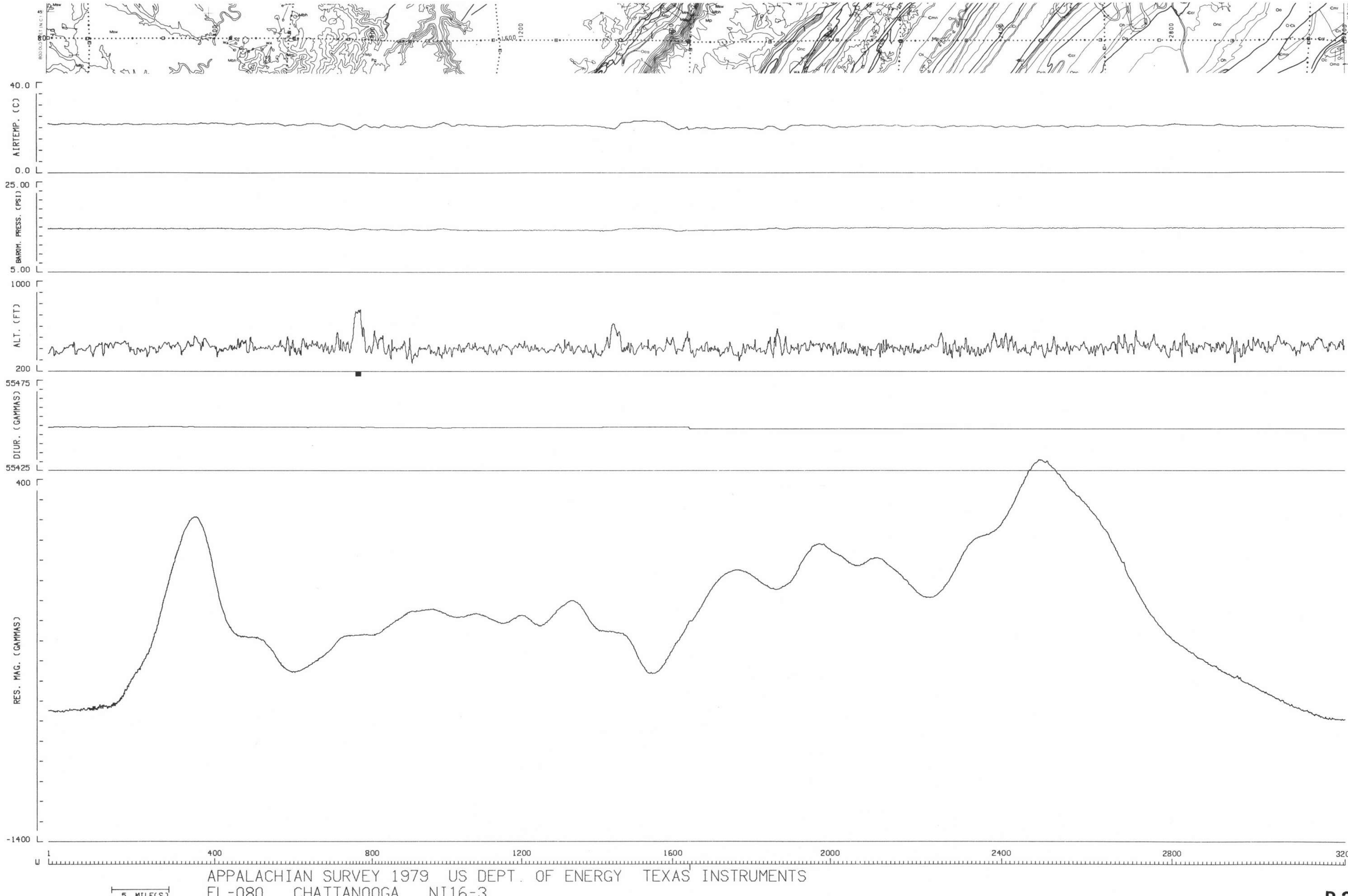
FL-060 CHATTANOOGA NI16-3



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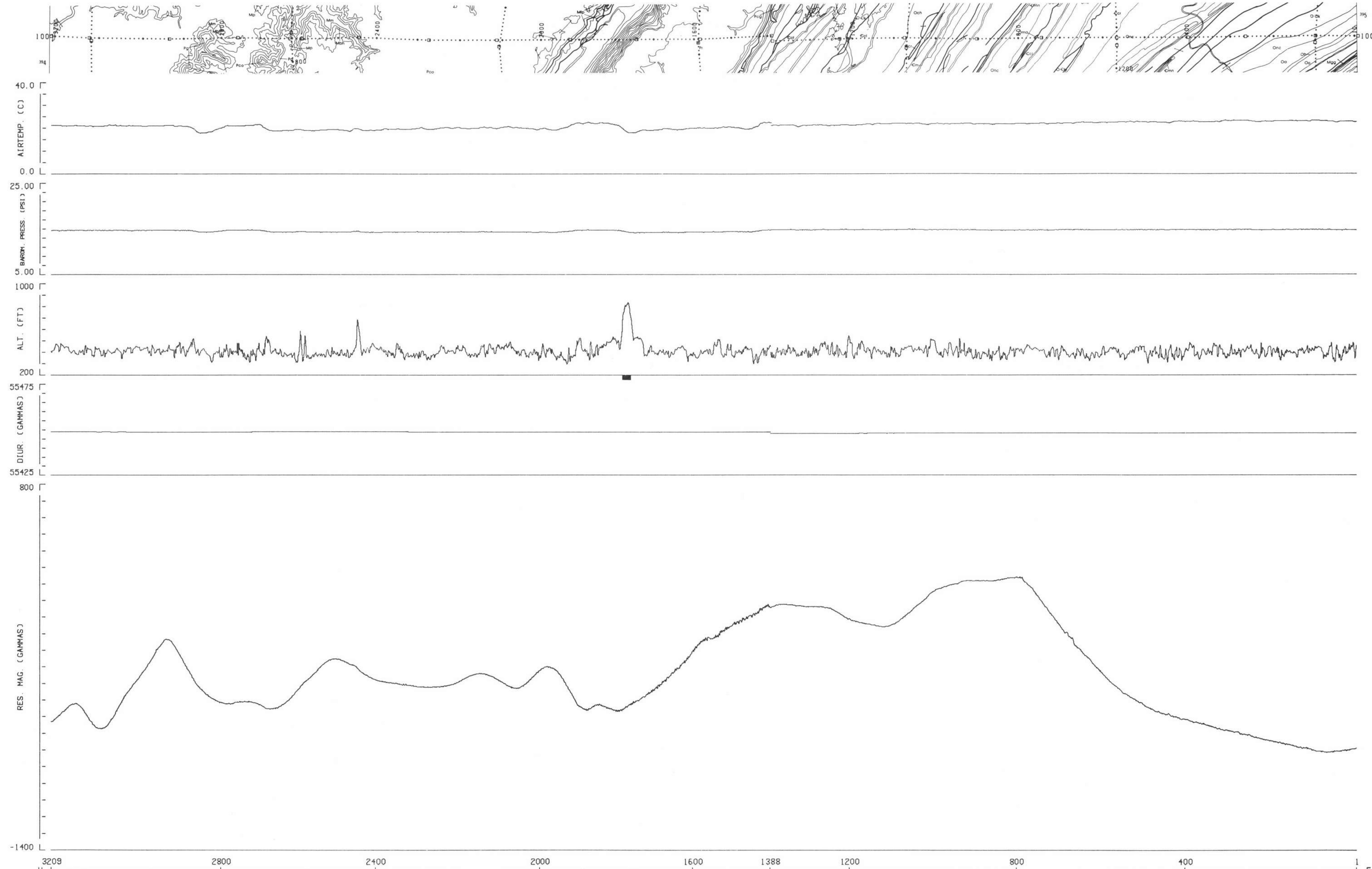
FL-080 CHATTANOOGA NI16-3



5 MILE(S)

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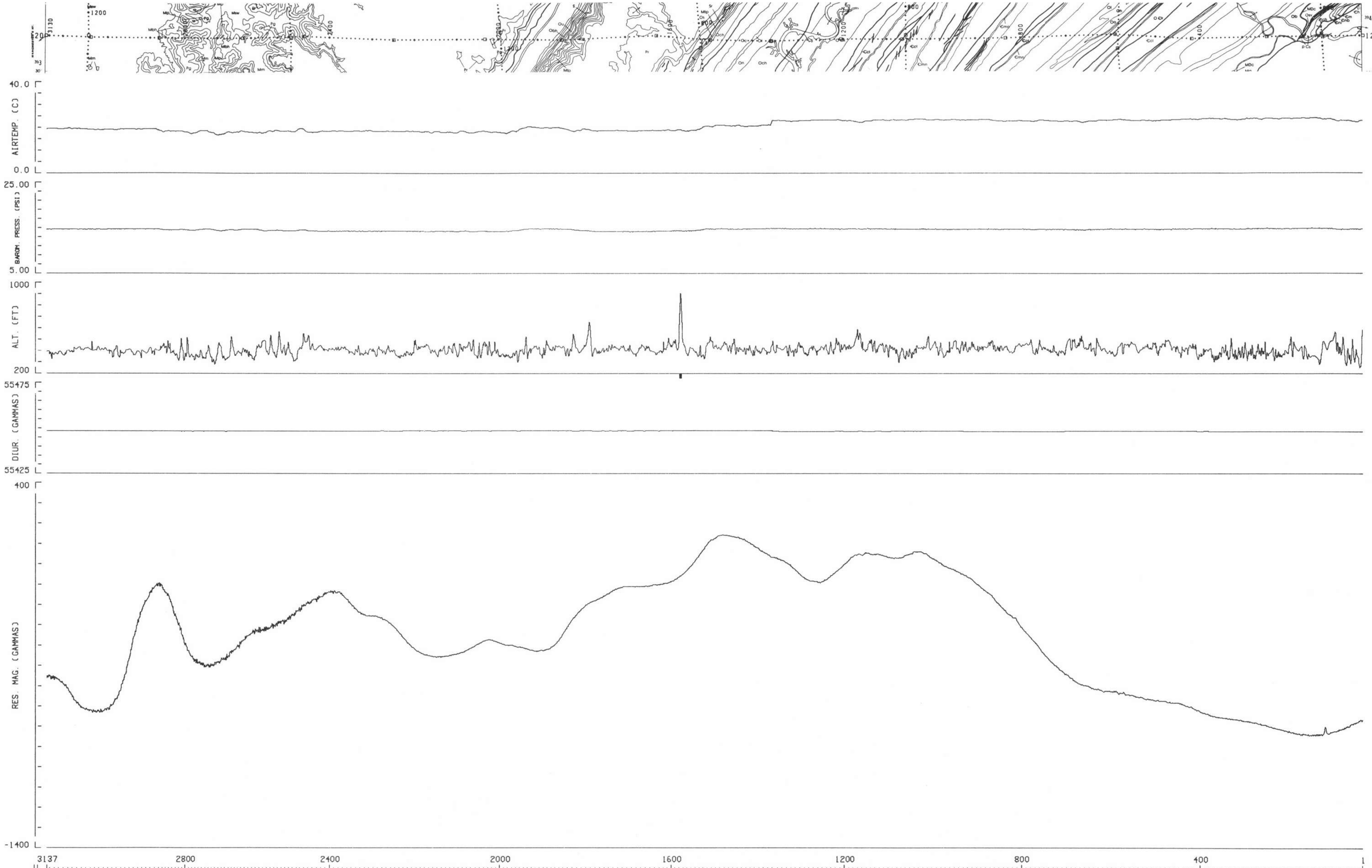
FL-100 CHATTANOOGA NI16-3



5 MILE(S)

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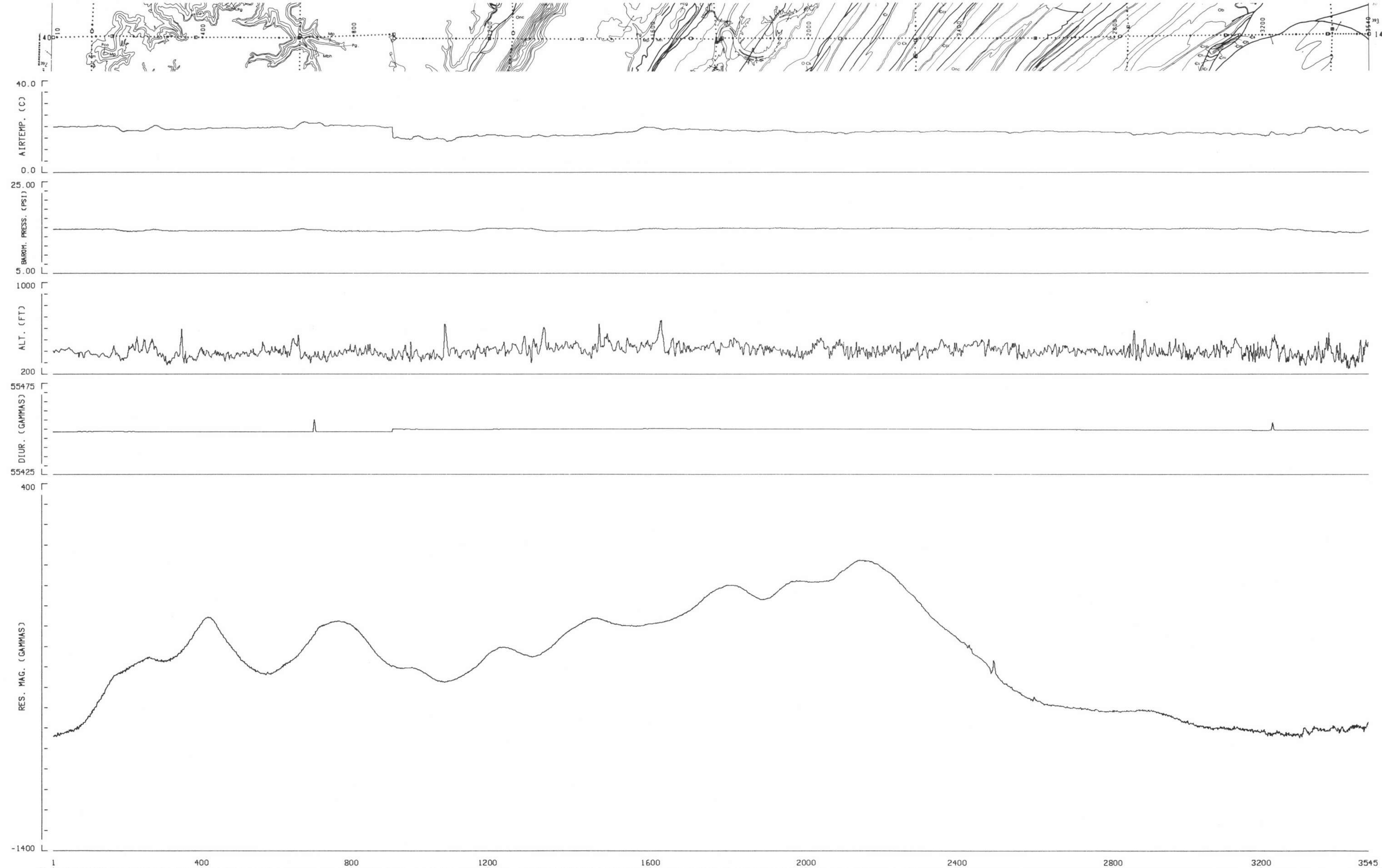
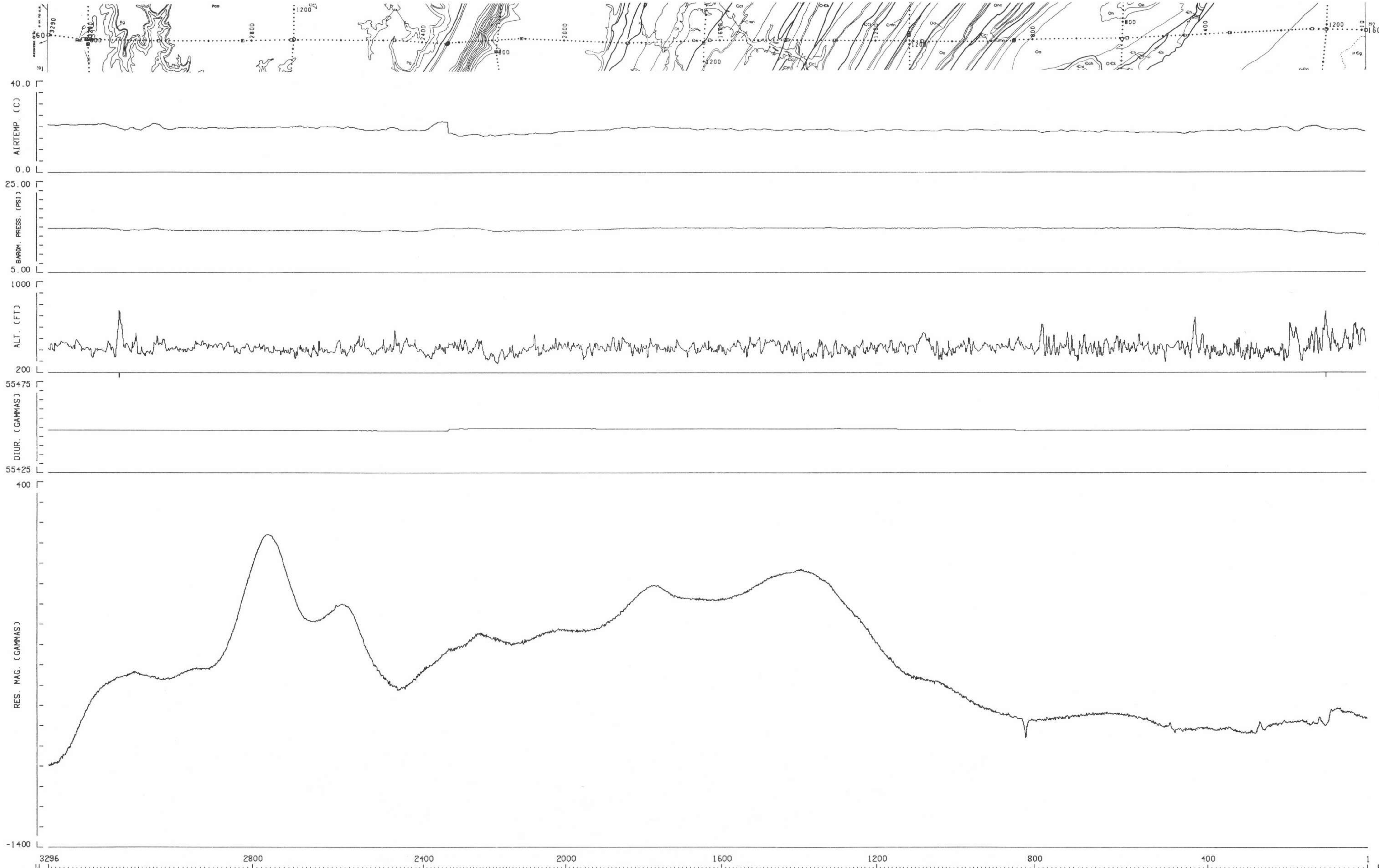
FL-120 CHATTANOOGA NI16-3



APPALACHIAN SURVEY 1979 US DEPT. OF ENERGY TEXAS INSTRUMENTS

5 MILE(S)

FL-140 CHATTANOOGA NI16-3



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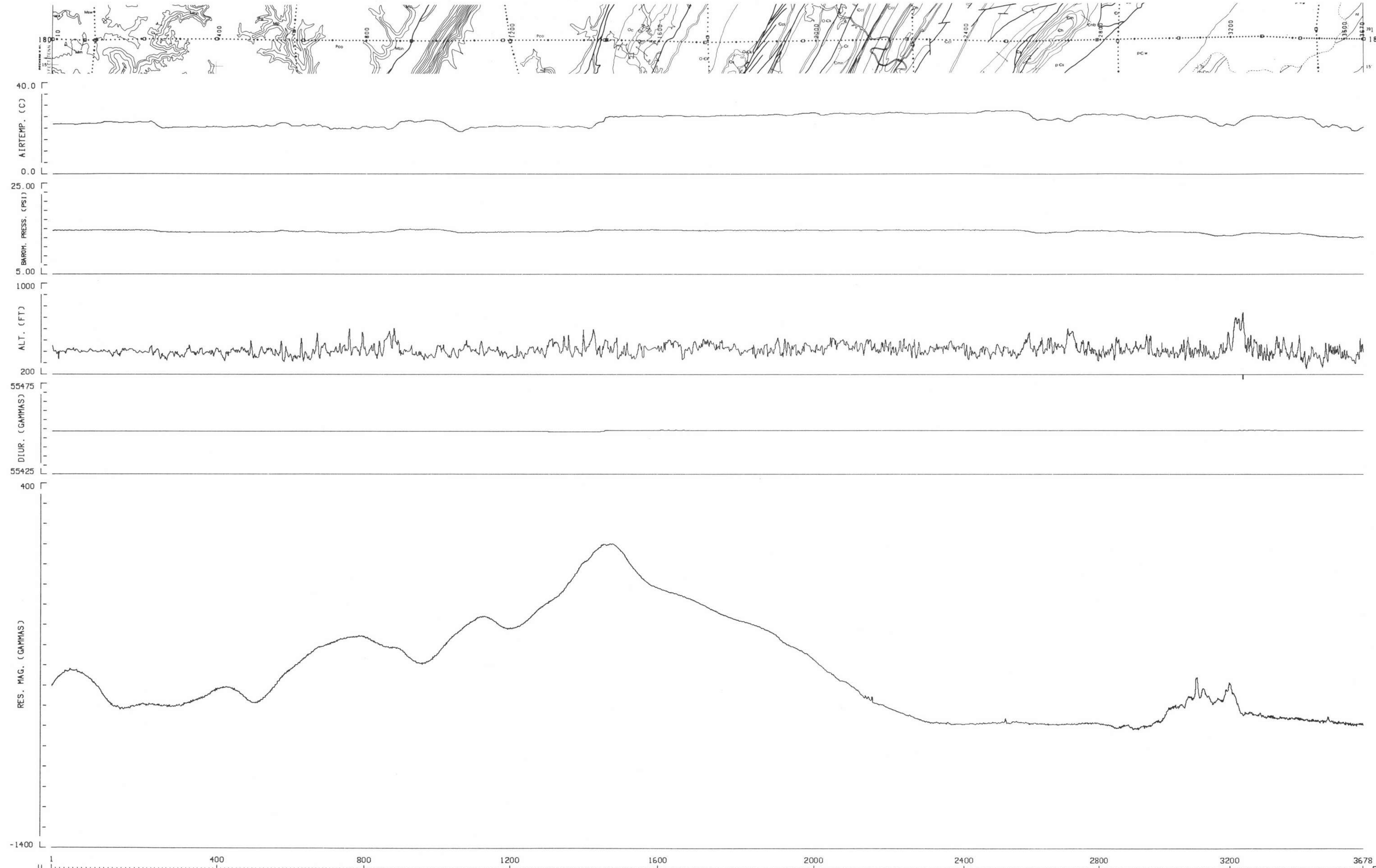

5 MILE(S)

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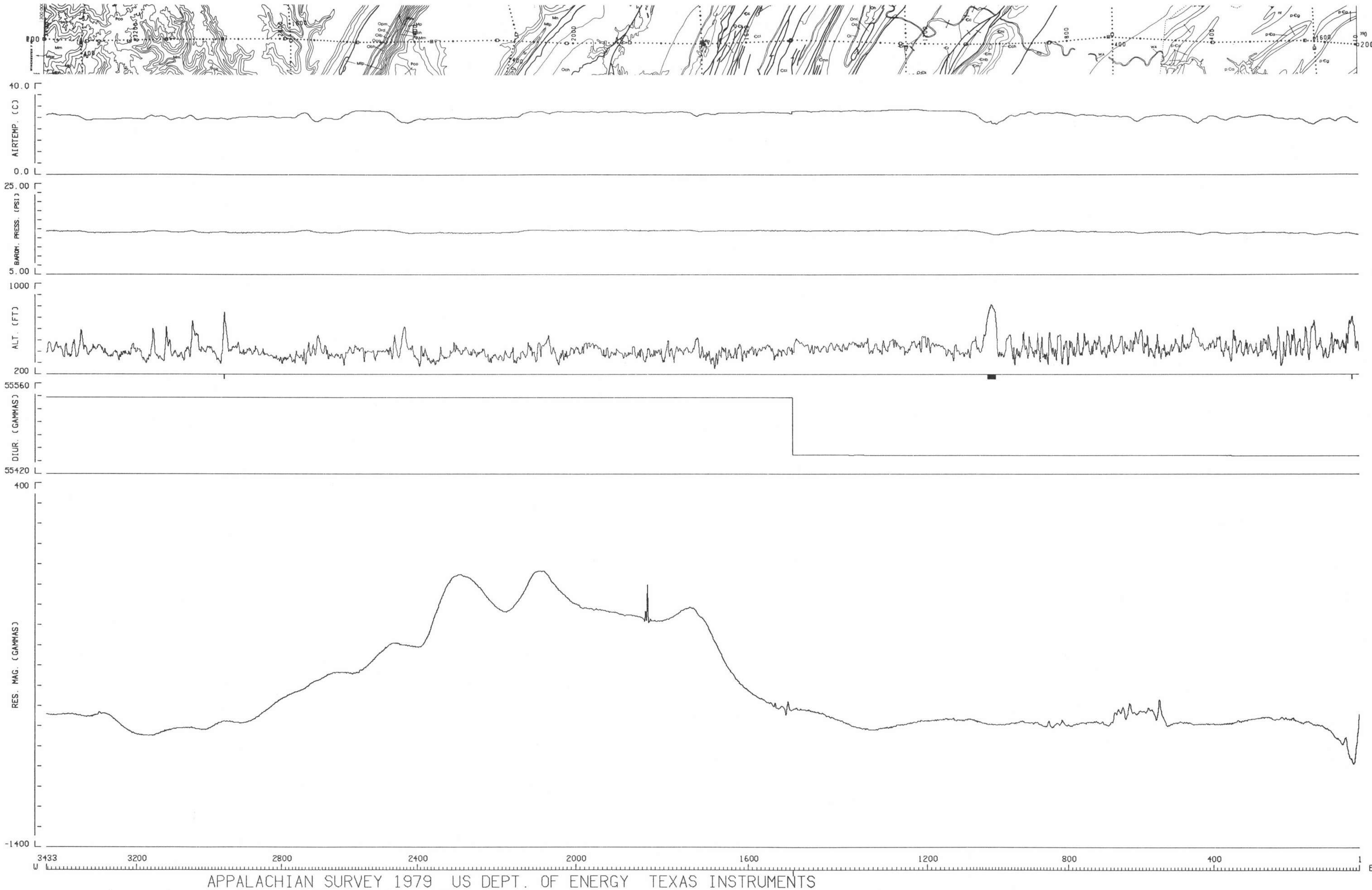
FL-180 CHATTANOOGA NI16-3



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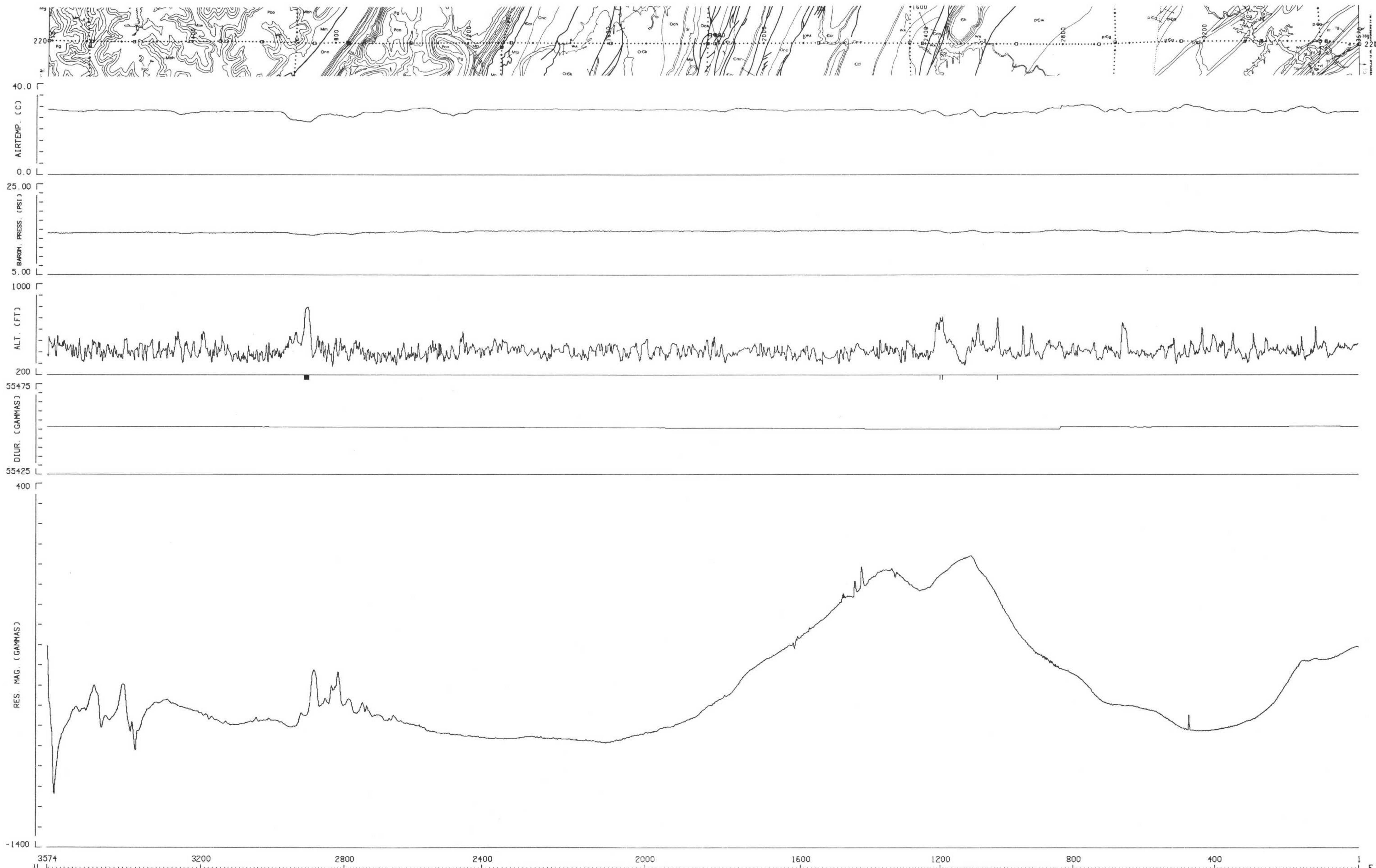
FL-200 CHATTANOOGA NI16-3



5 MILE(S)

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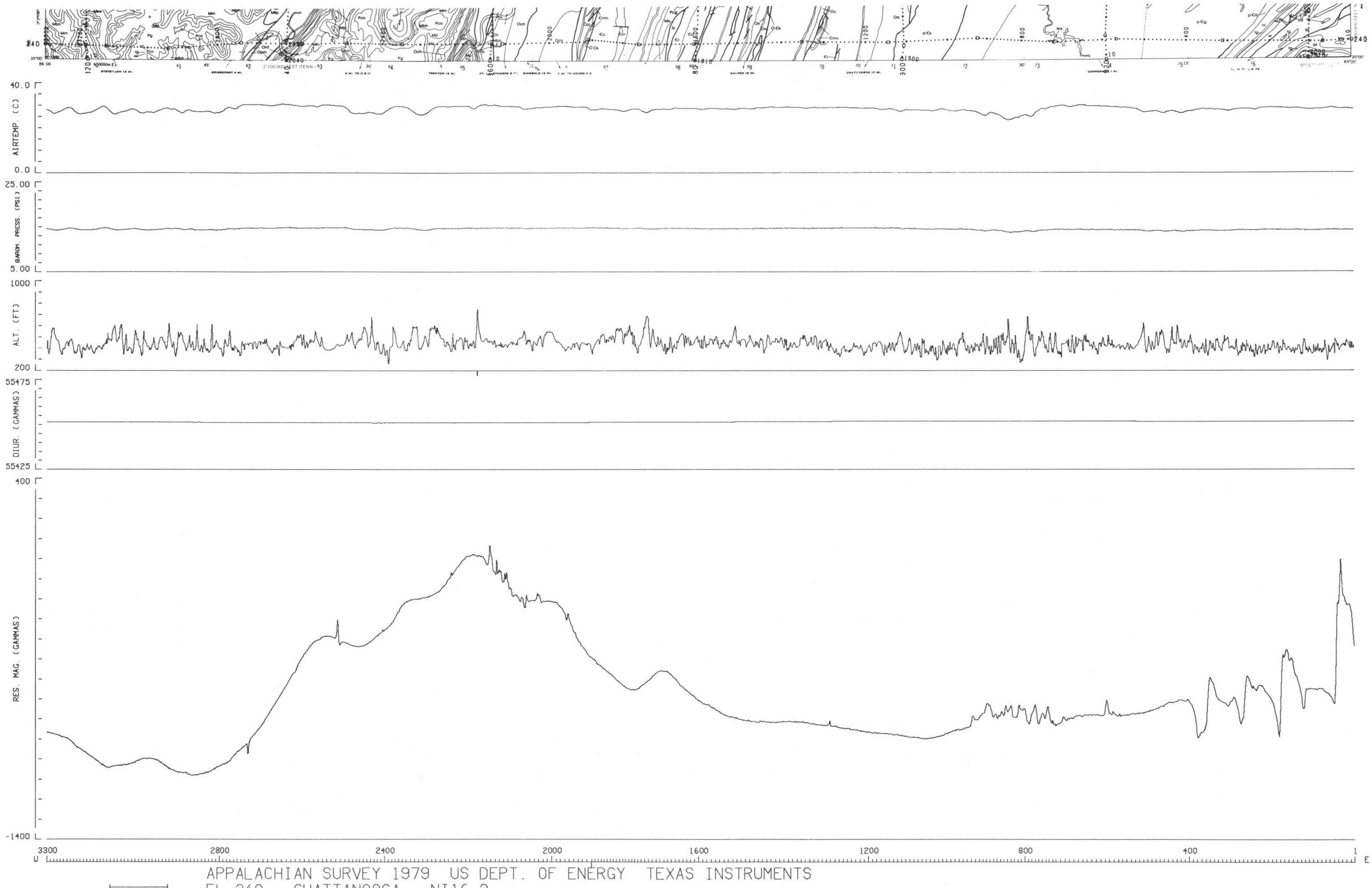
FL-220 CHATTANOOGA NI16-3



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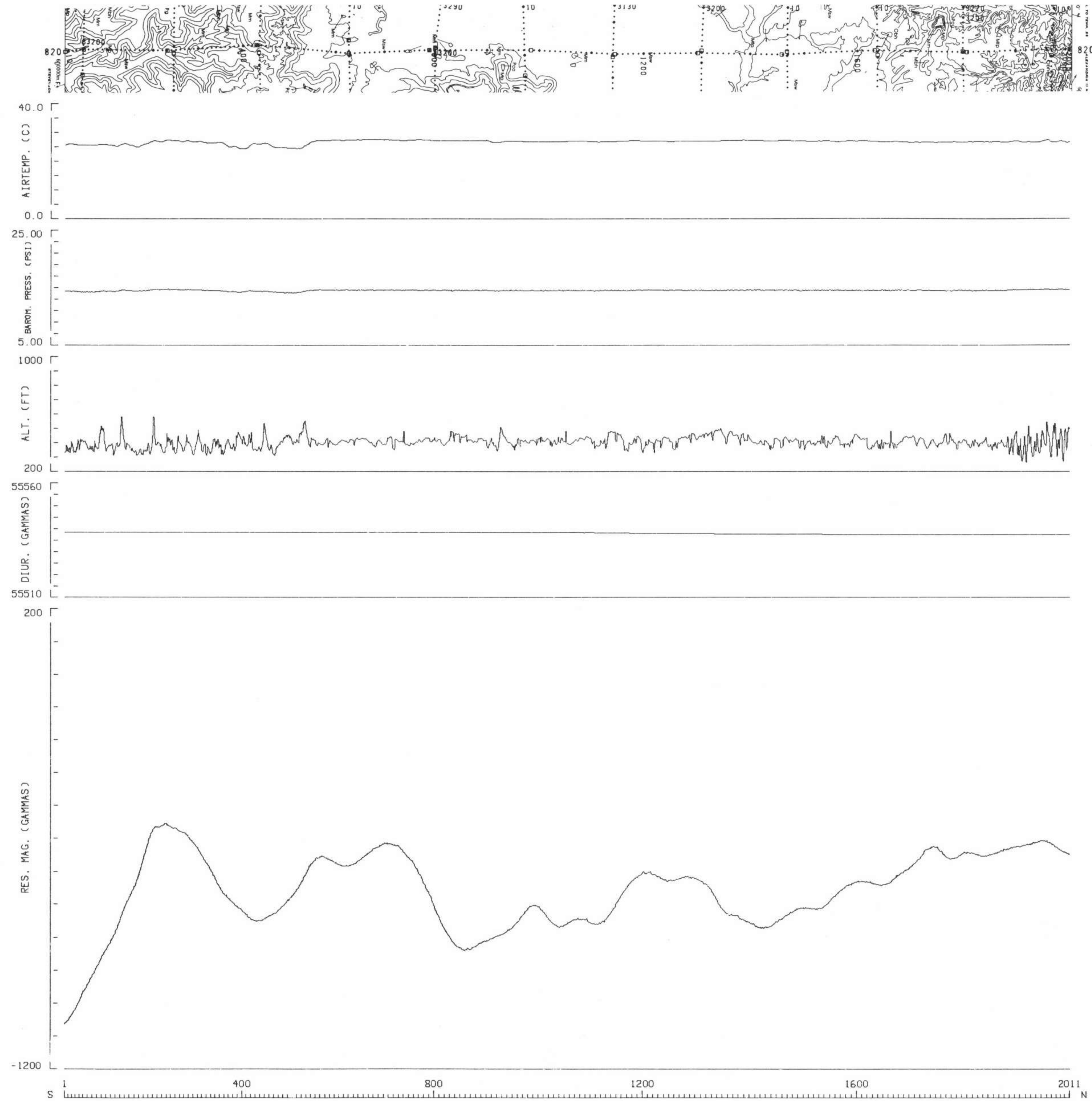

5 MILE(S)

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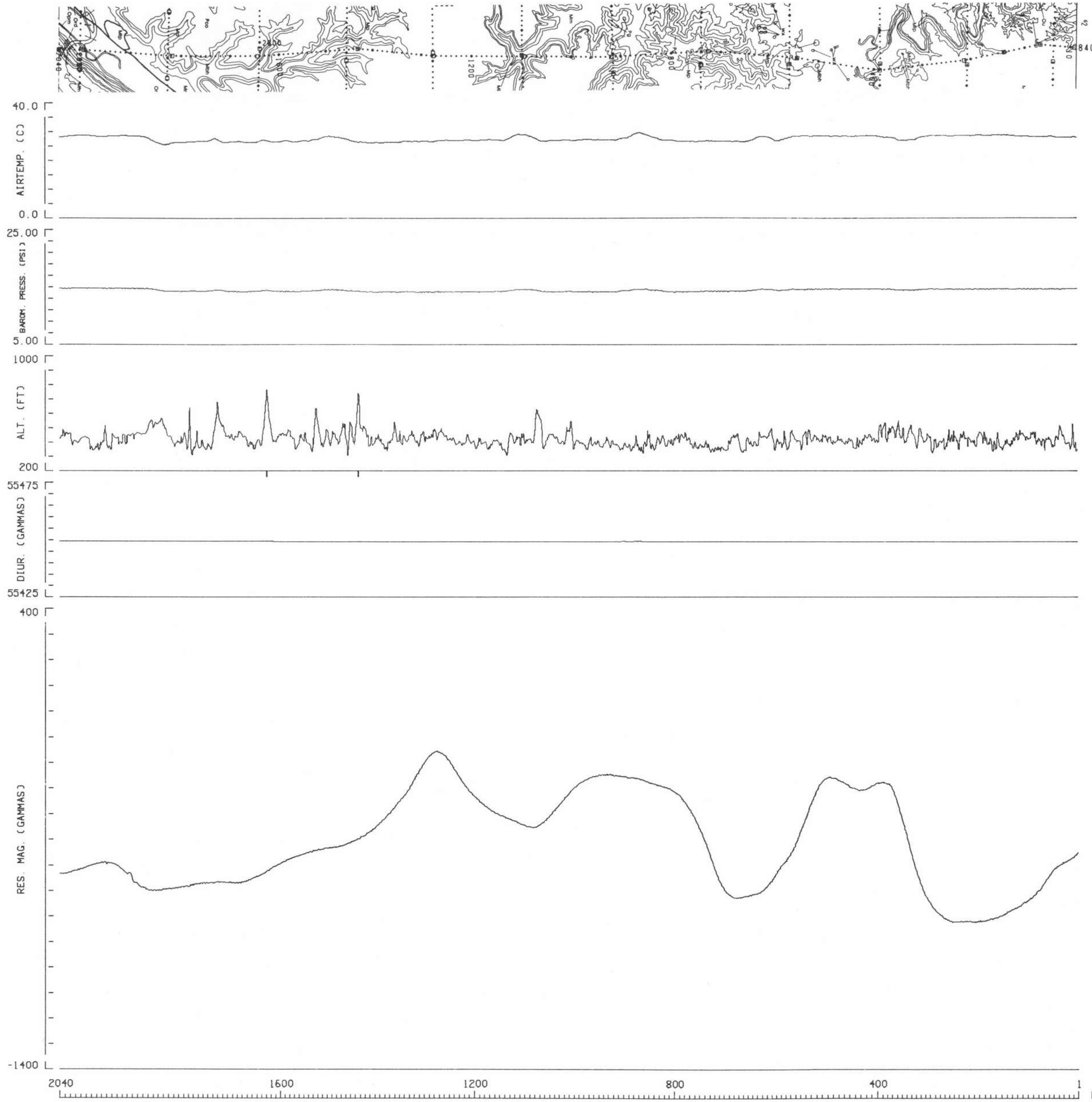

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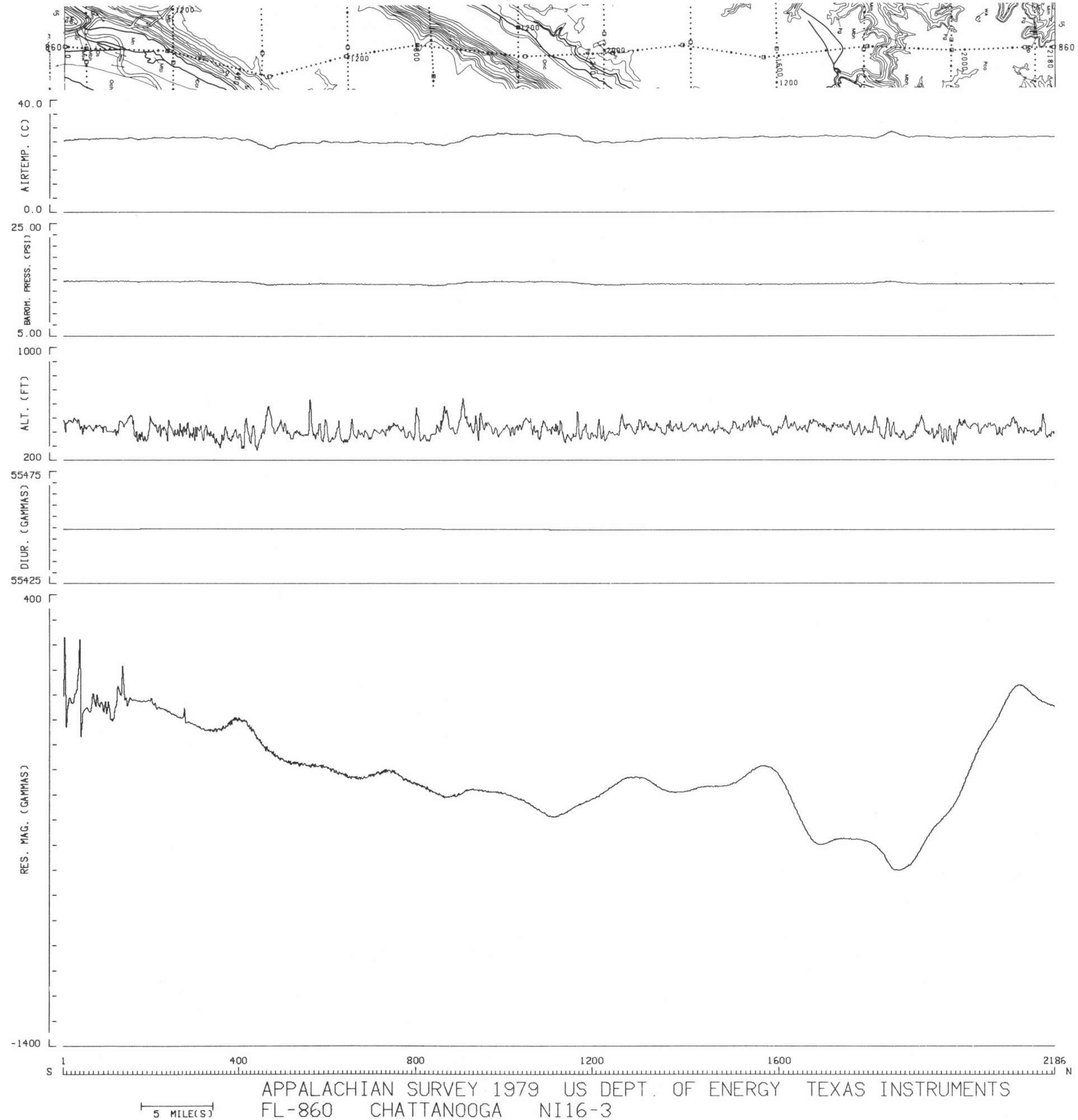
5 MILE(S) FL-840 CHATTANOOGA NI16-3



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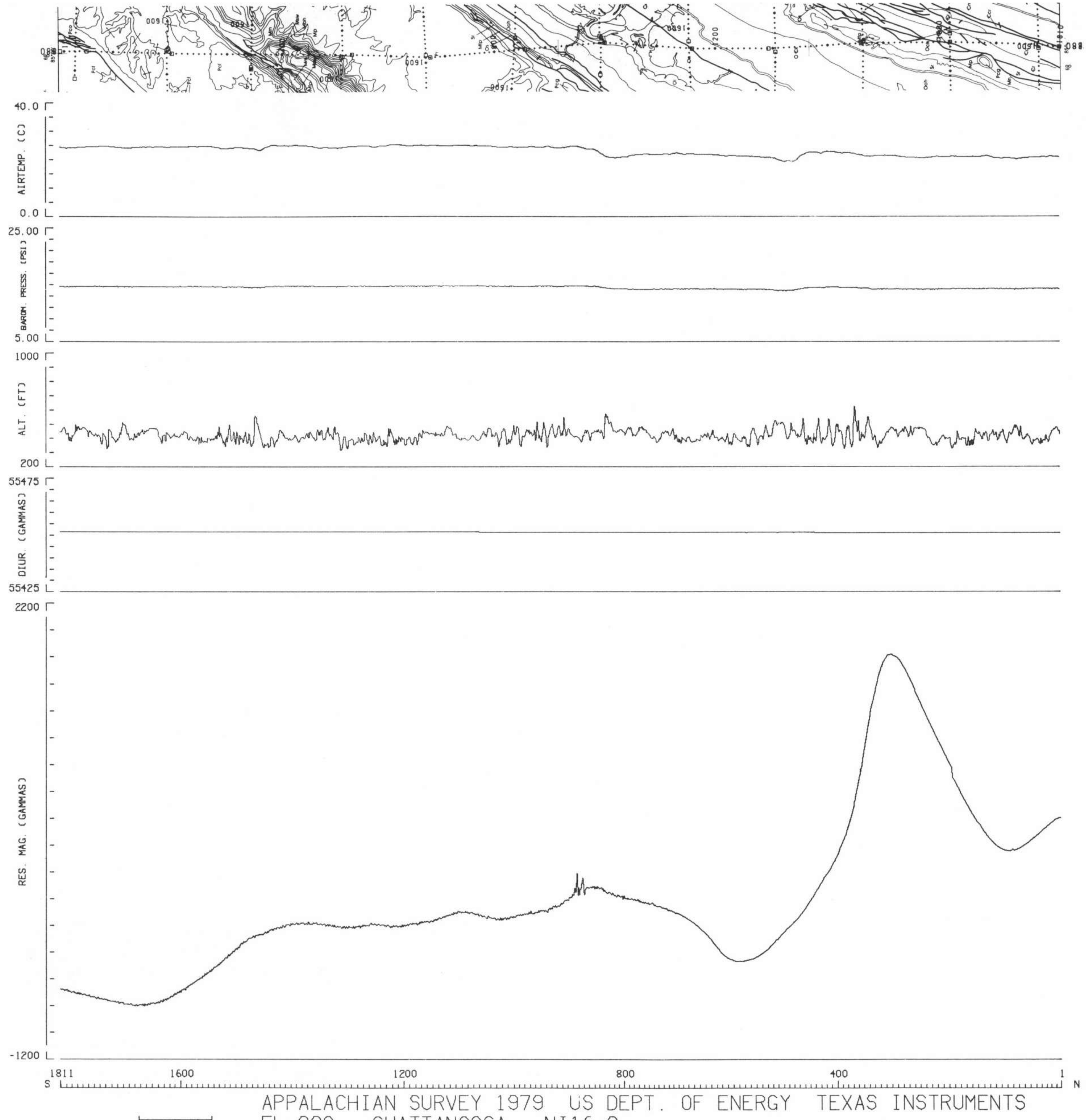
FL-860 CHATTANOOGA NI16-3



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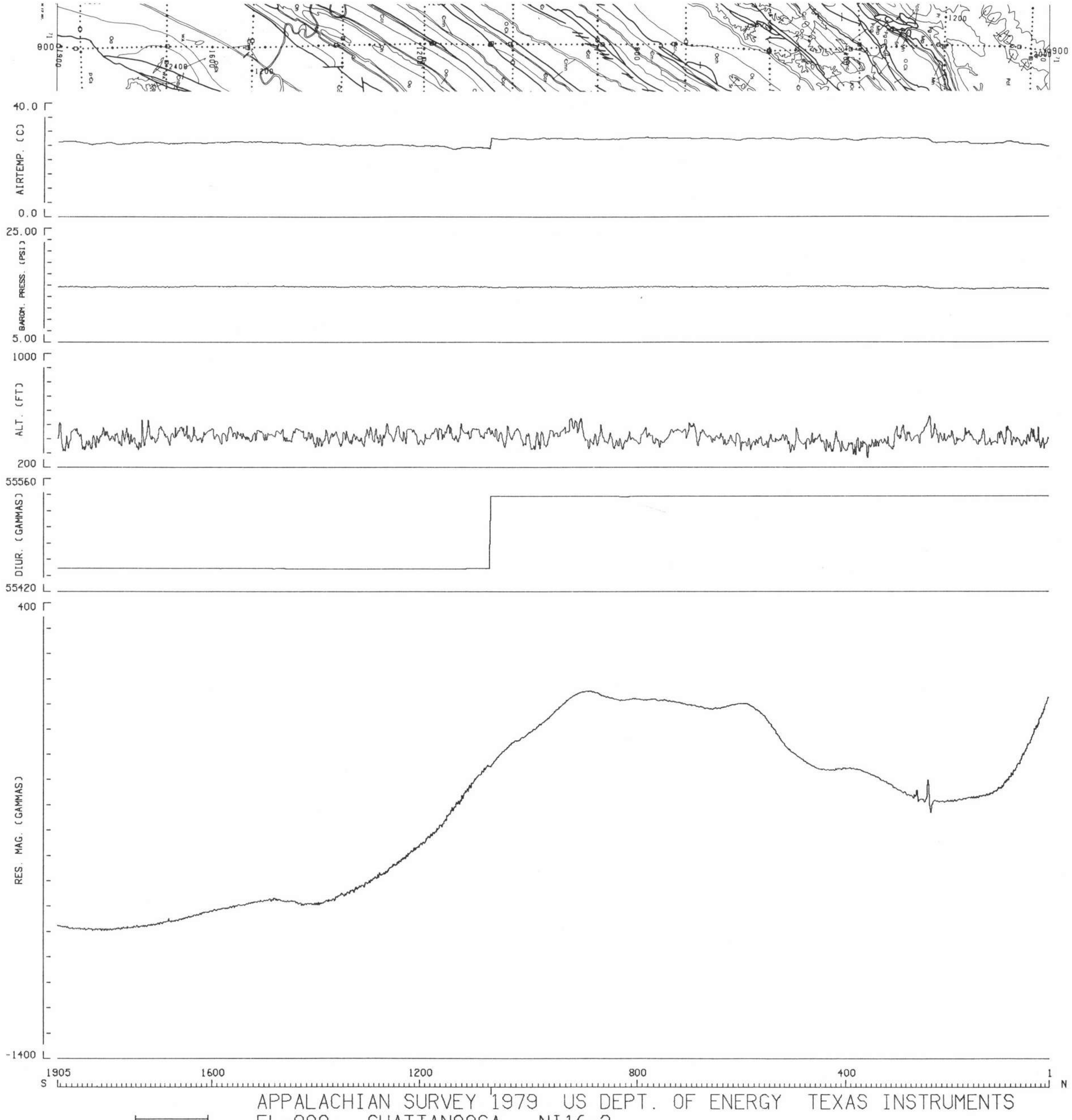
FL-880 CHATTANOOGA NI16-3



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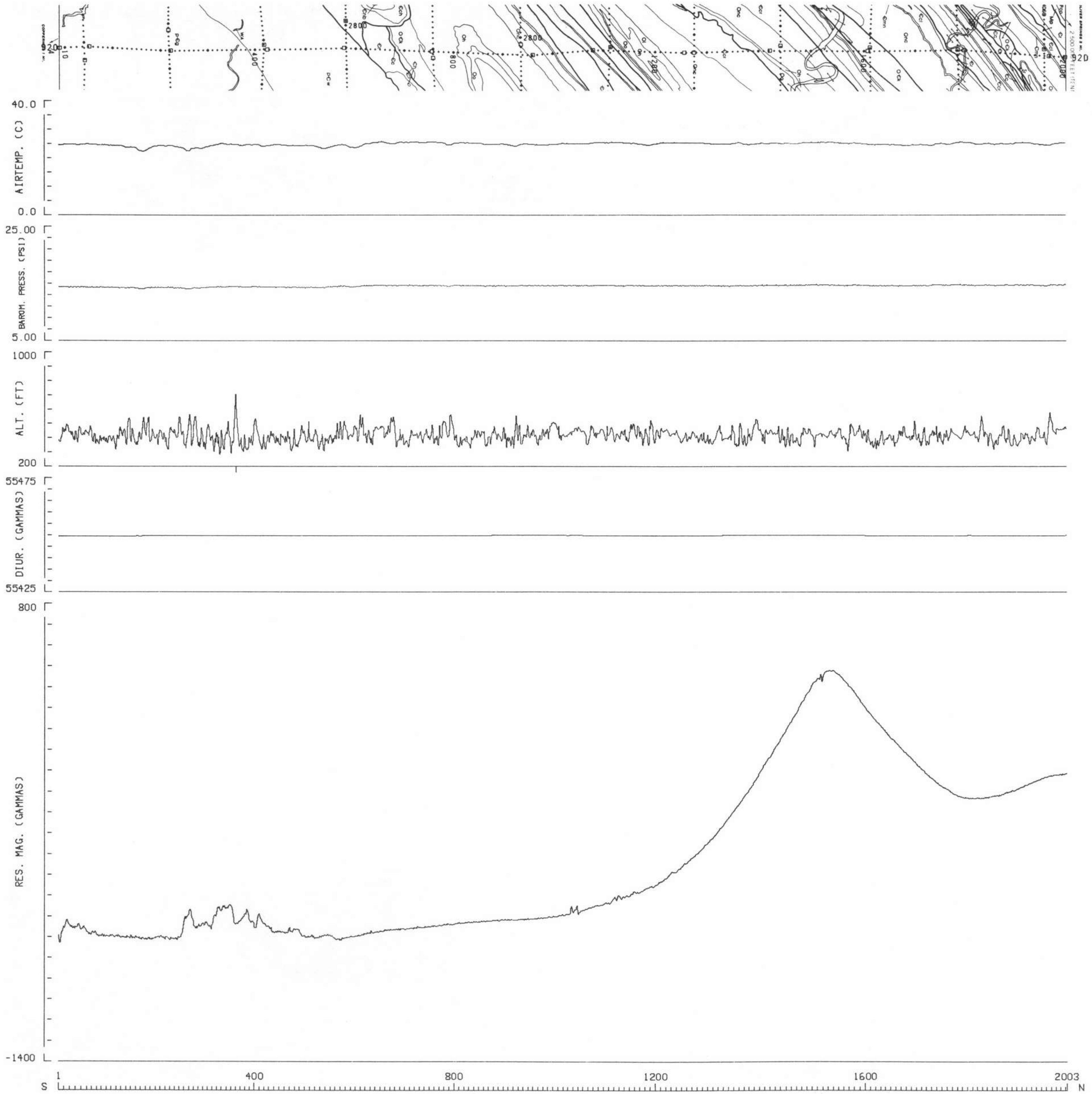
FL-900 CHATTANOOGA NI16-3



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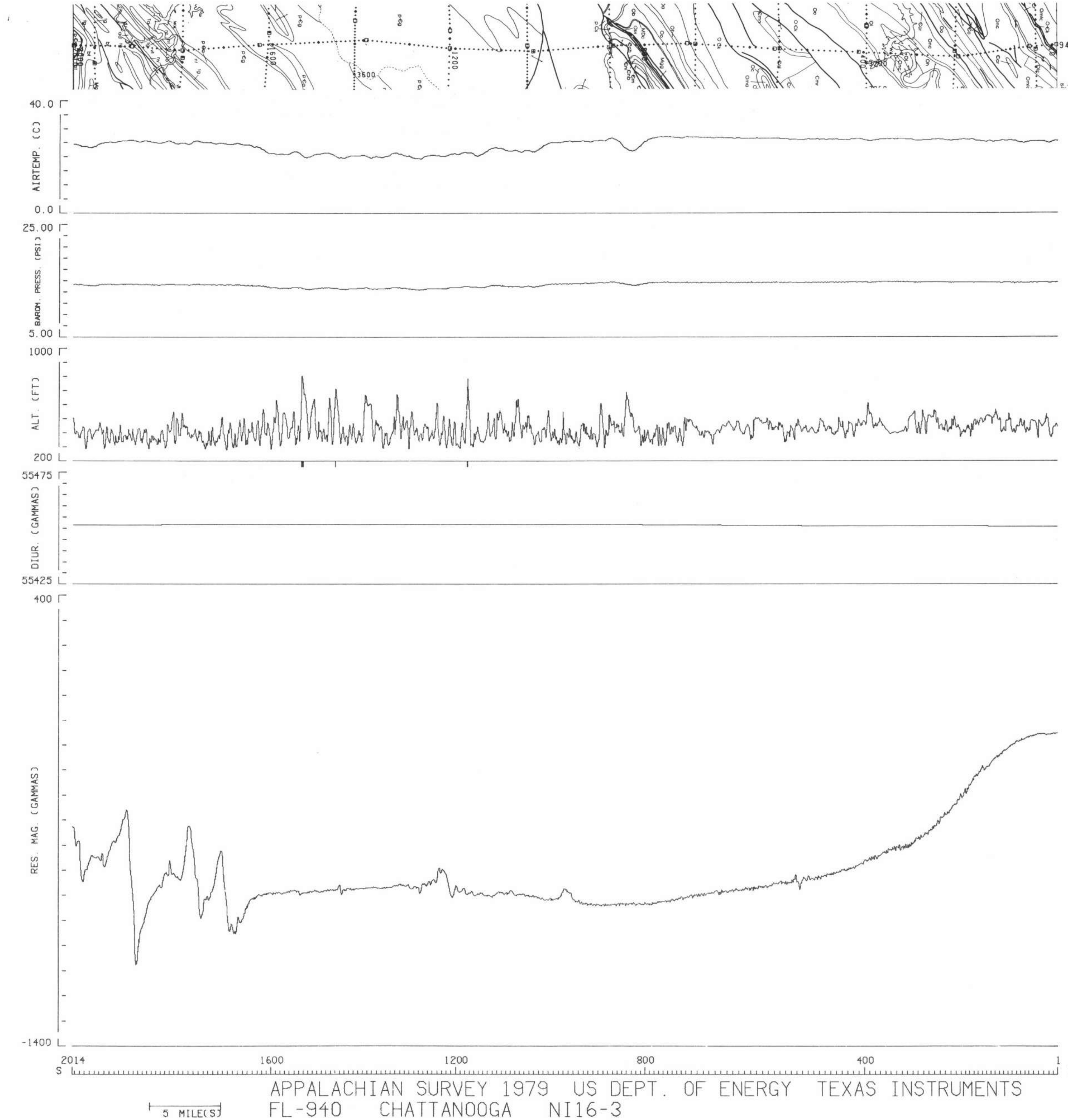
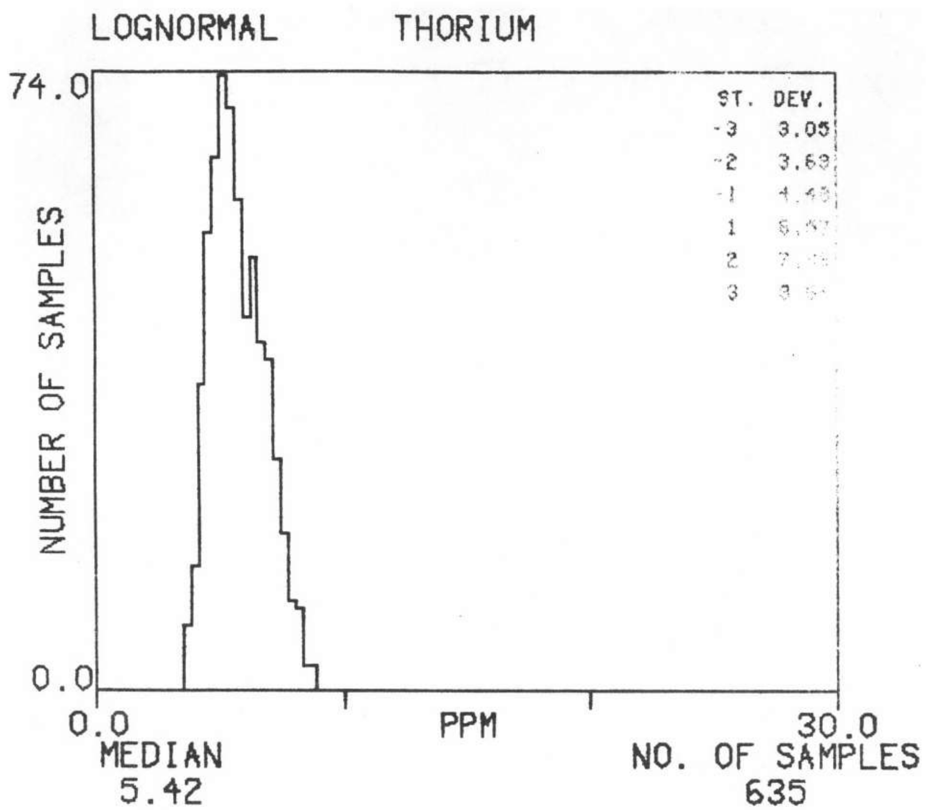
FL-920 CHATTANOOGA NI16-3

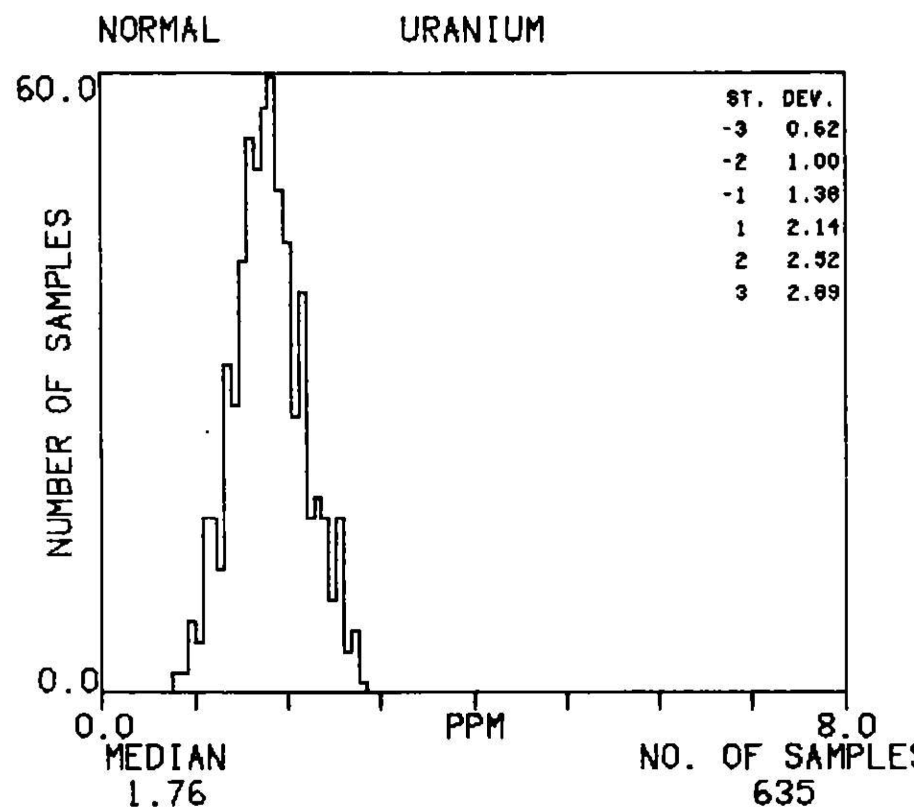


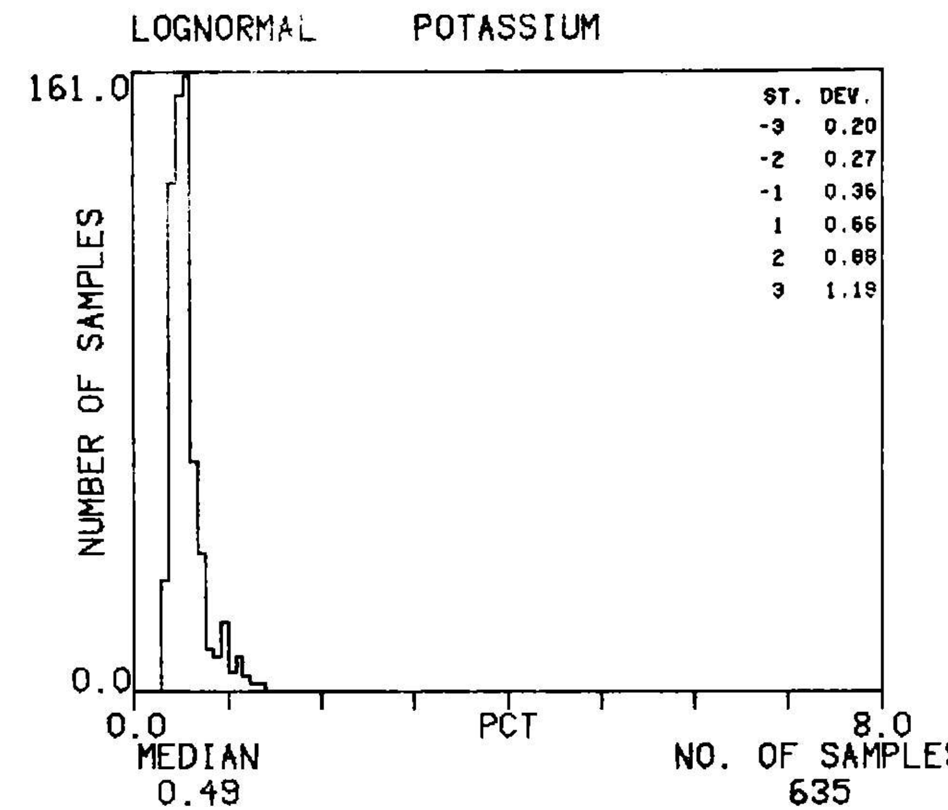
APPALACHIAN SURVEY 1979 US DEPT. OF ENERGY TEXAS INSTRUMENTS
FL-940 CHATTANOOGA NI16-3

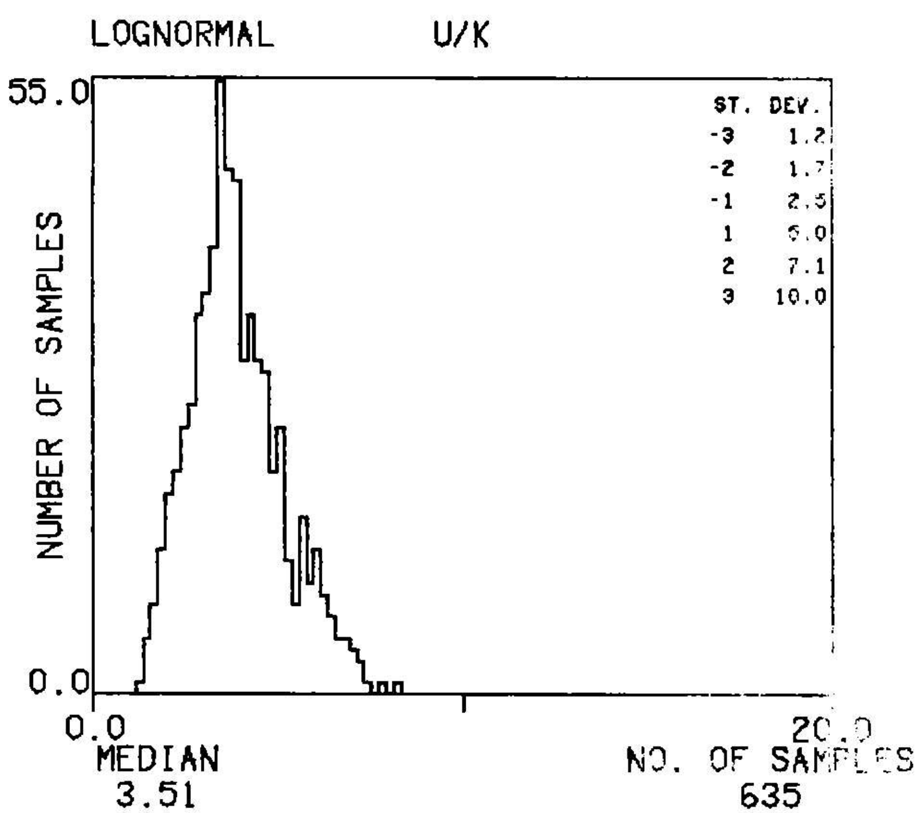
HISTOGRAMS : PCF

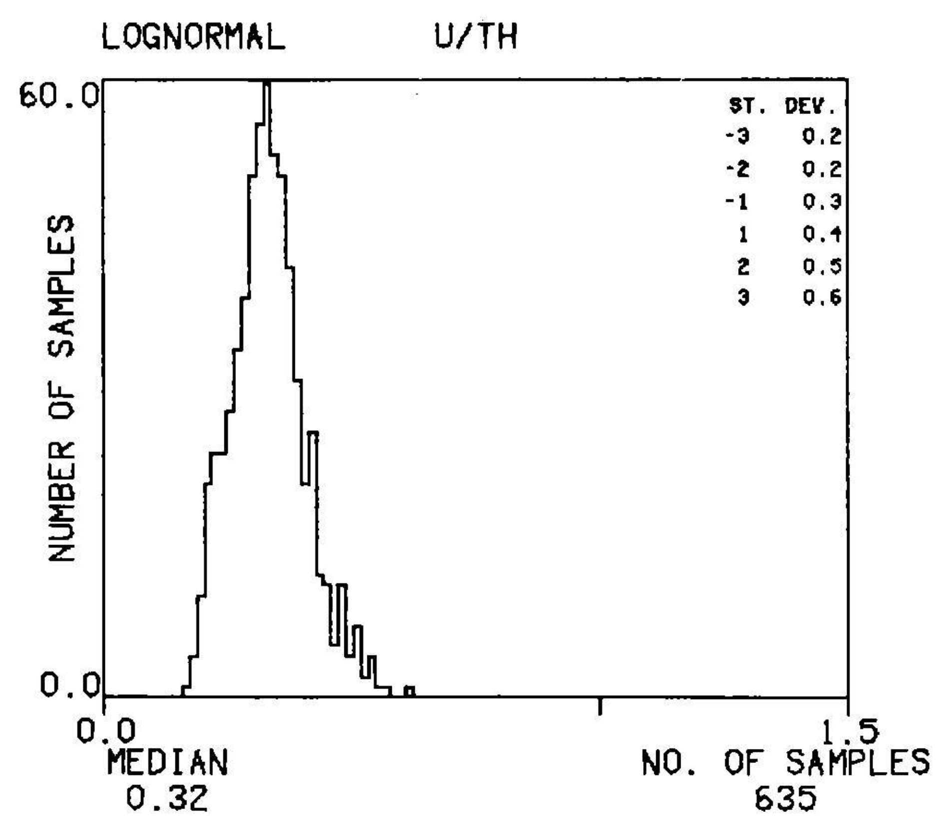
TEXAS INSTRUMENTS CHATTANOOGA NI16-3 APPALACHIAN BASIN SURVEY 1979

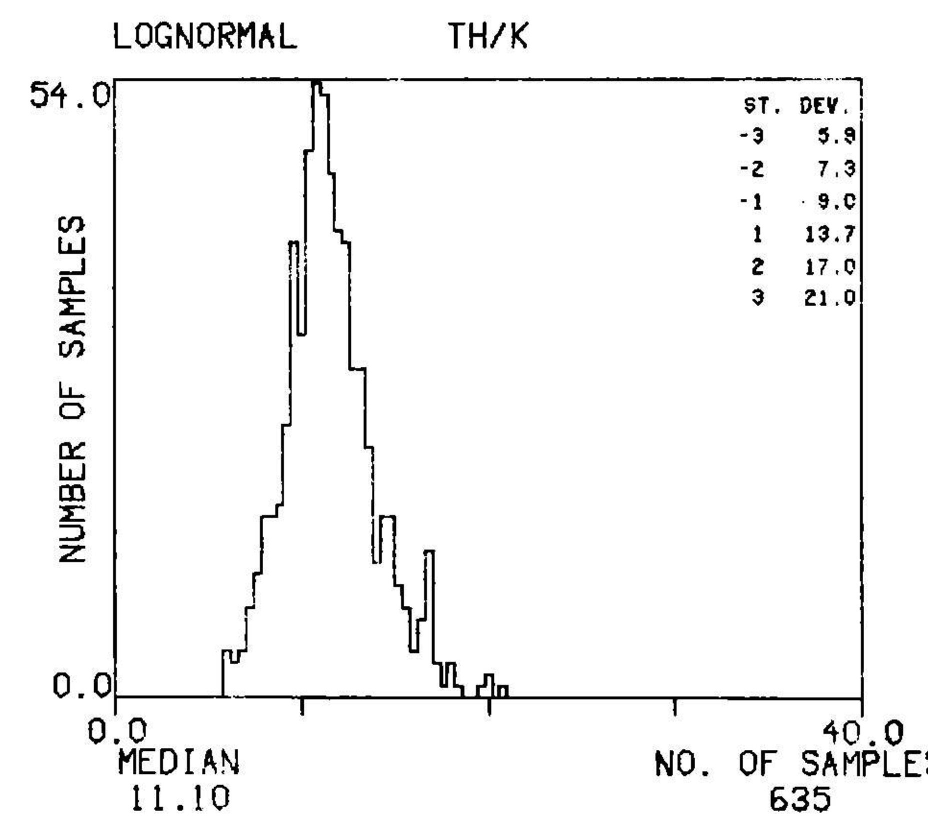












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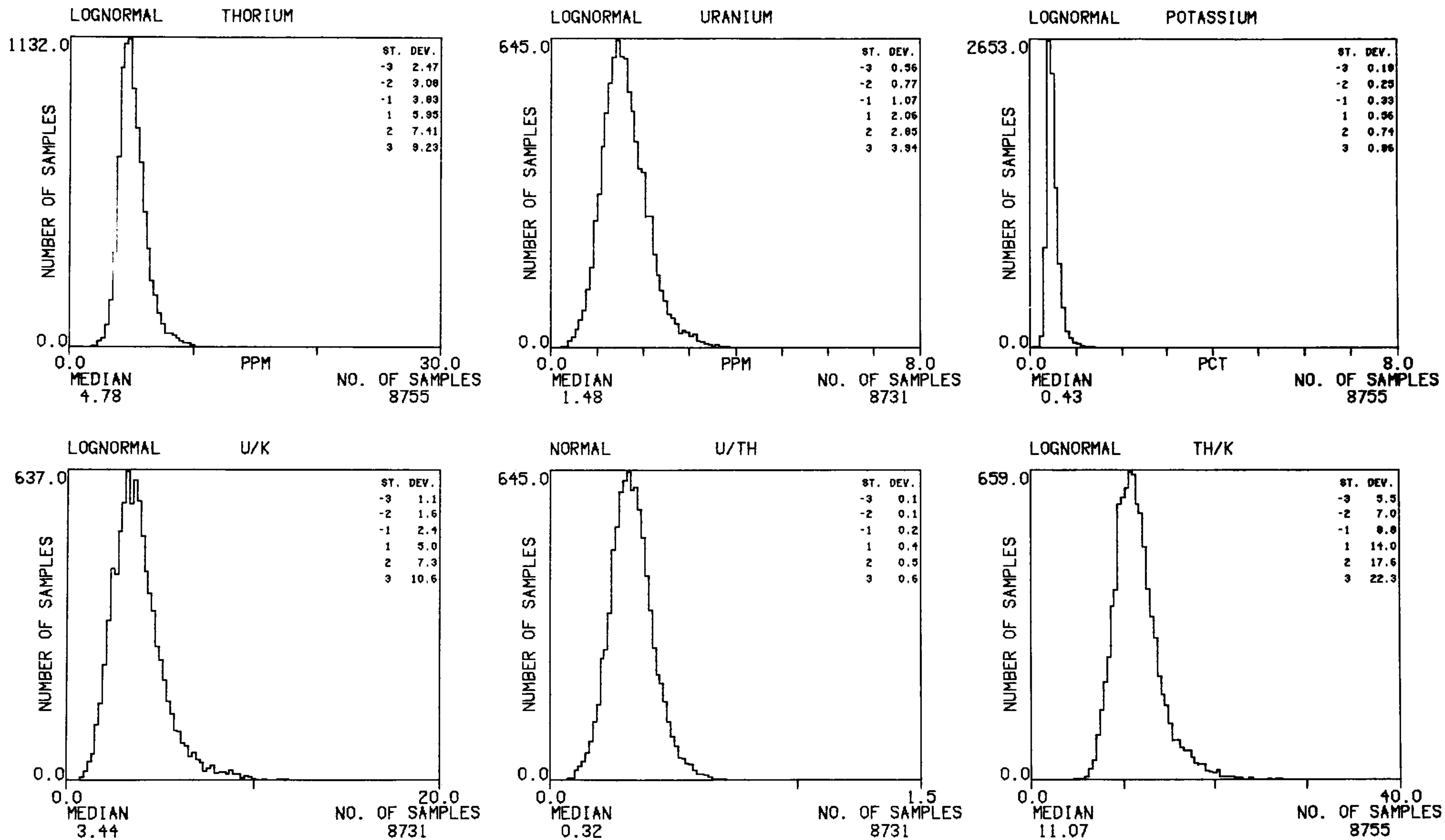

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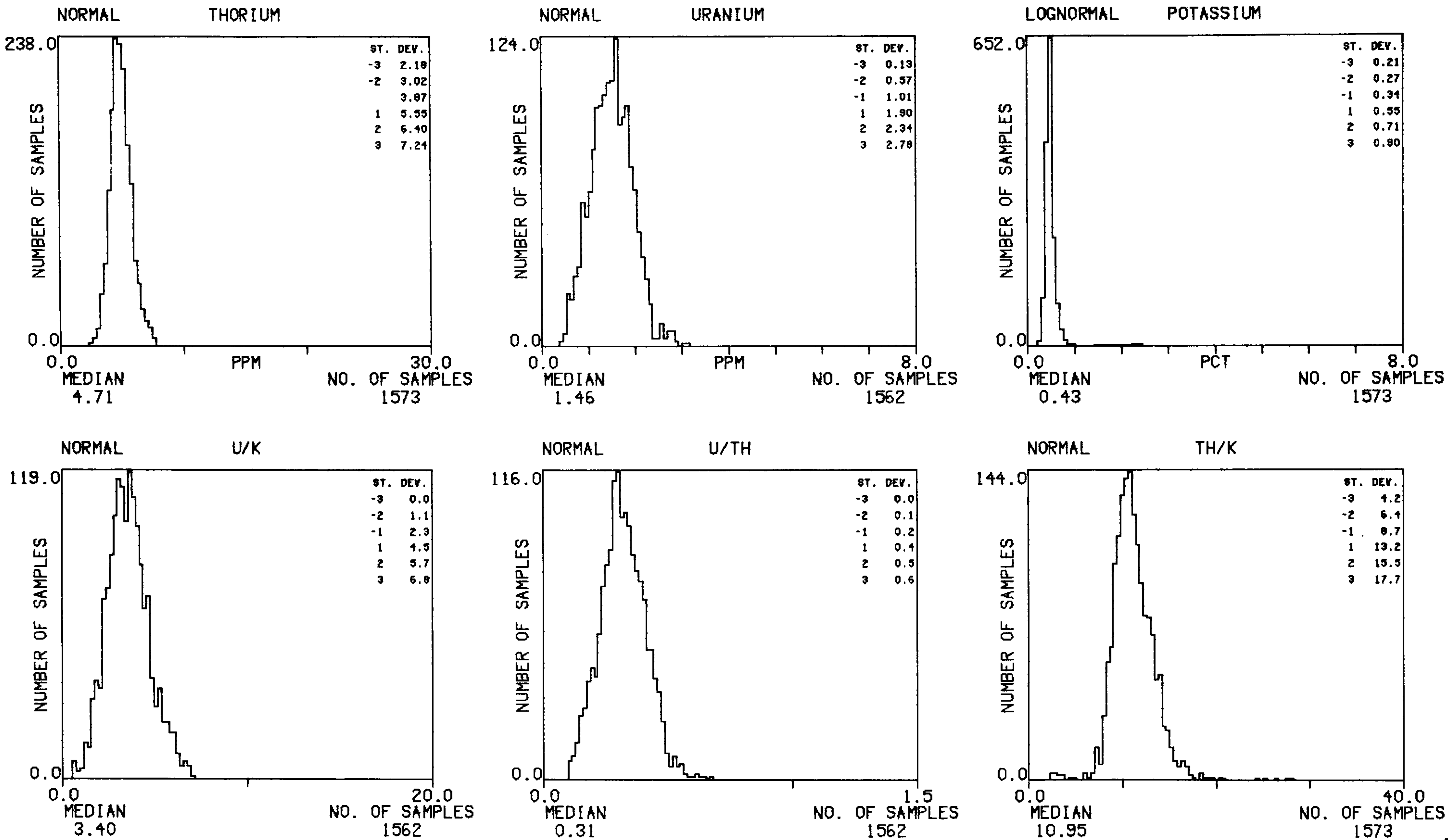

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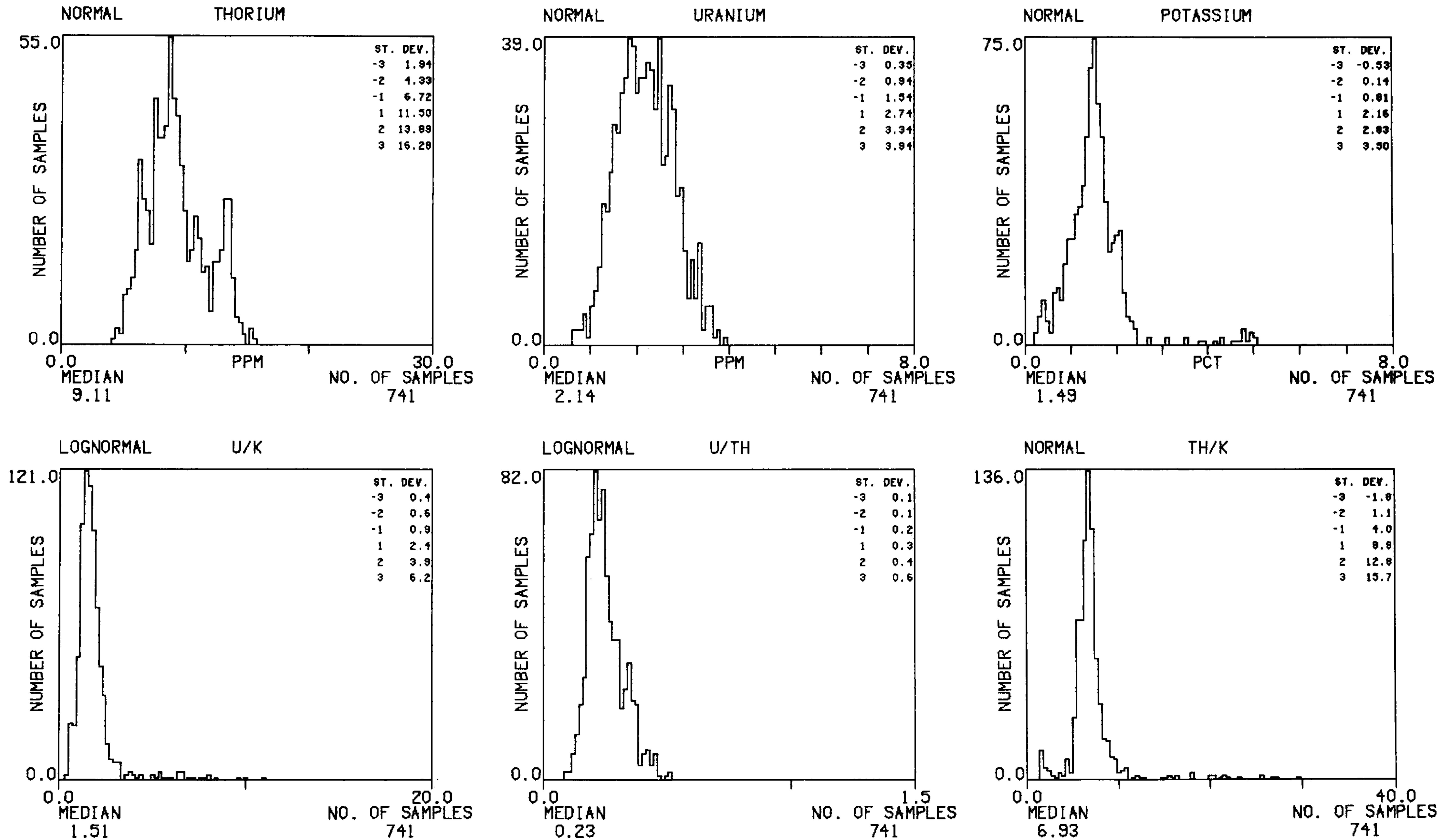

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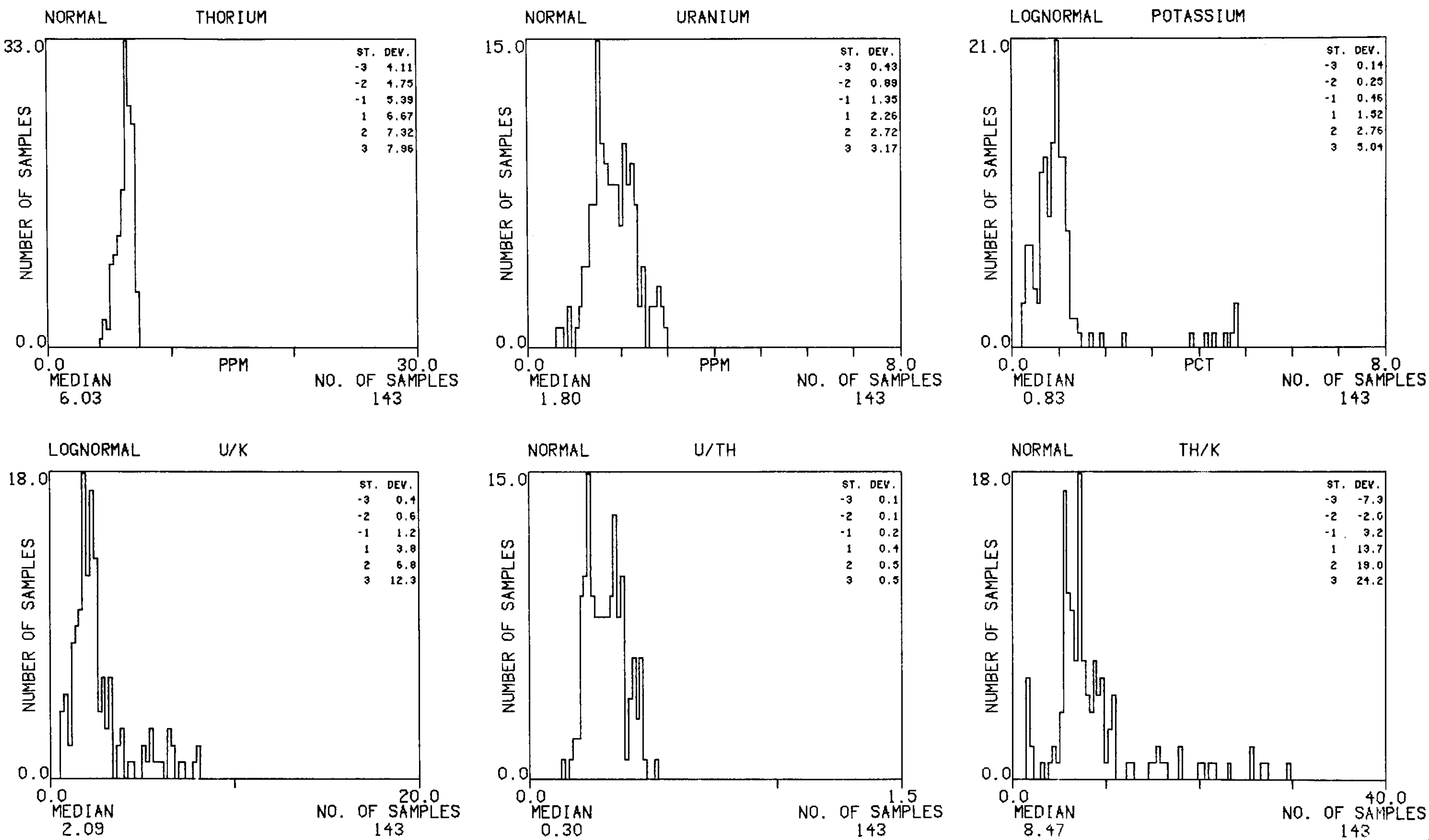
TEXAS INSTRUMENTS CHATTANOOGA NI16-3 APPALACHIAN BASIN SURVEY 1979



HISTOGRAMS : PCG-2

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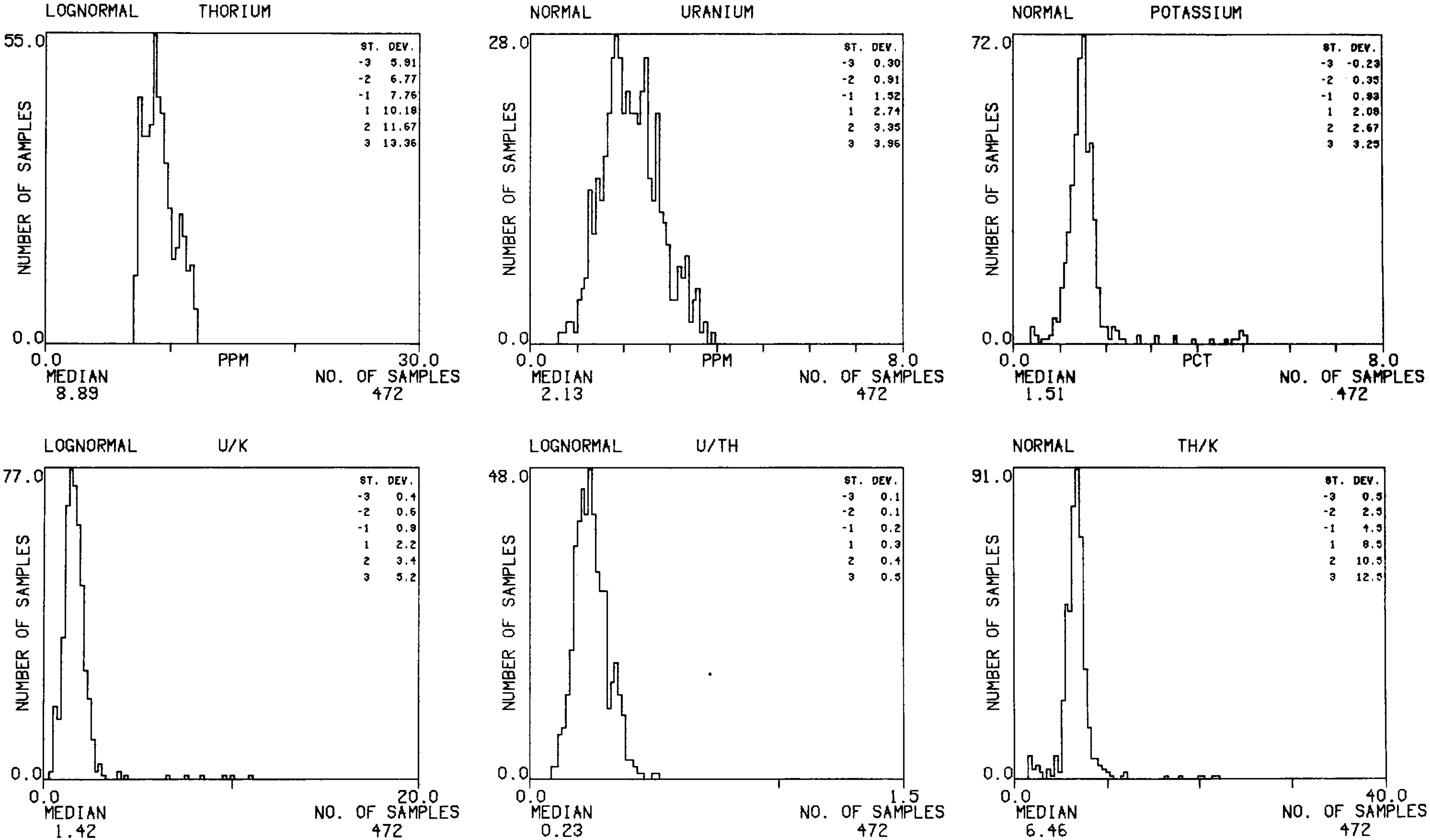

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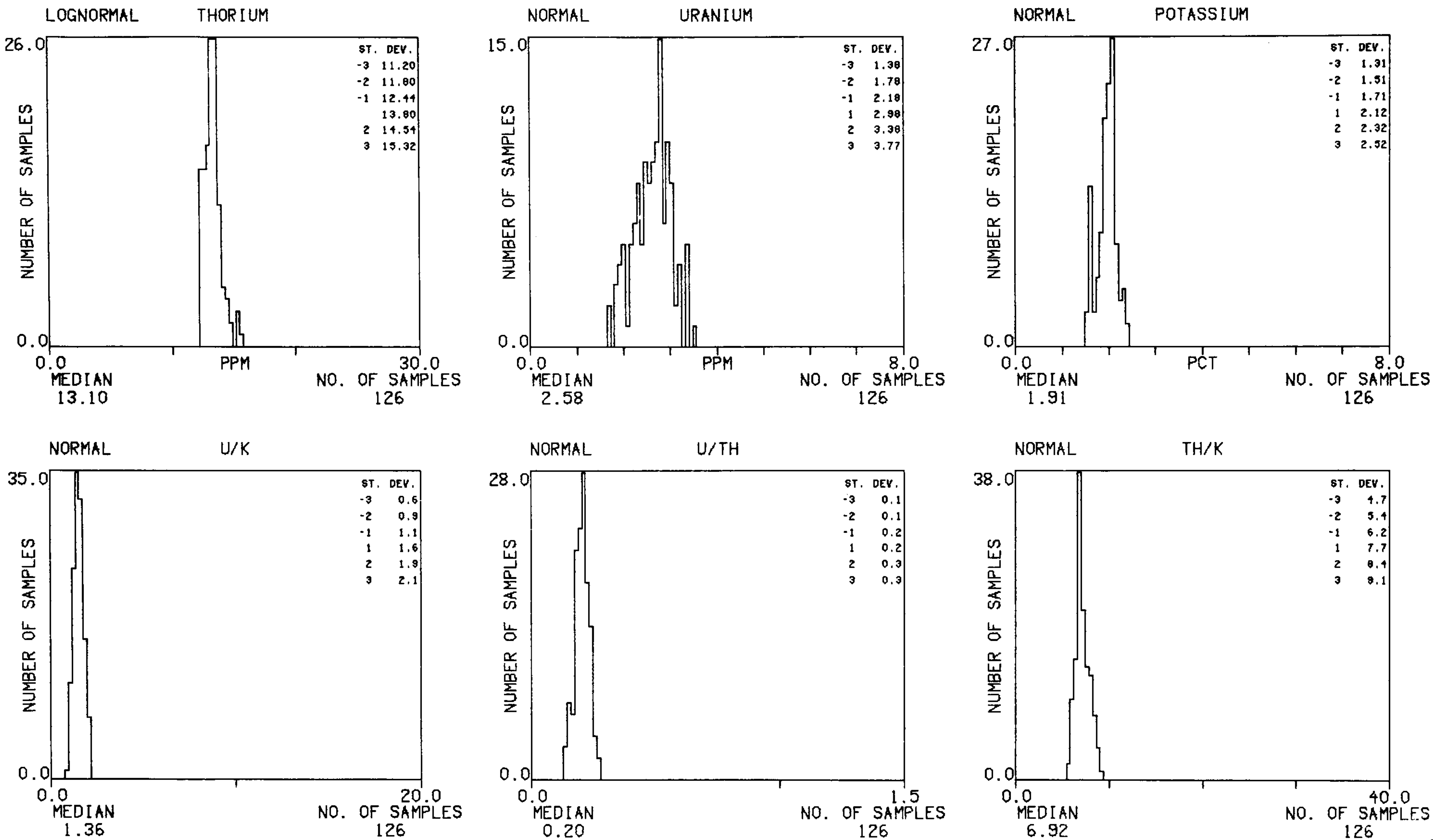

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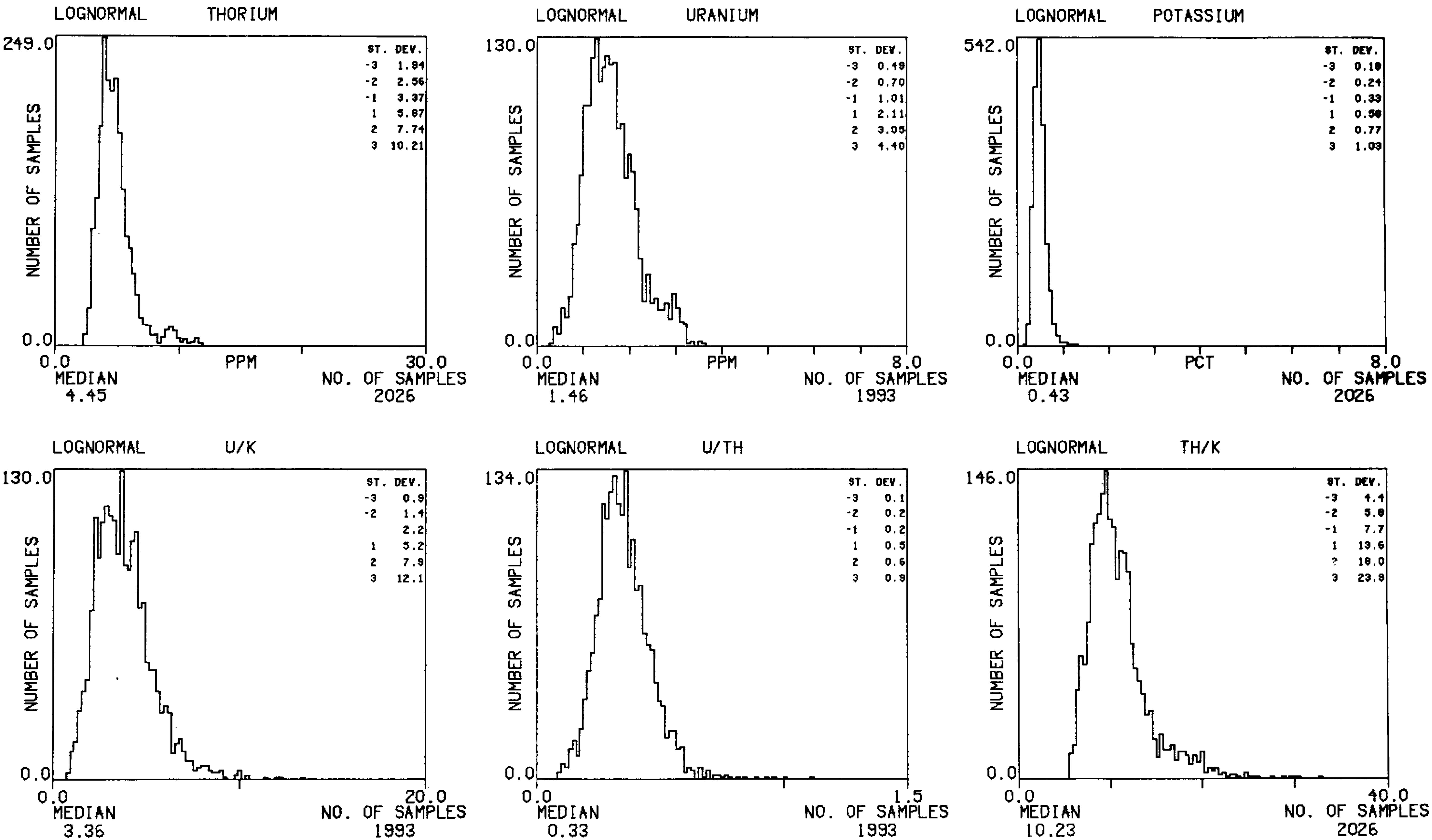

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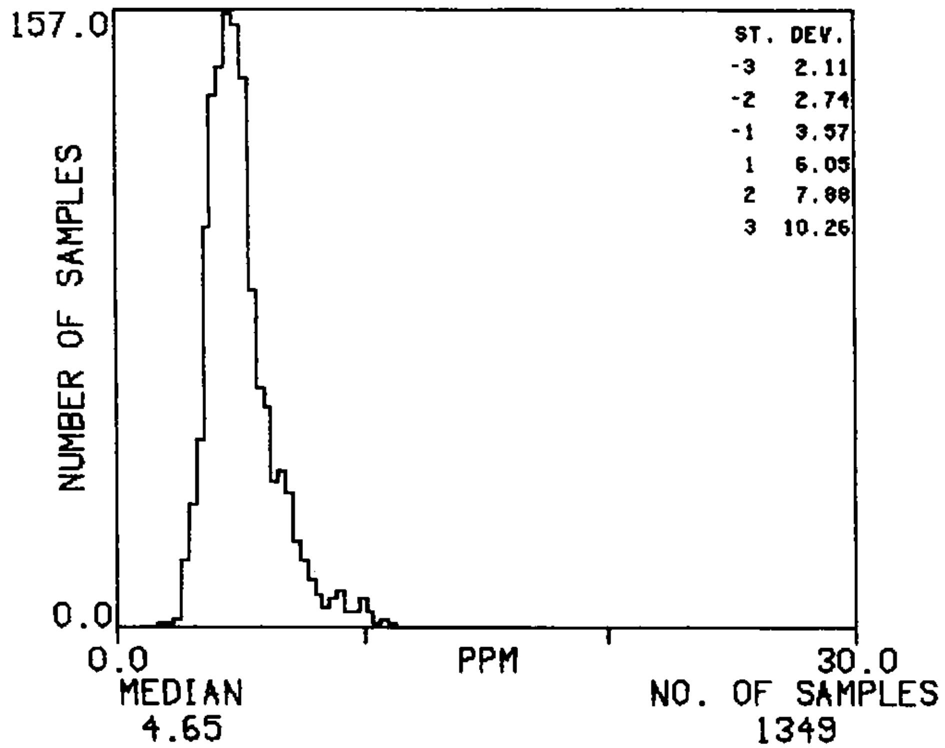
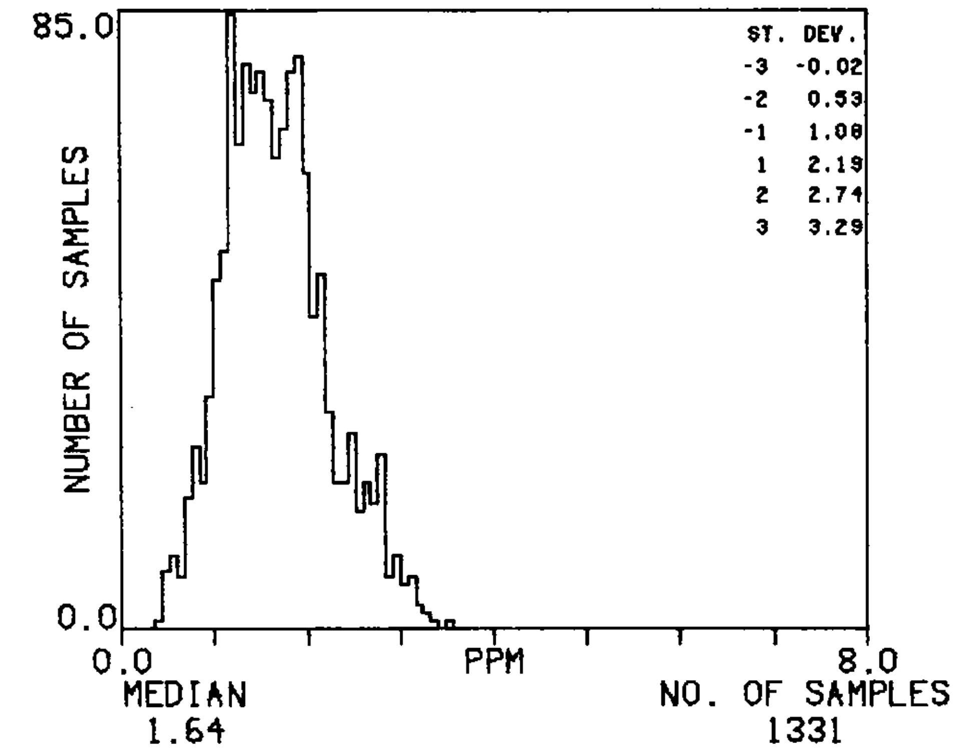
TEXAS INSTRUMENTS CHATTANOOGA NI16-3 APPALACHIAN BASIN SURVEY 1979

LOGNORMAL THORIUM



NORMAL URANIUM



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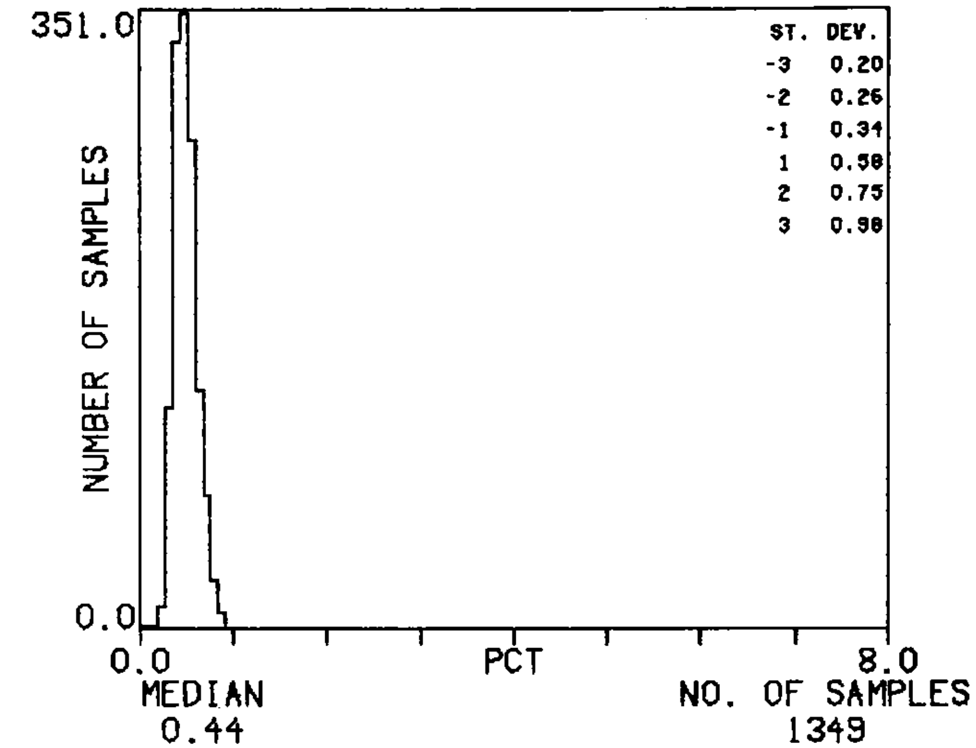

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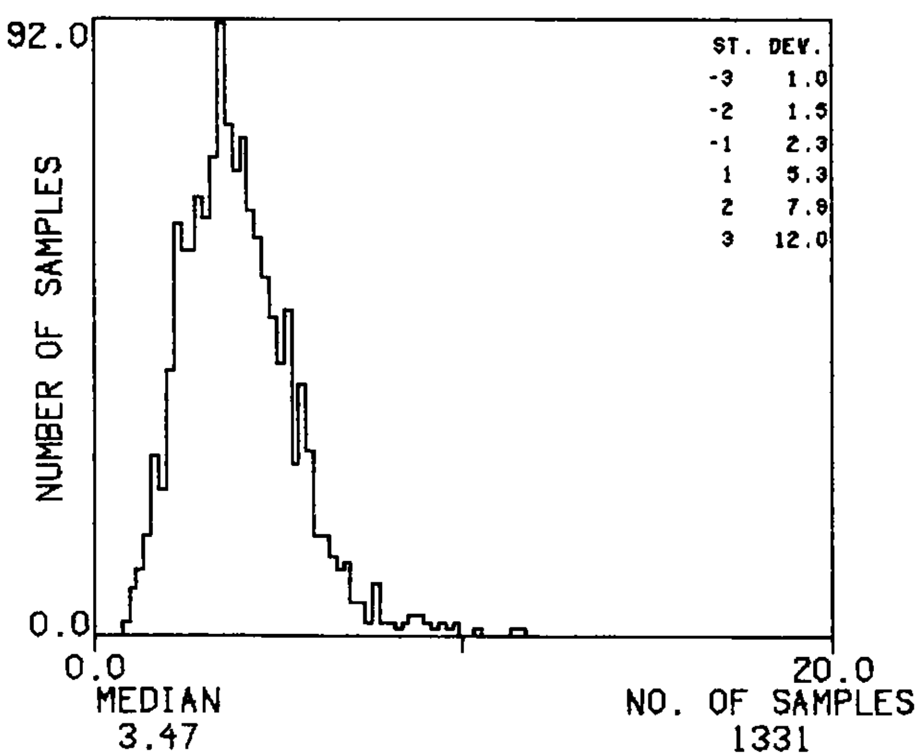

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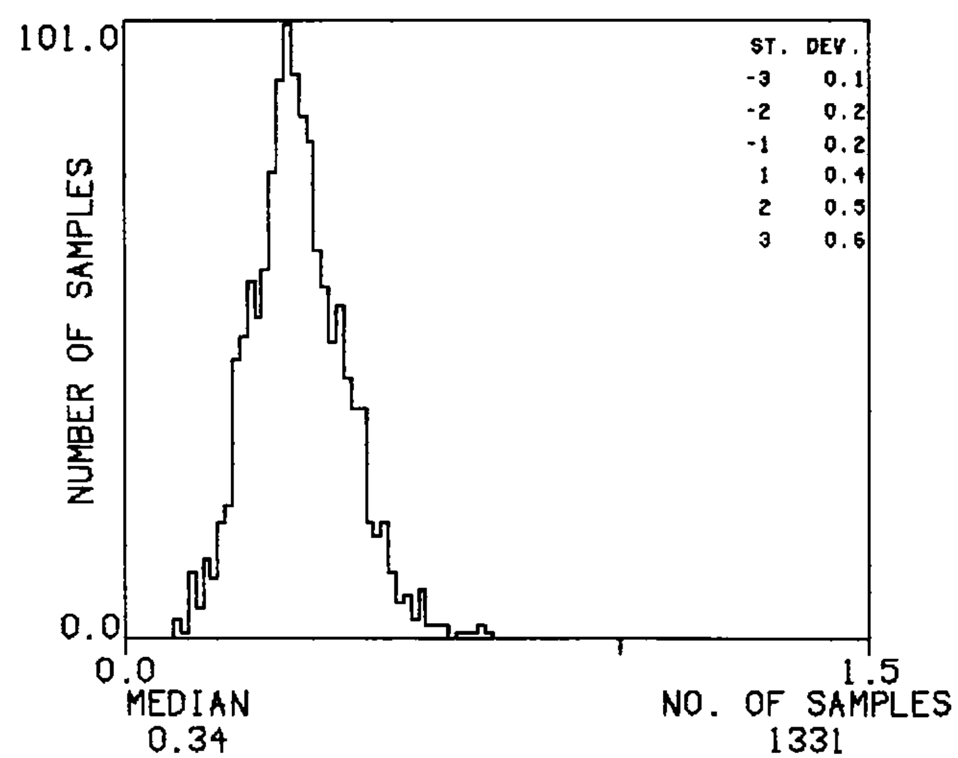

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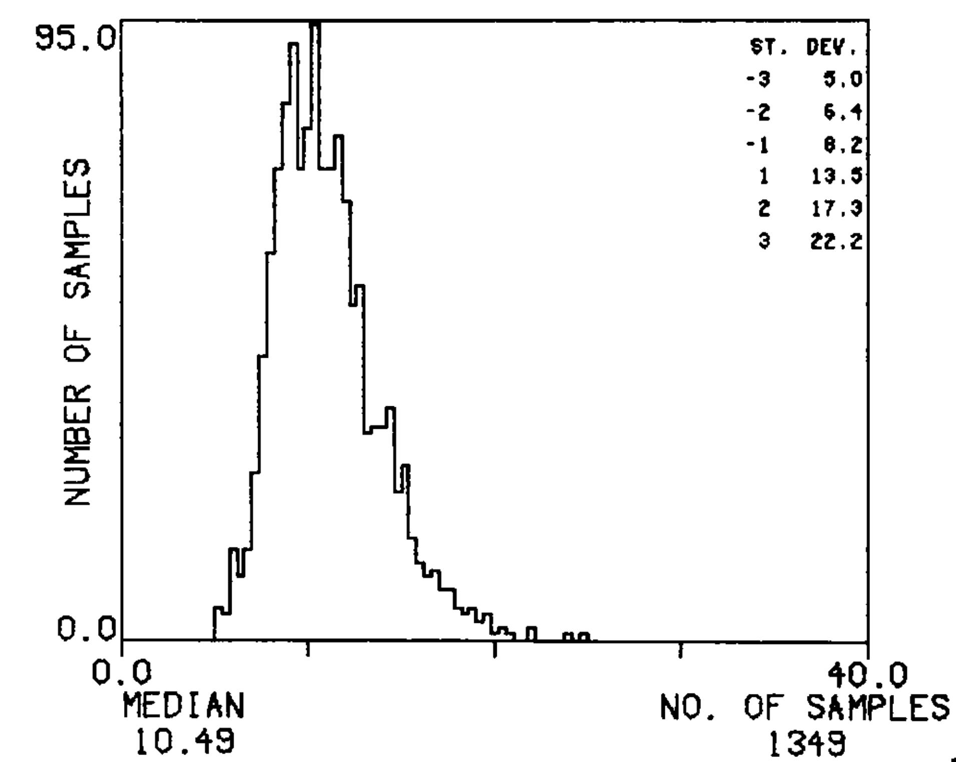

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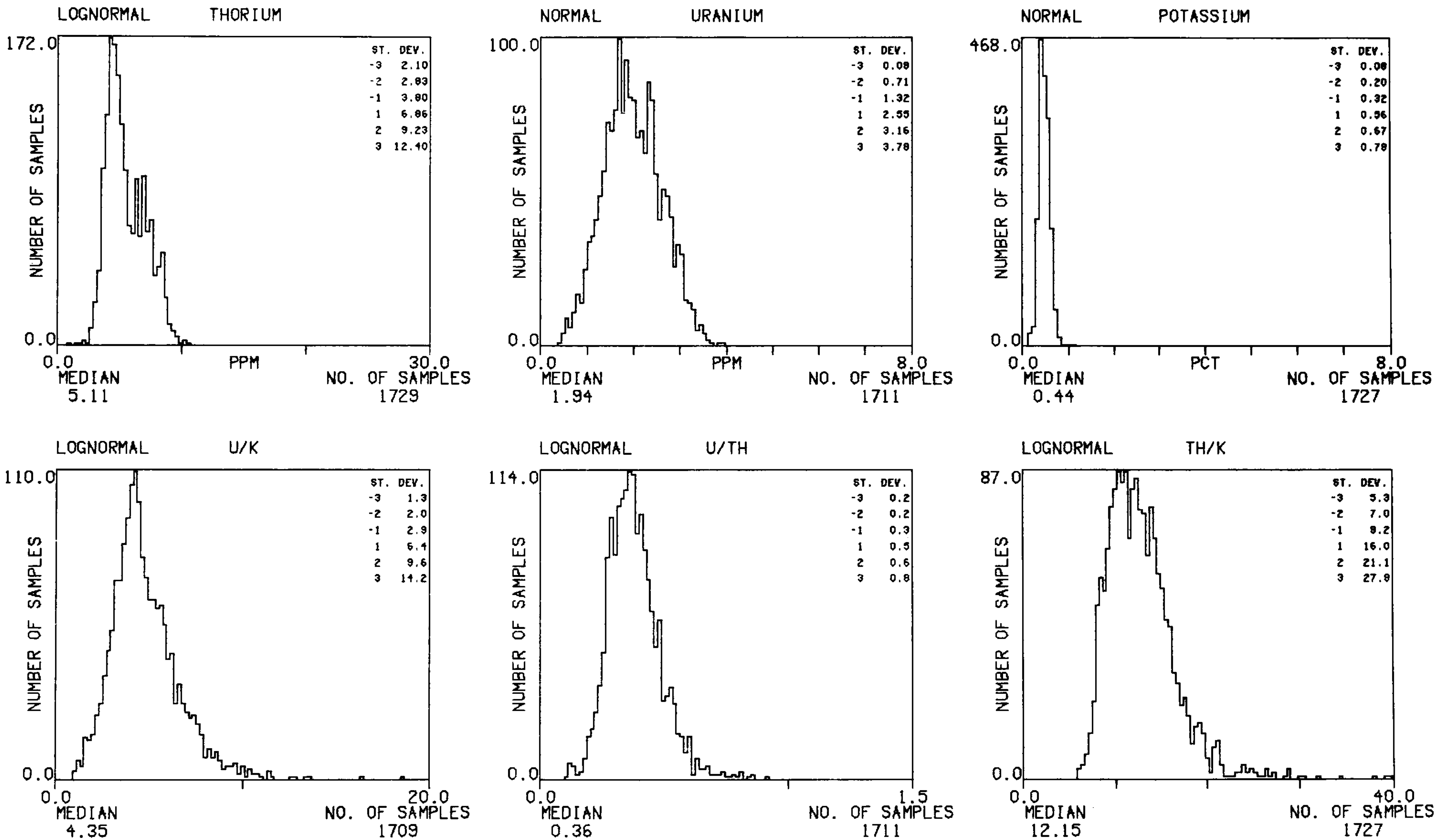
TEXAS INSTRUMENTS CHATTANOOGA NI16-3 APPALACHIAN BASIN SURVEY 1979



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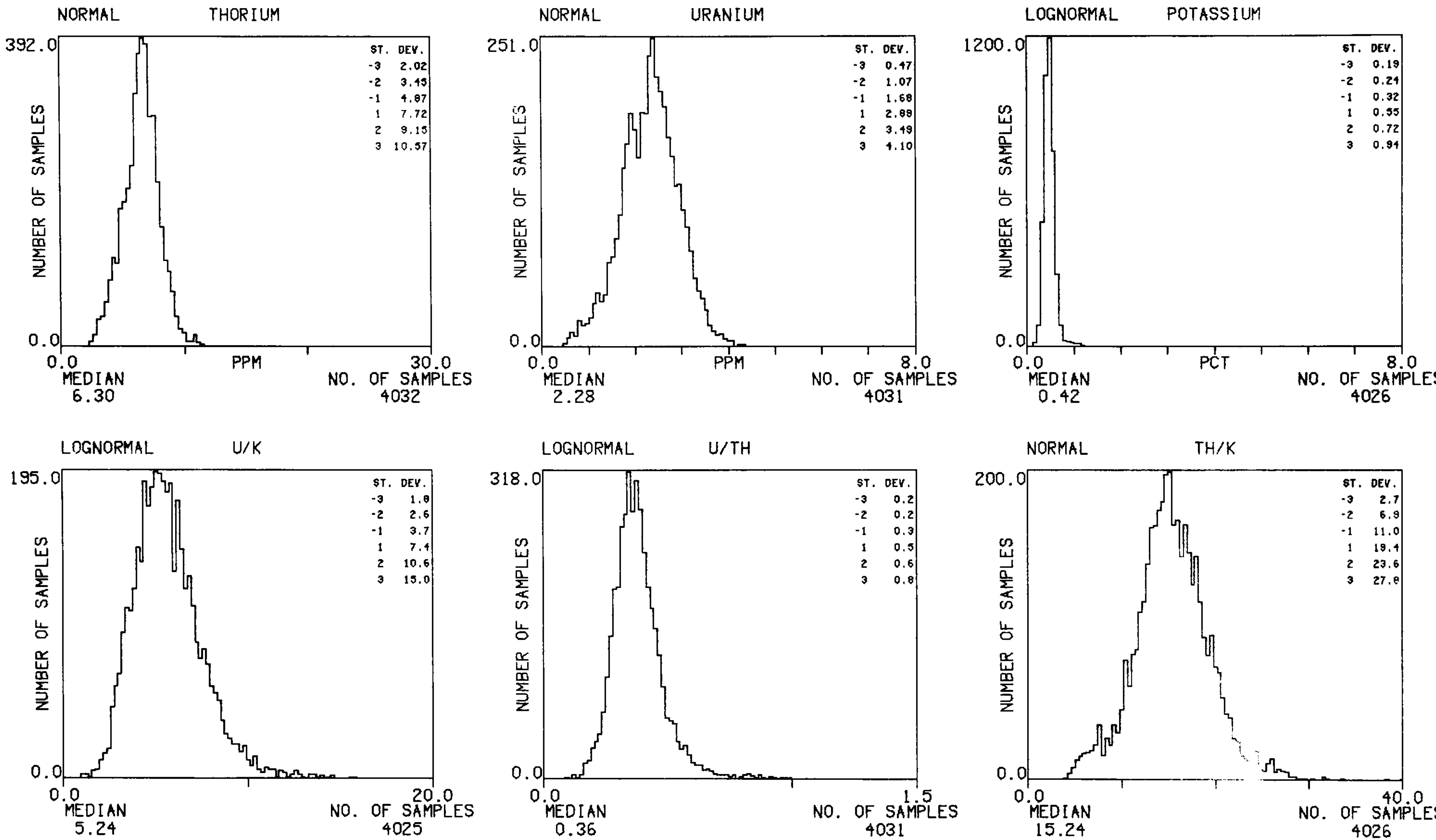

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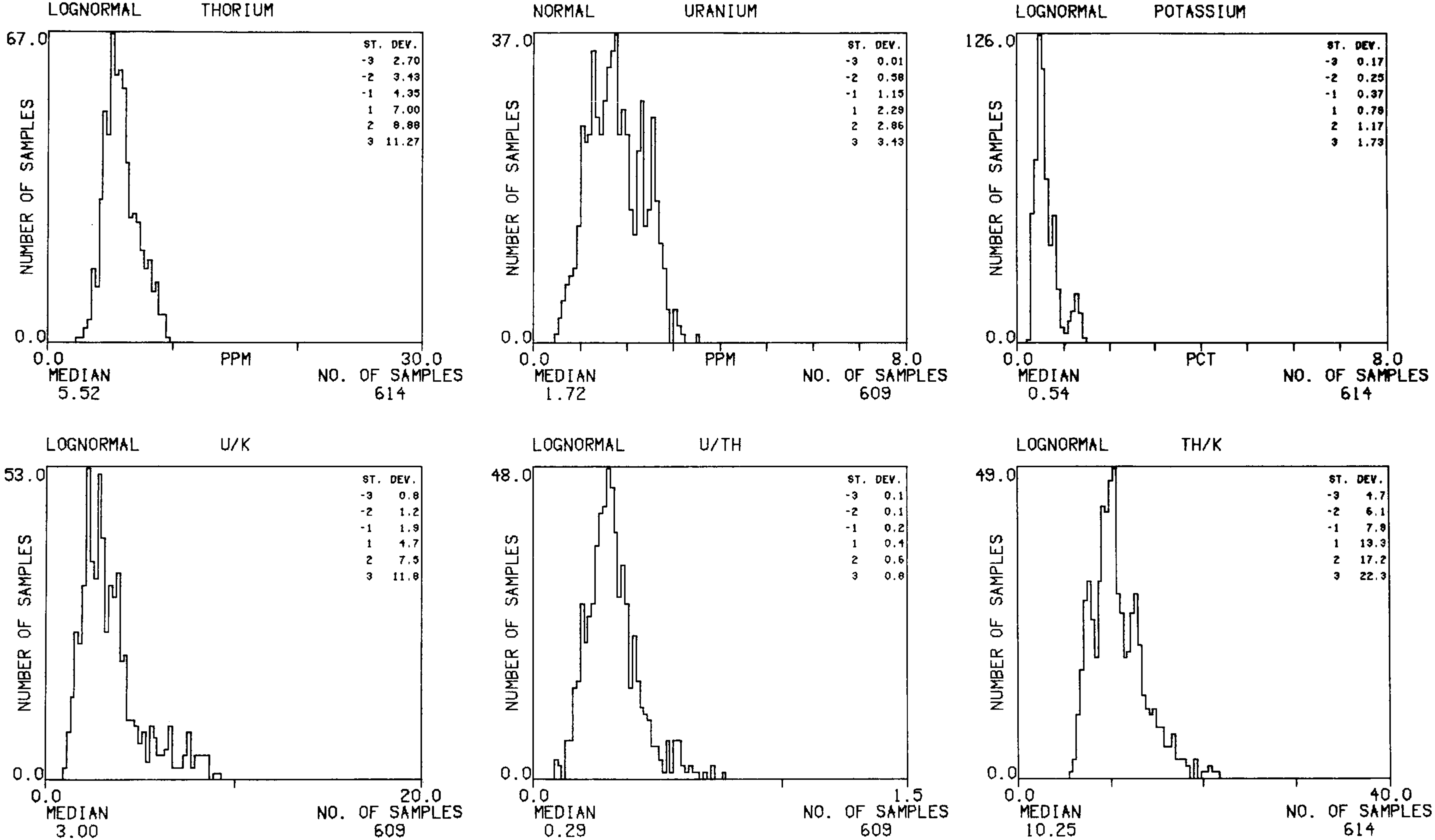

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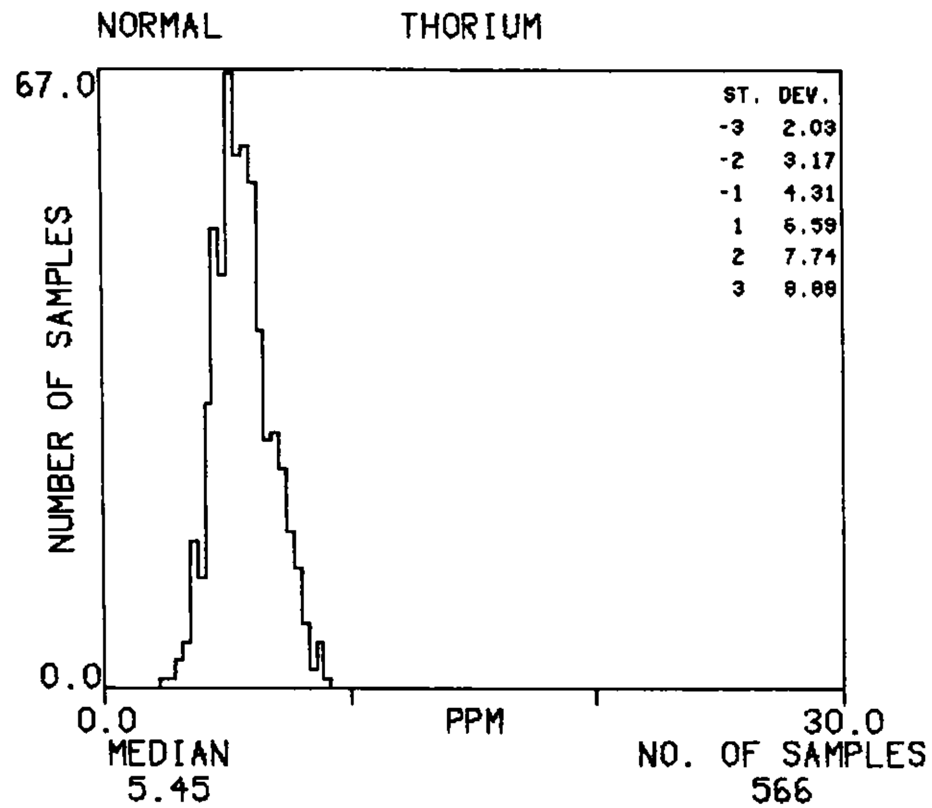

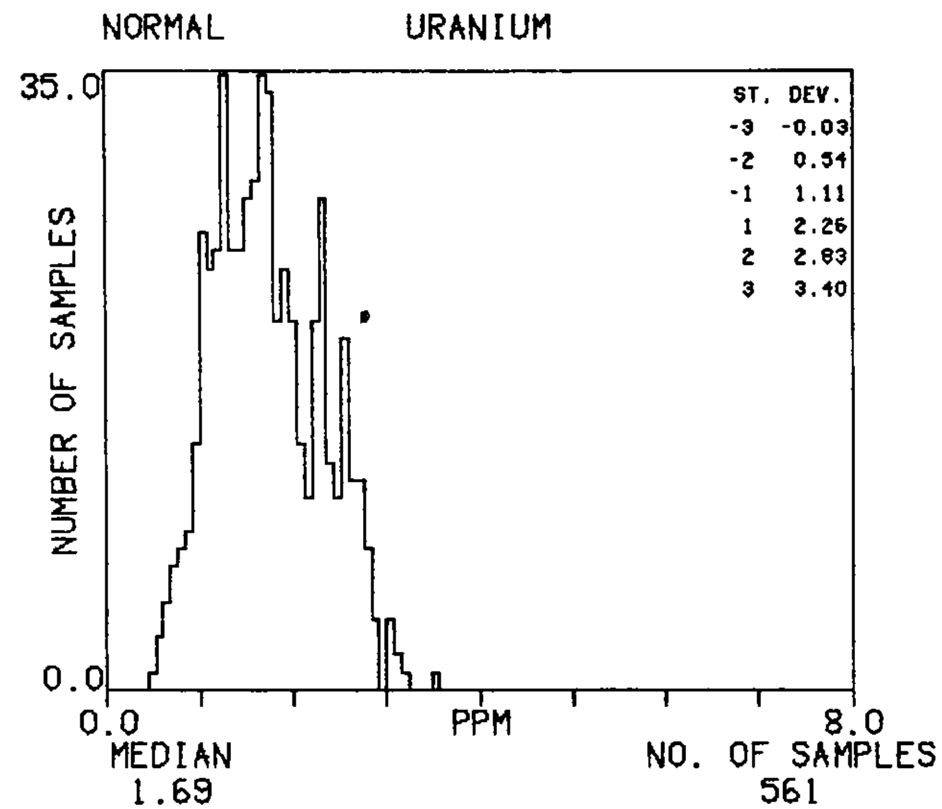

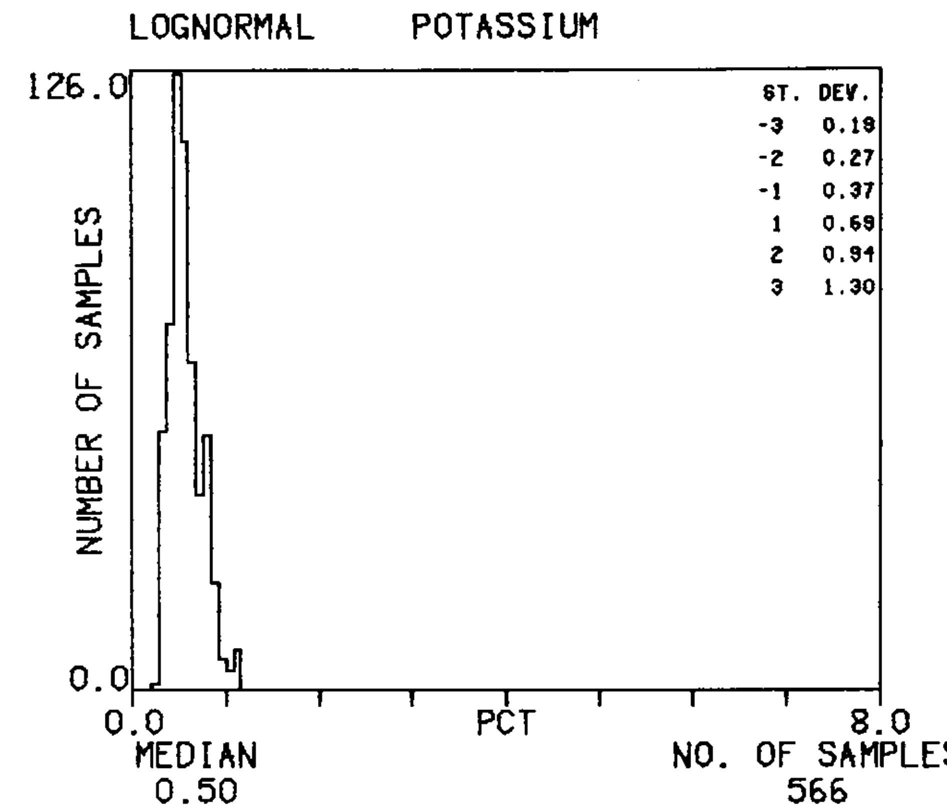

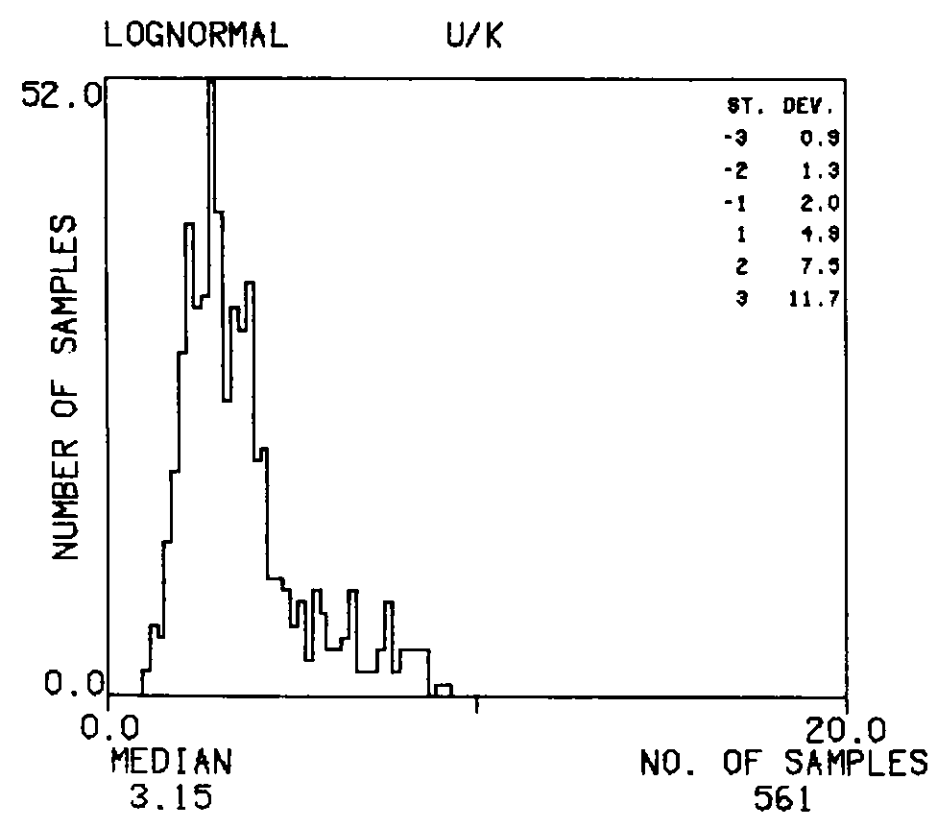

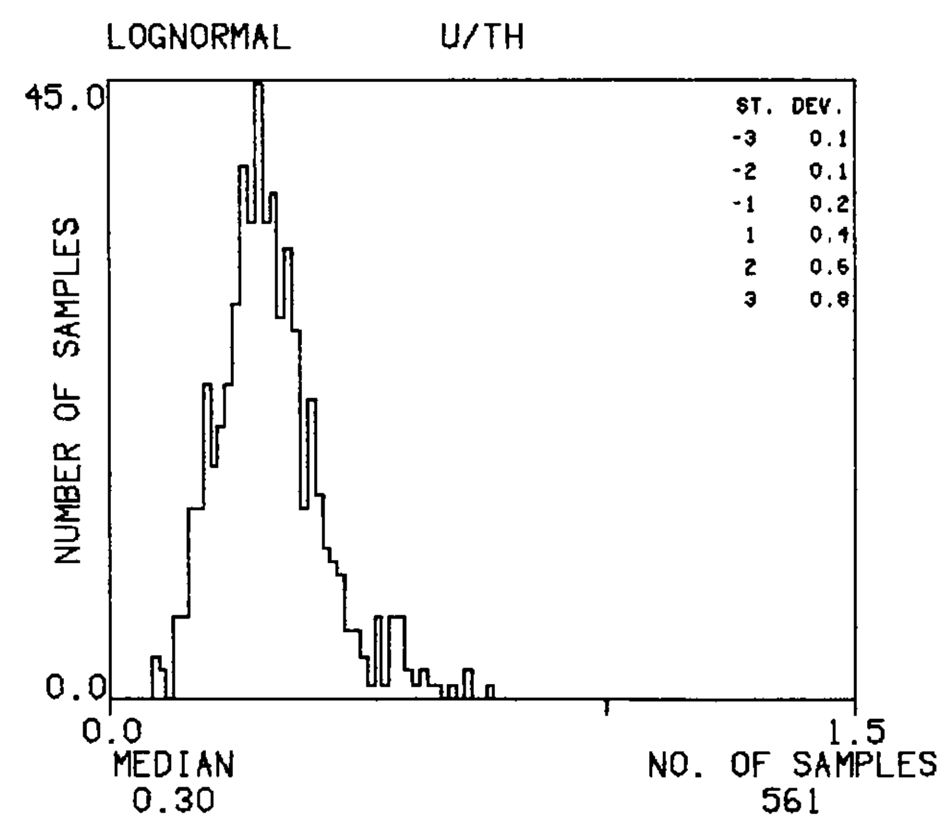

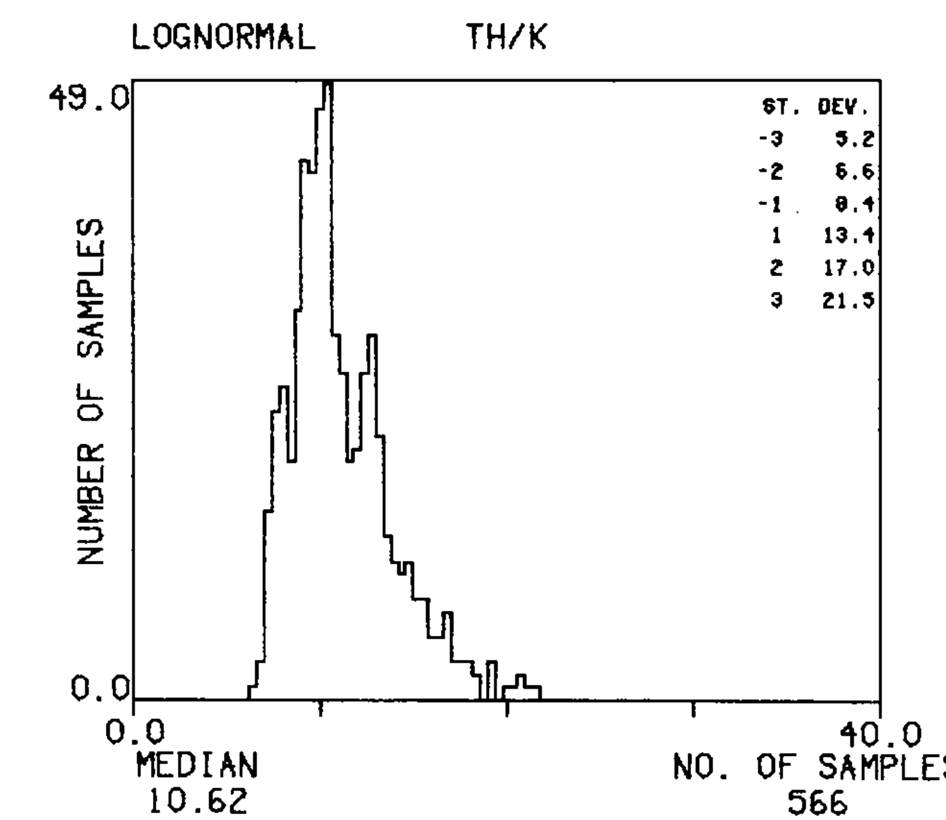

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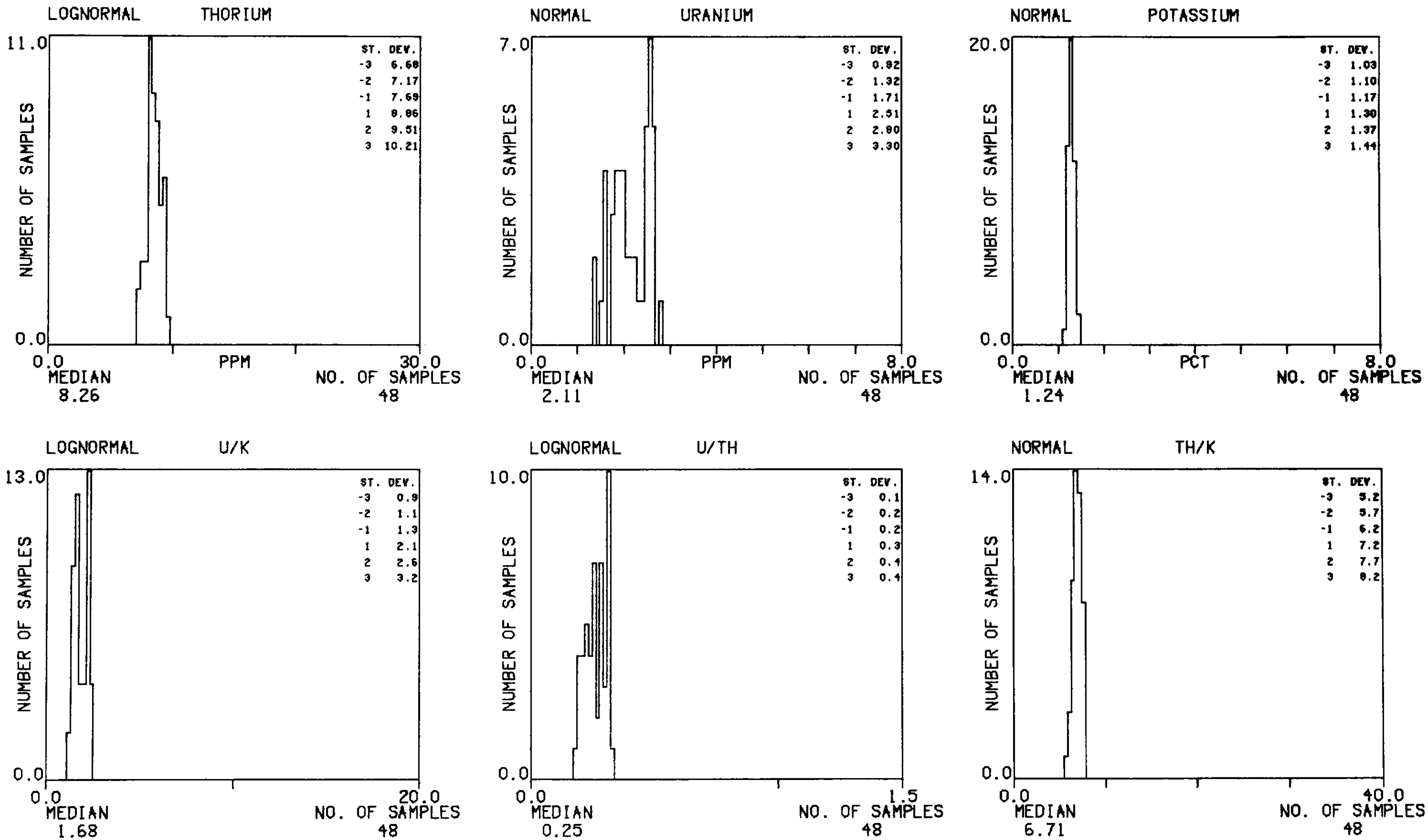

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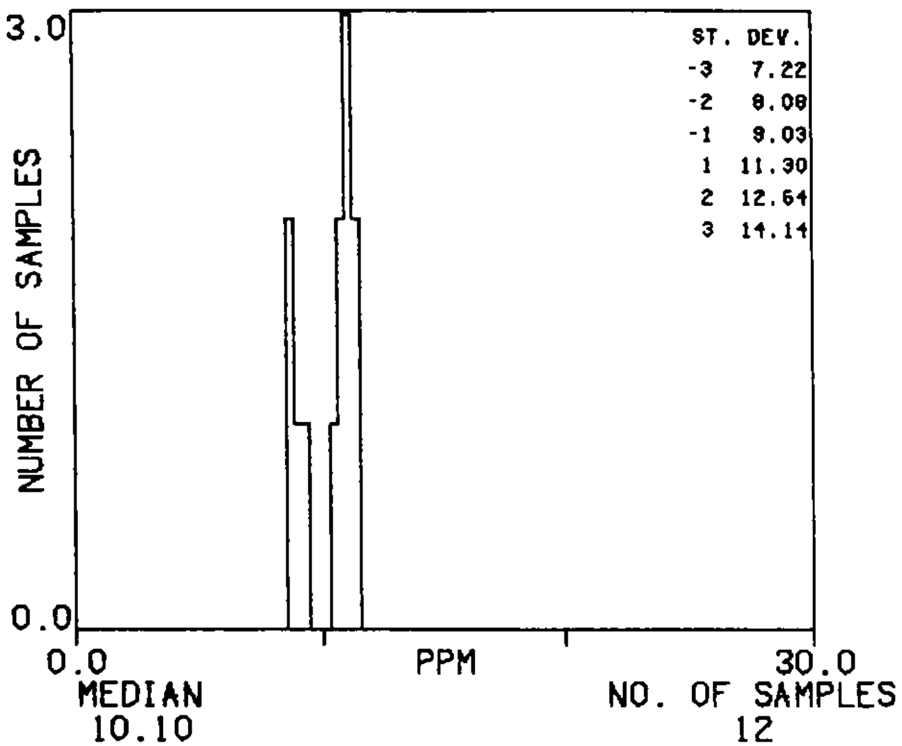

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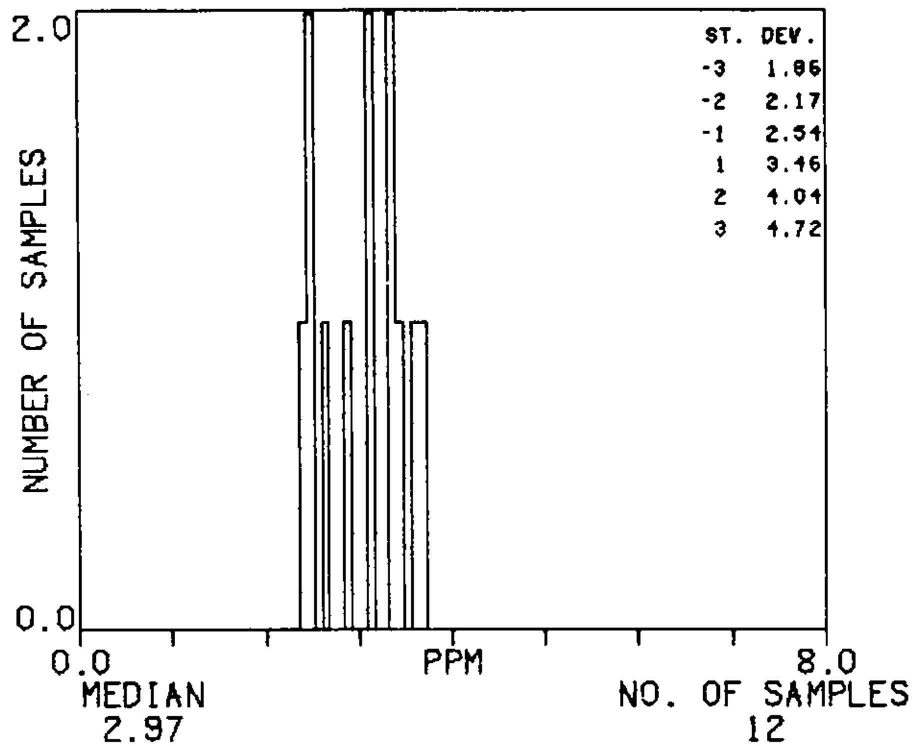

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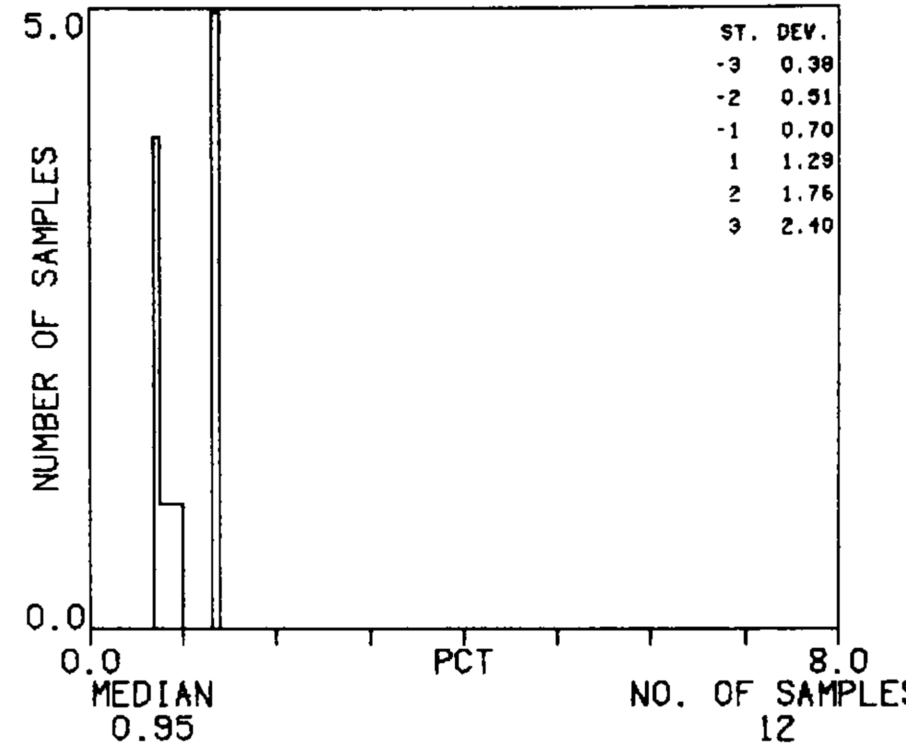

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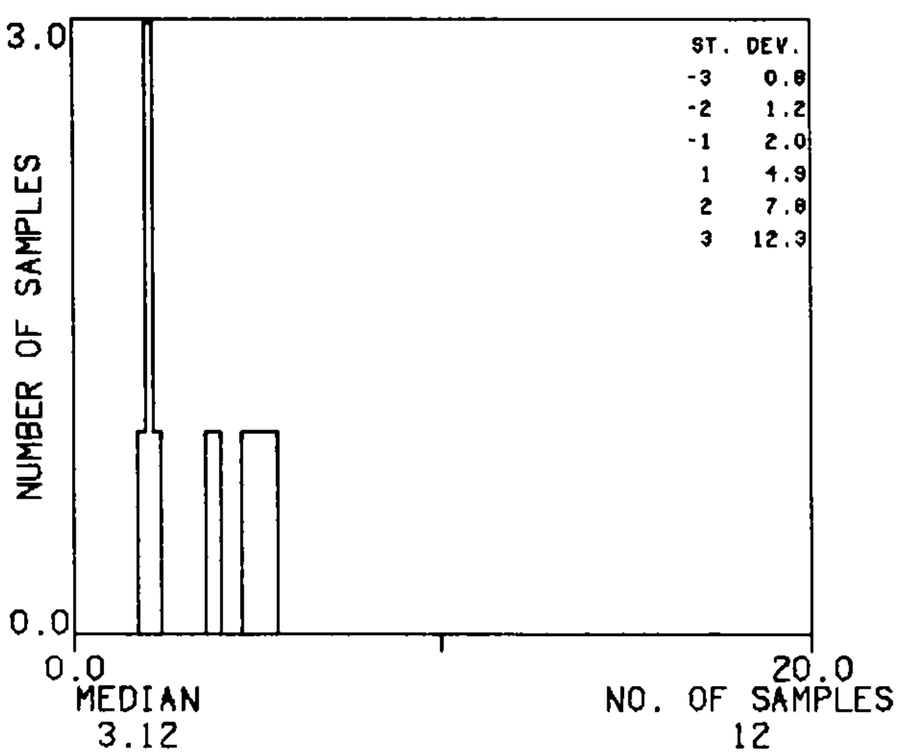

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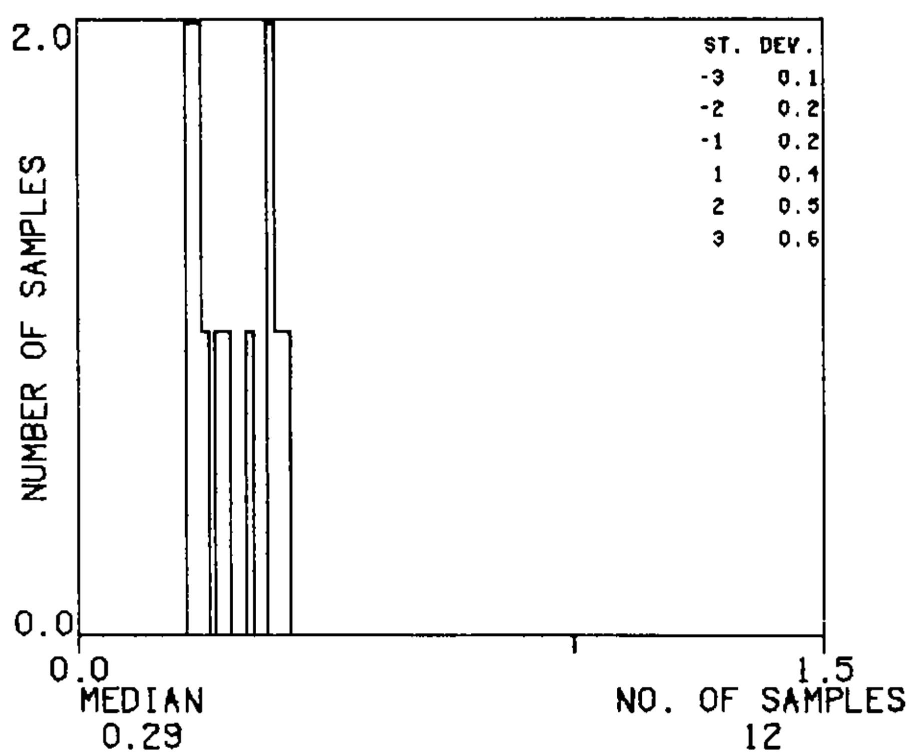

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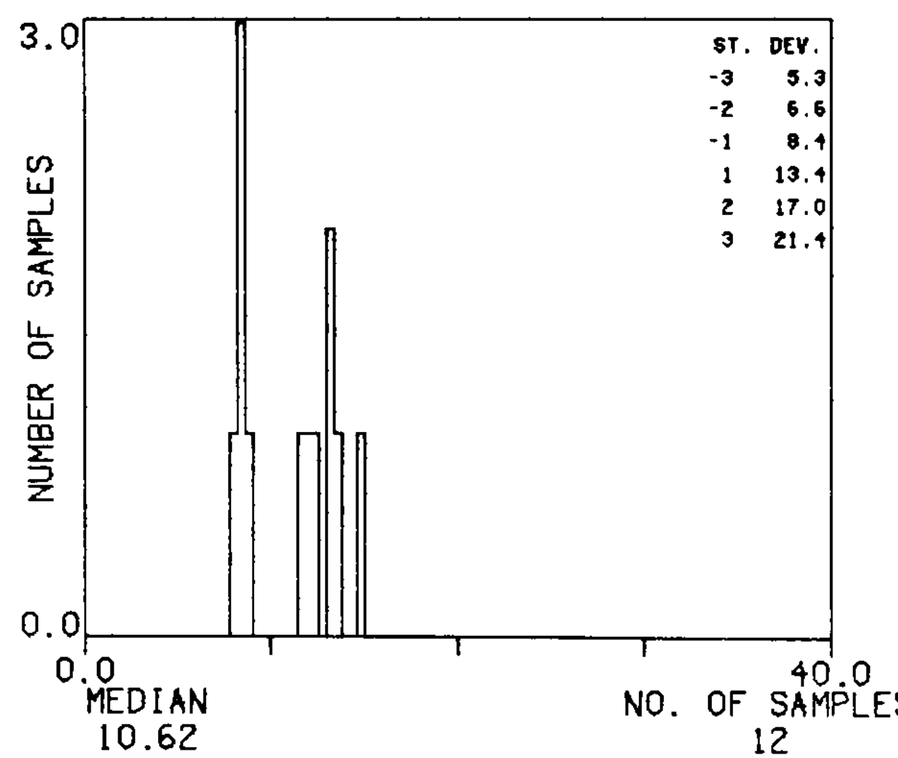

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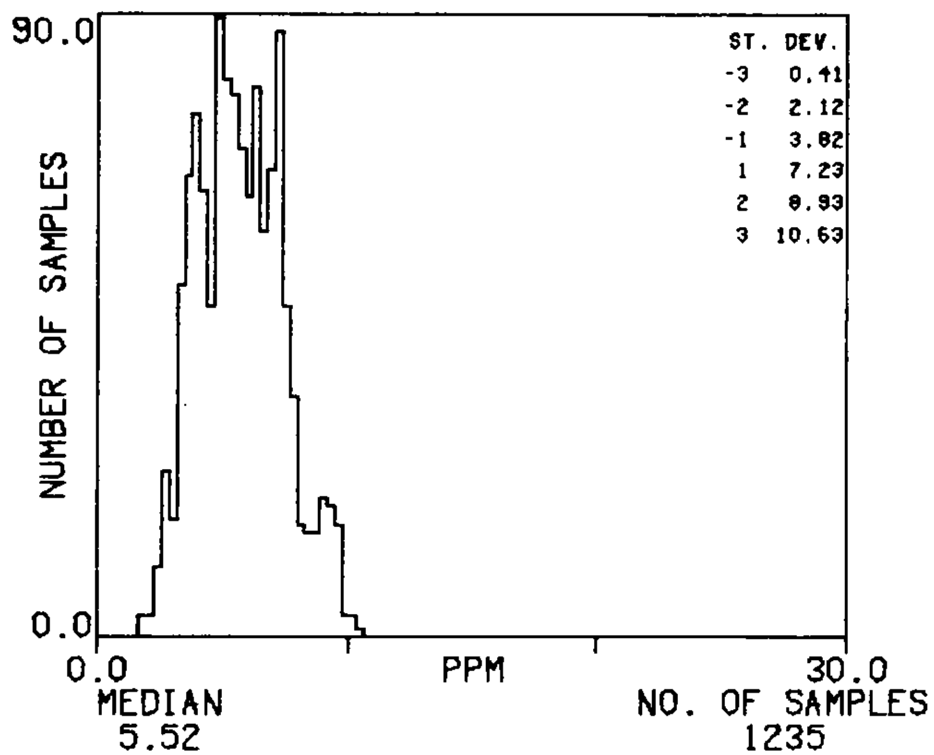

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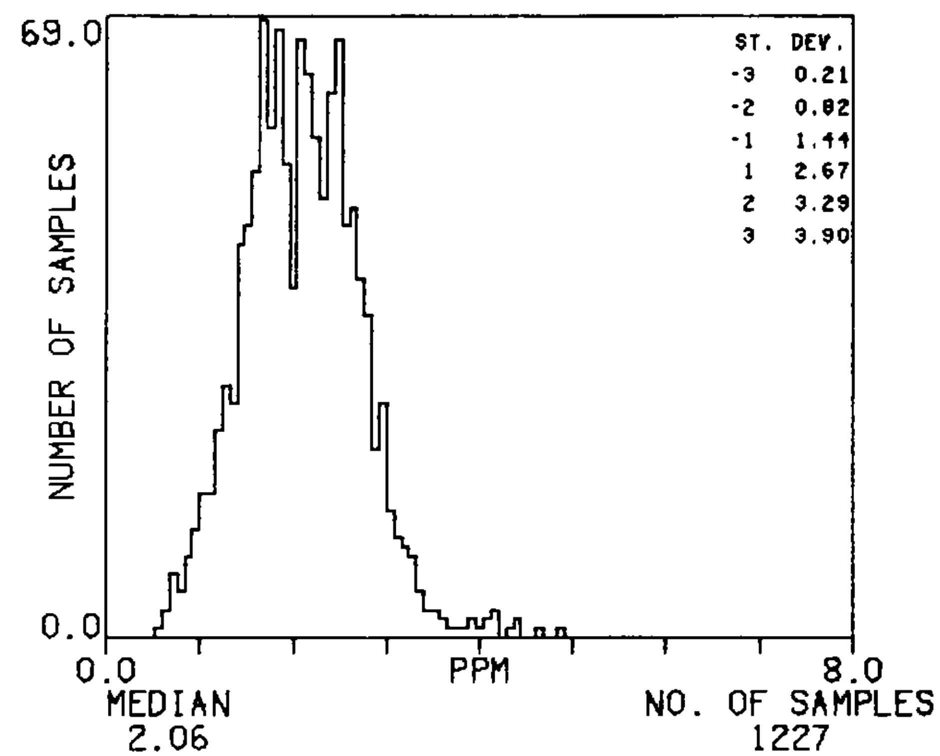

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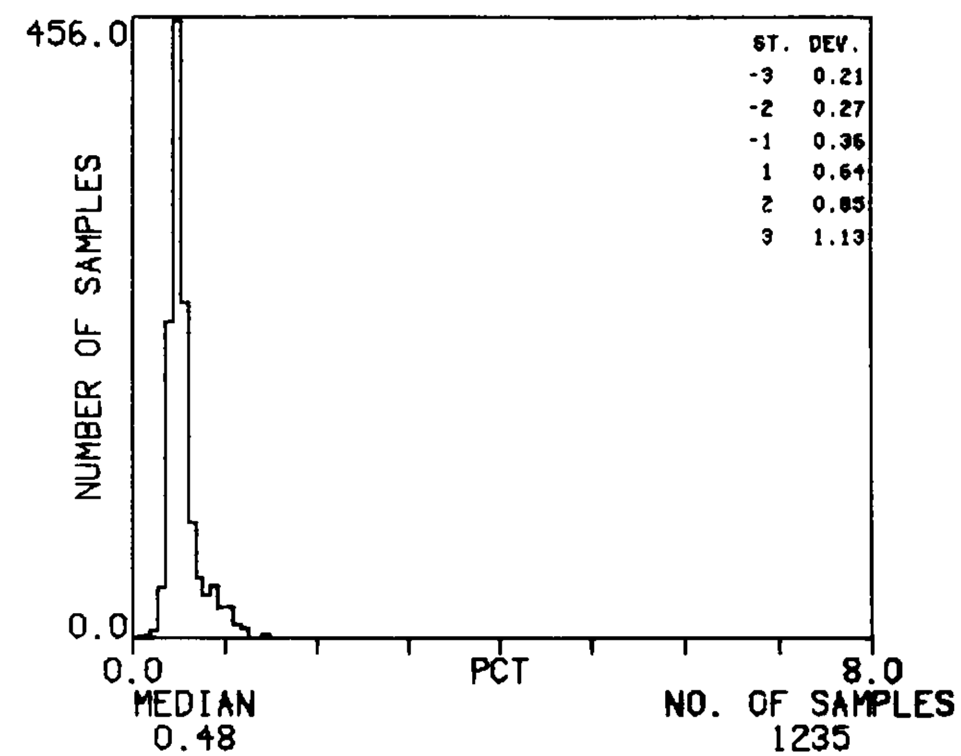

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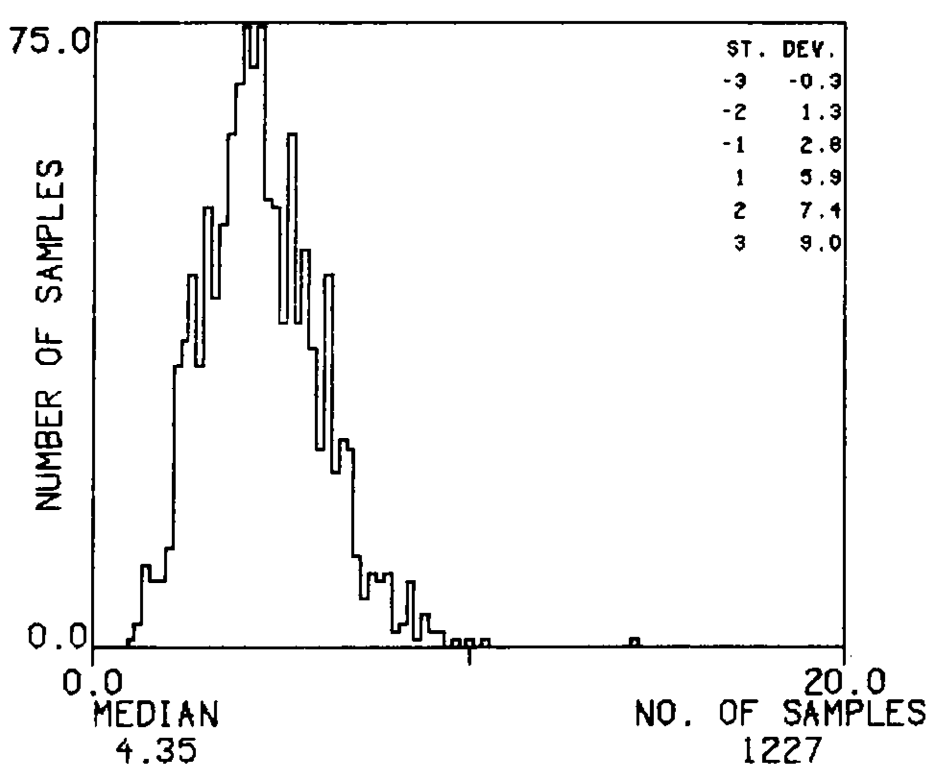

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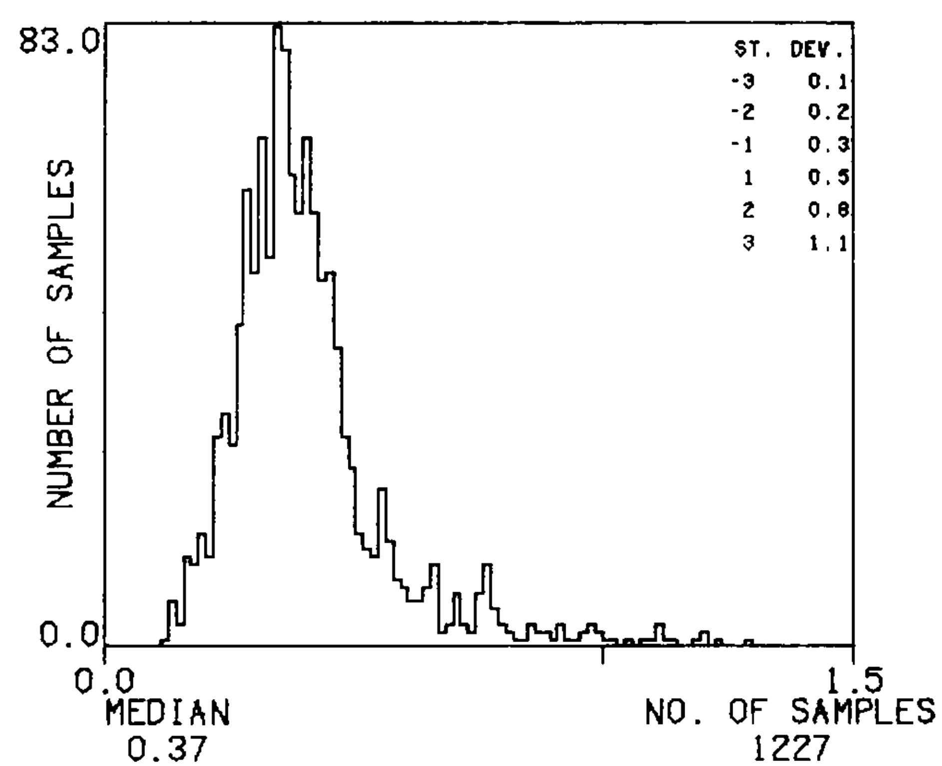

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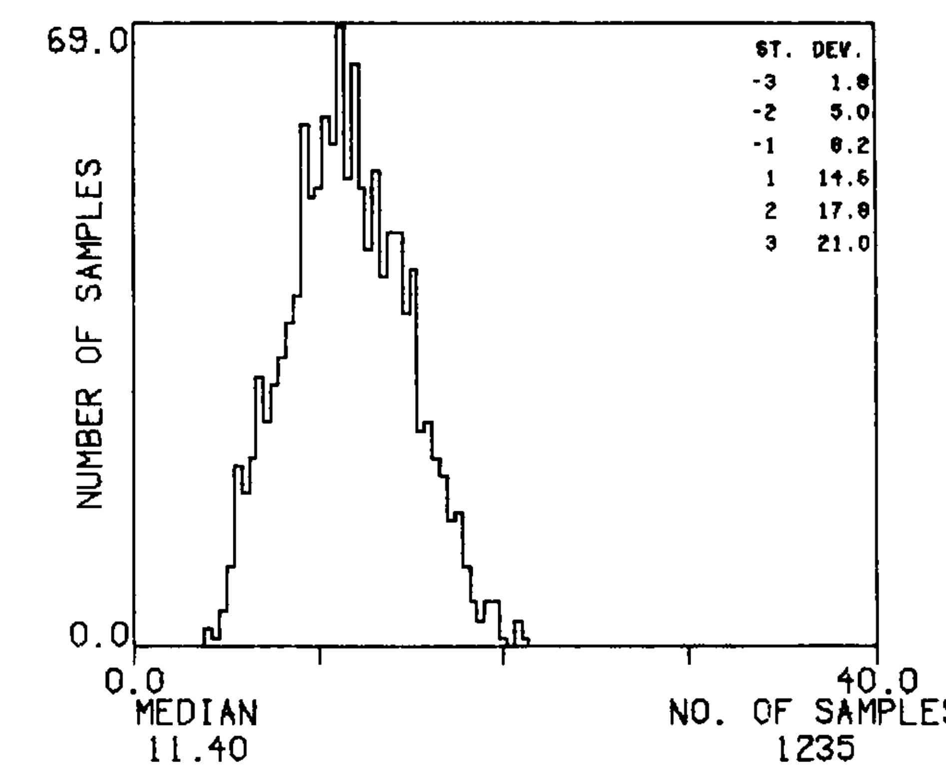

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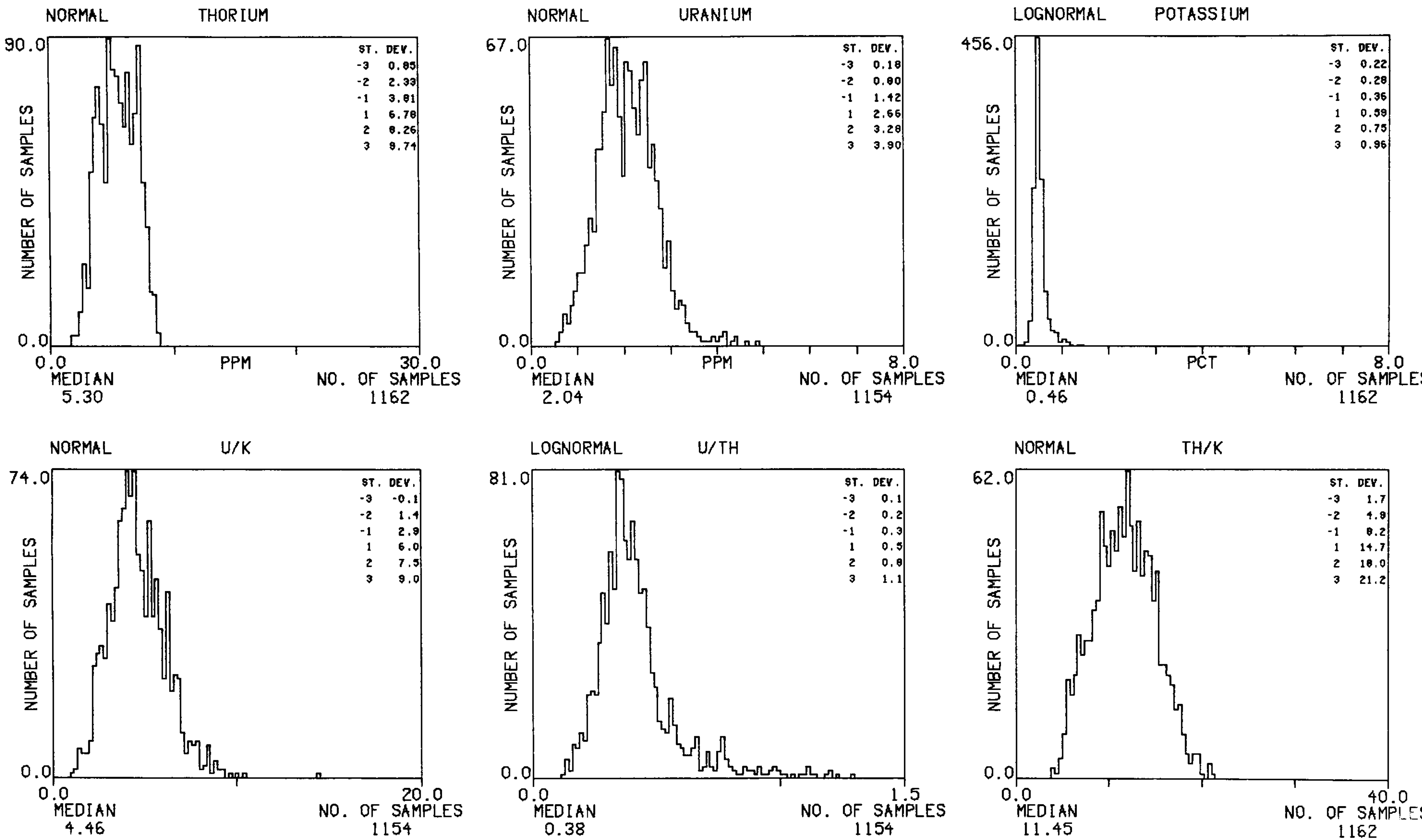

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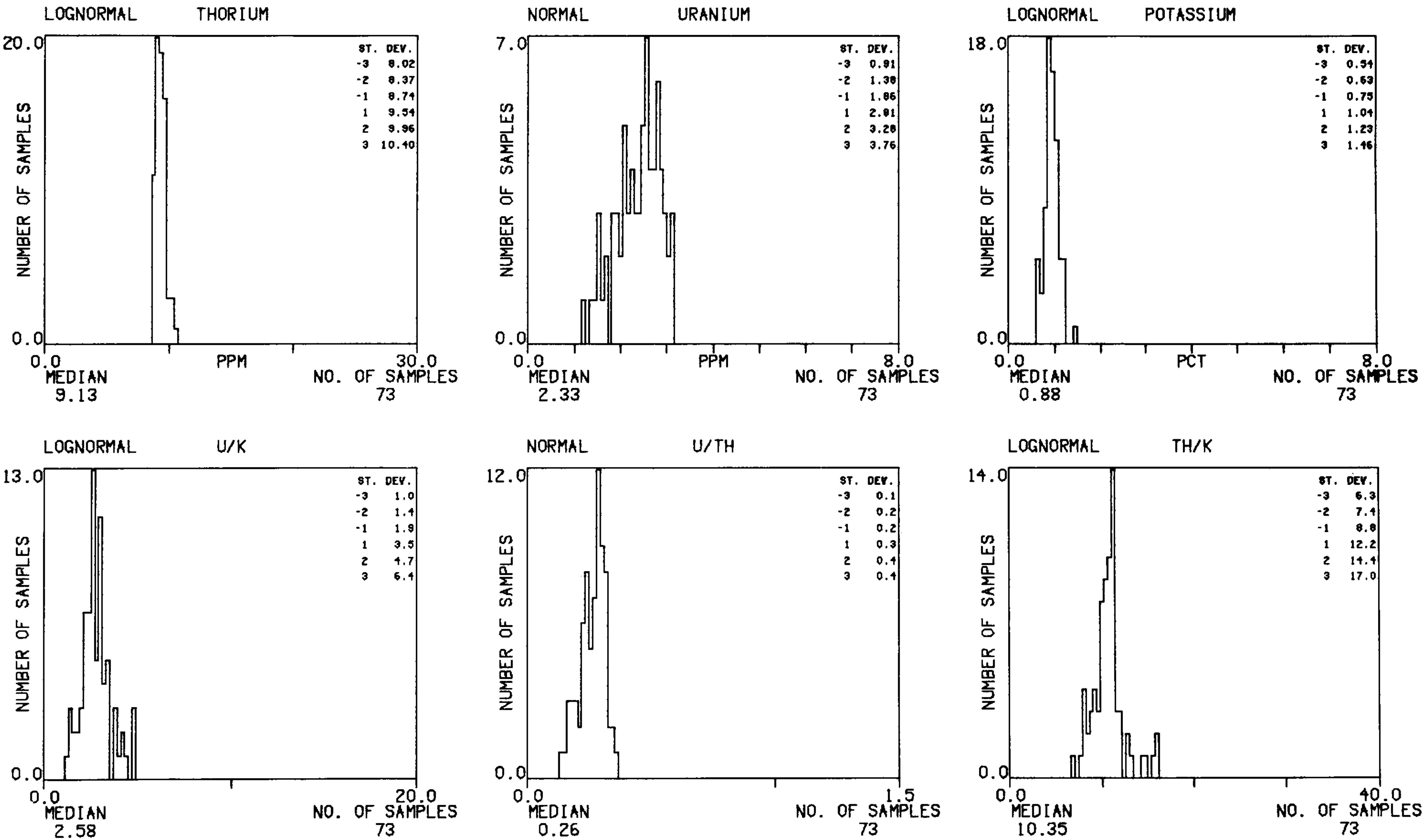

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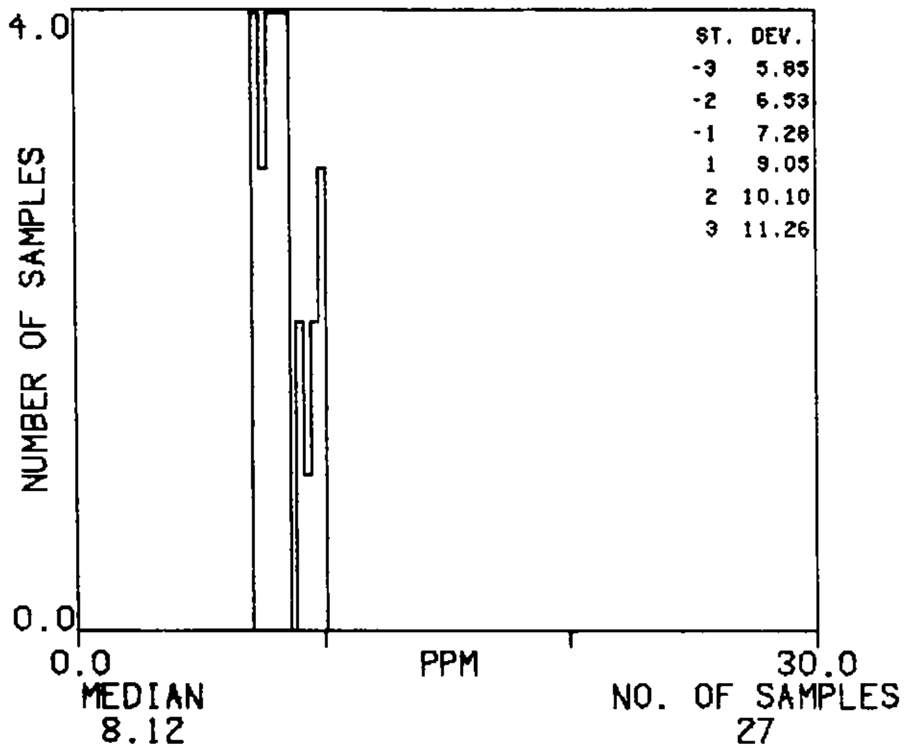

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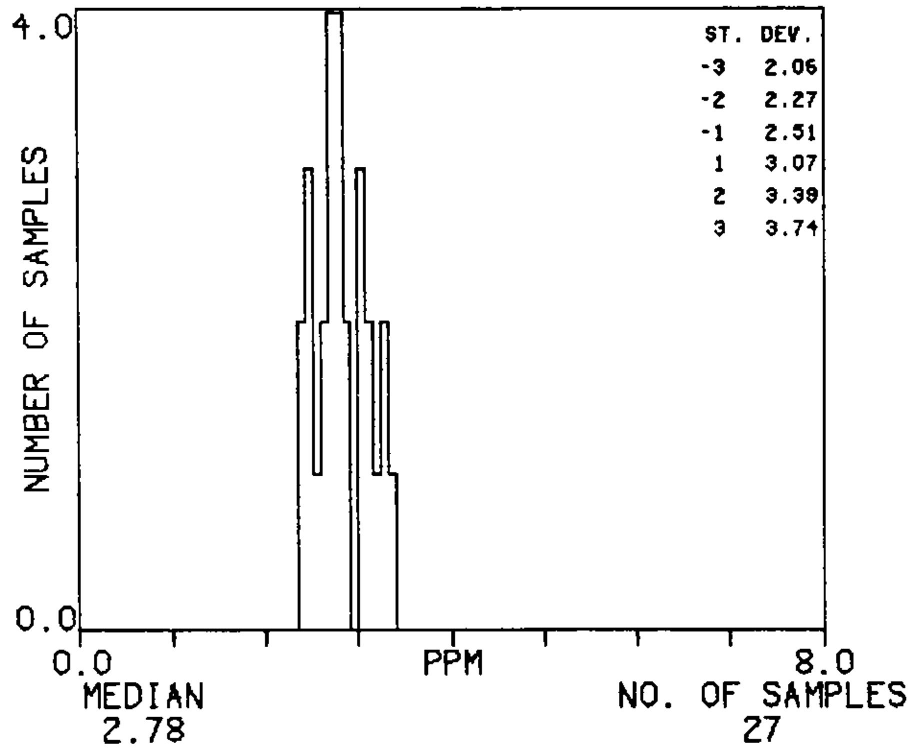

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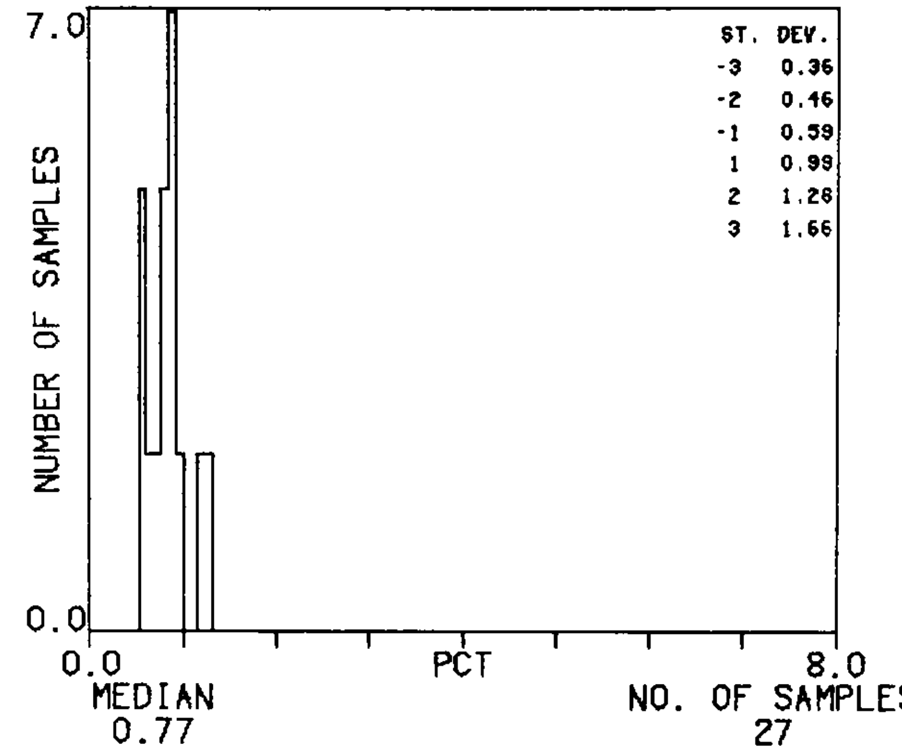

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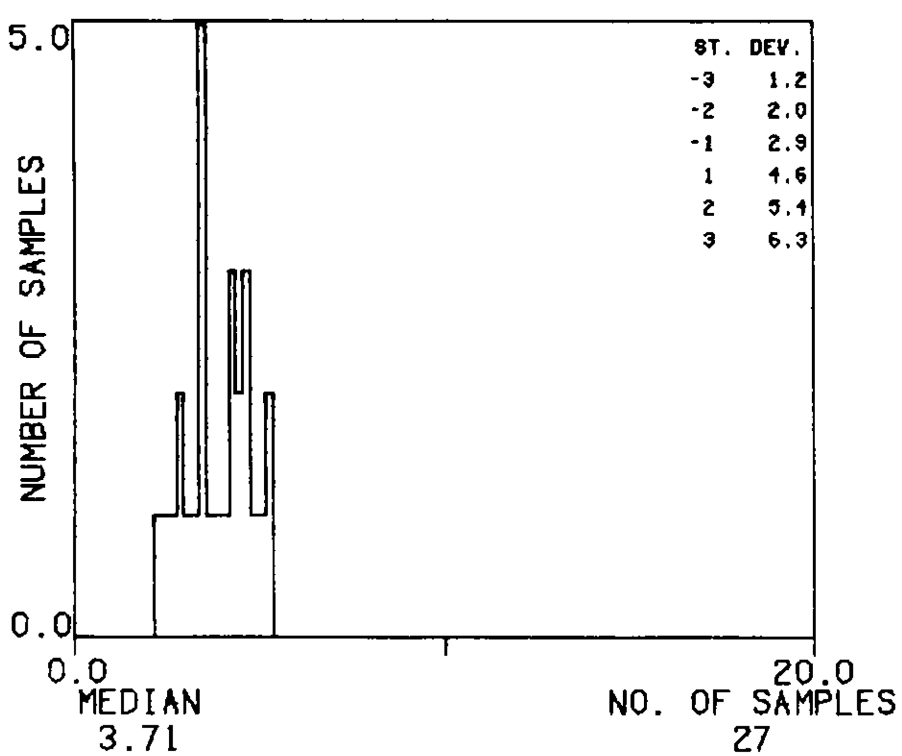

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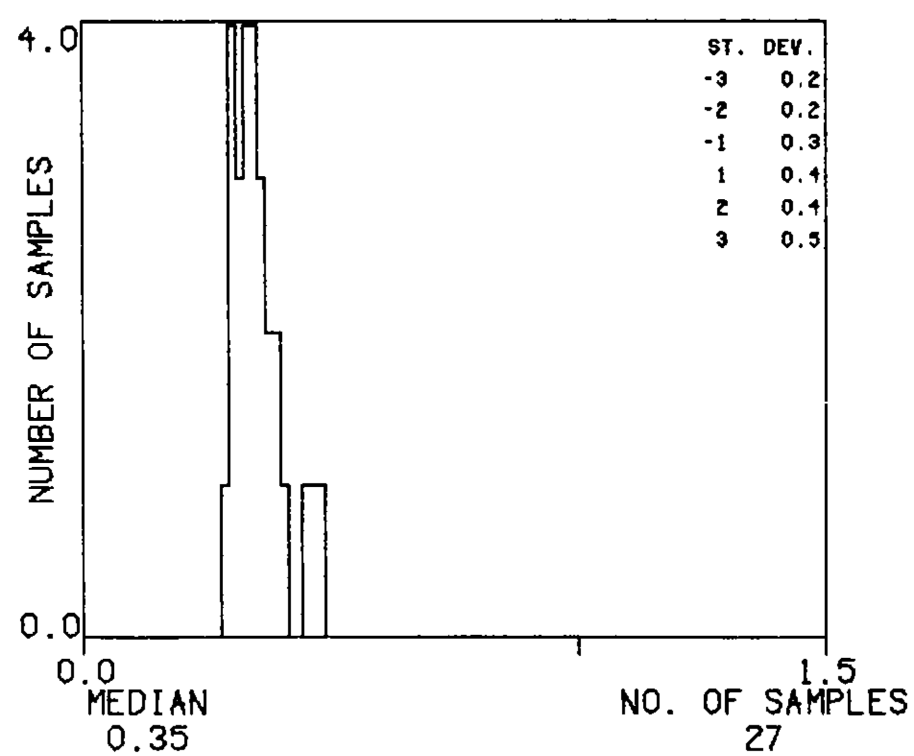

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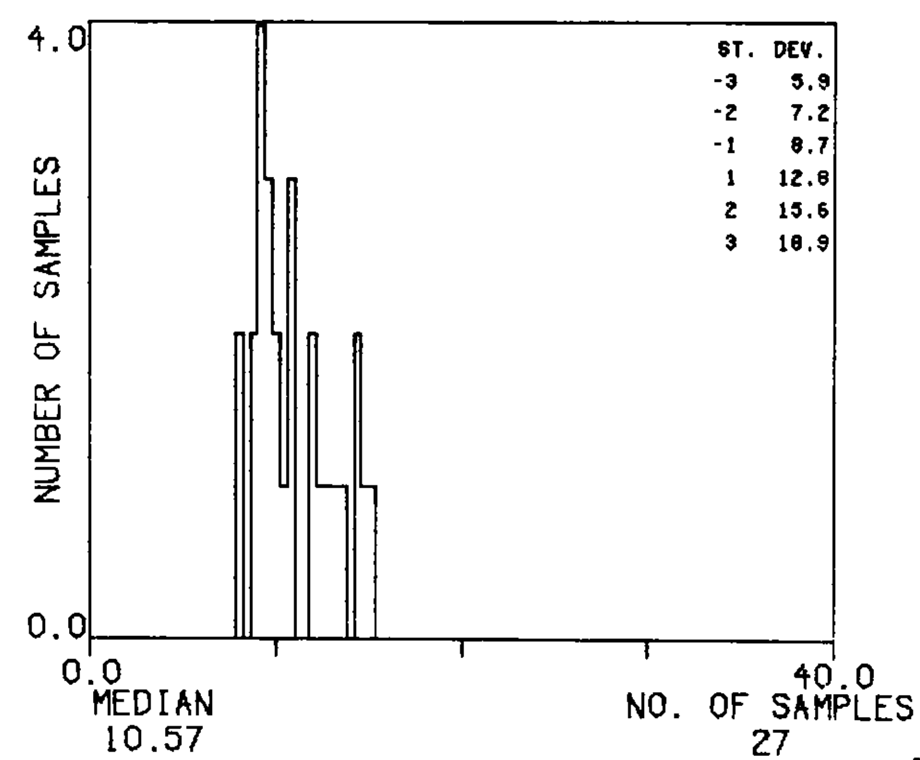

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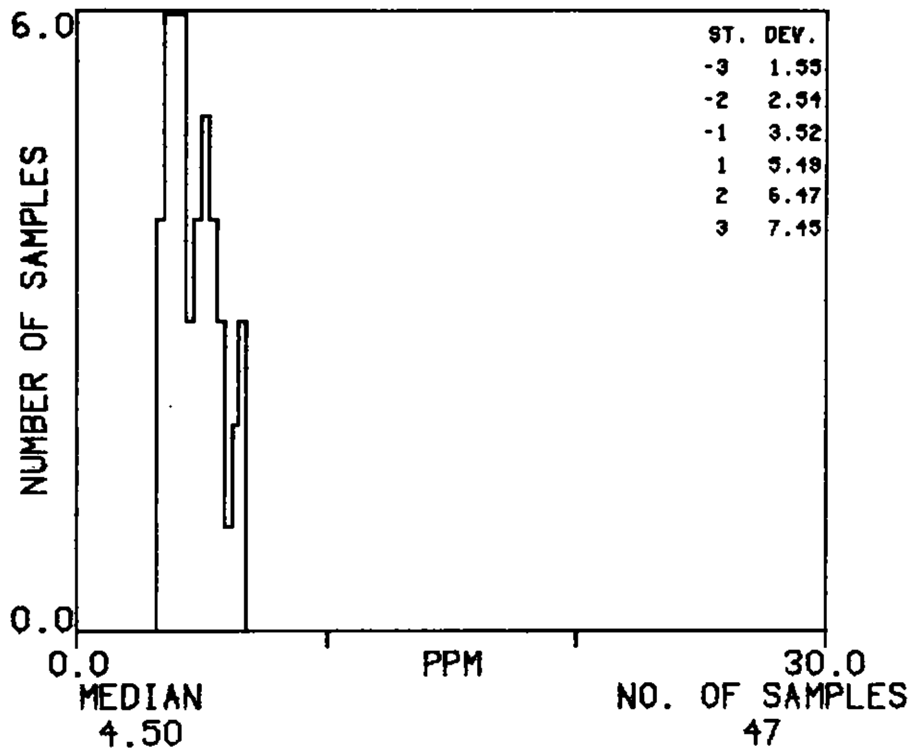

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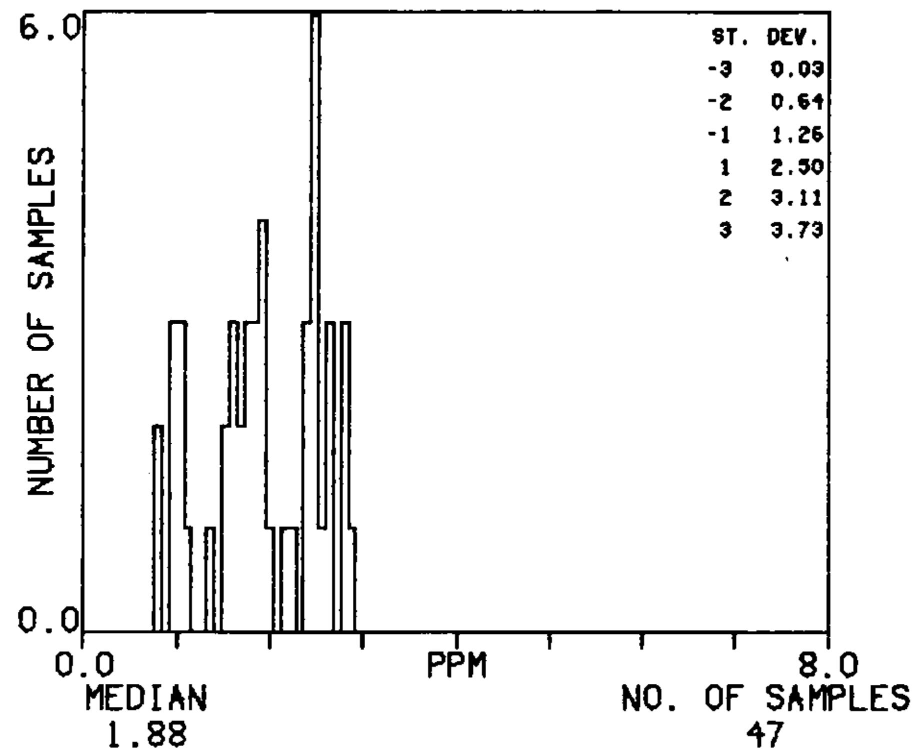

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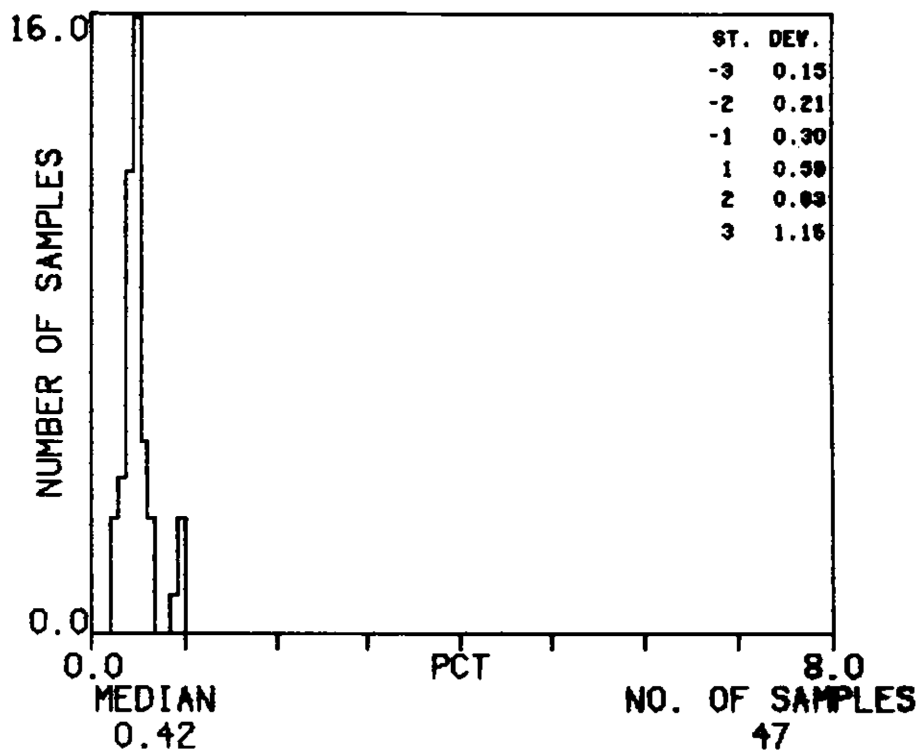

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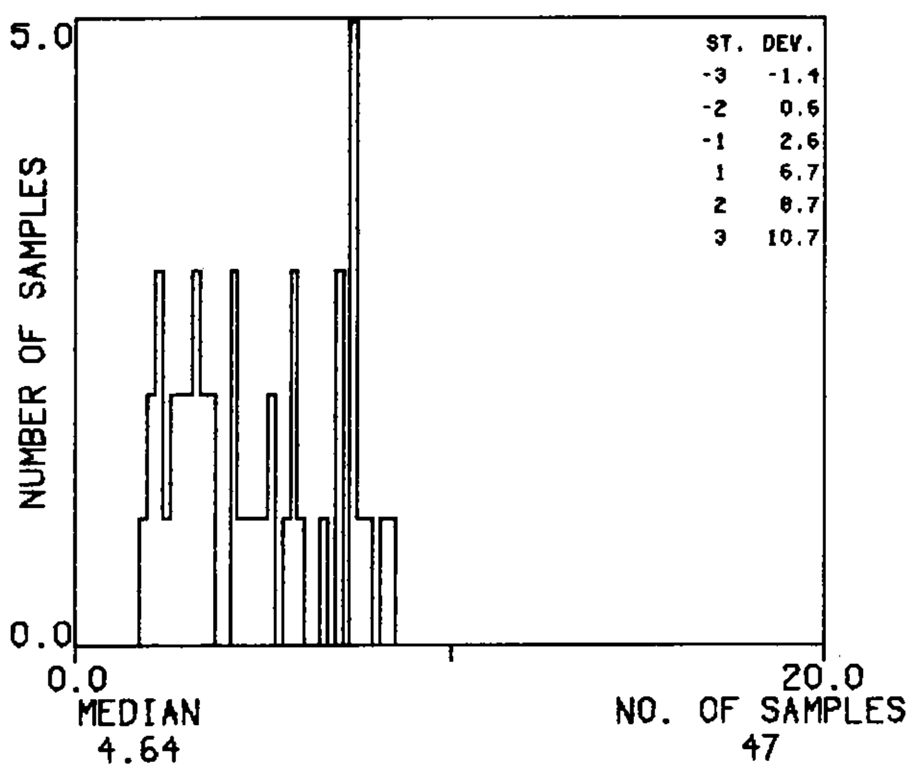

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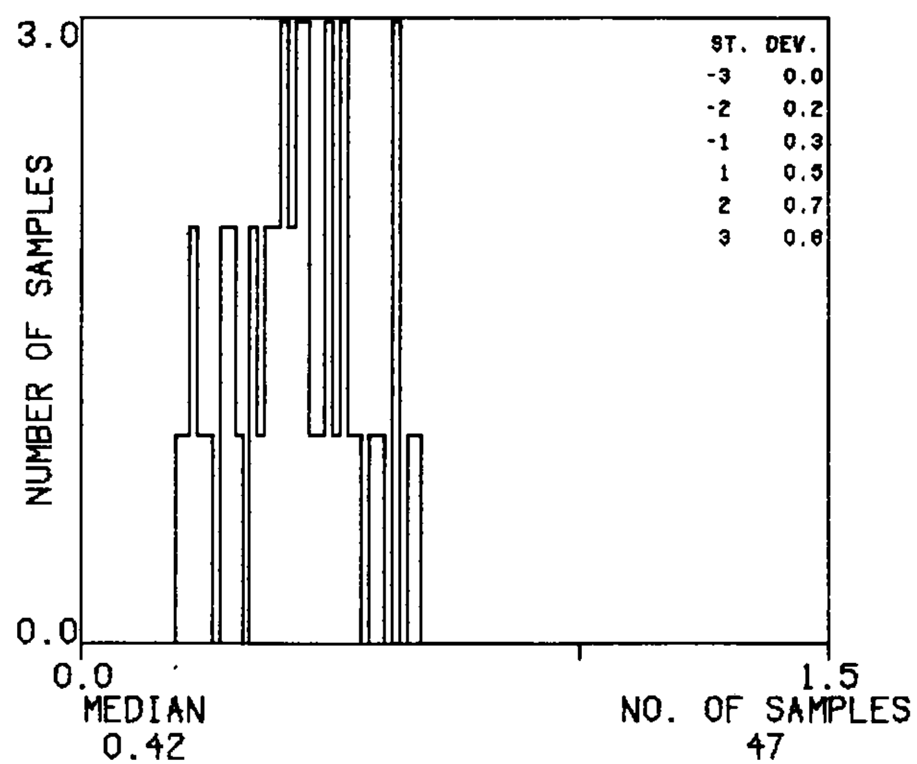

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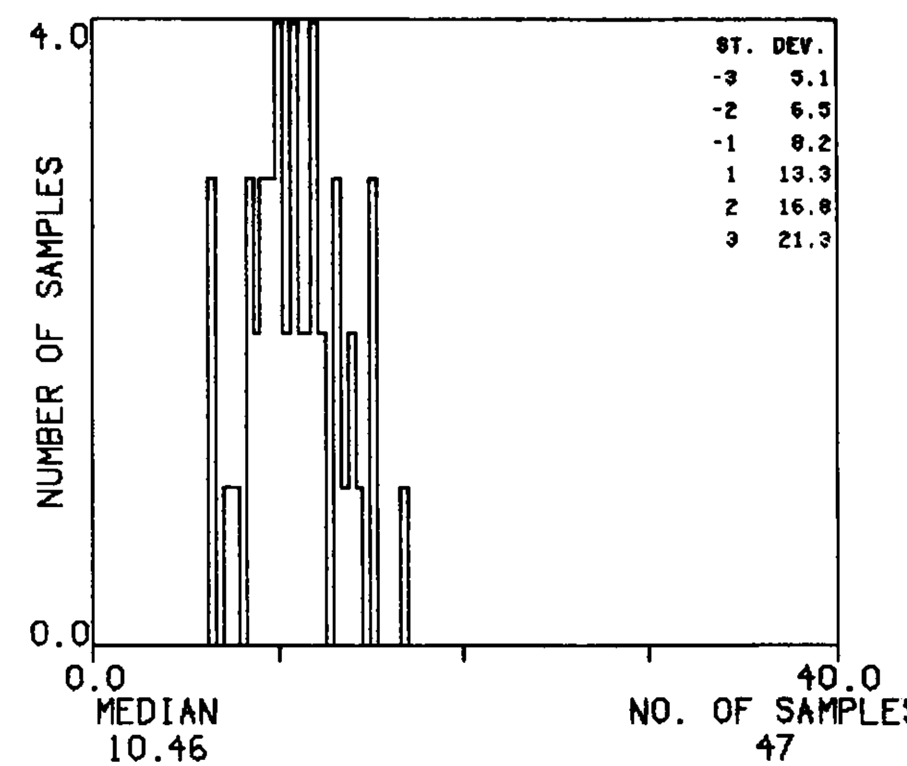

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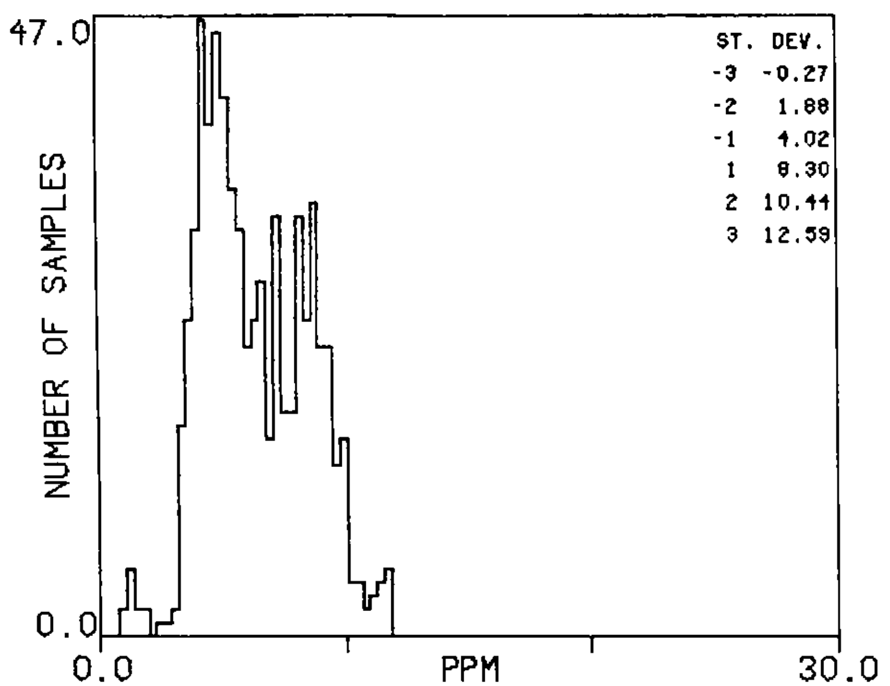

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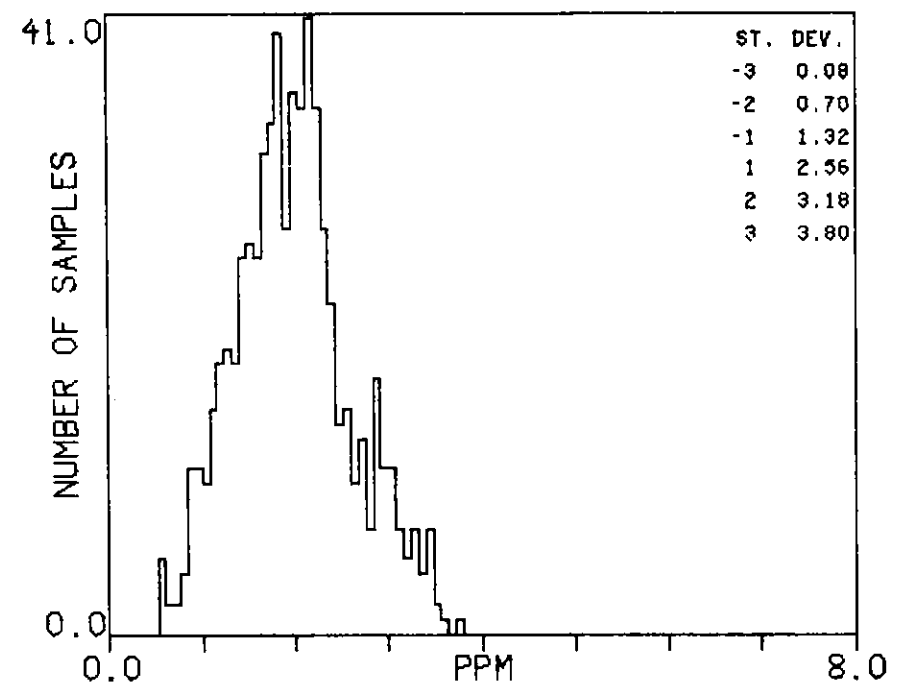

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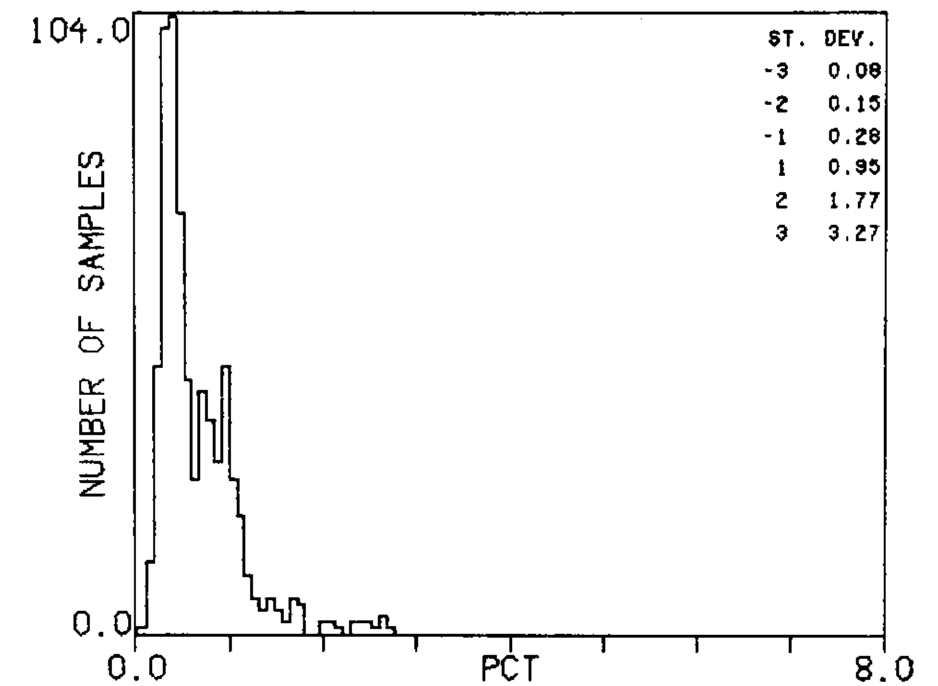

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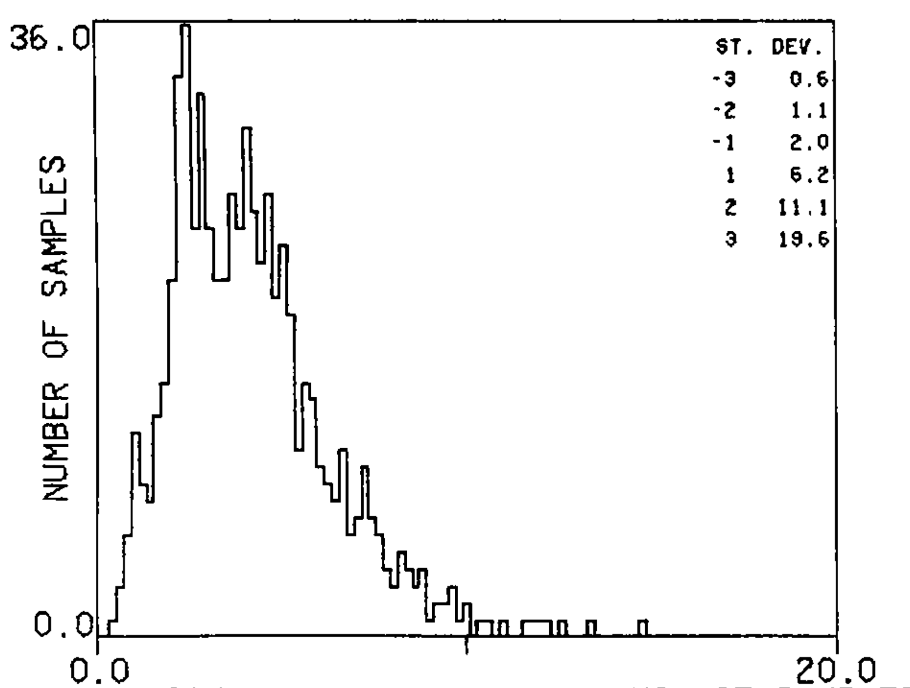

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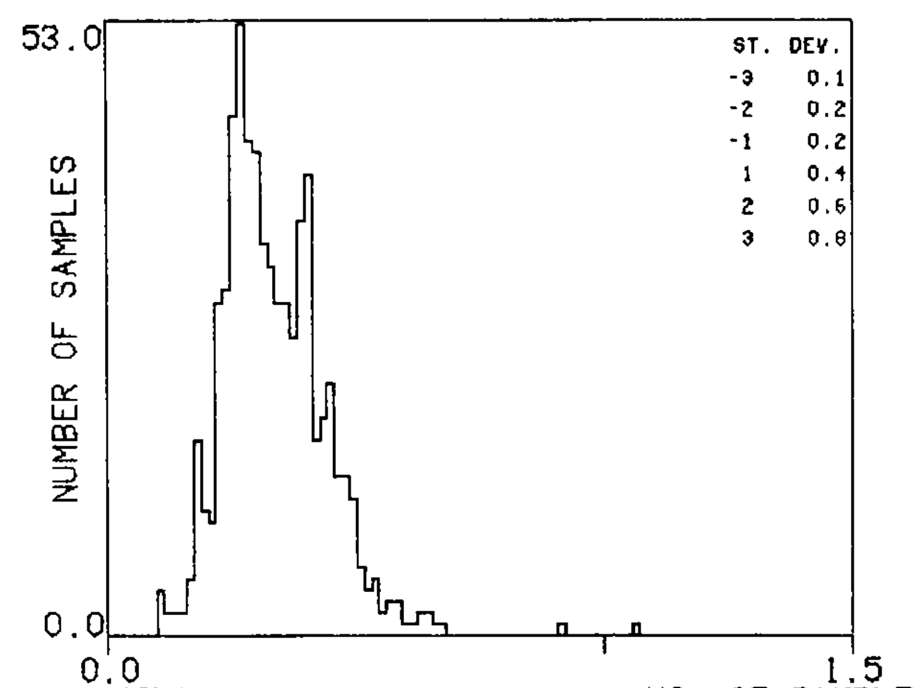

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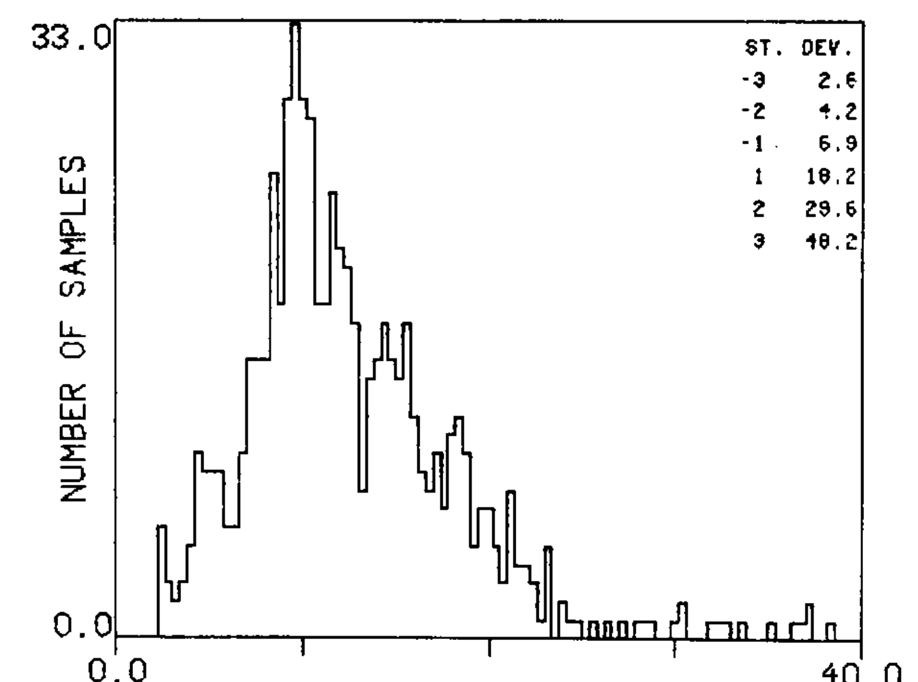

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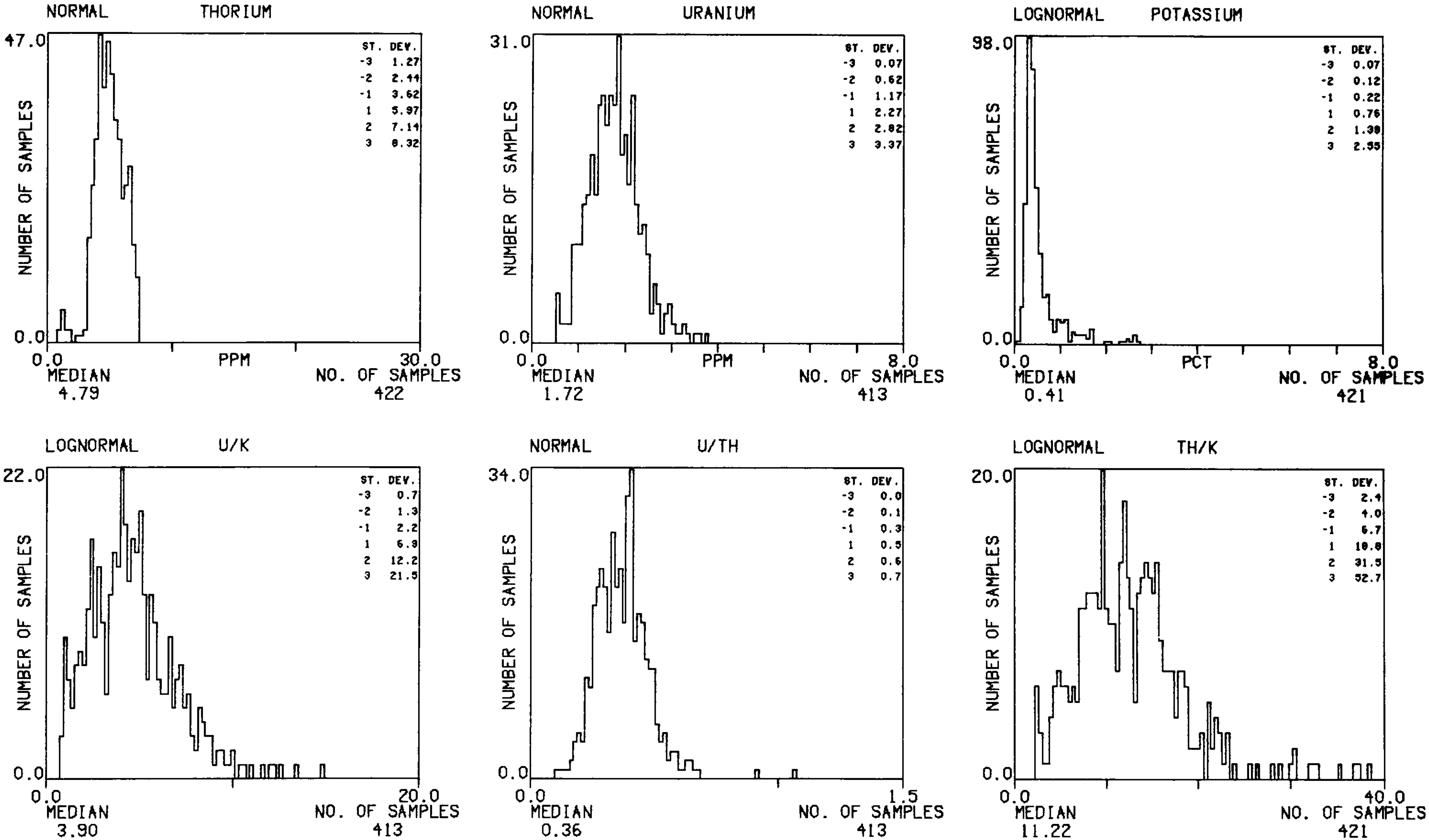

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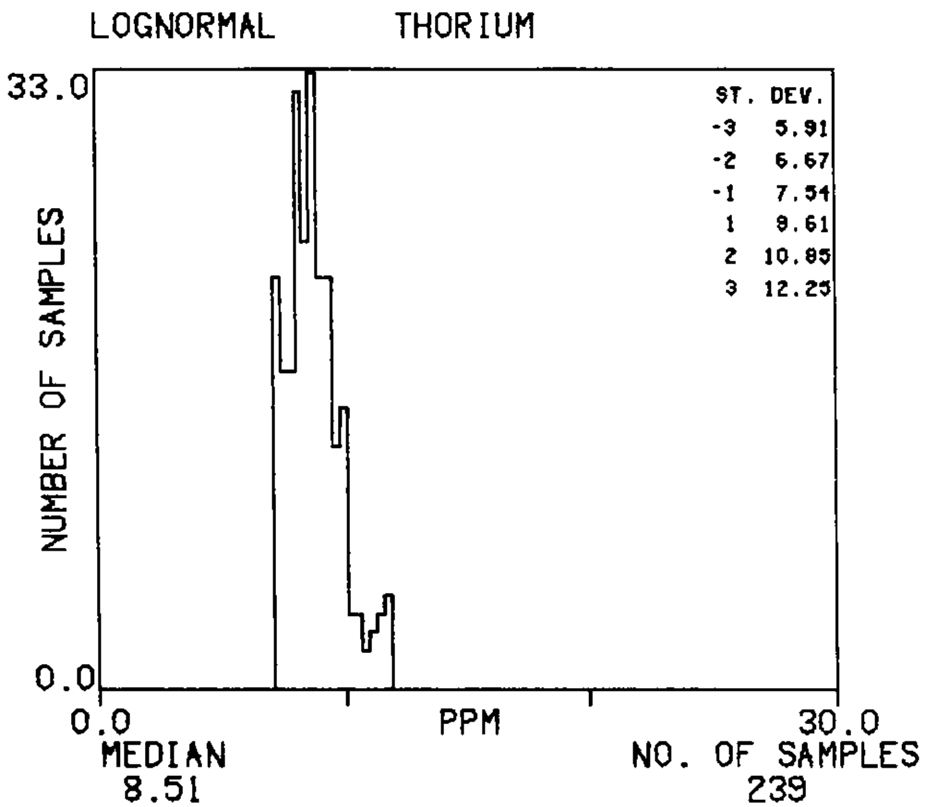

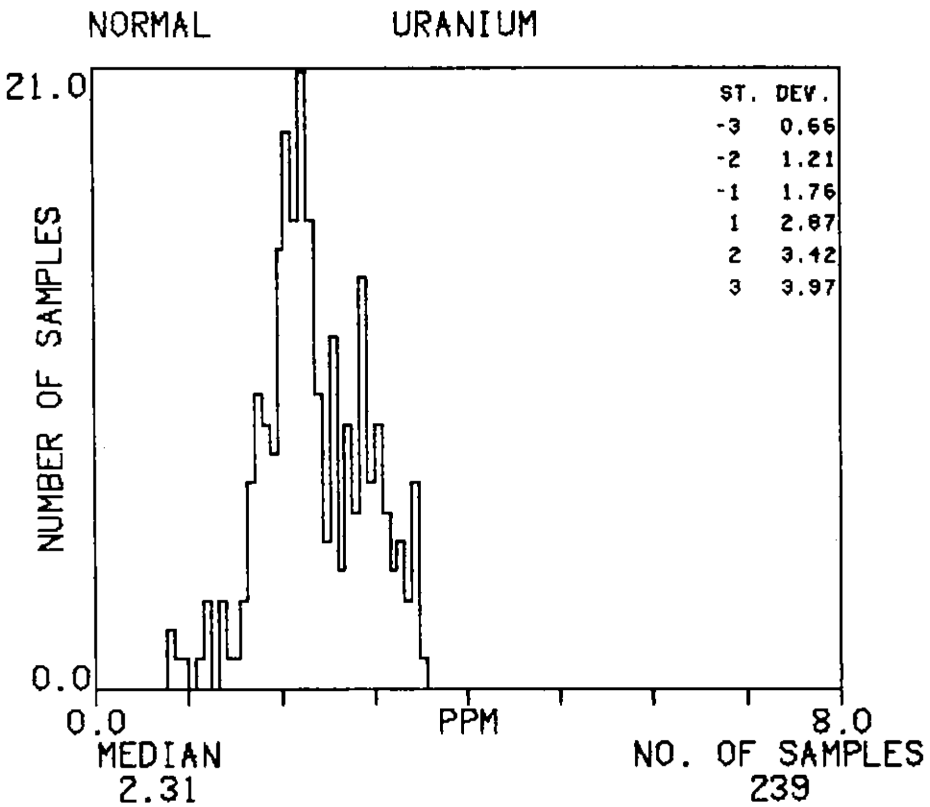

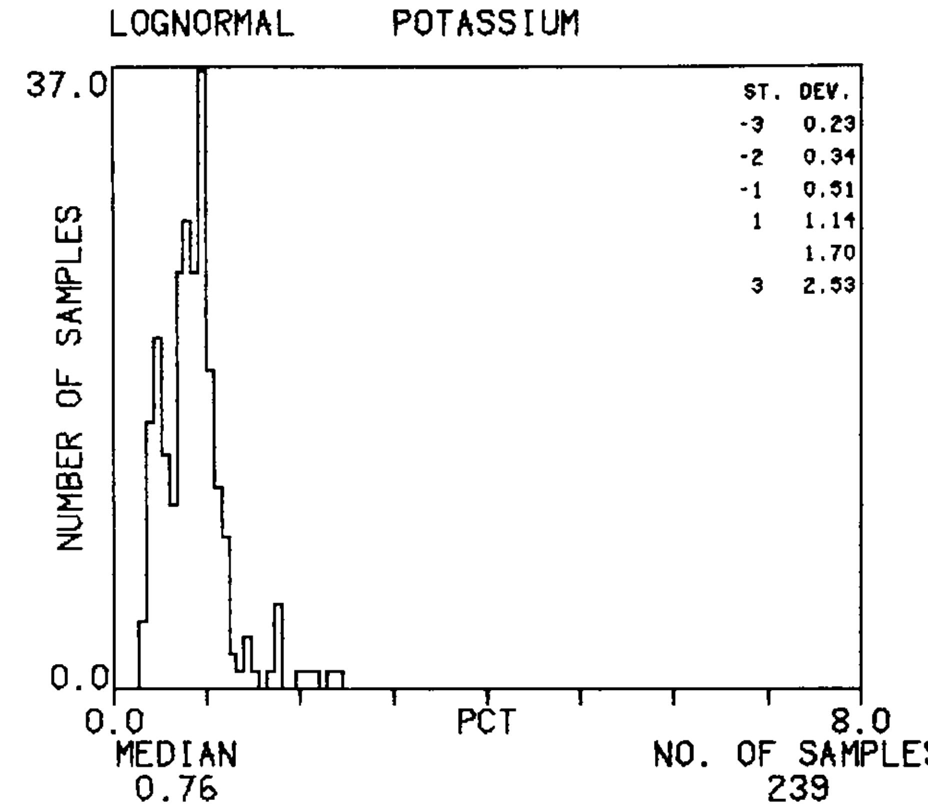

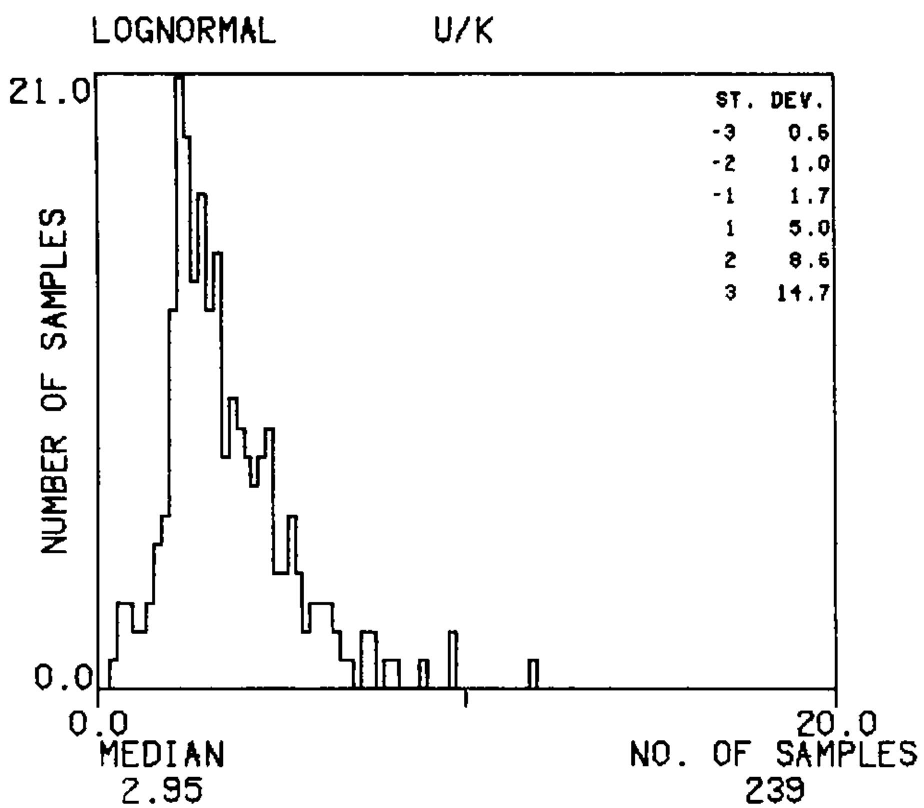

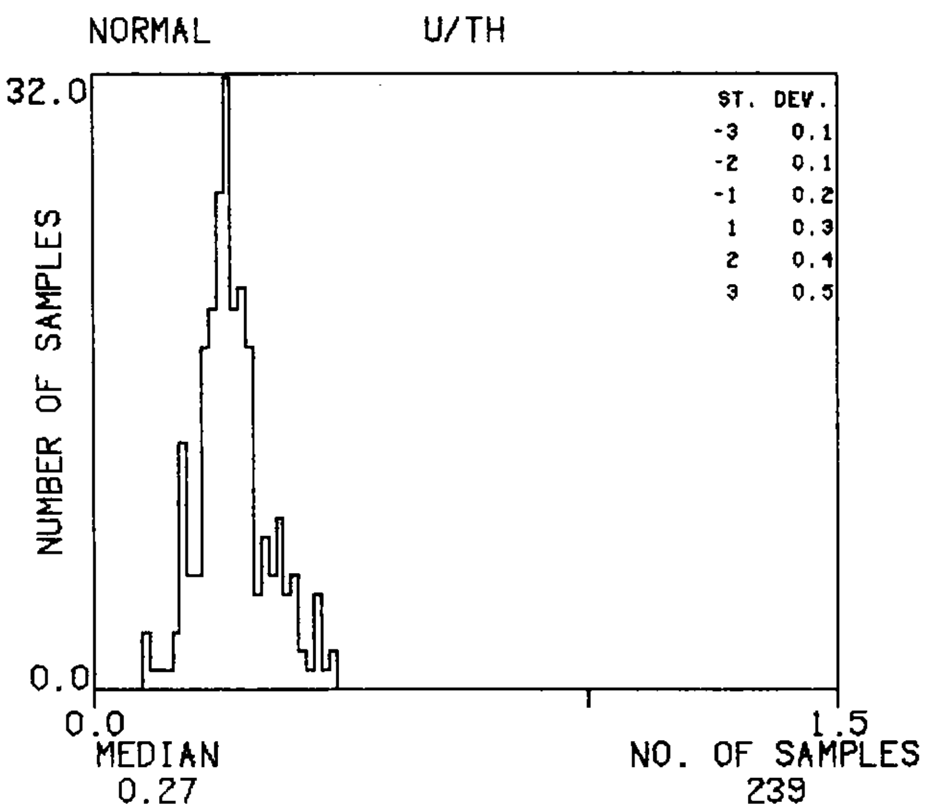

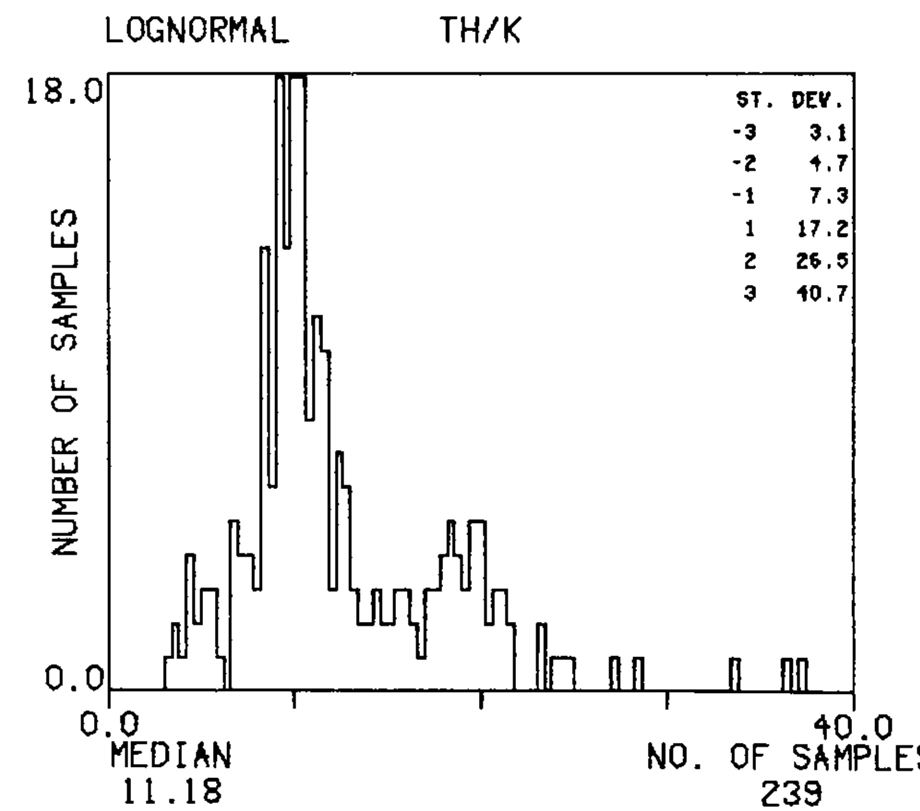

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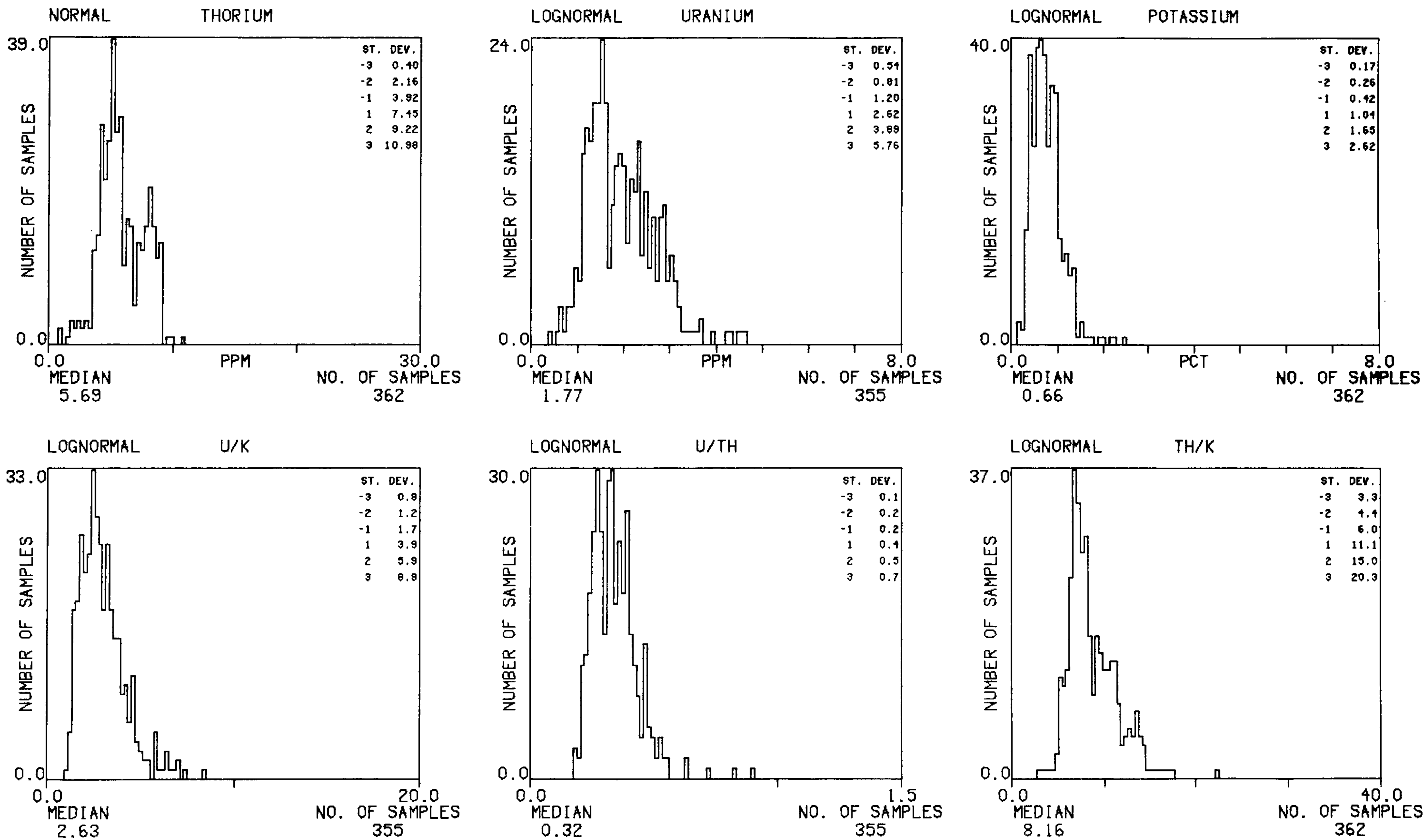

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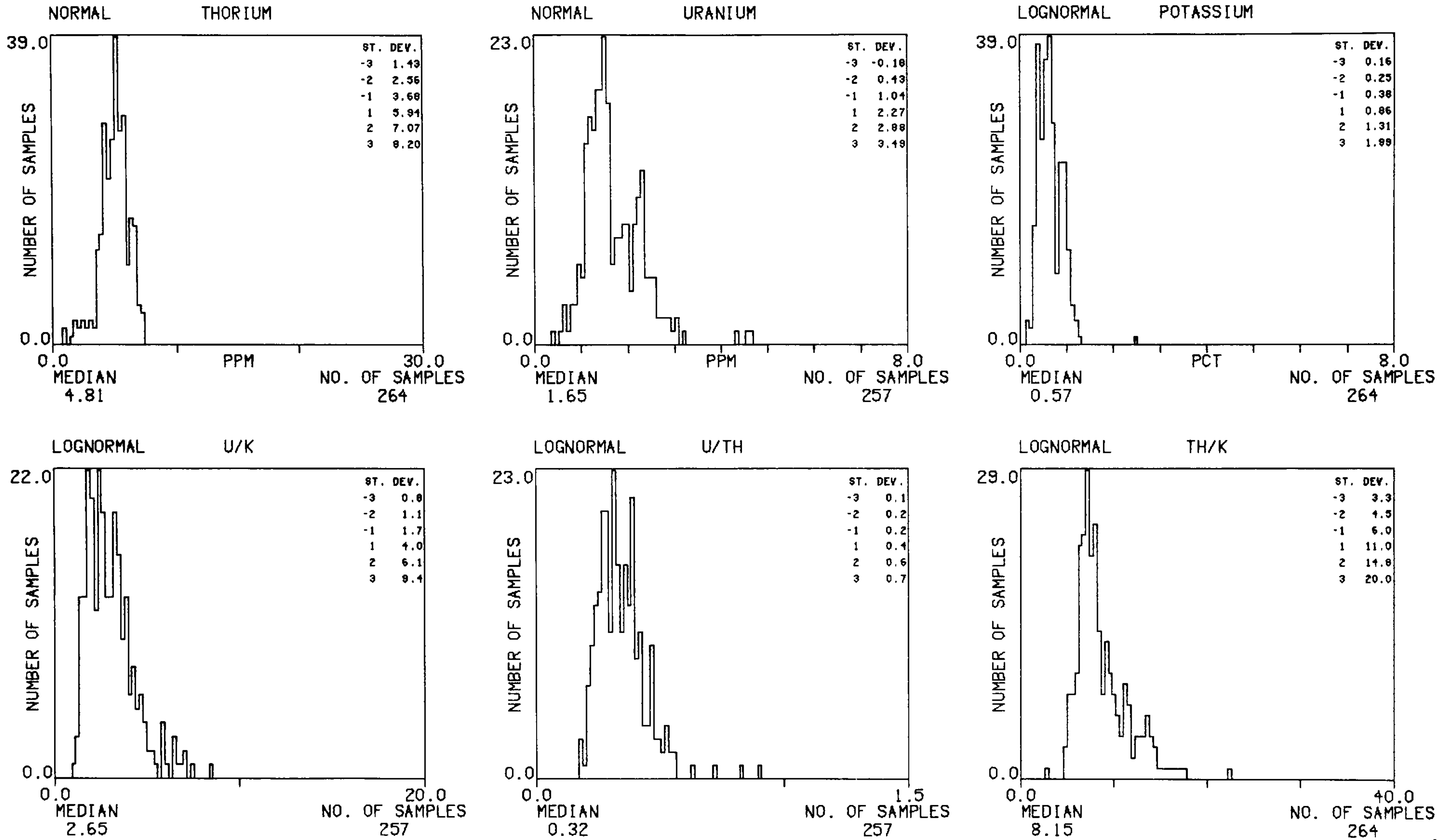

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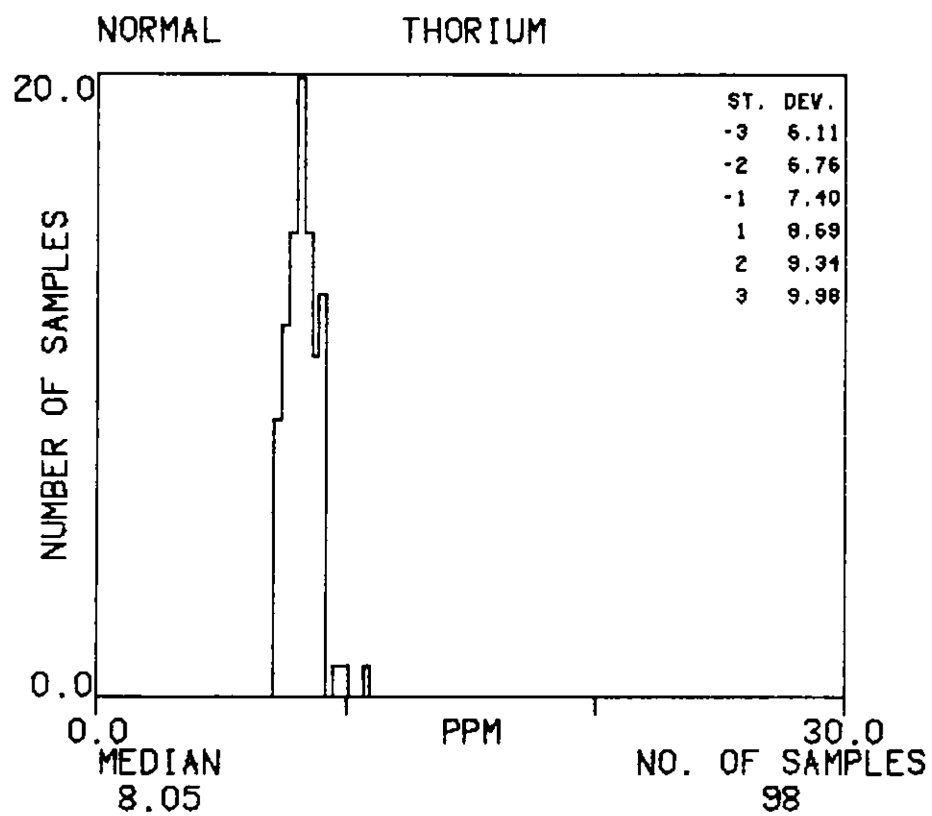

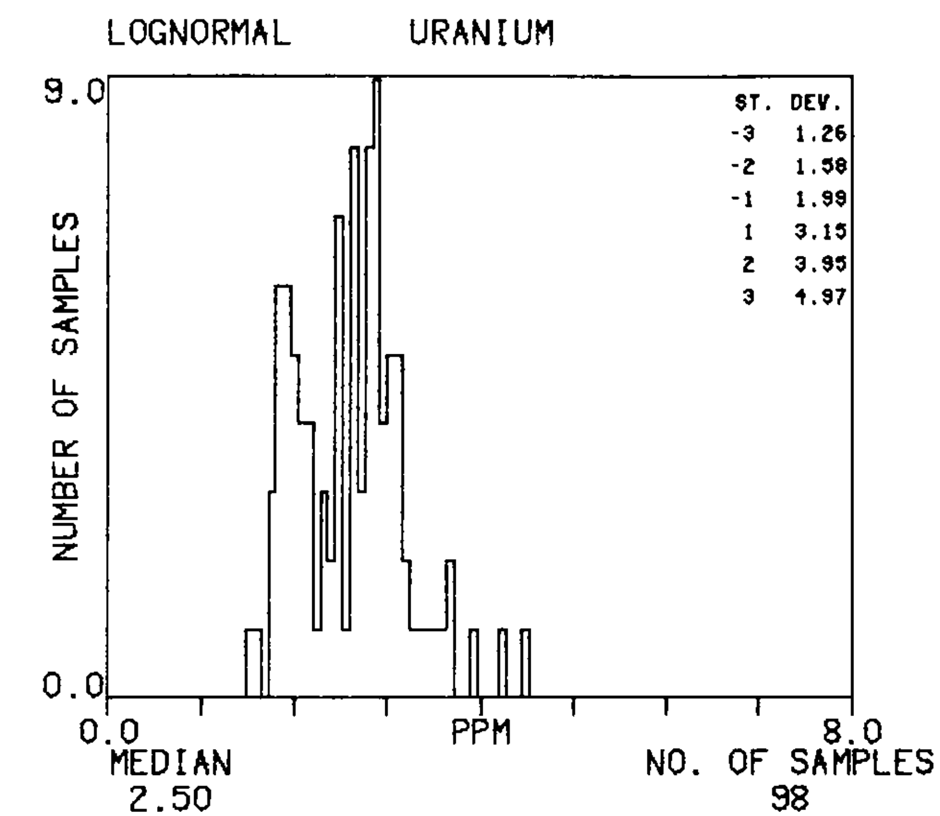

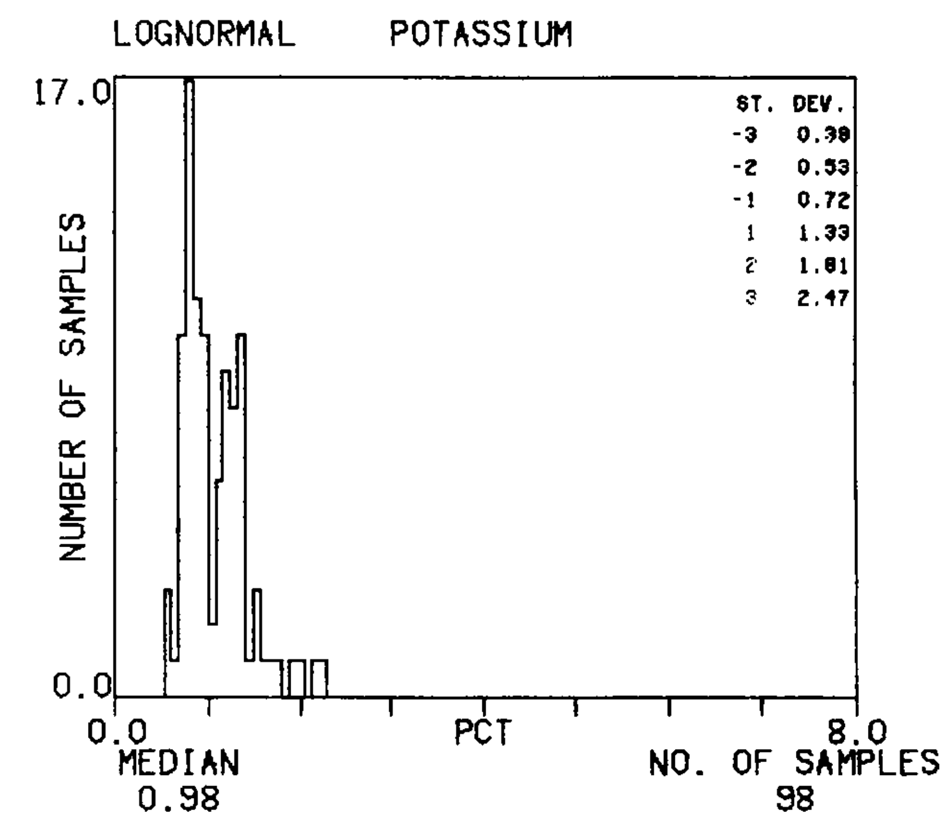

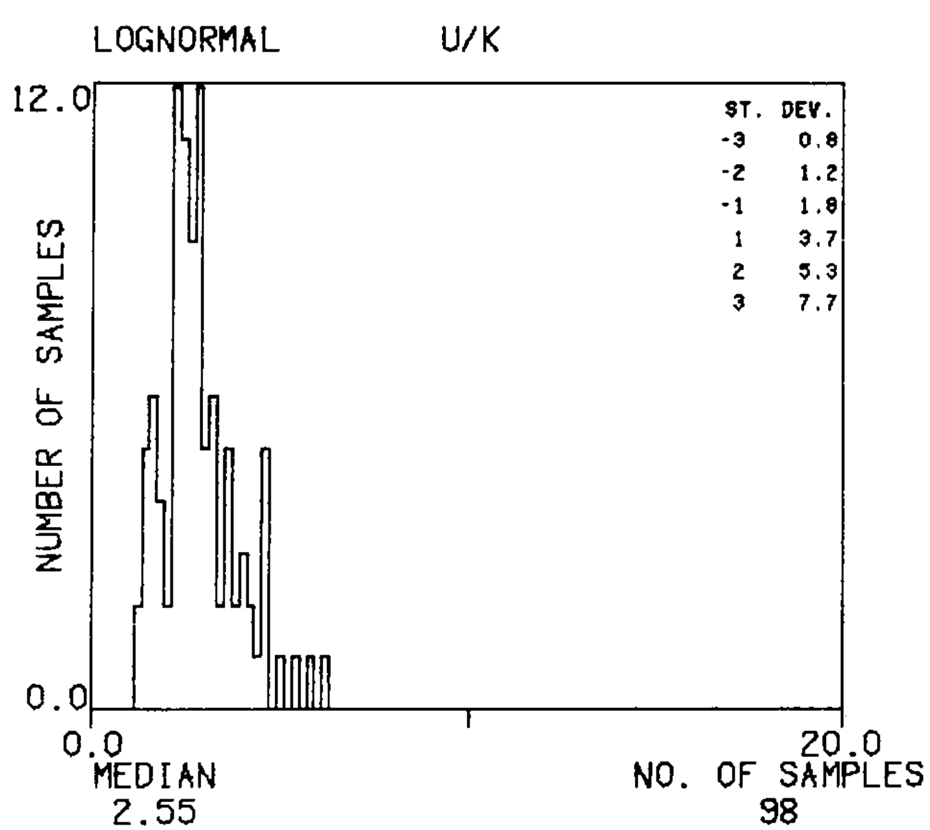

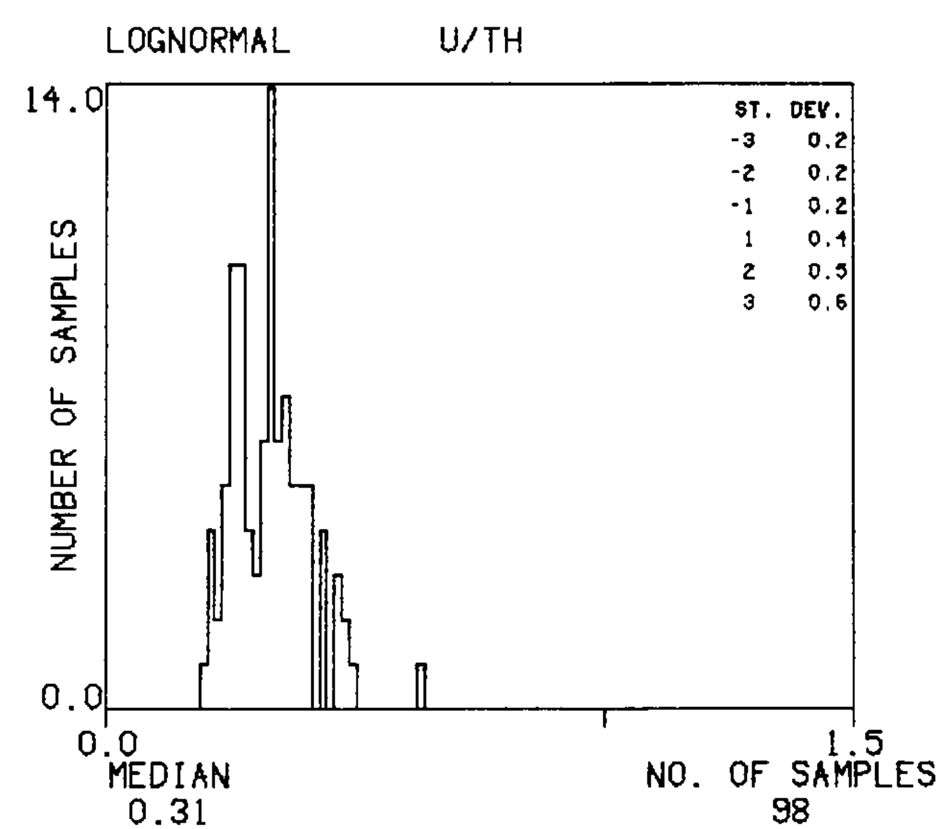

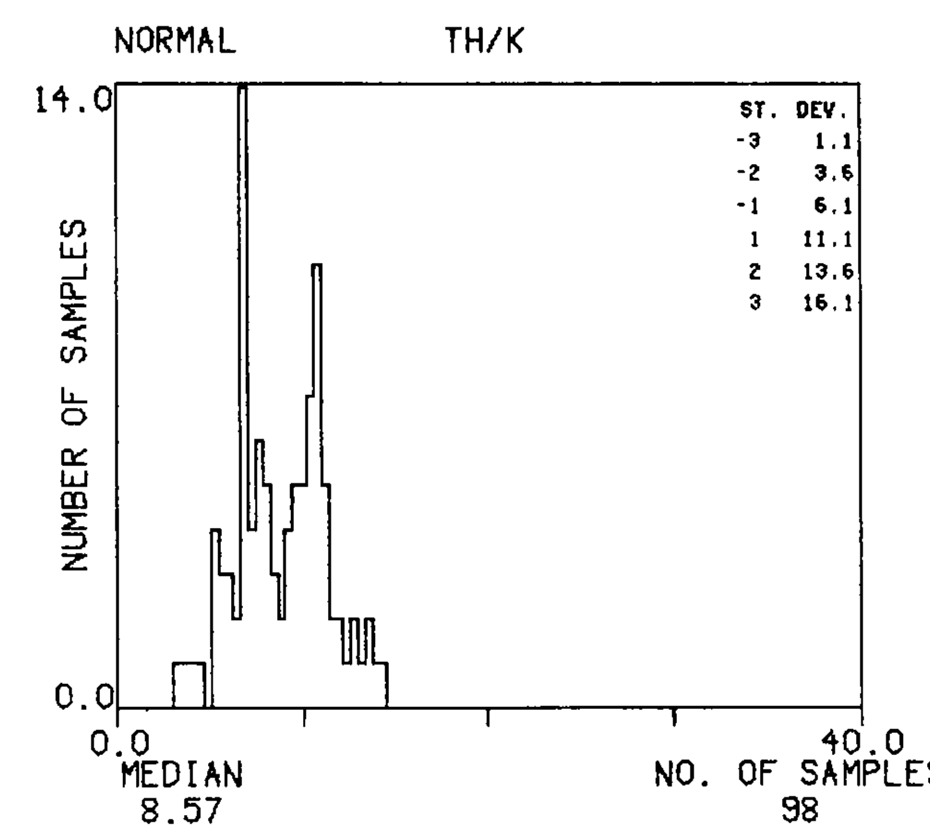

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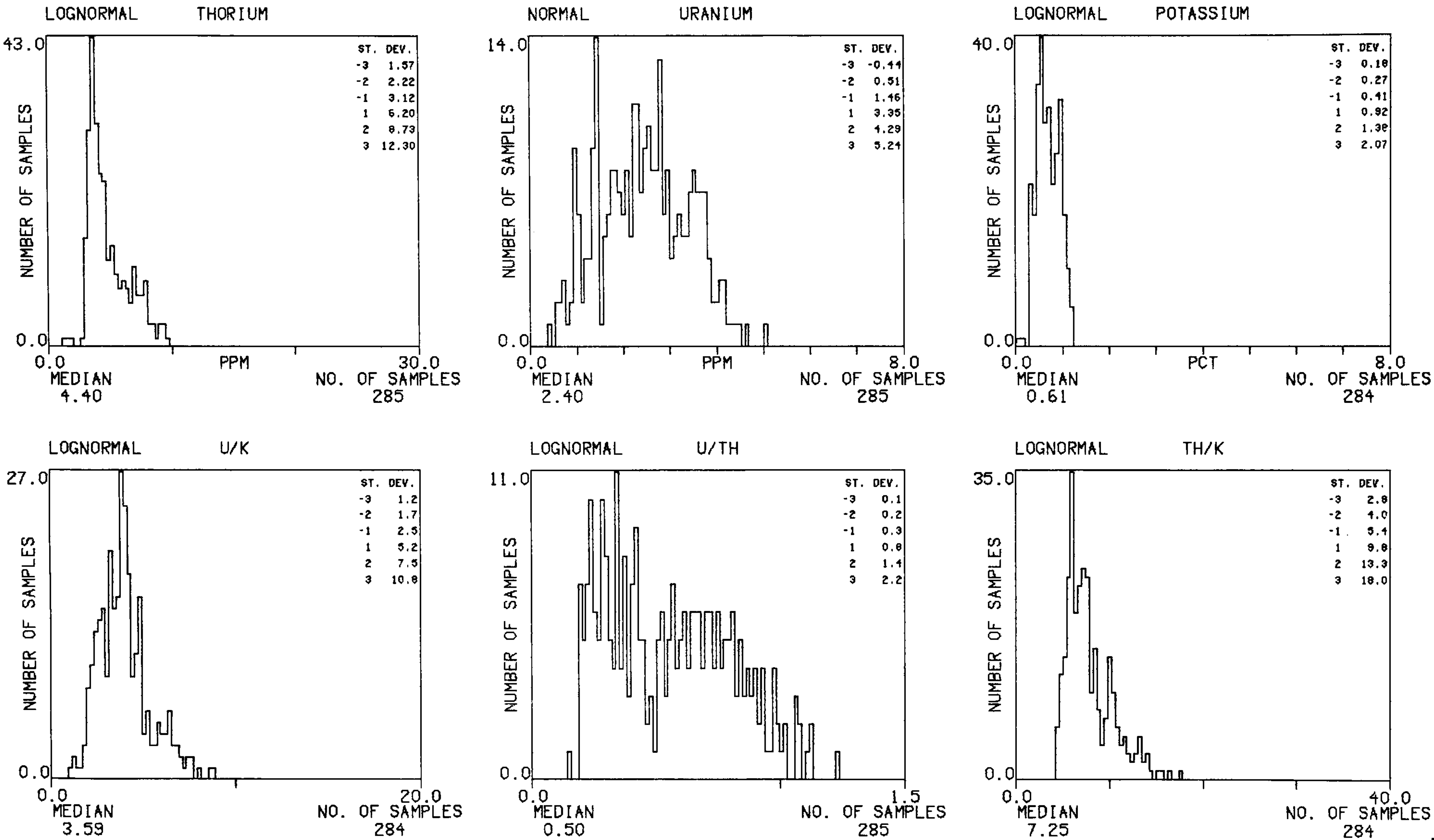

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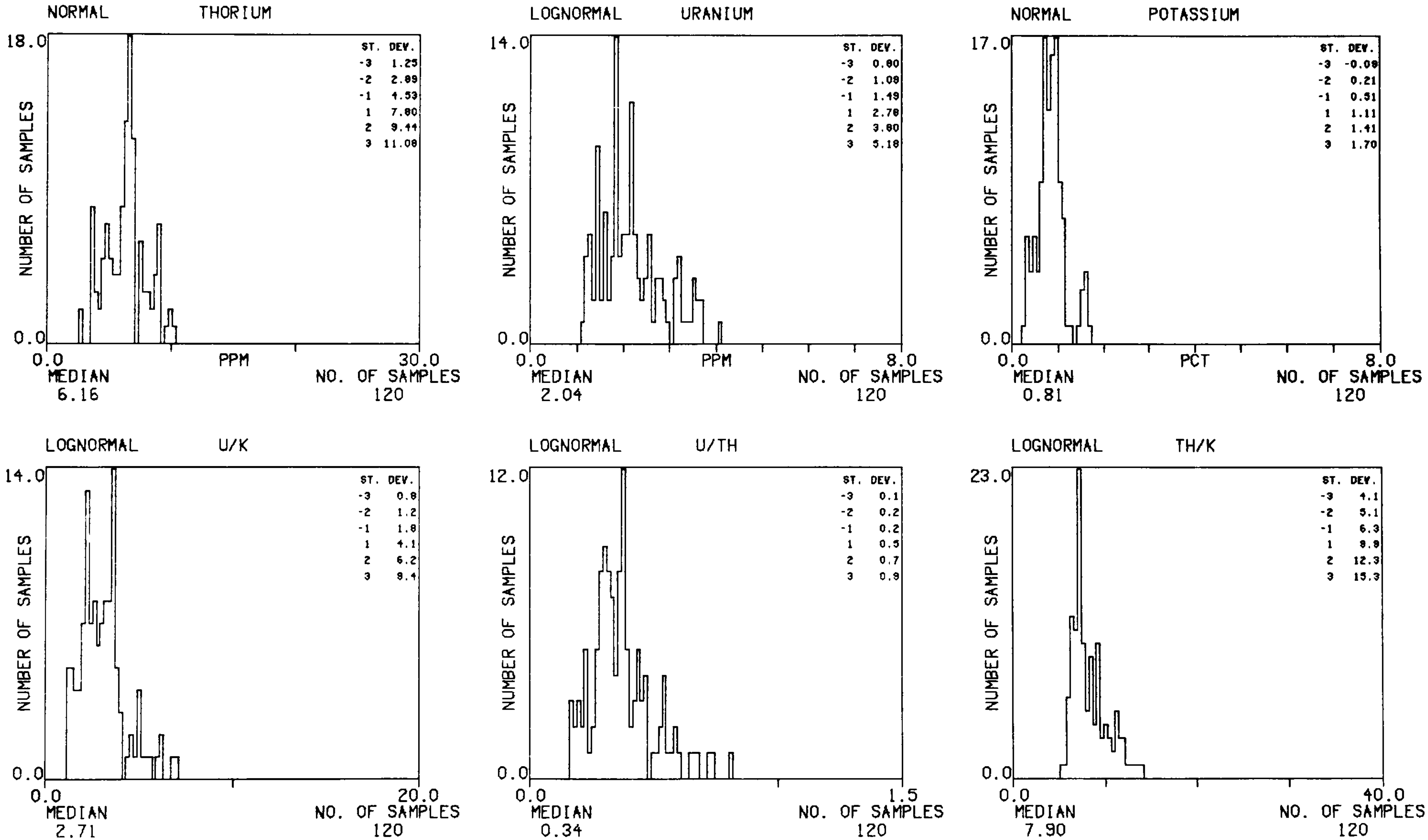

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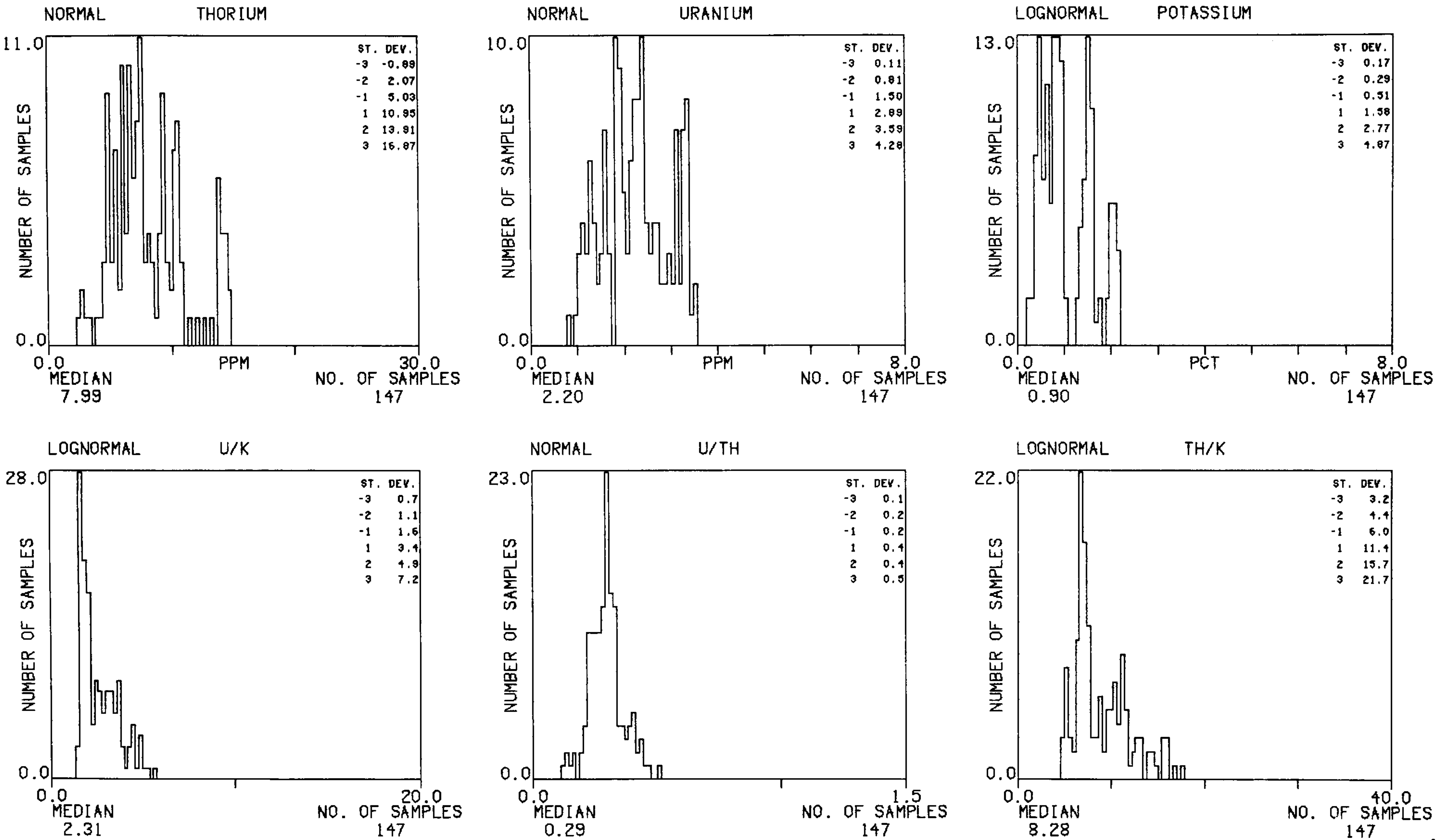

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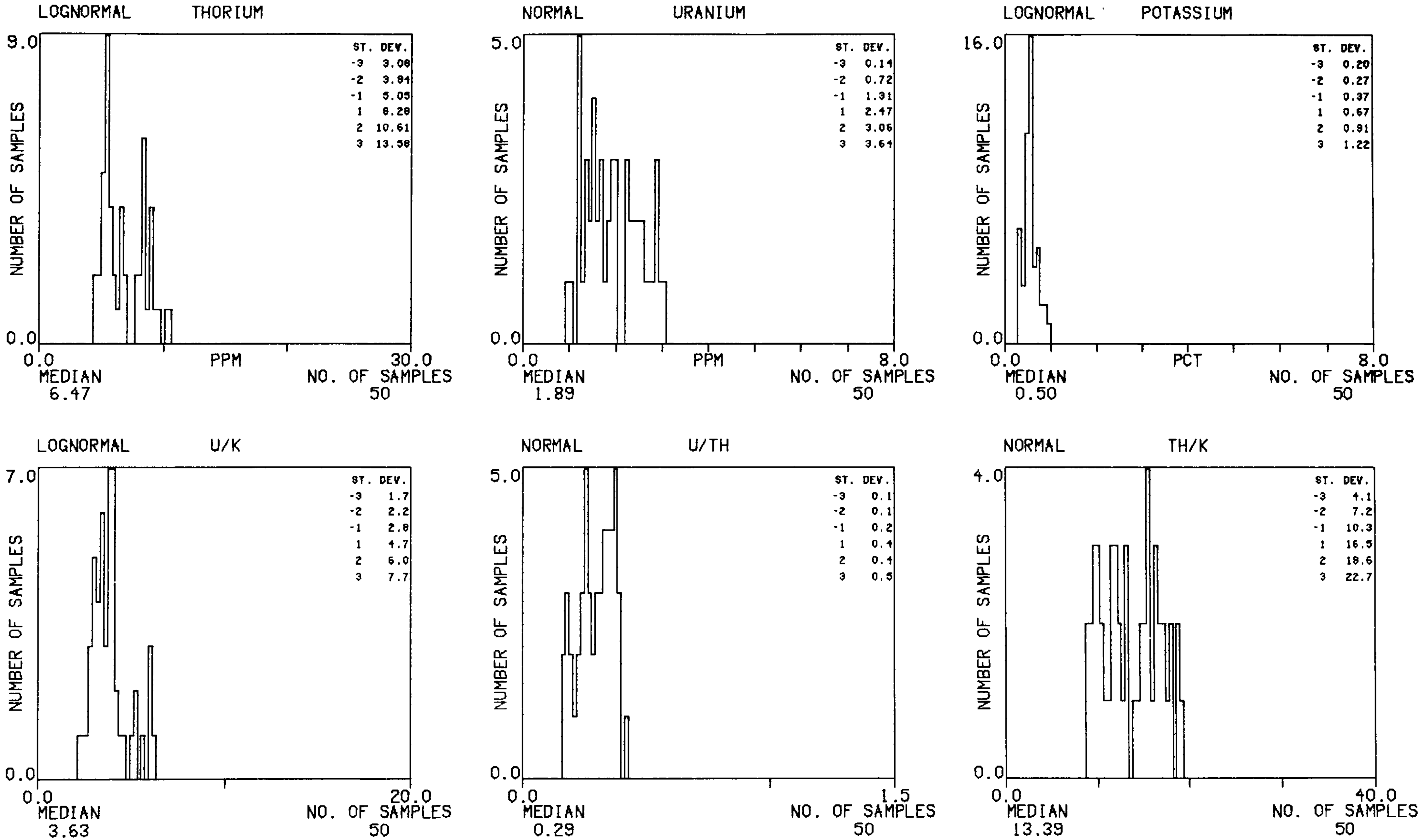

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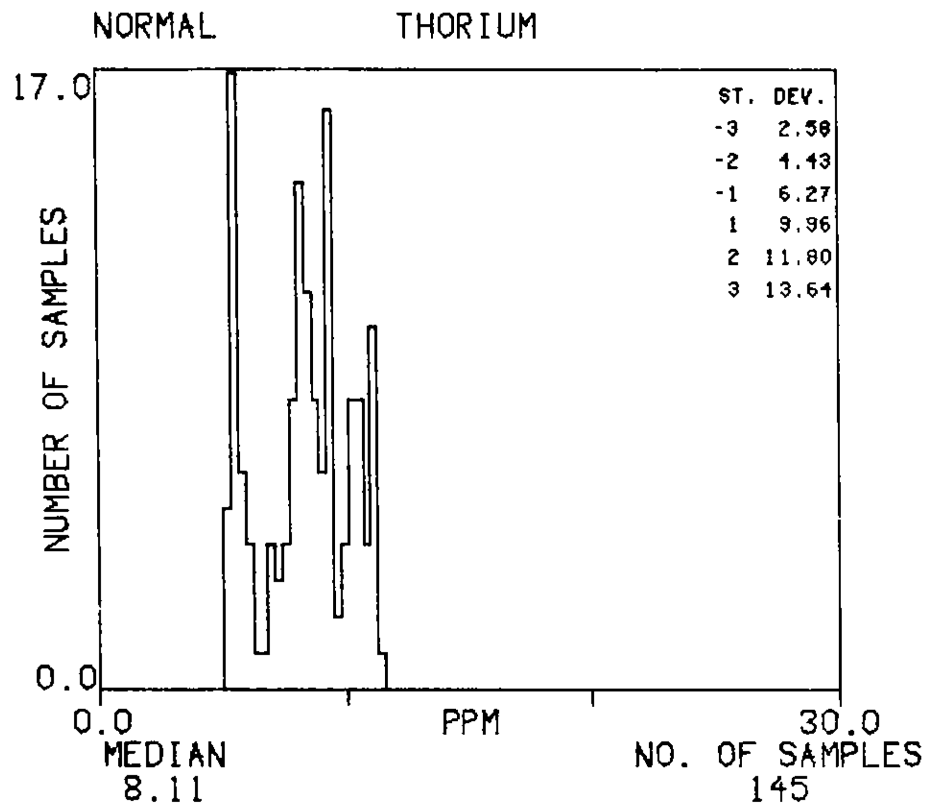

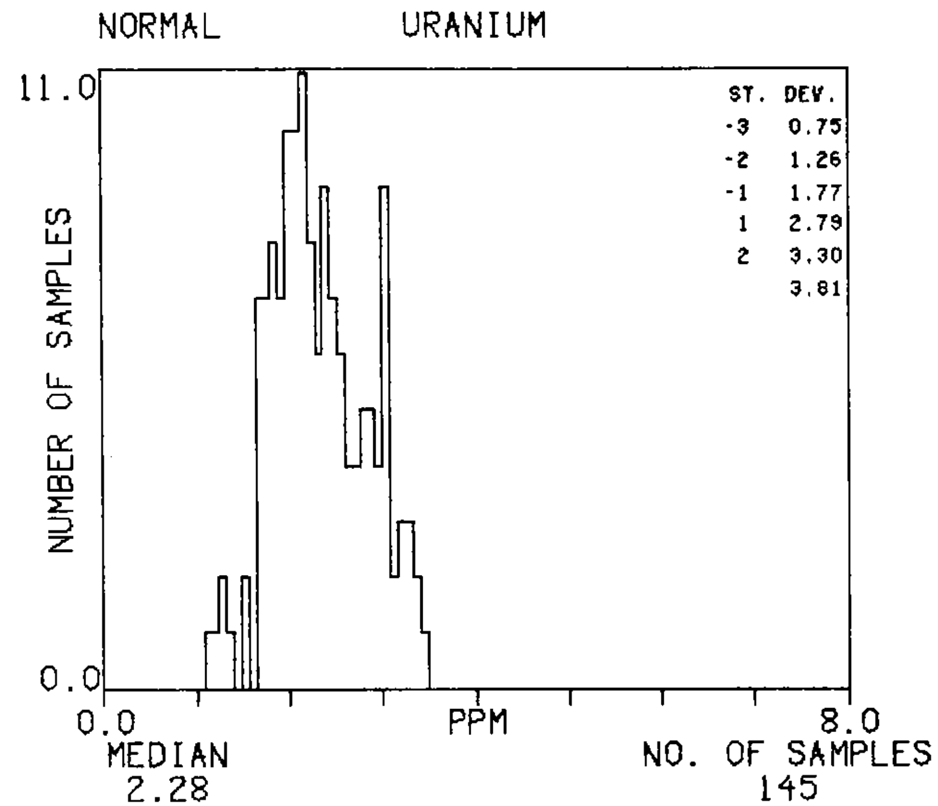

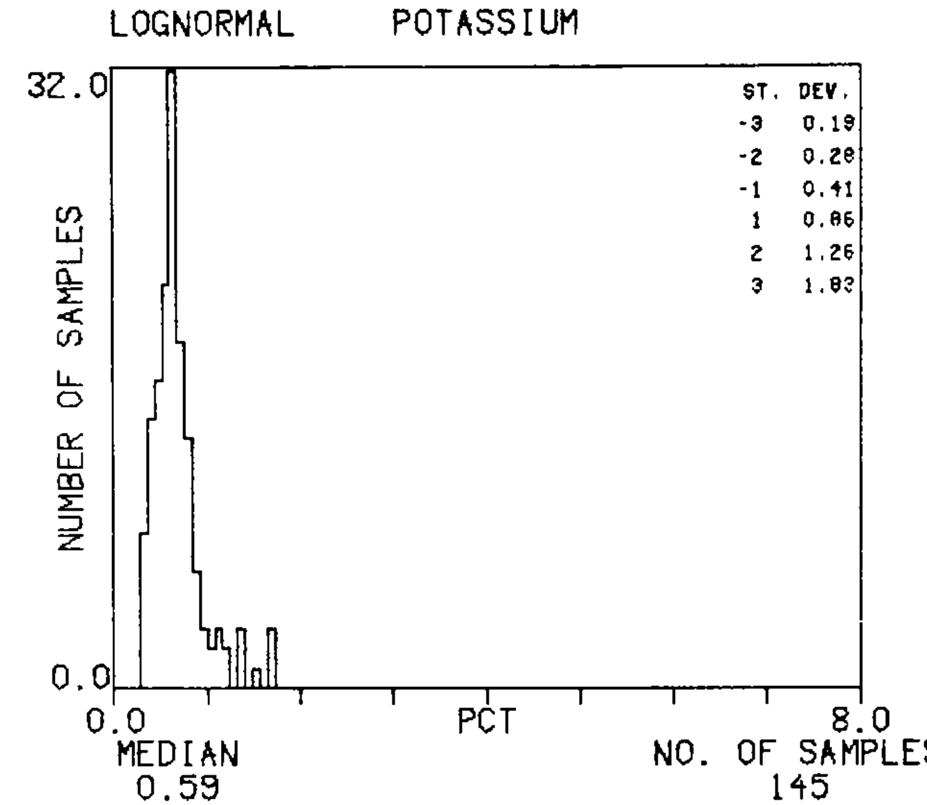

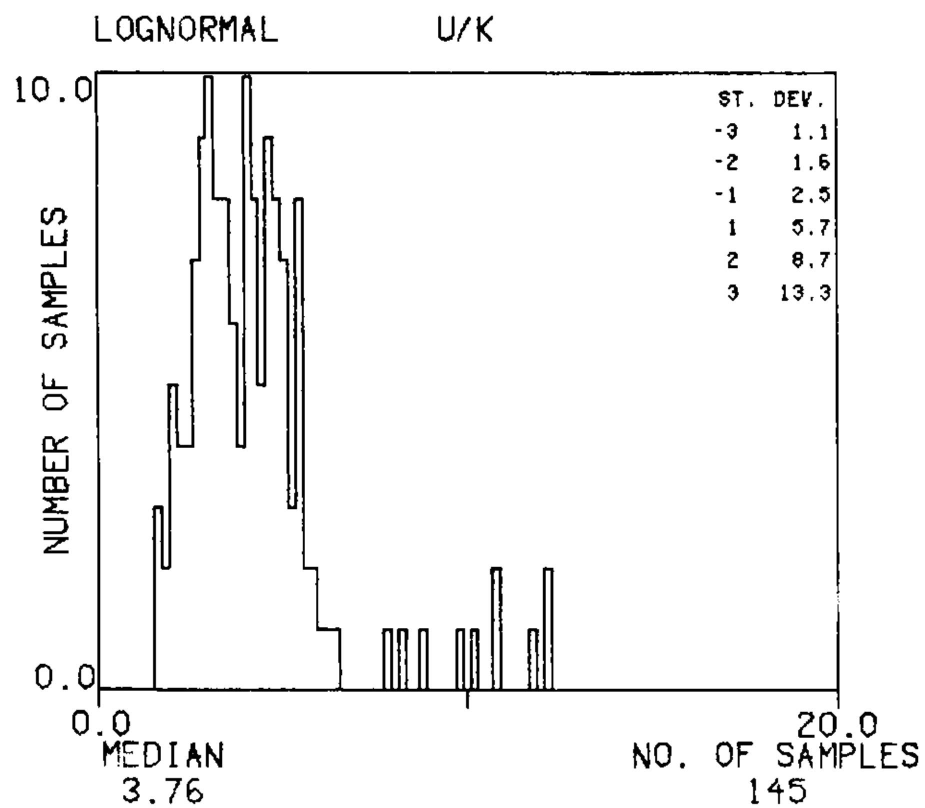

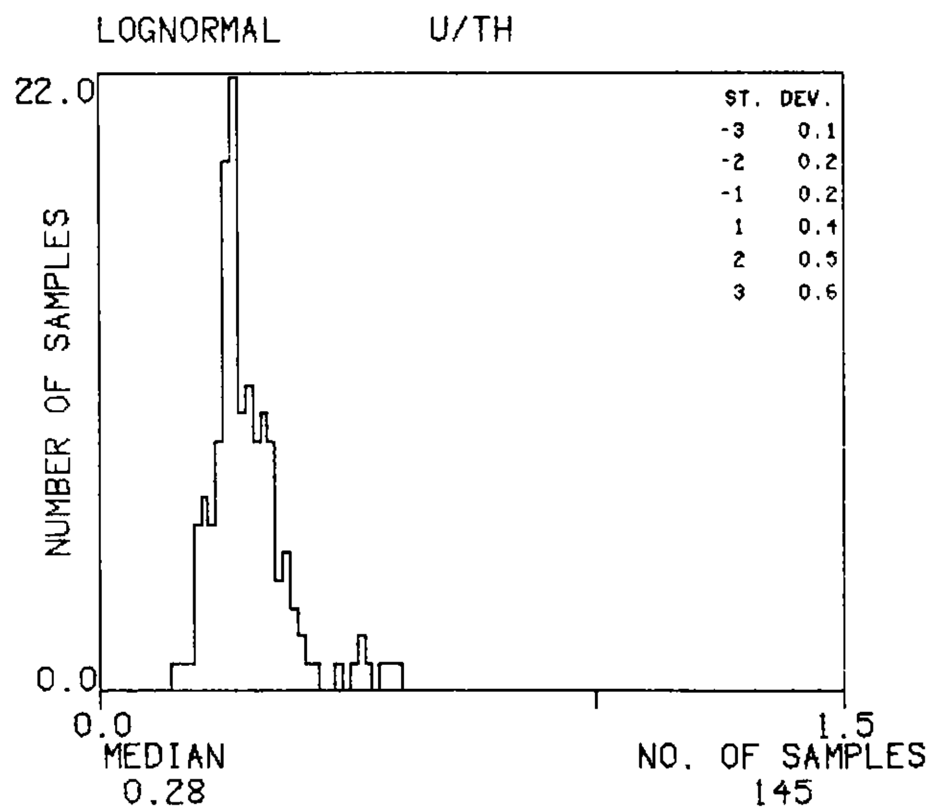

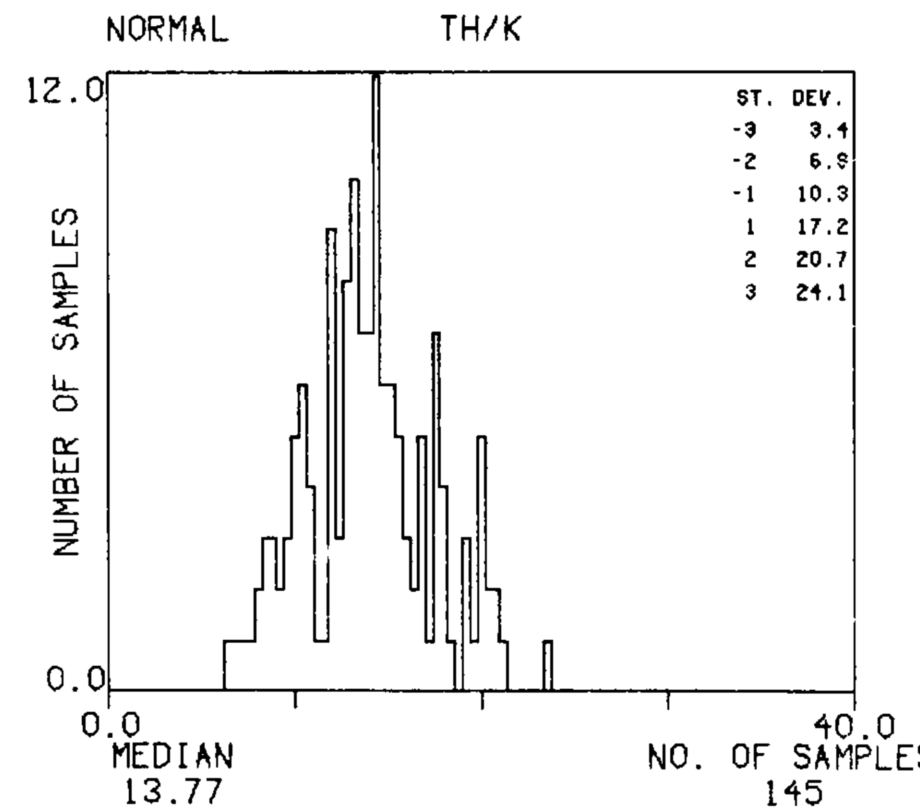

HISTOGRAMS : ORD-1

TEXAS INSTRUMENTS CHATTANOOGA NI16-3 APPALACHIAN BASIN SURVEY 1979

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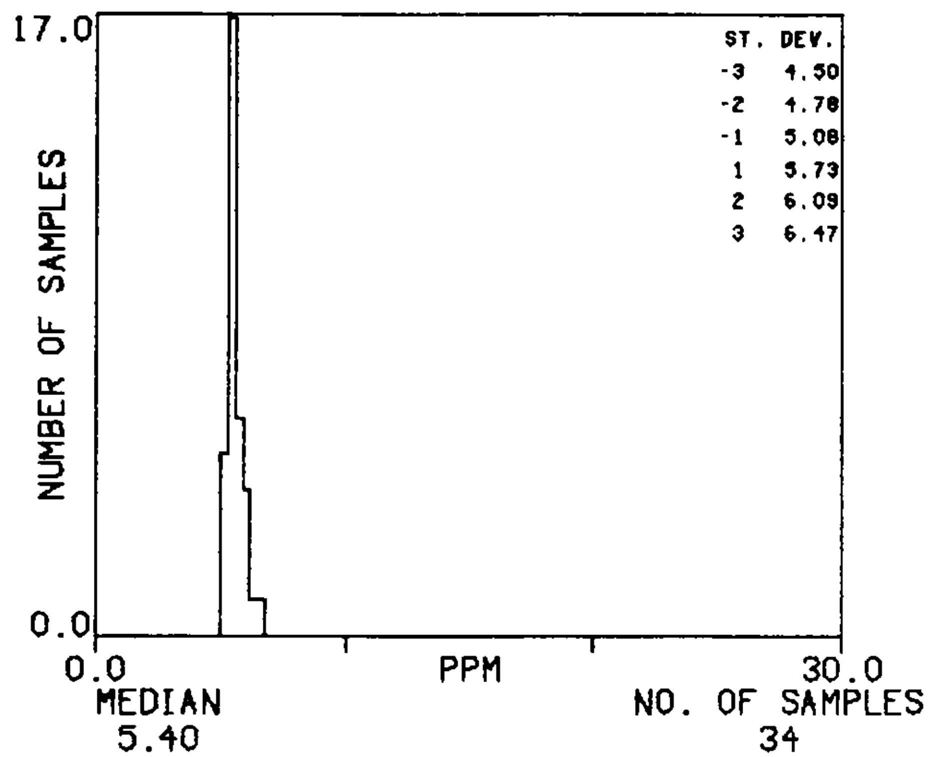

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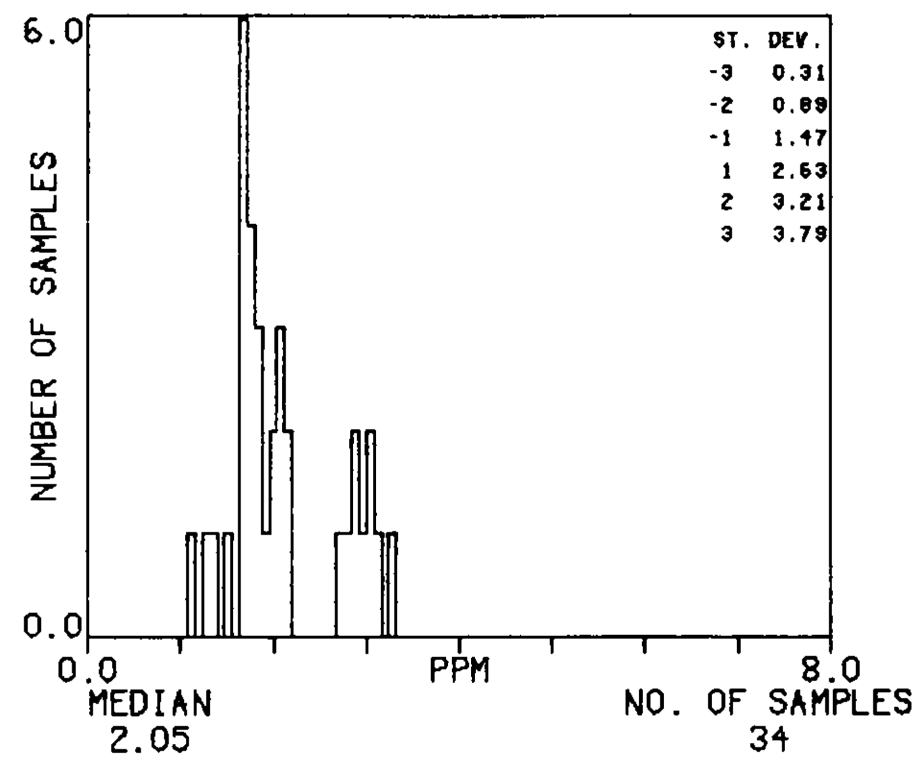

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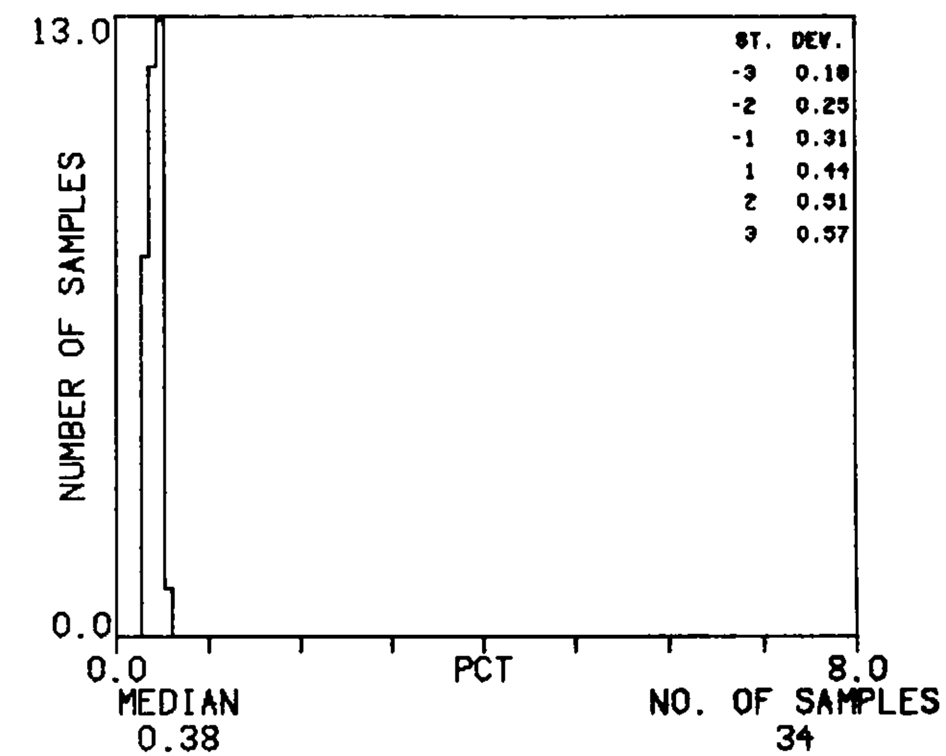

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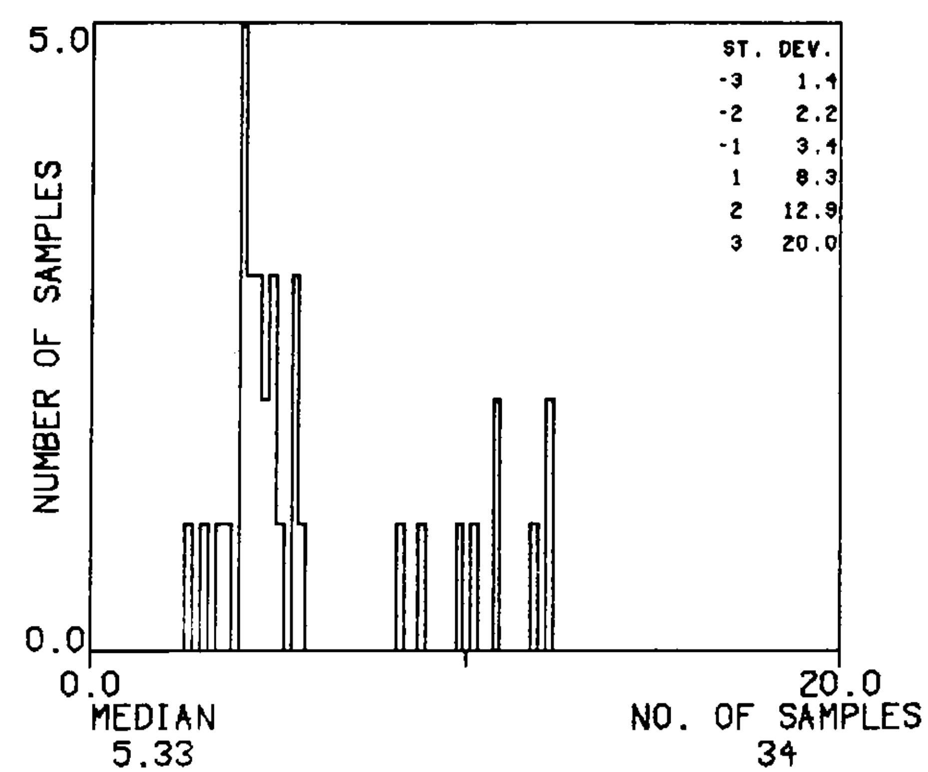

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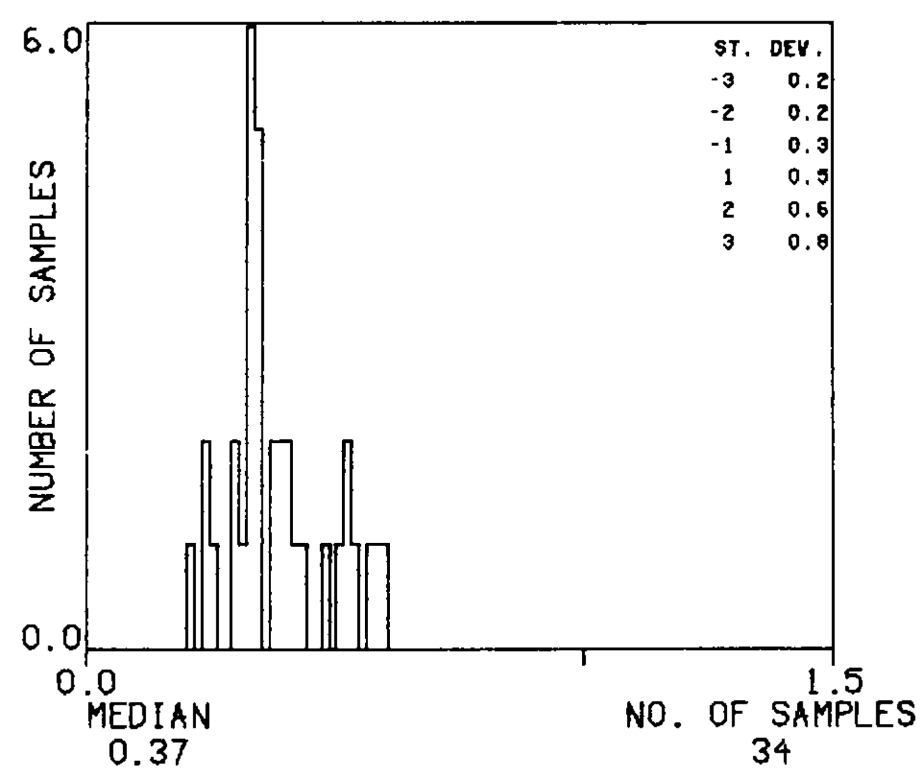

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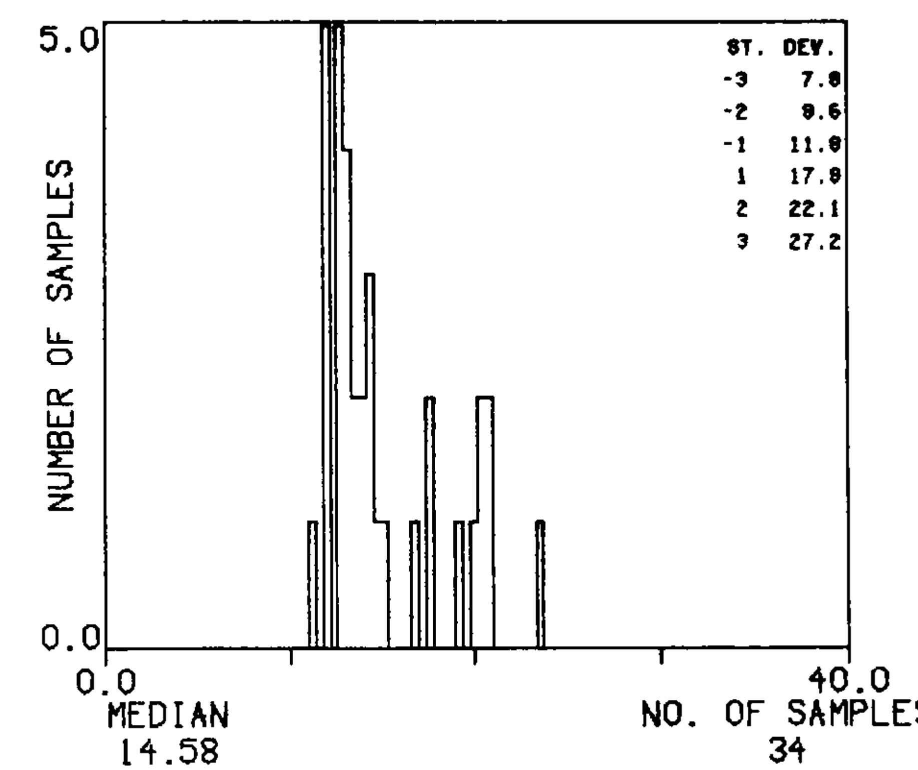

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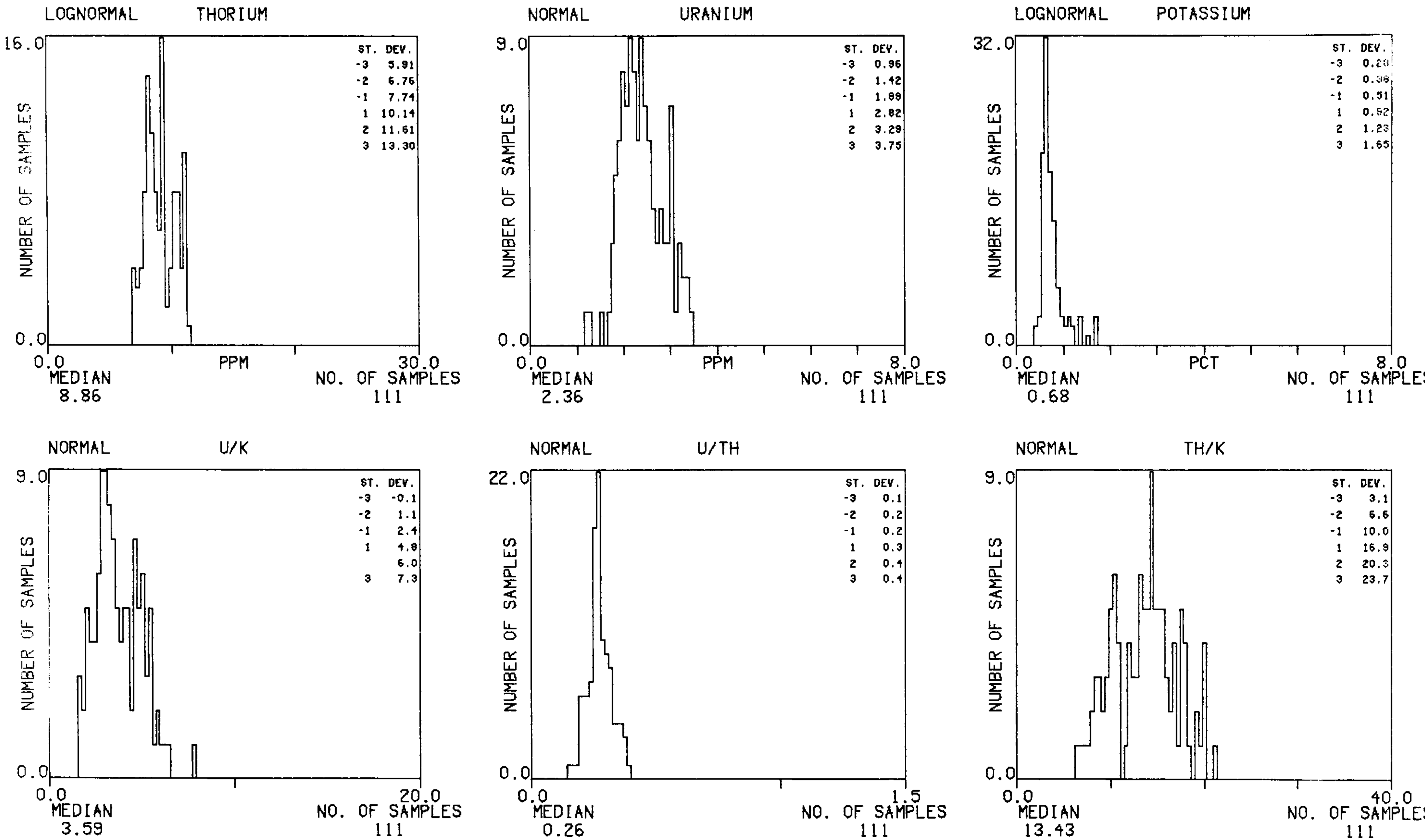

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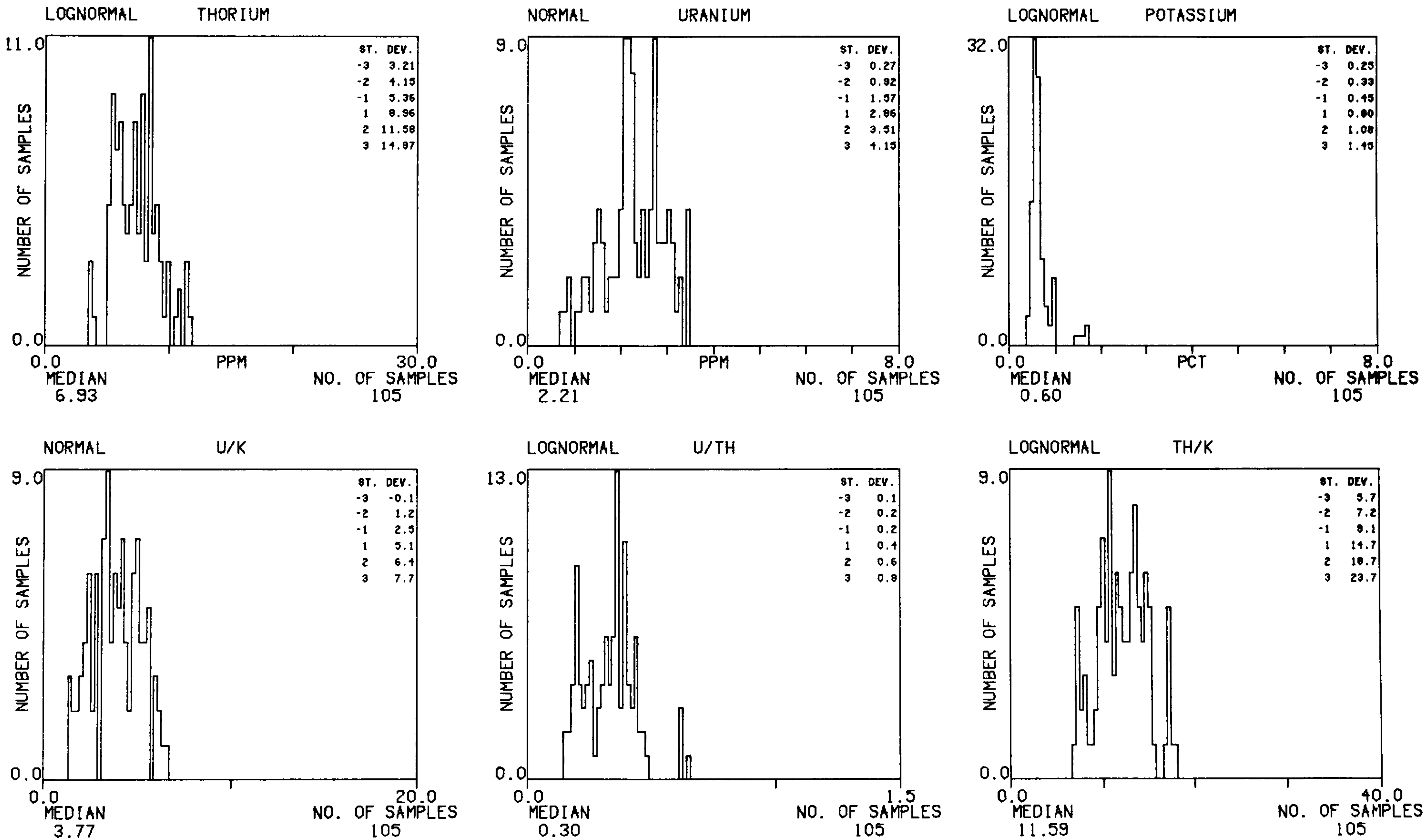

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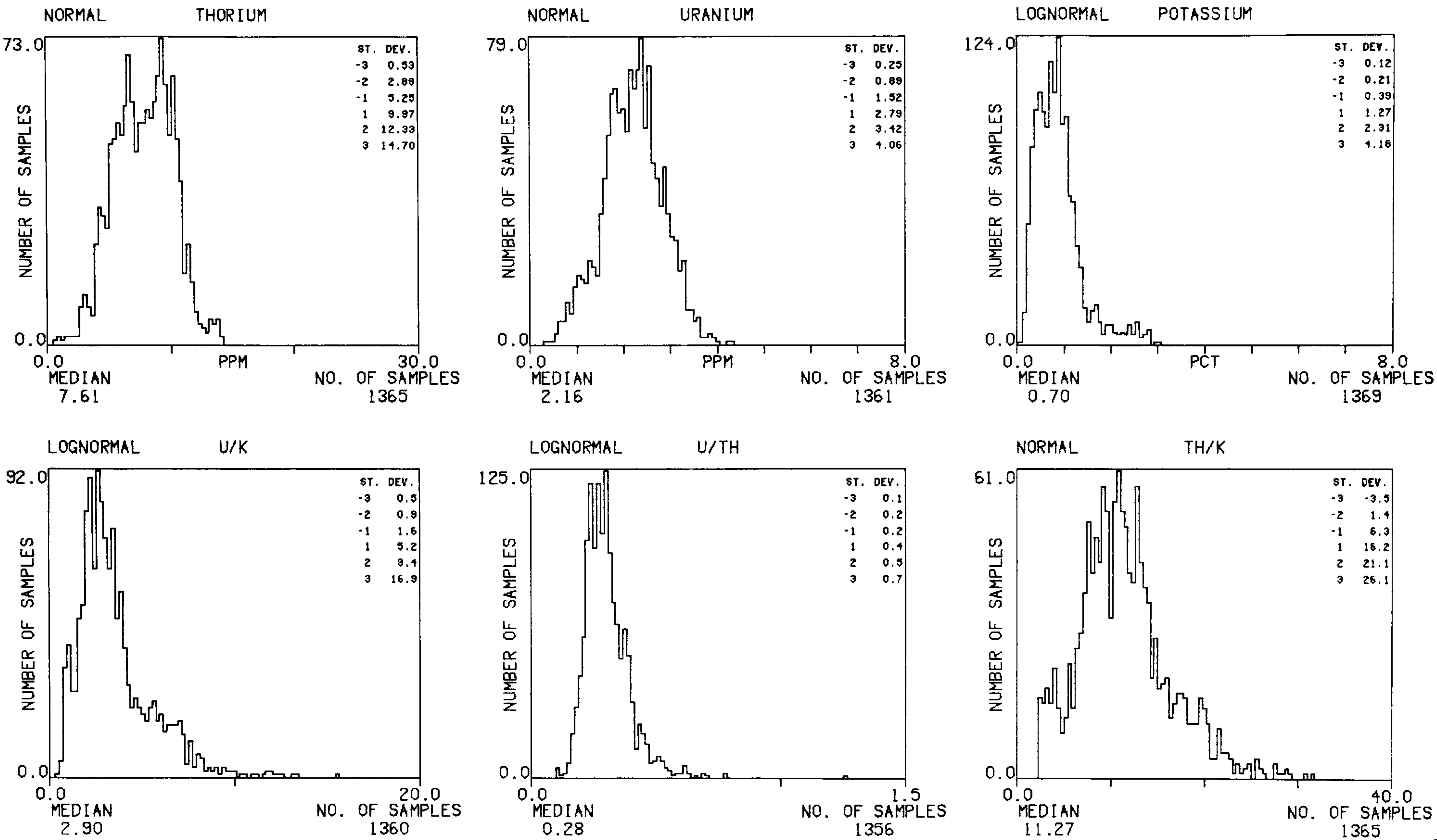

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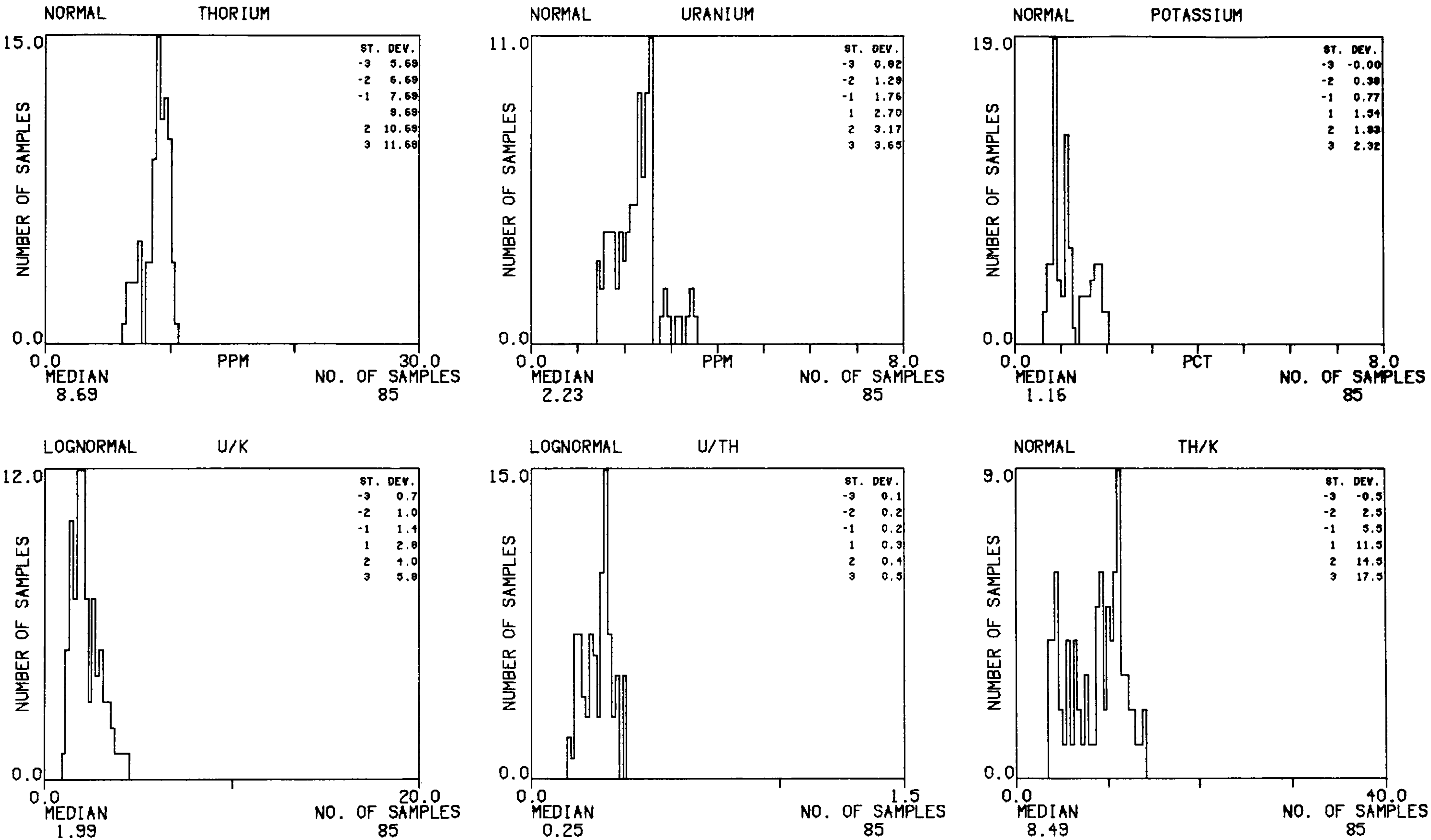

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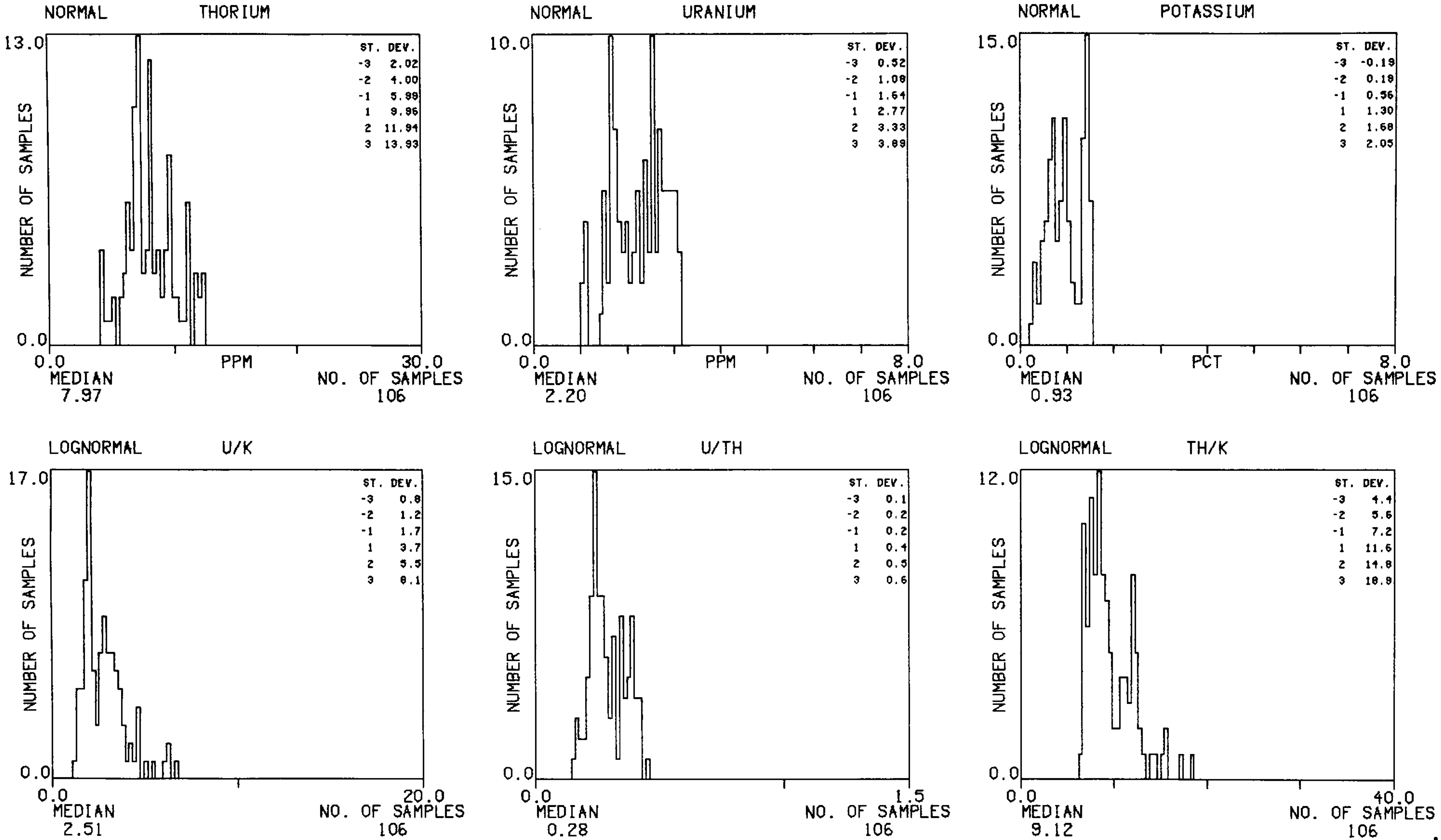

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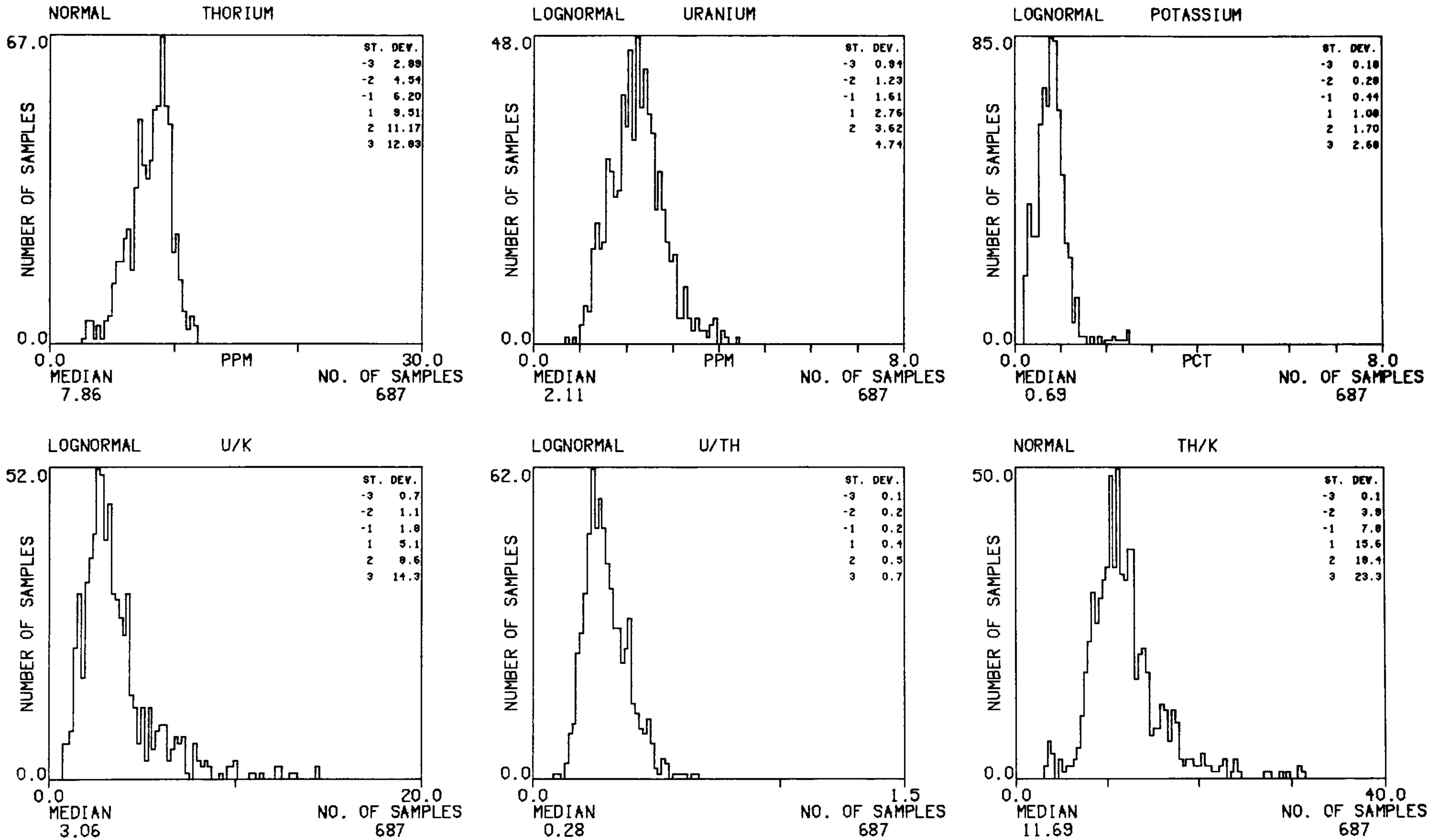

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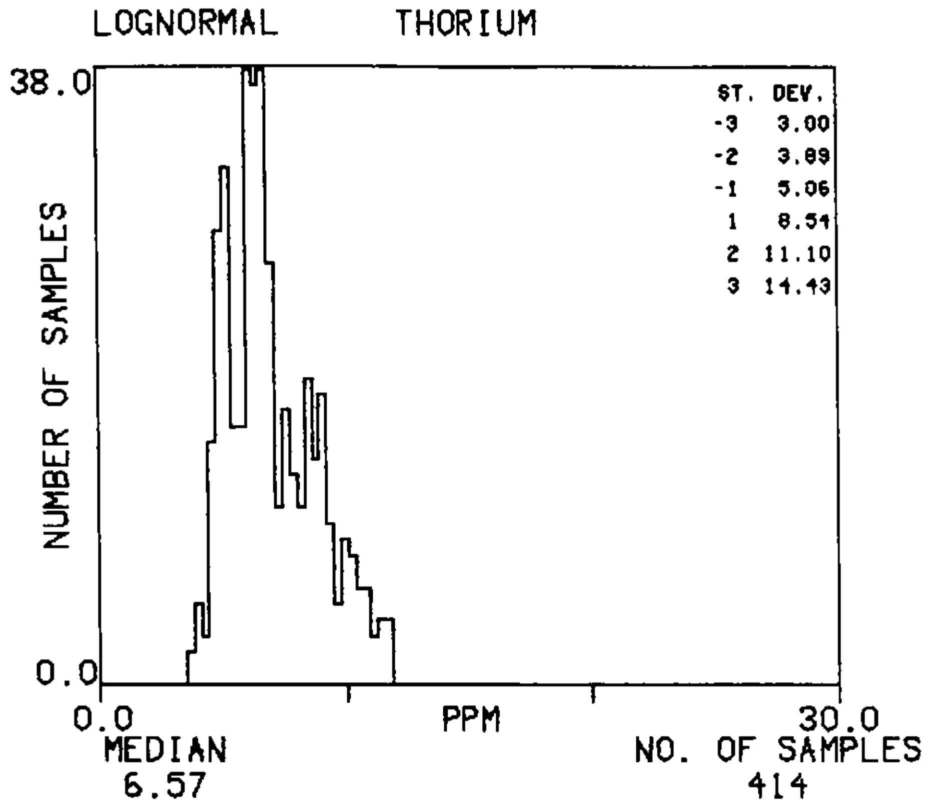

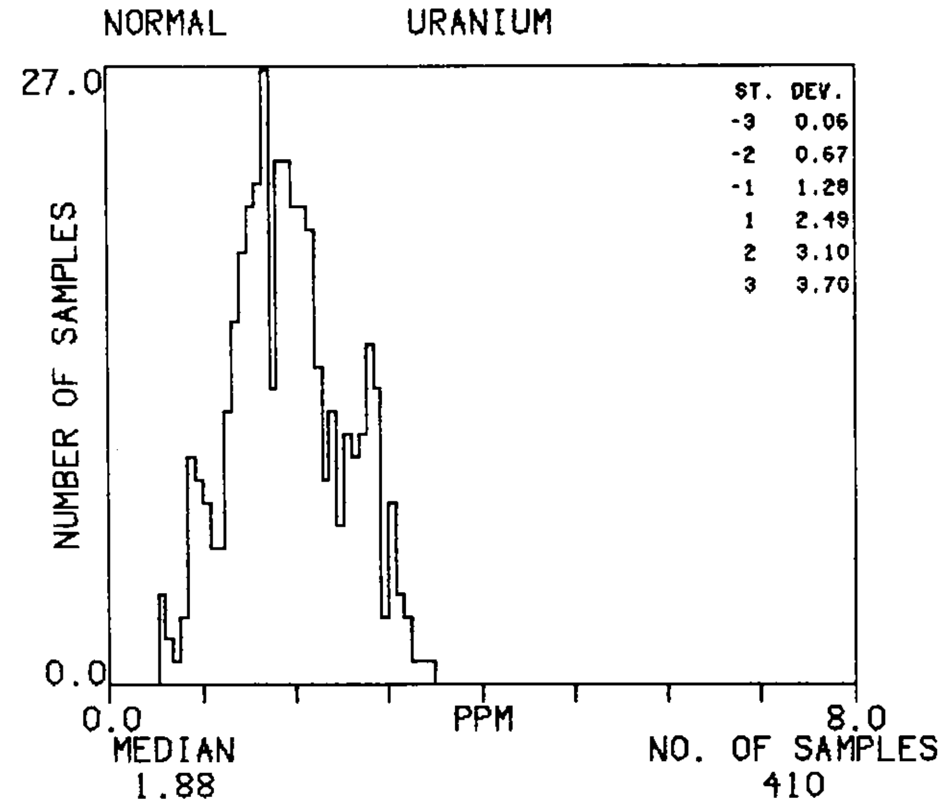

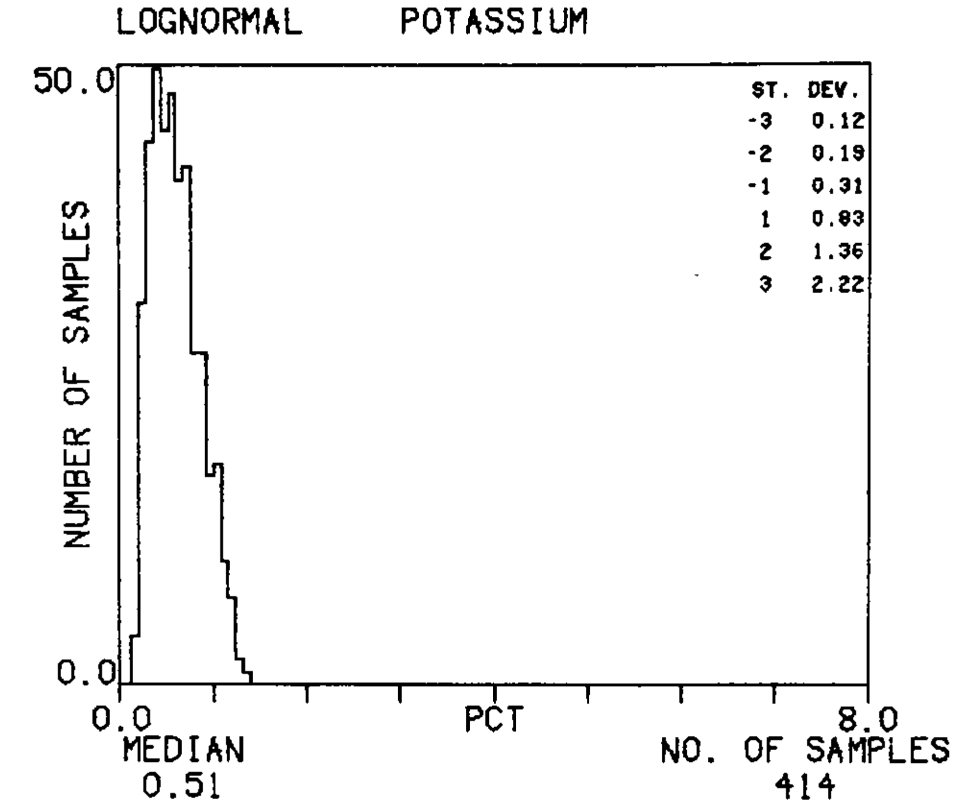

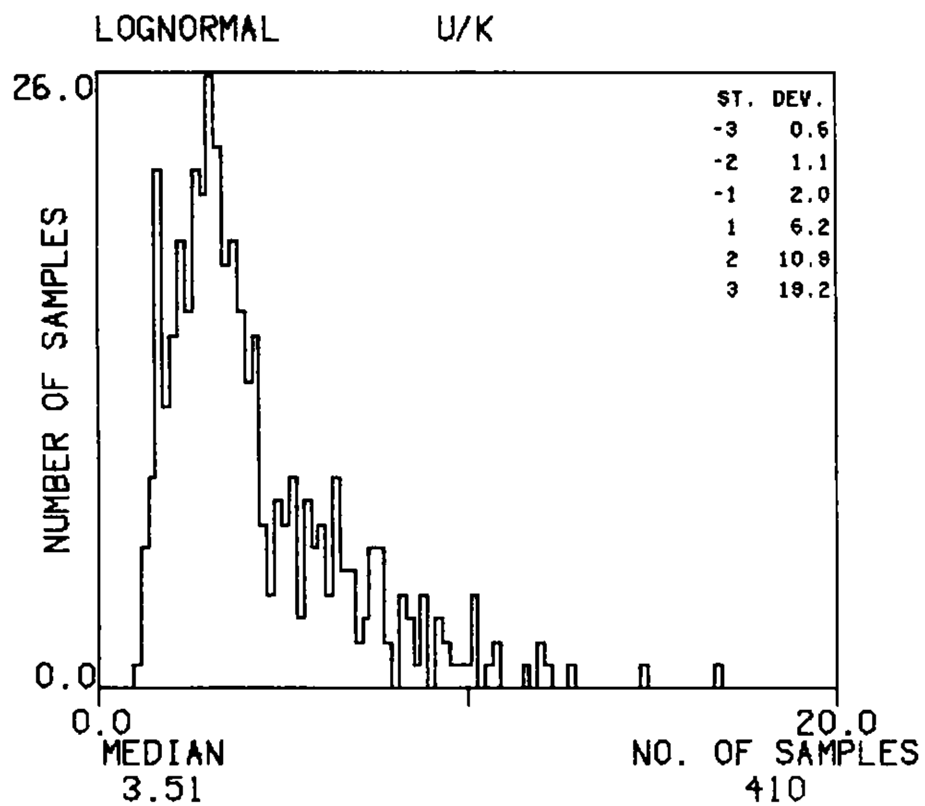

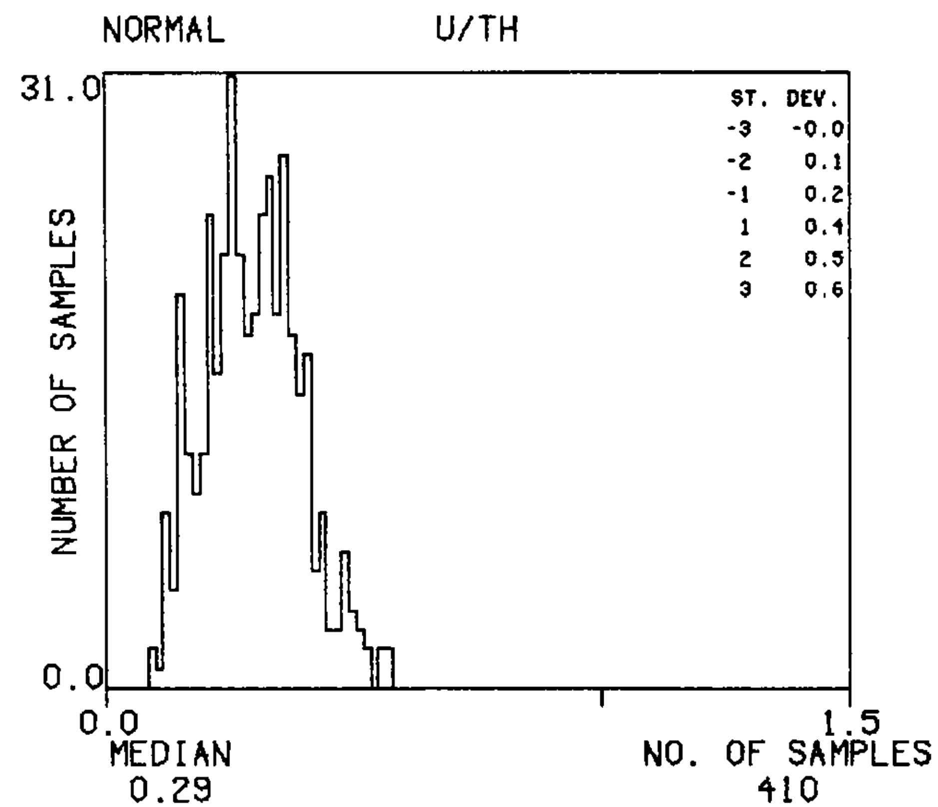

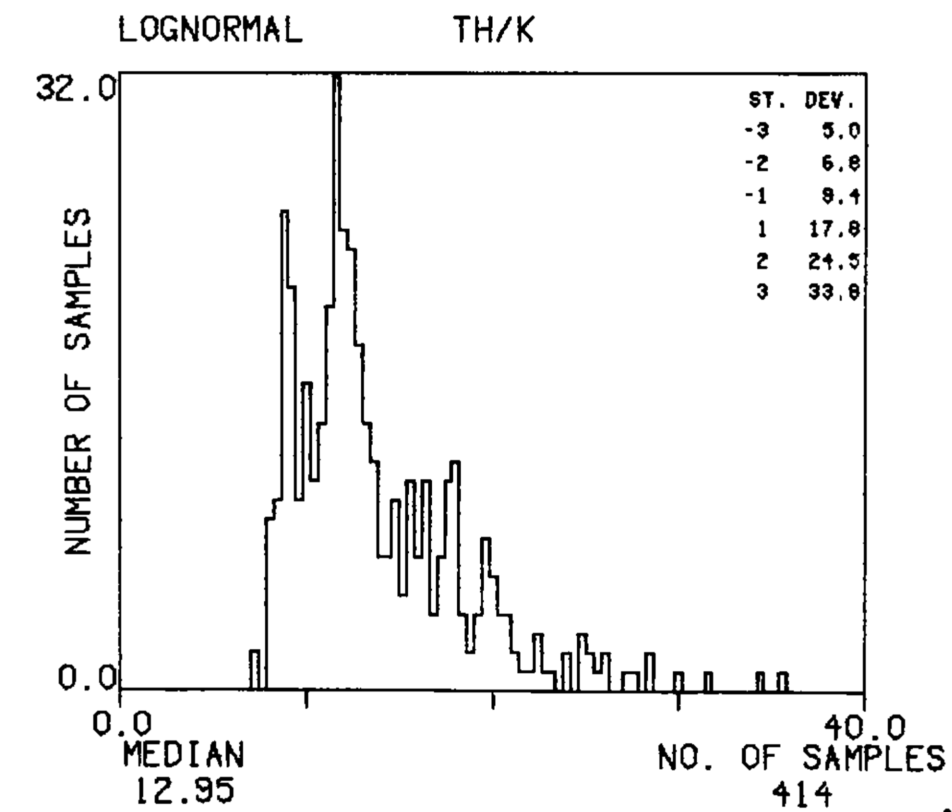

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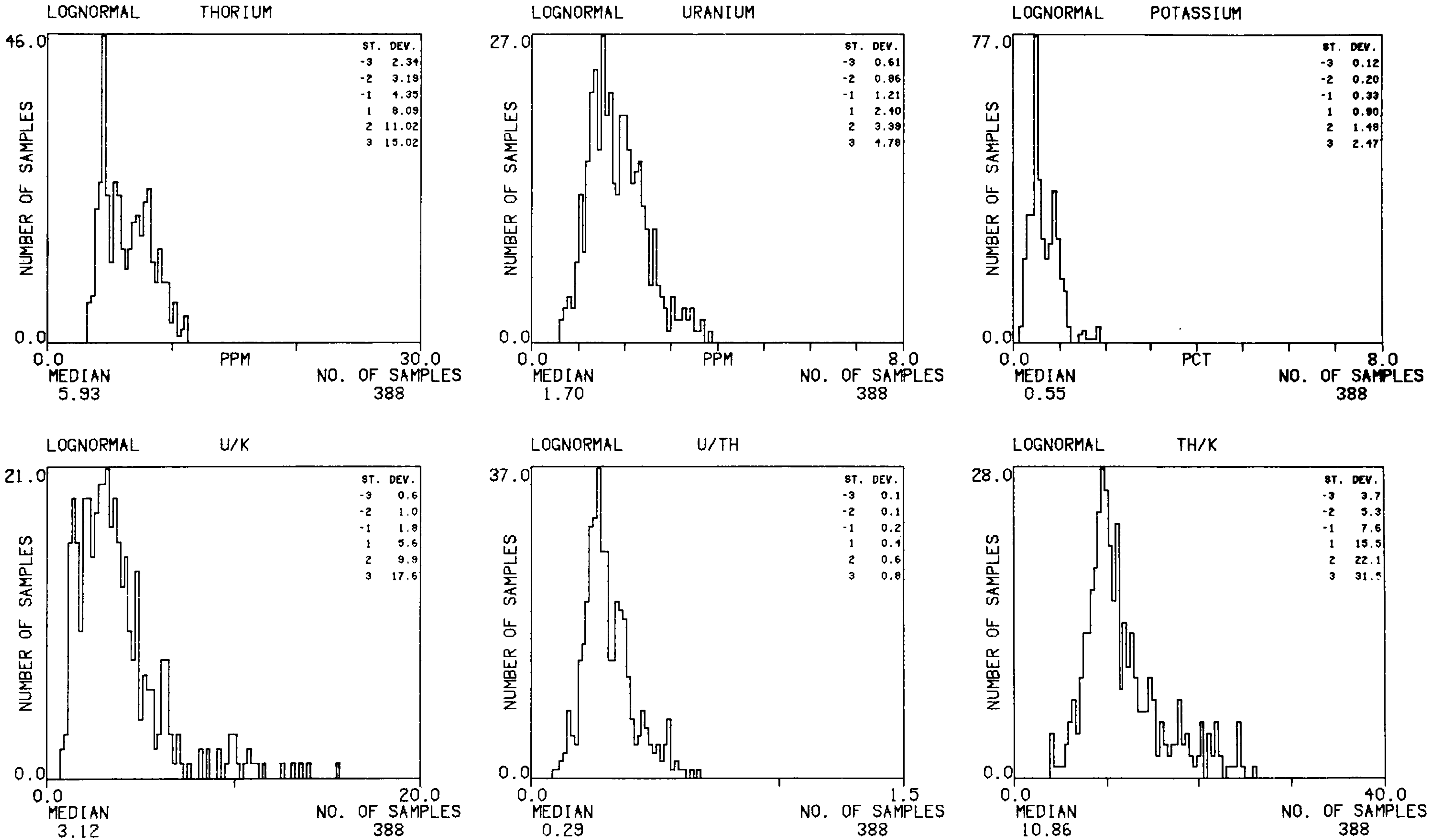

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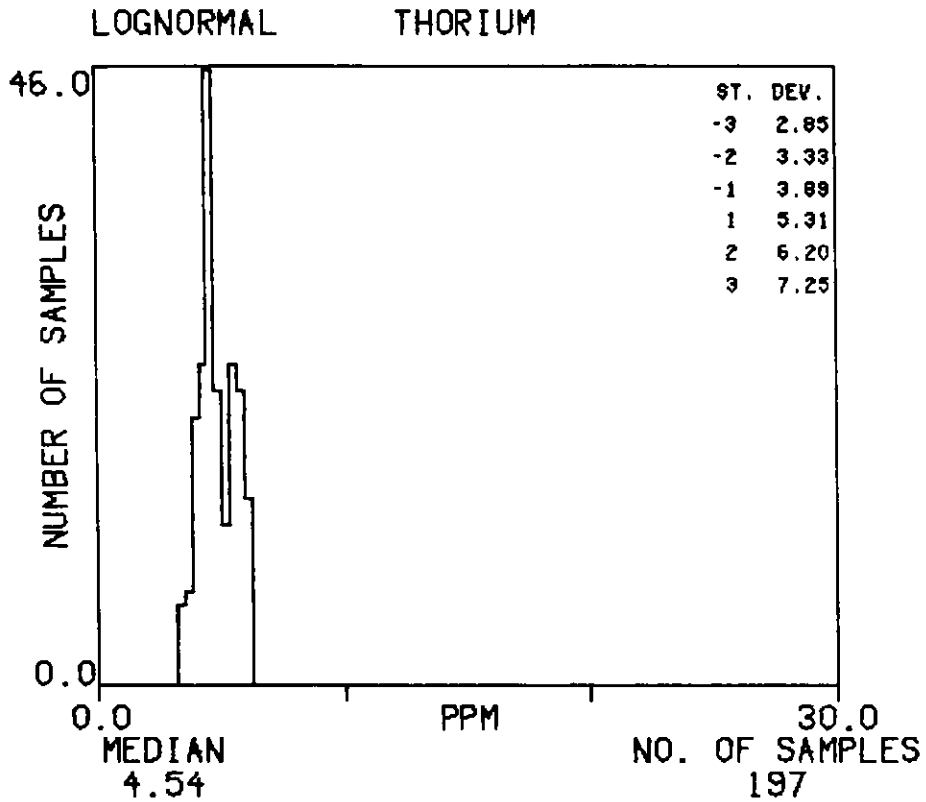

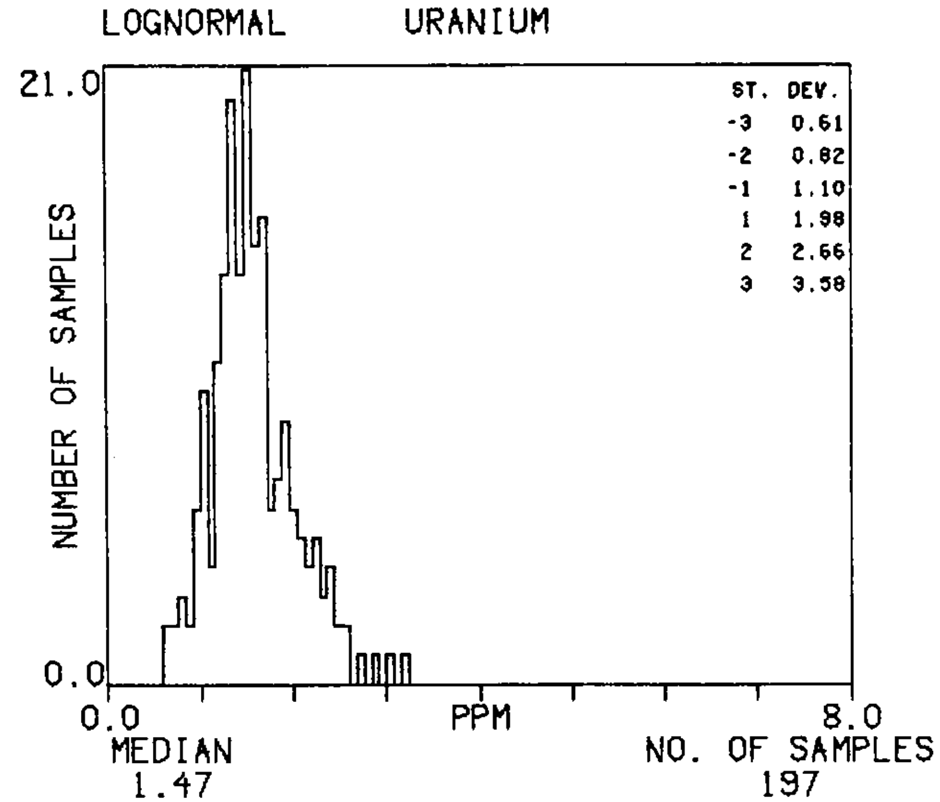

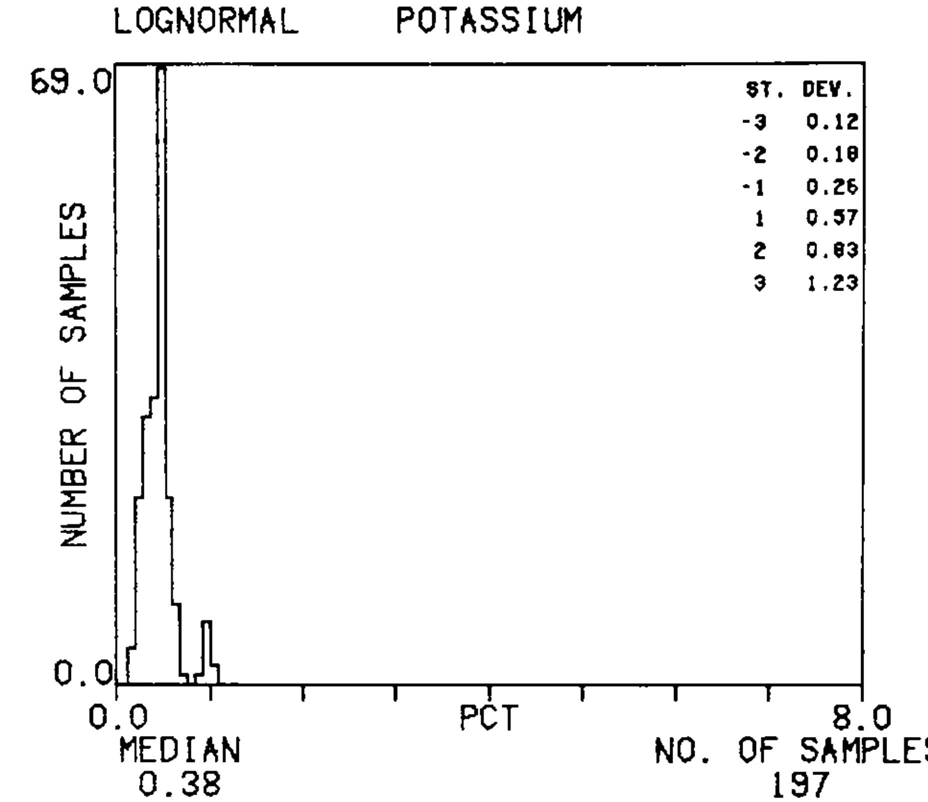

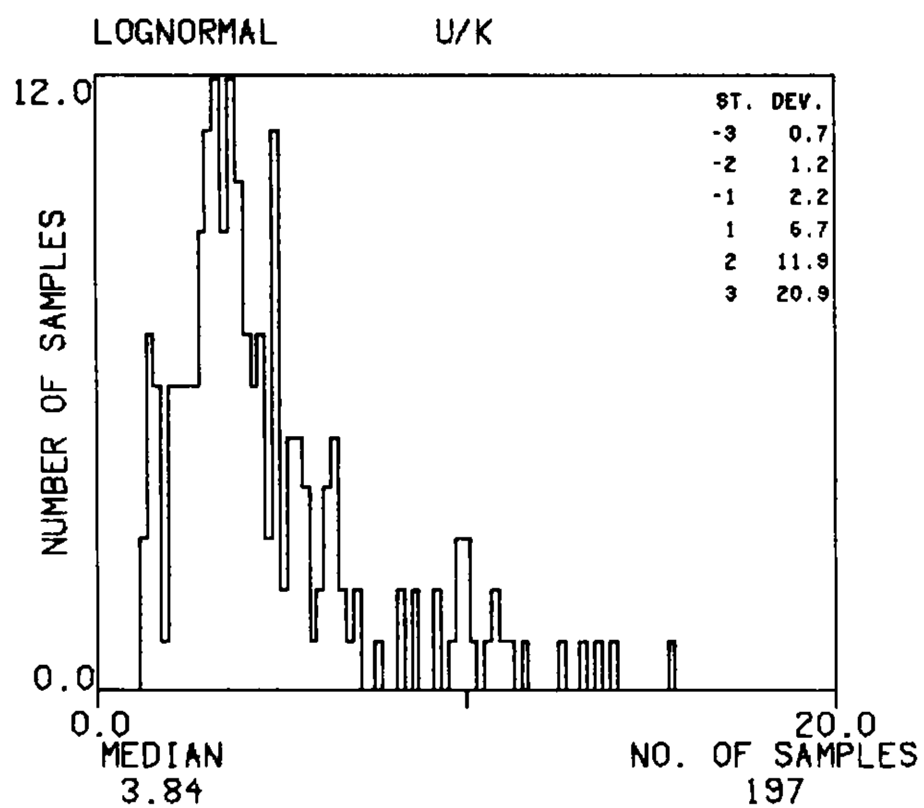

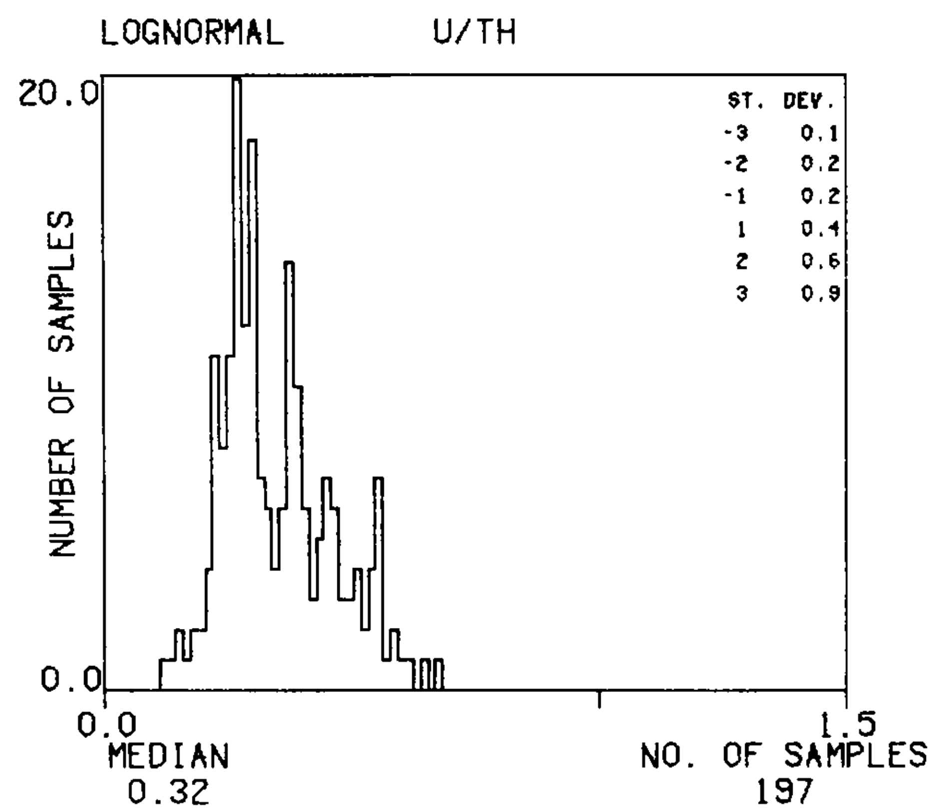

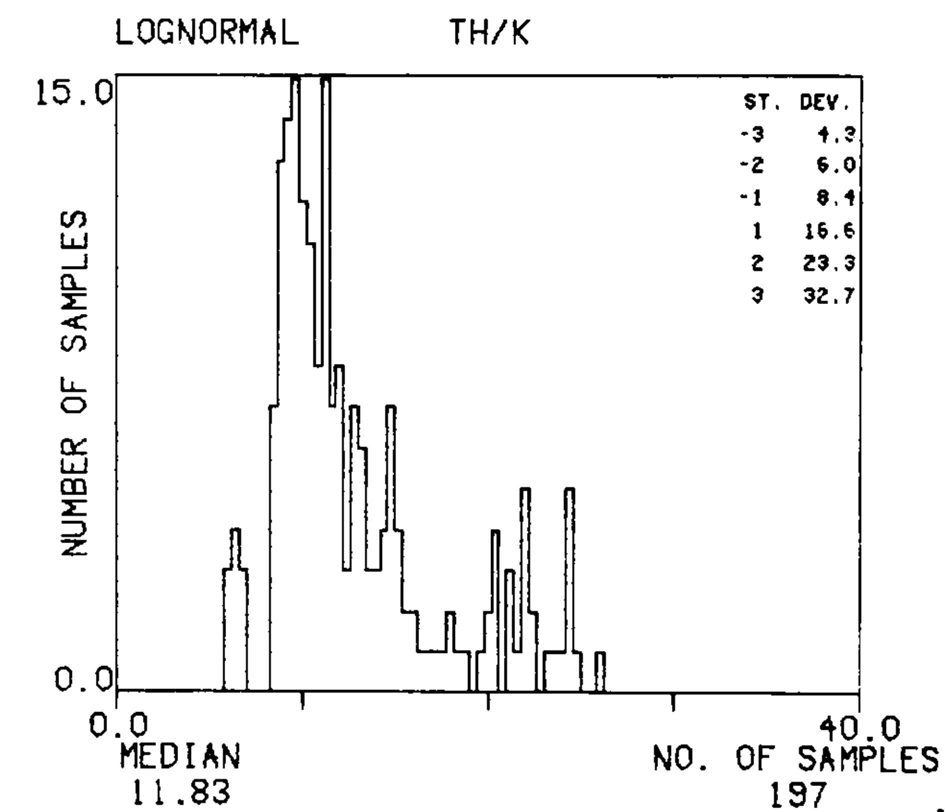

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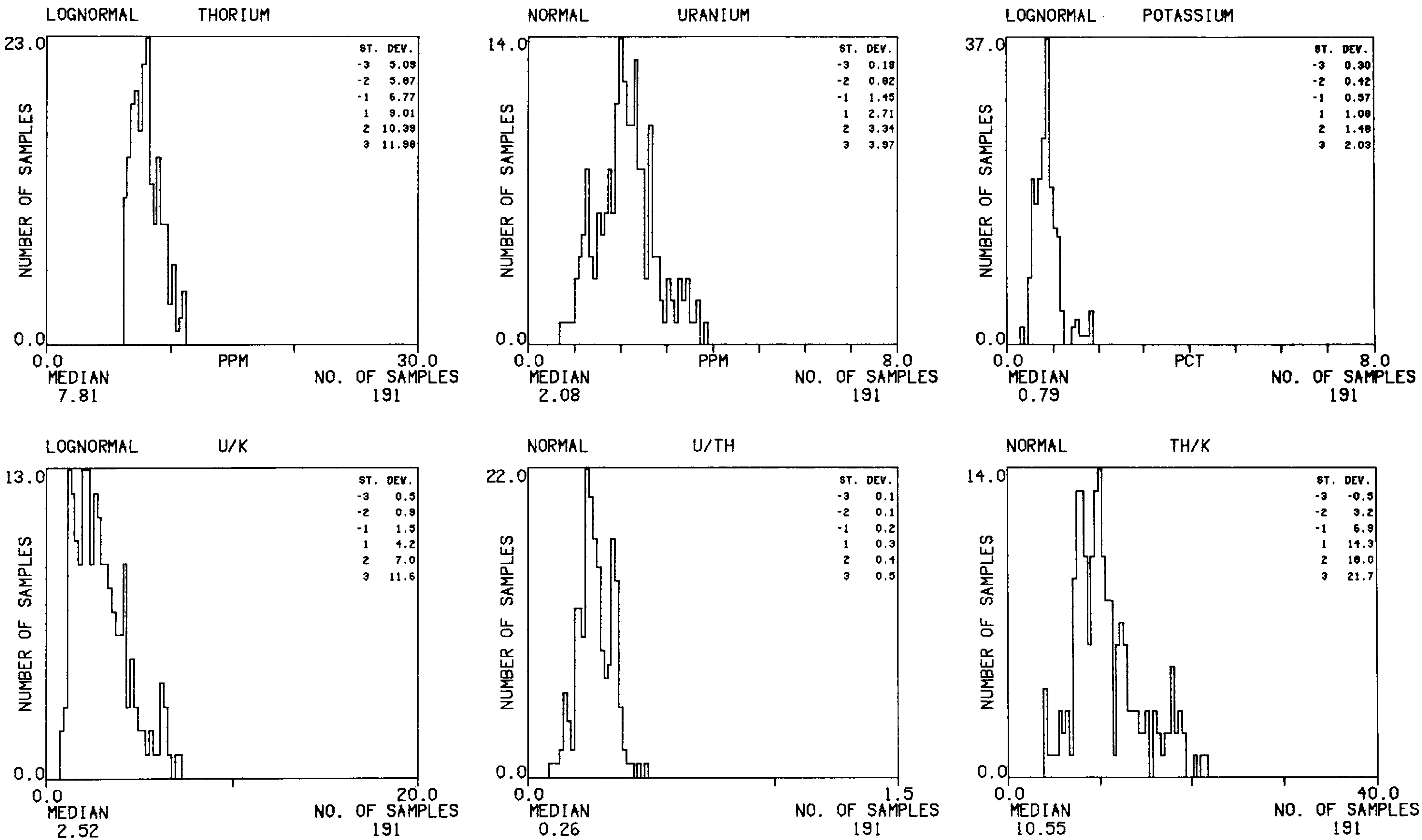

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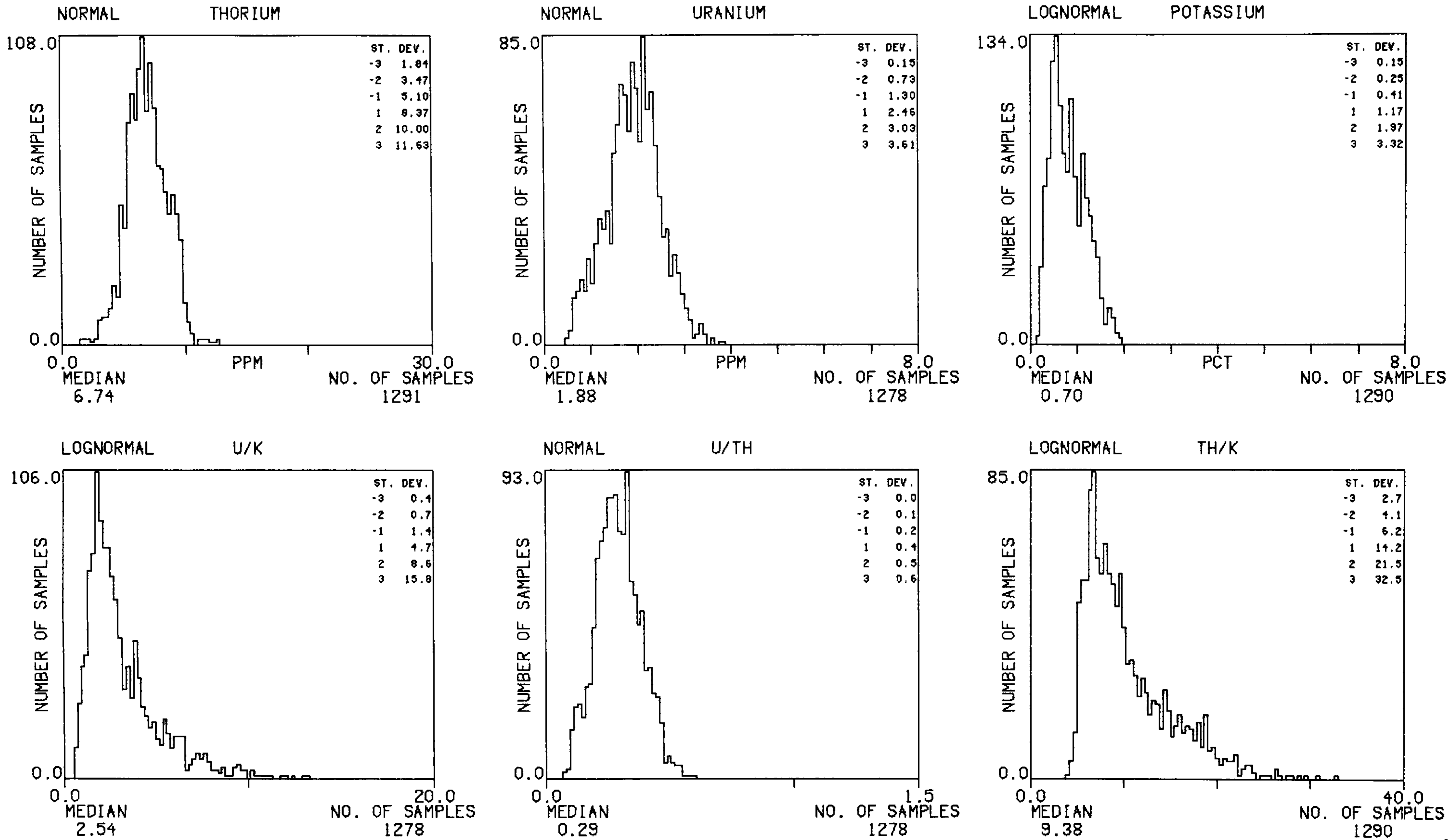

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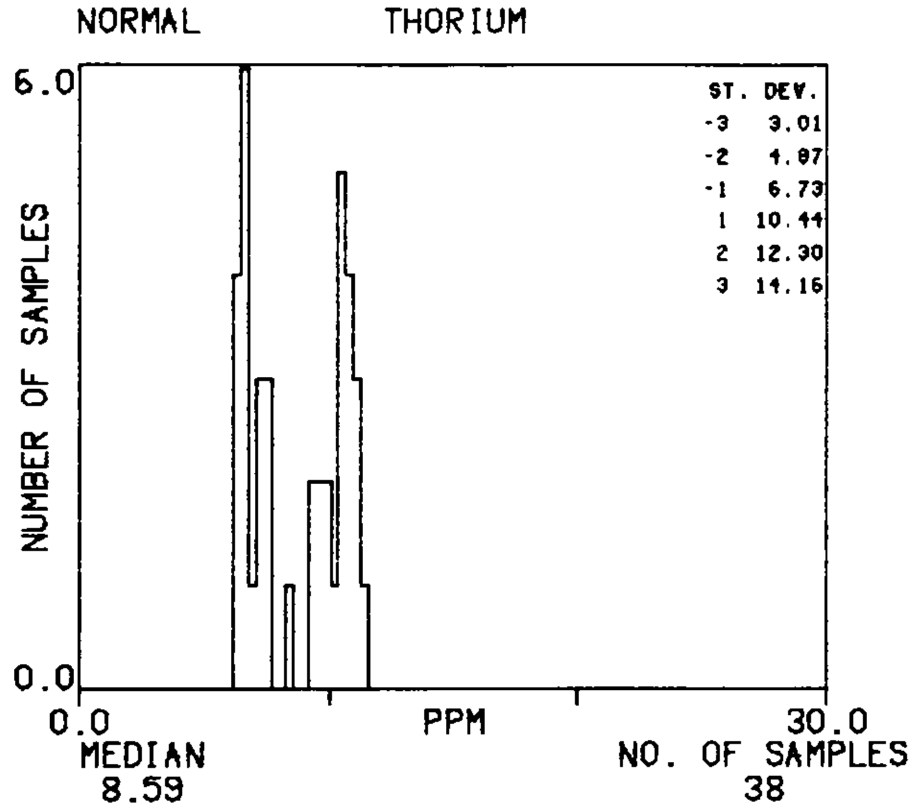

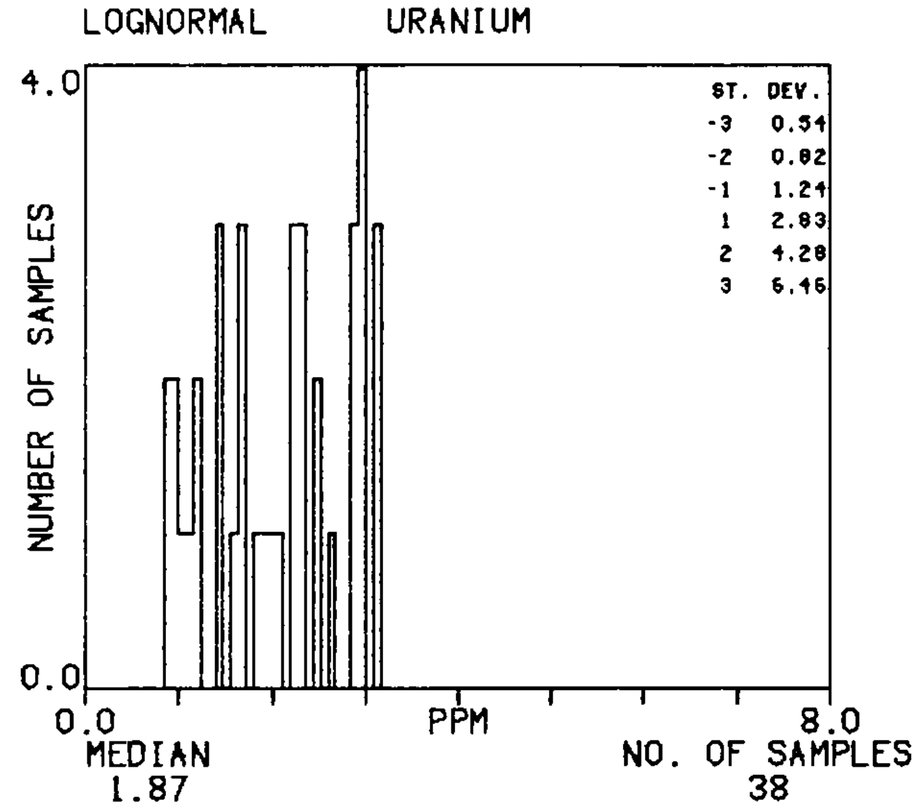

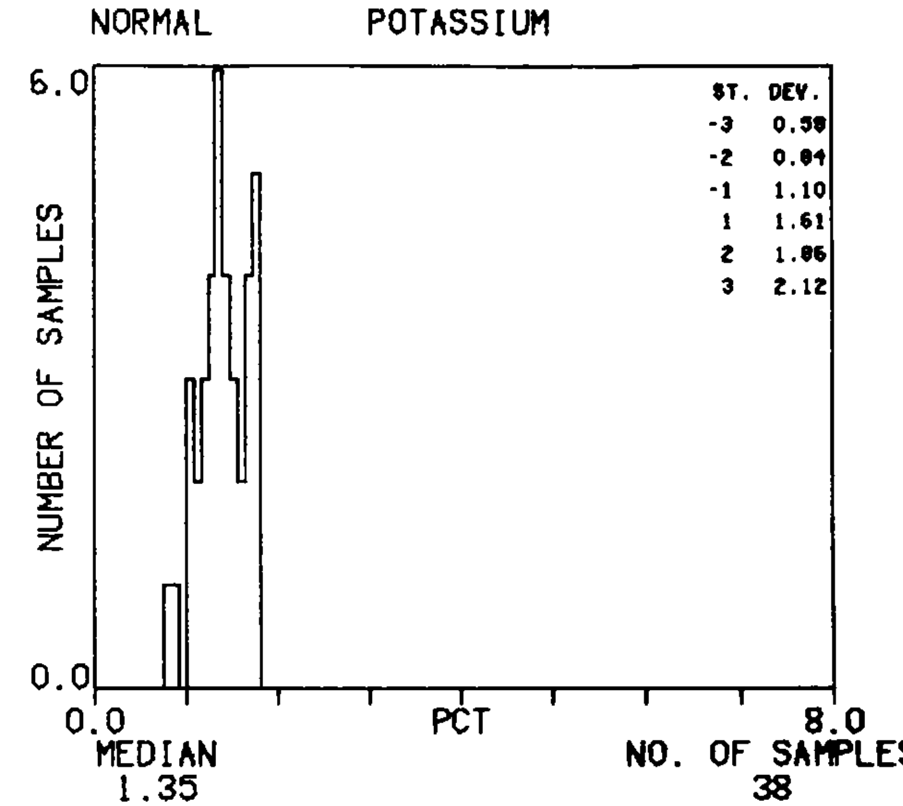

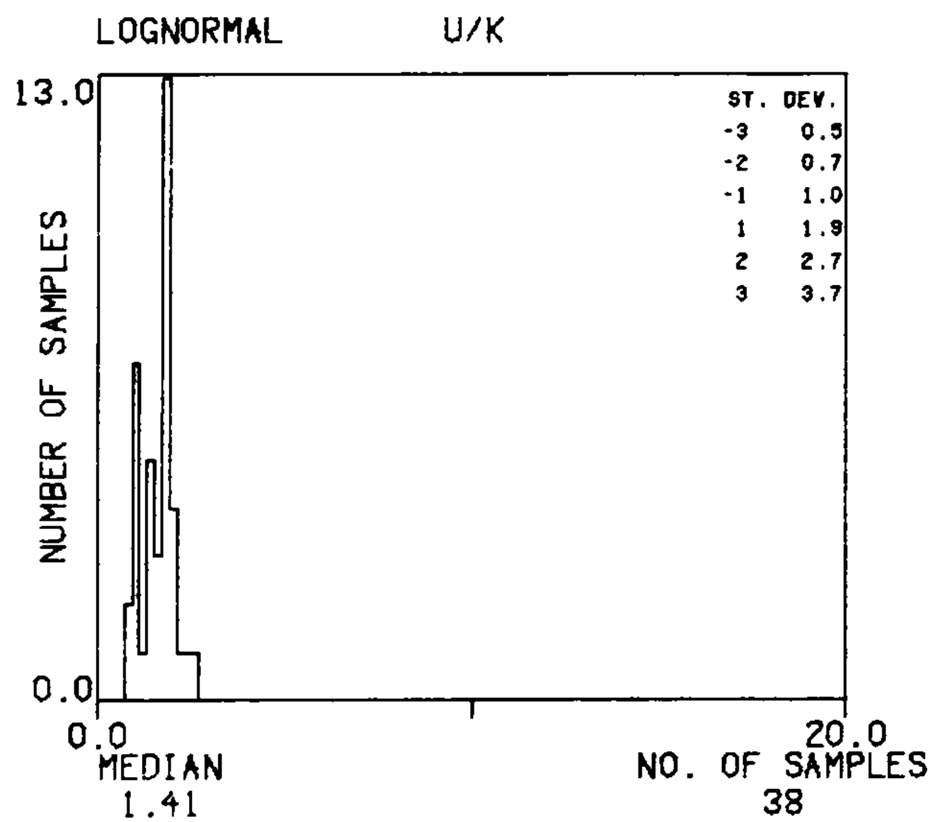

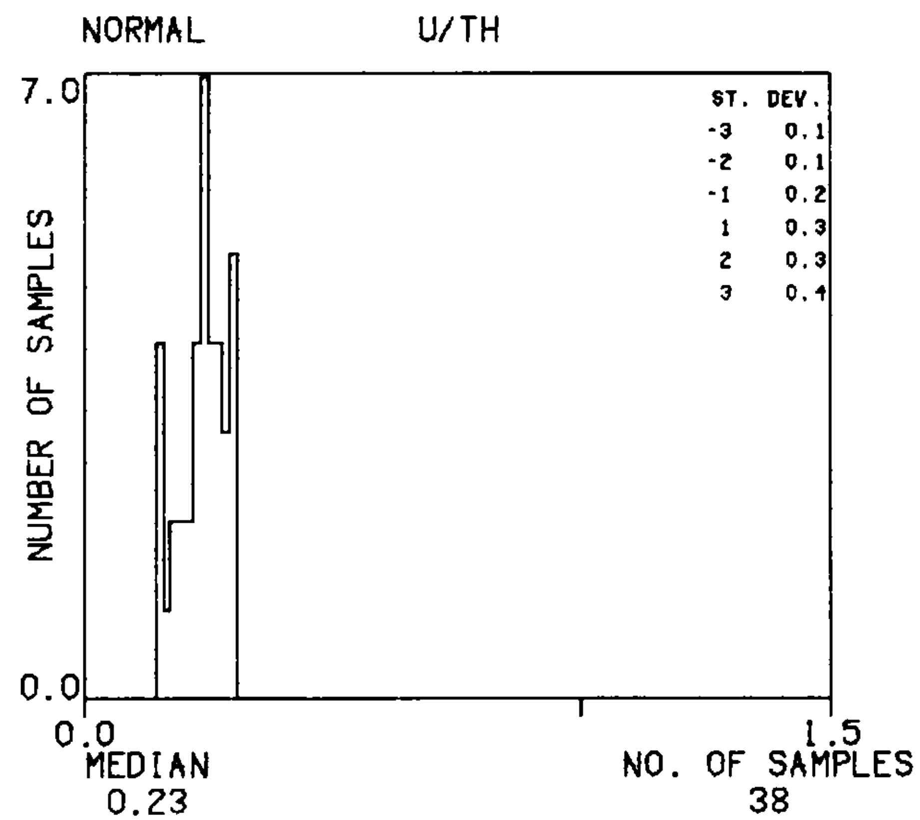

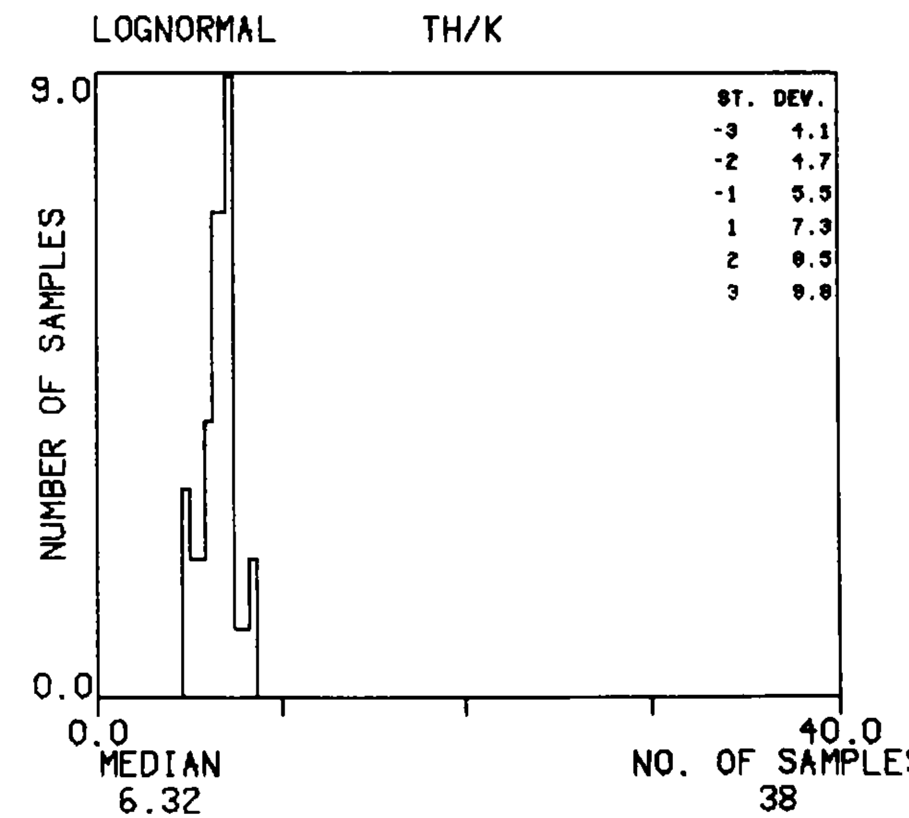

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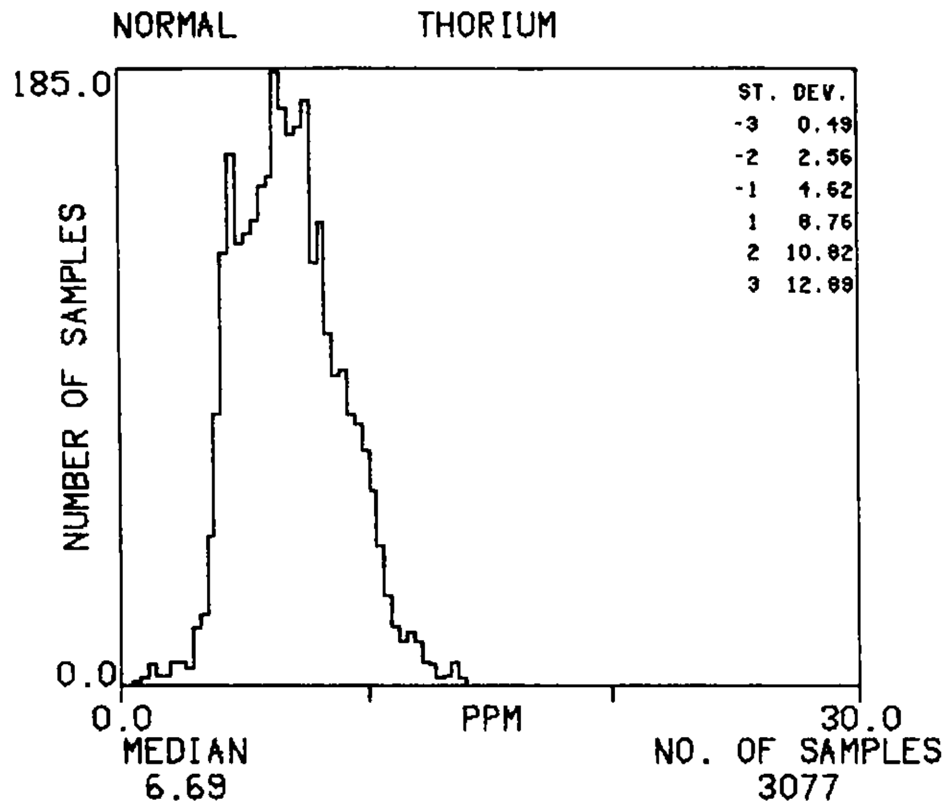

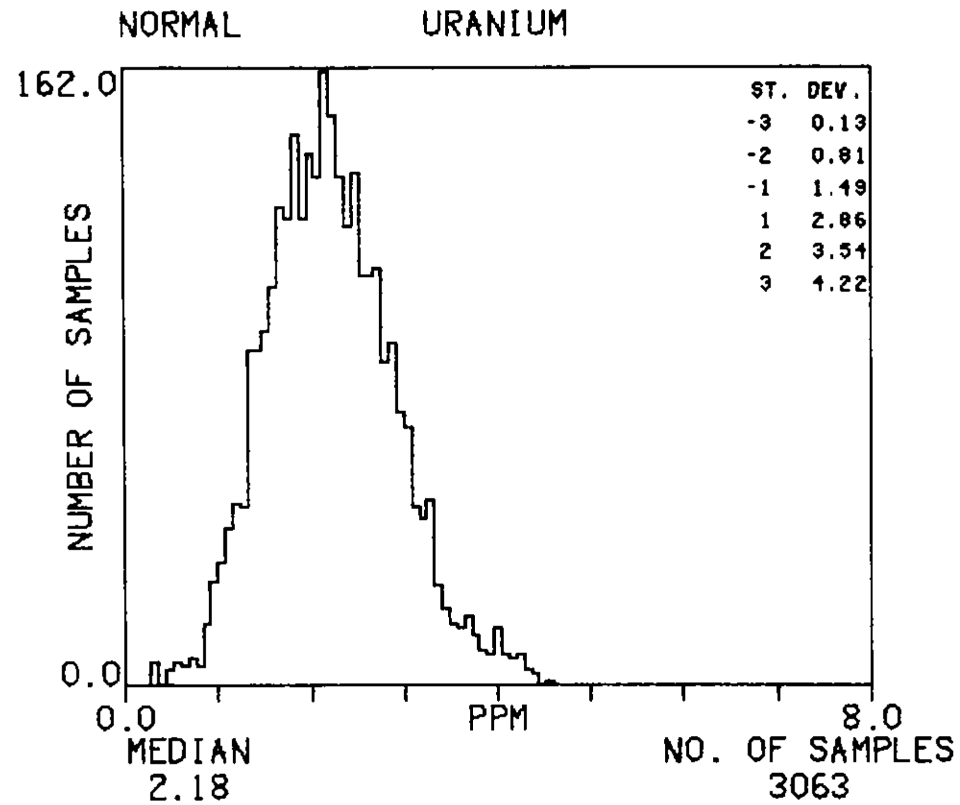

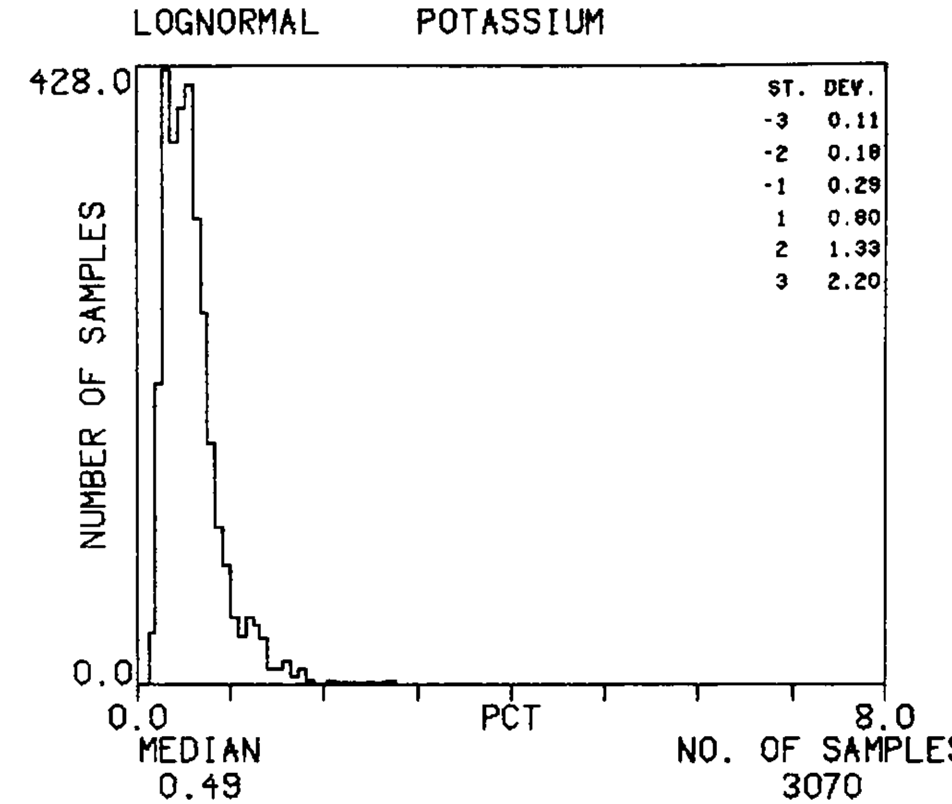

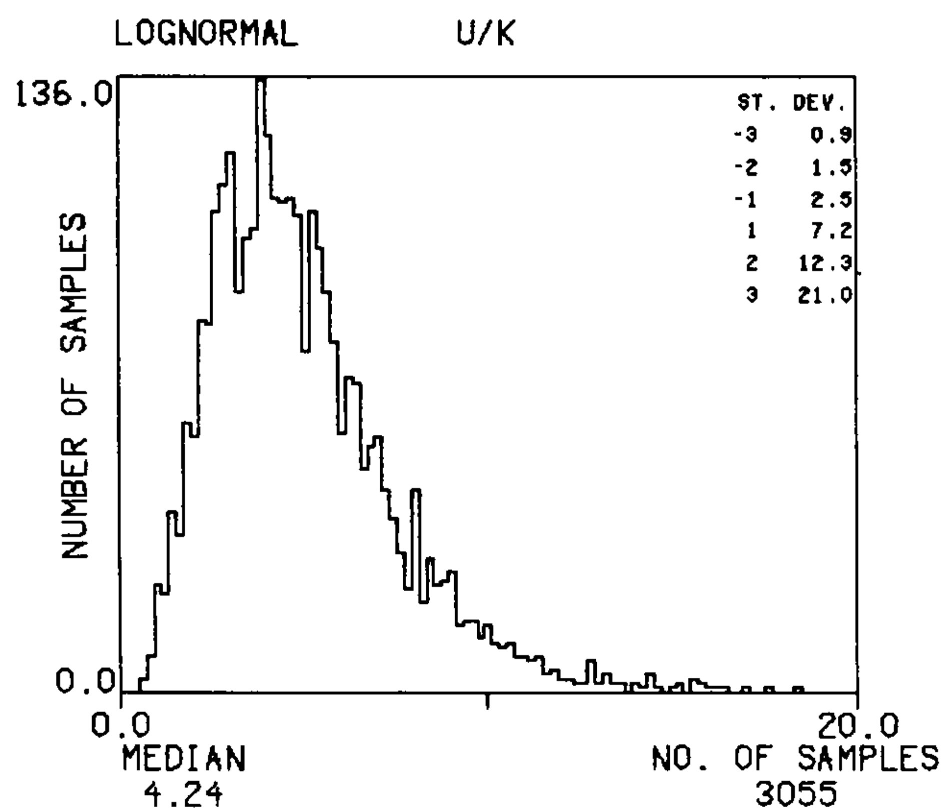

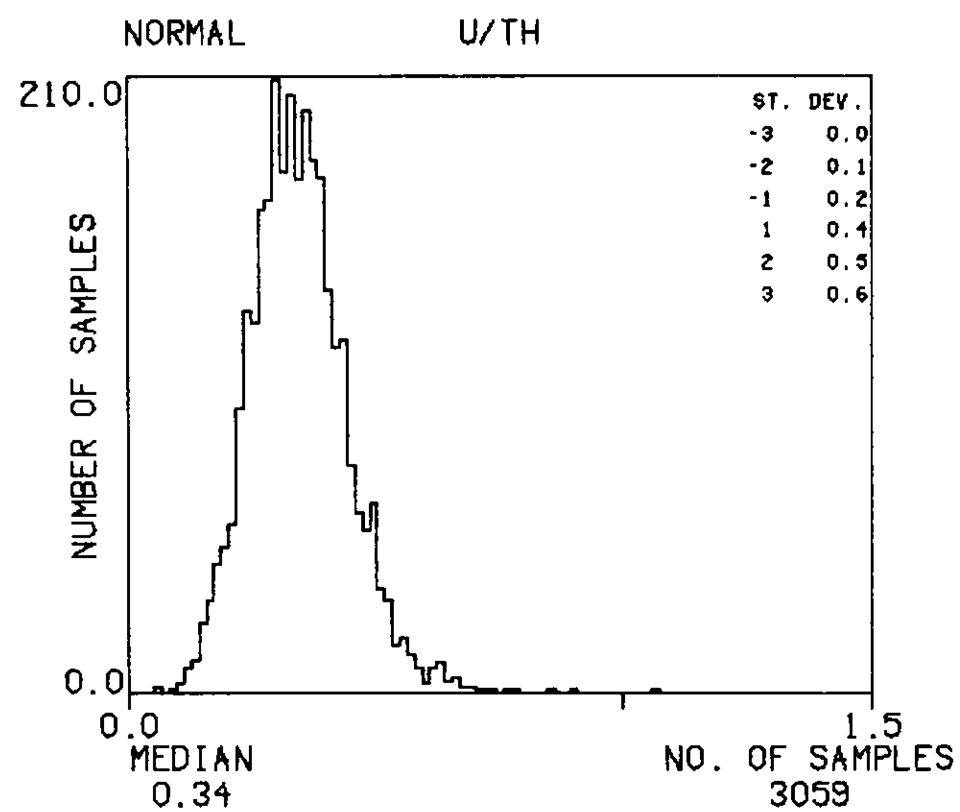

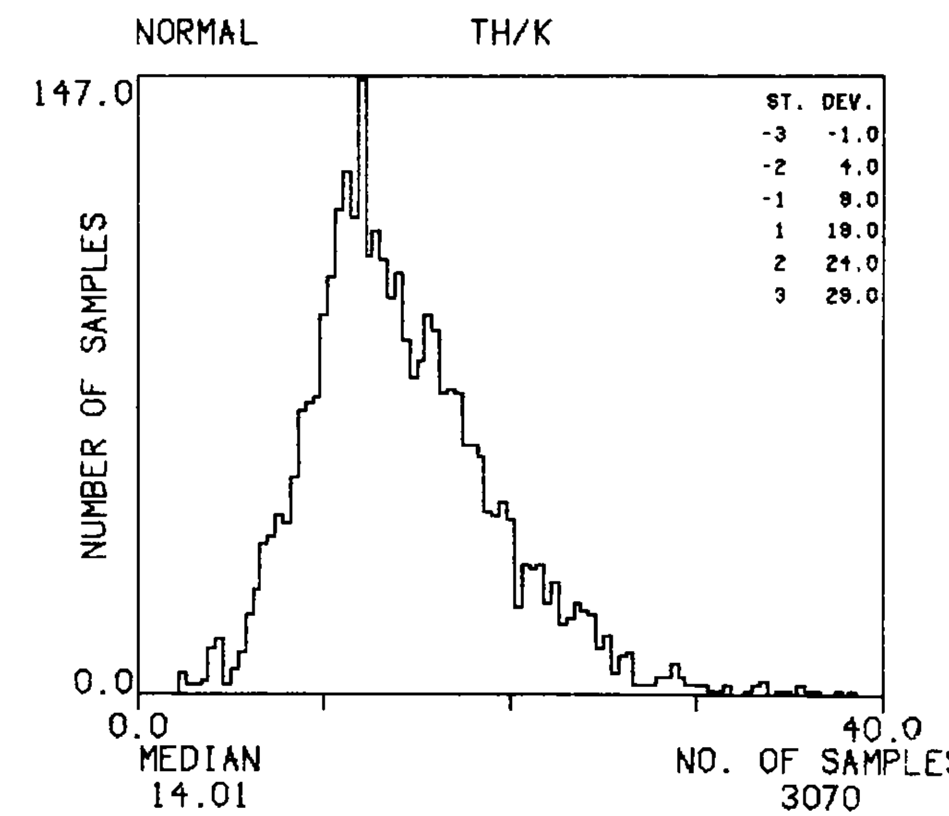

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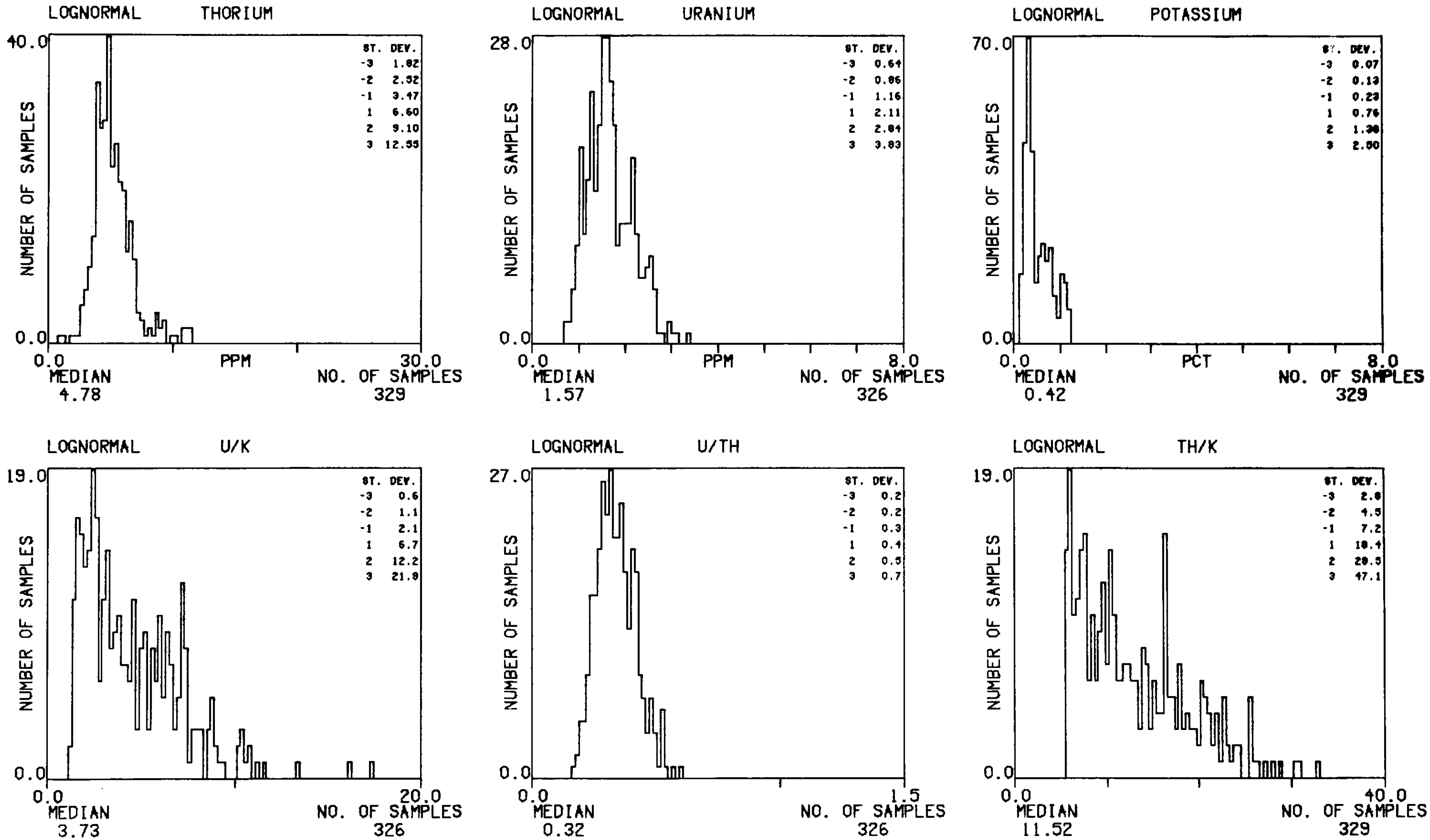

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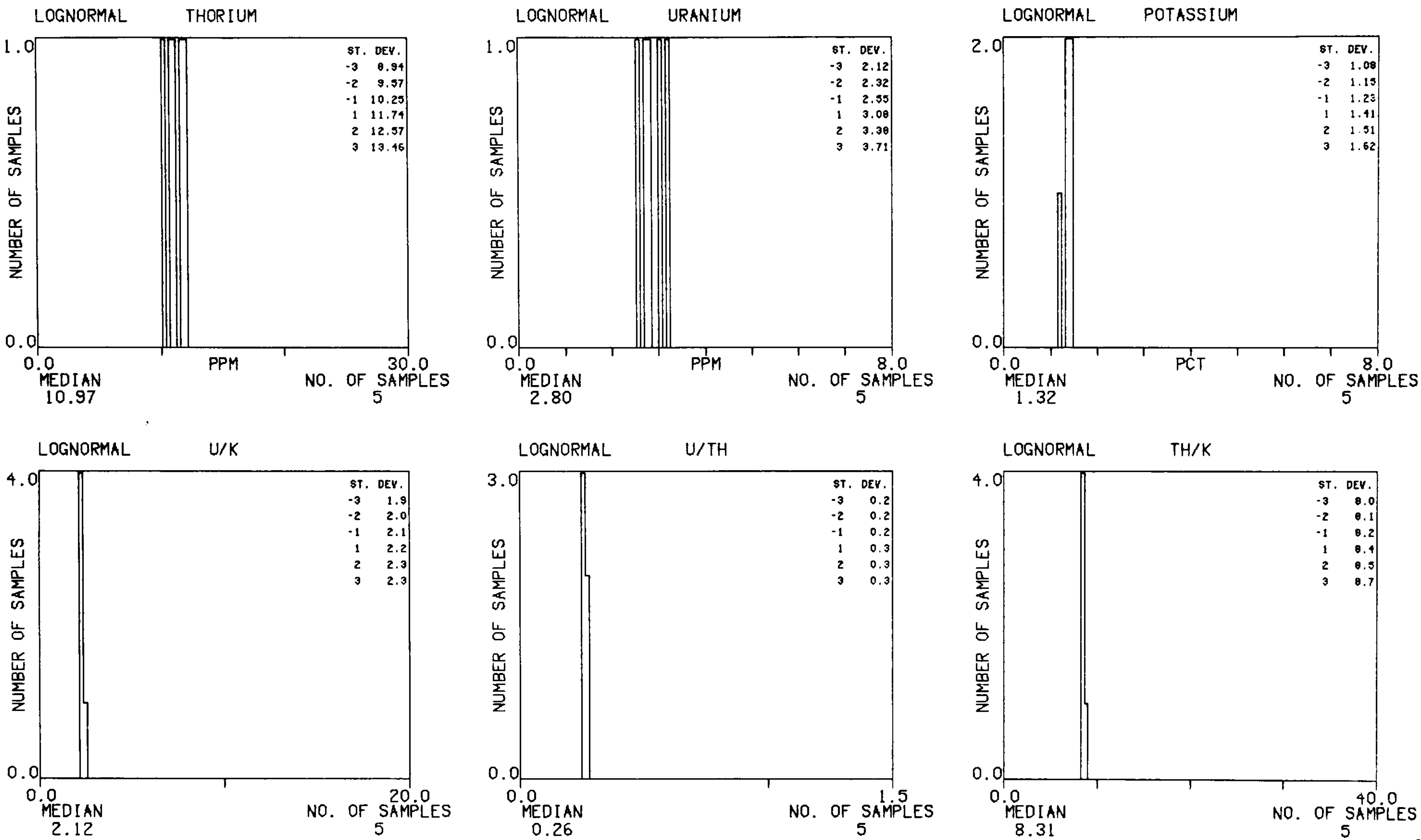

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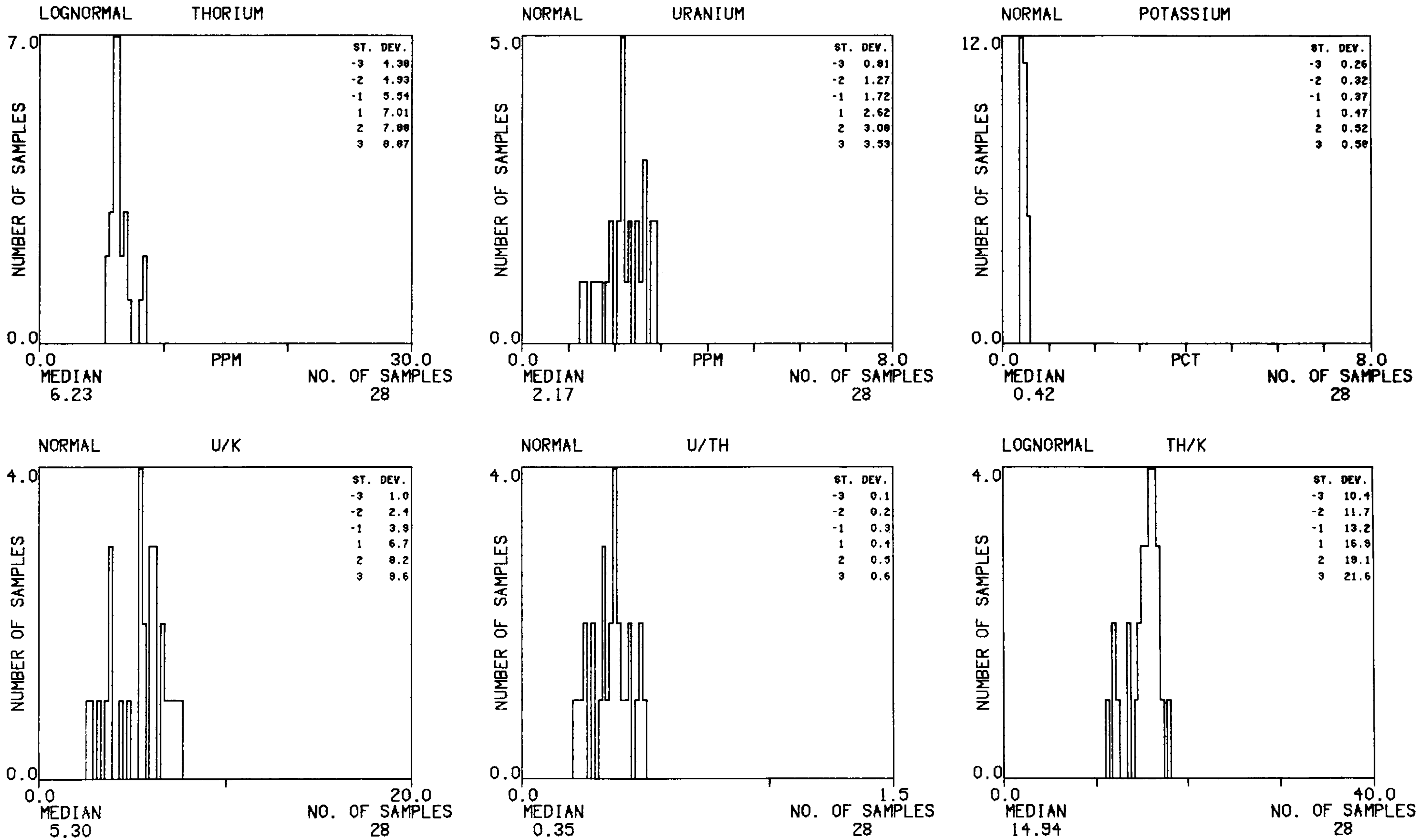

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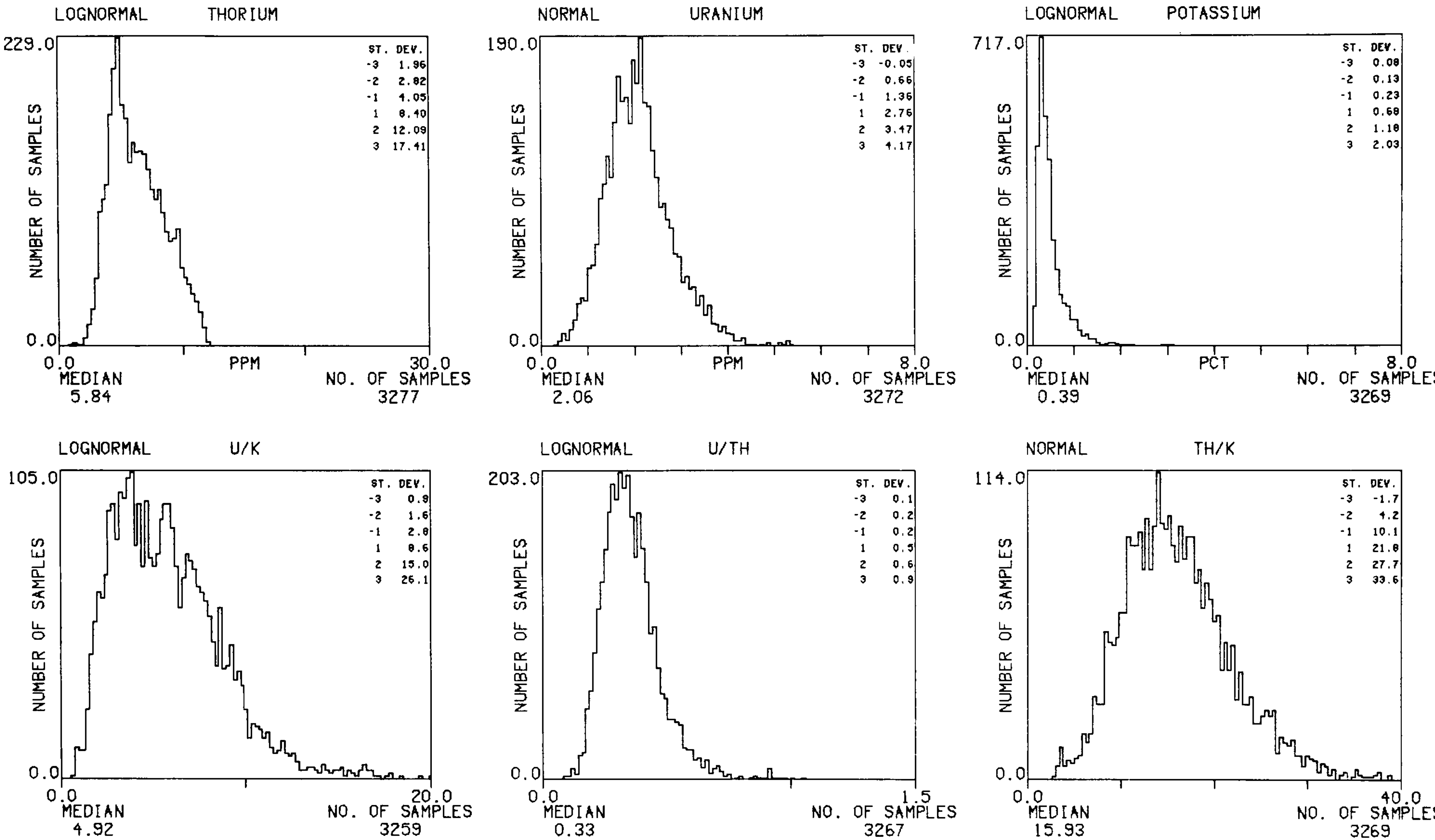

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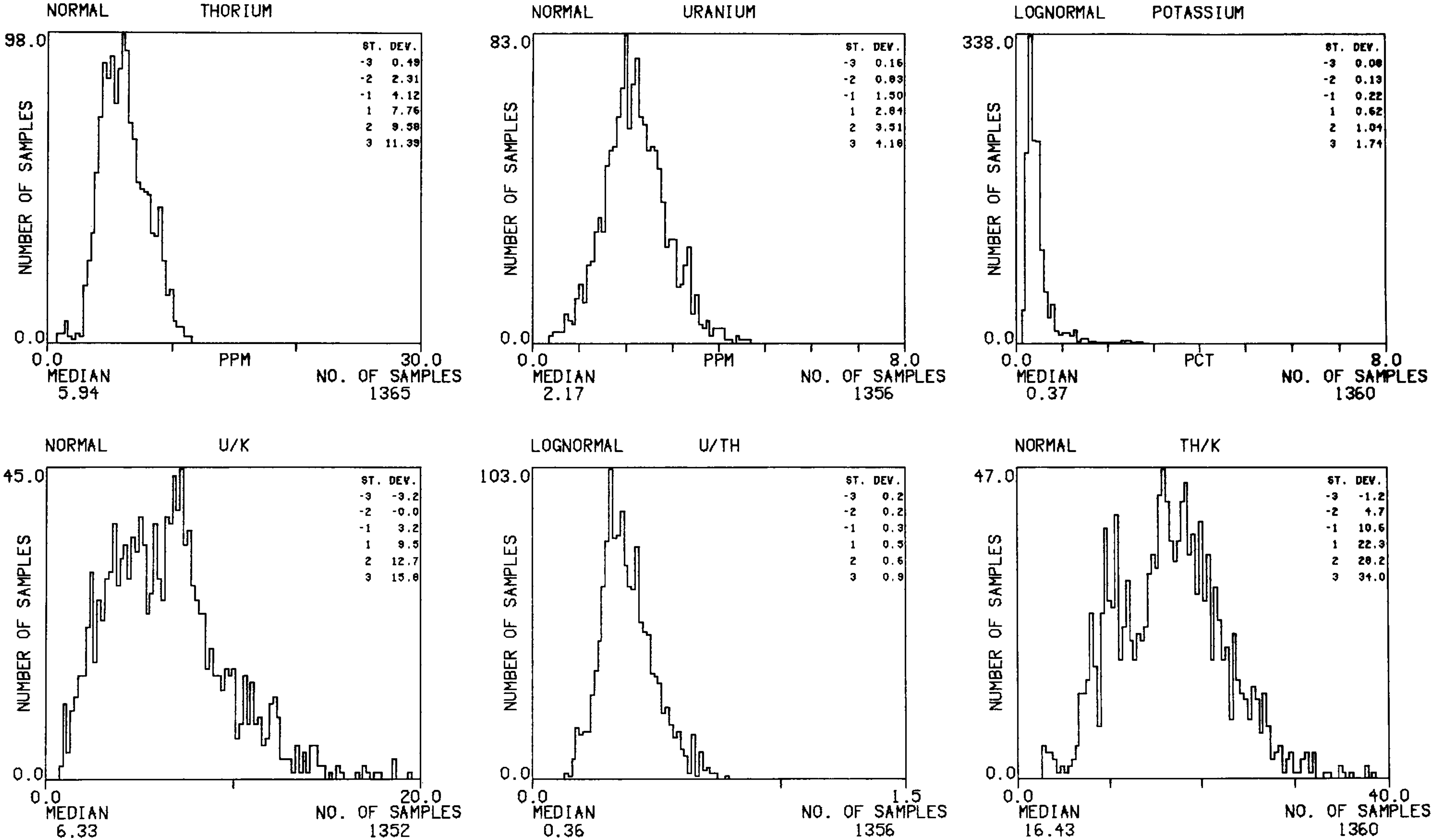

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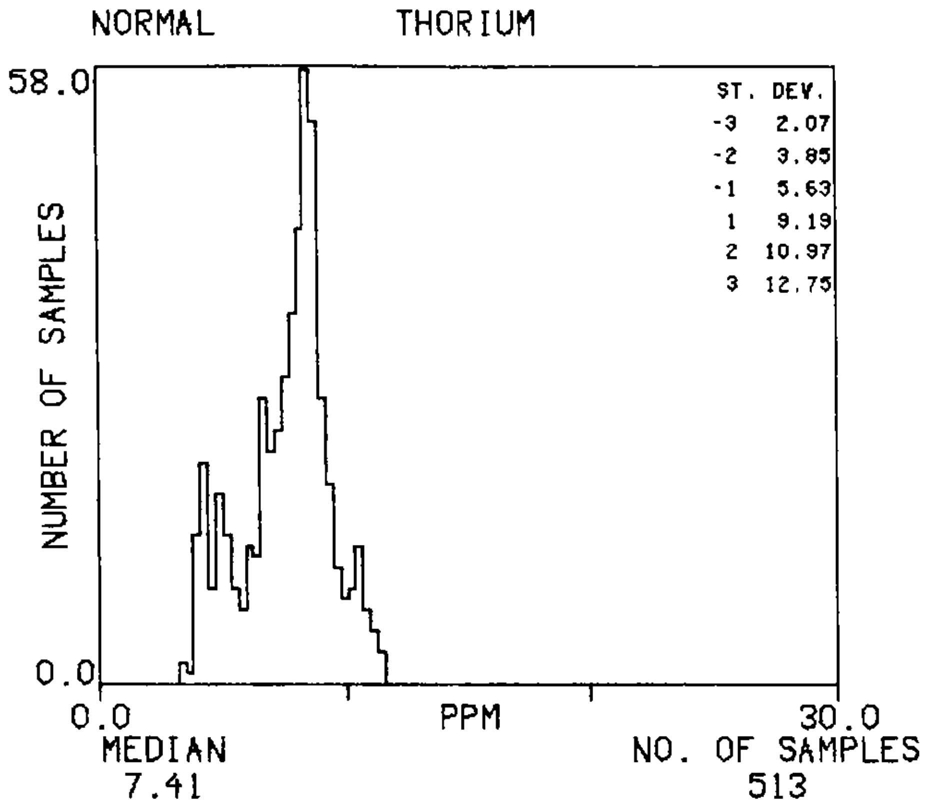

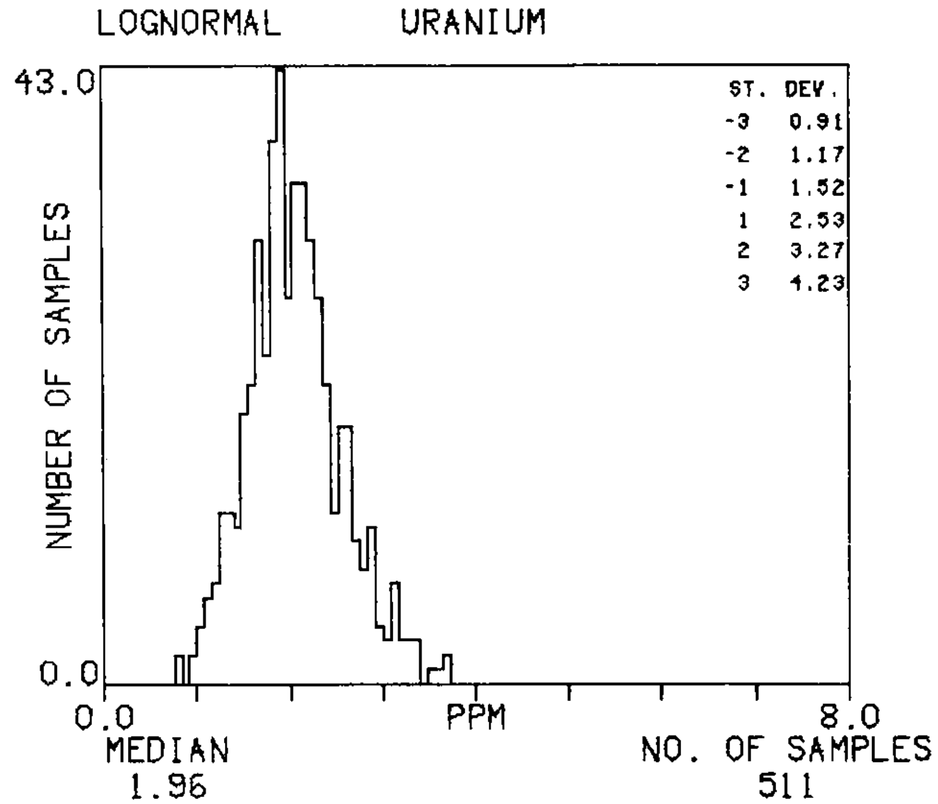

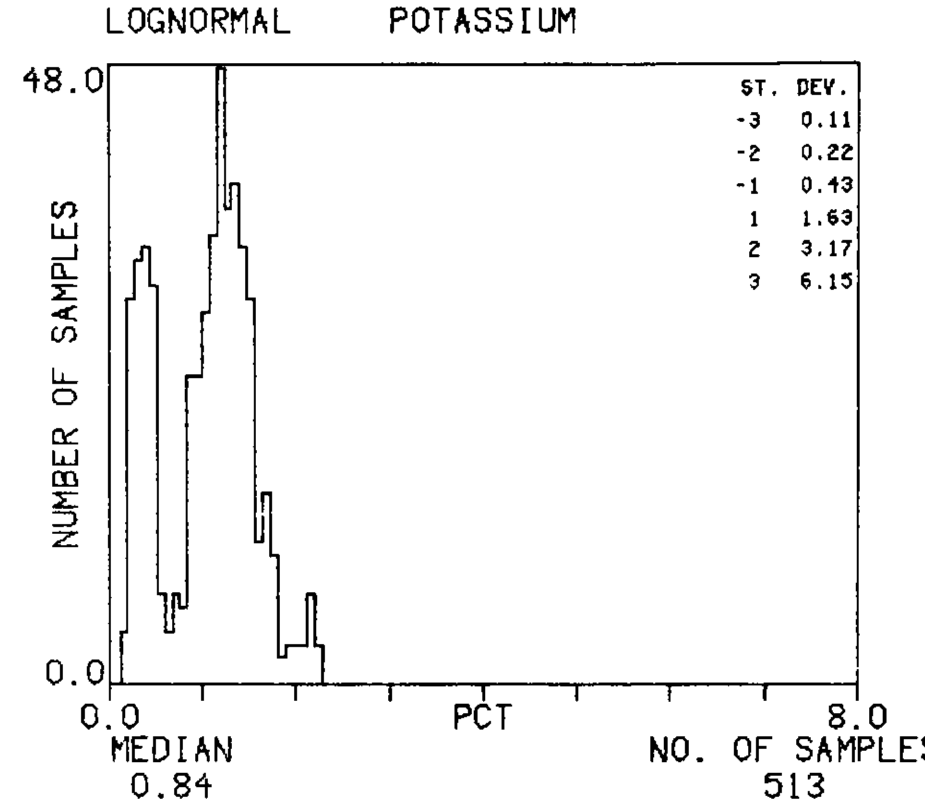

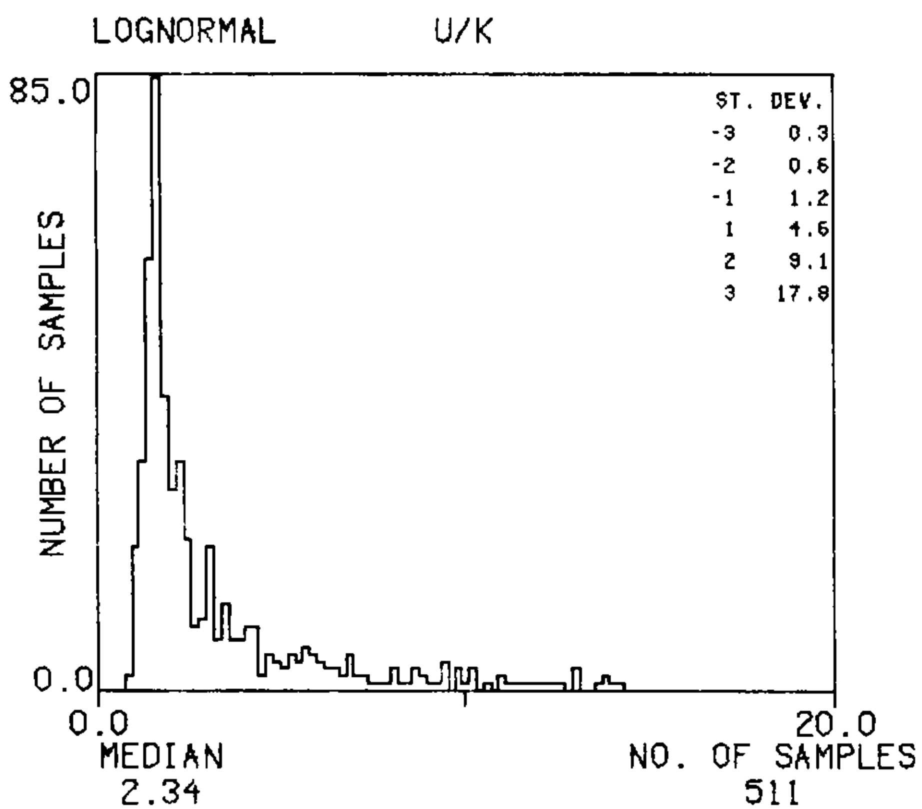

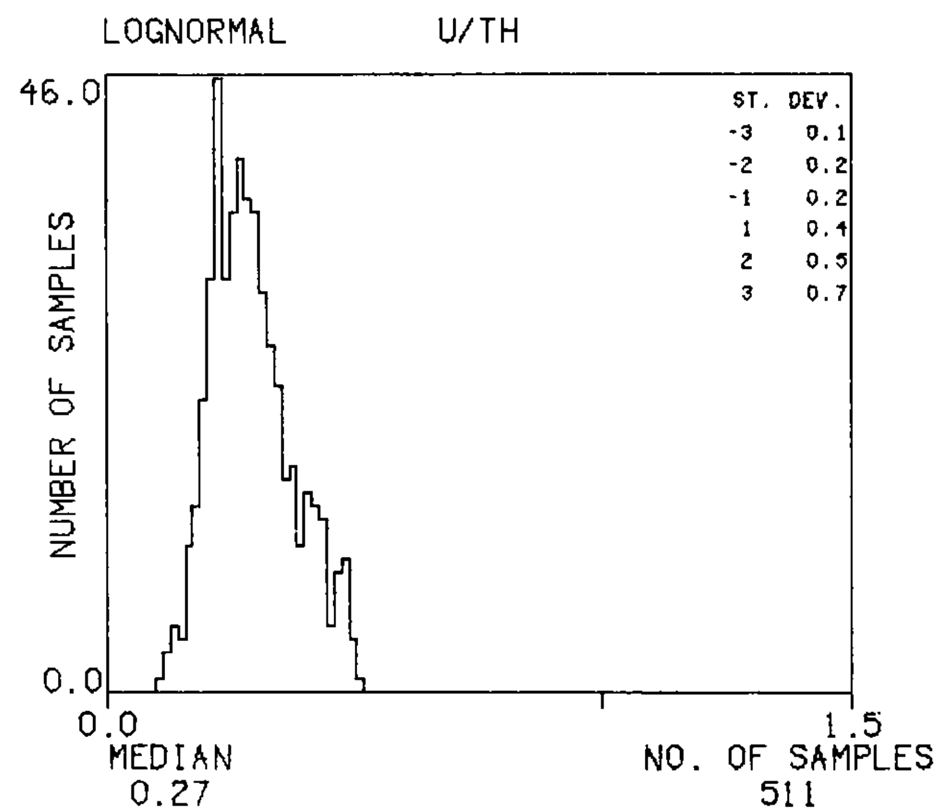

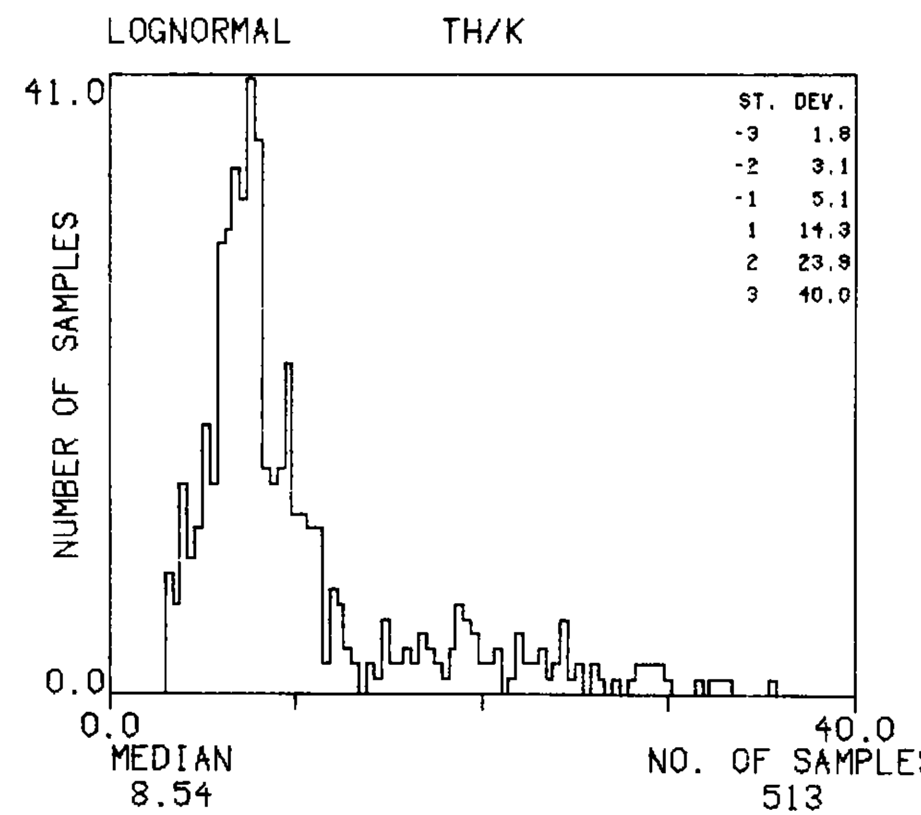

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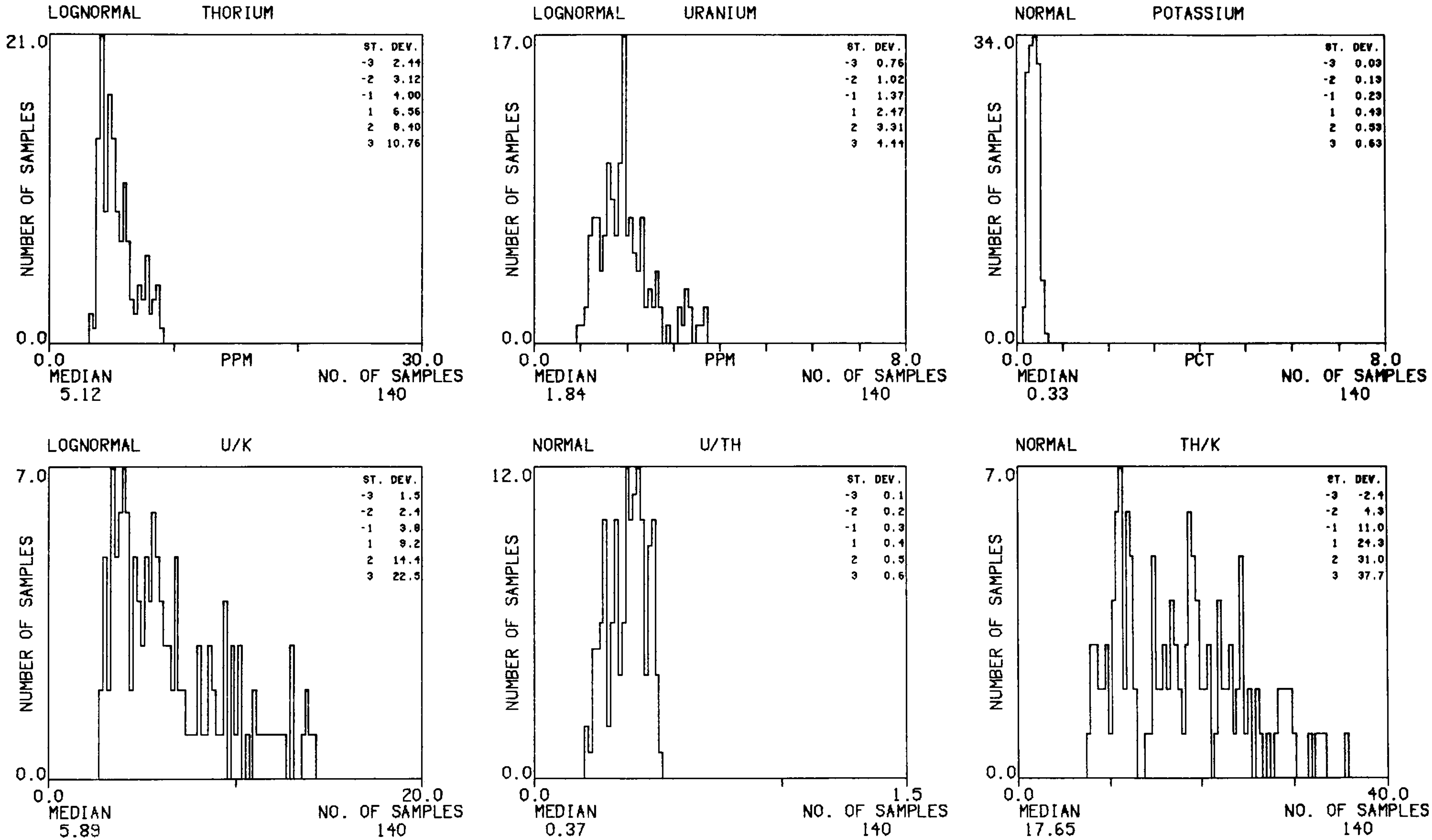

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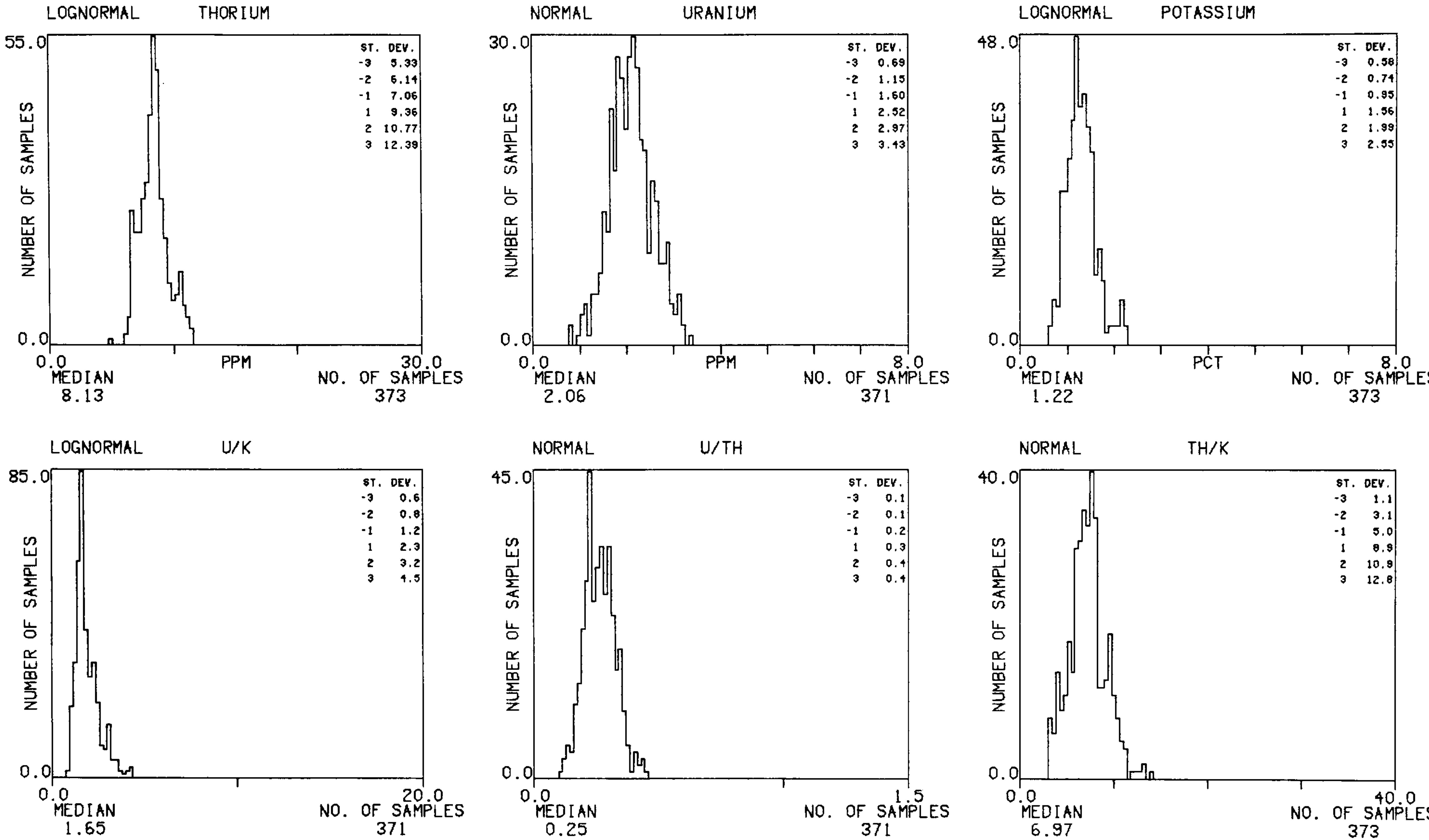

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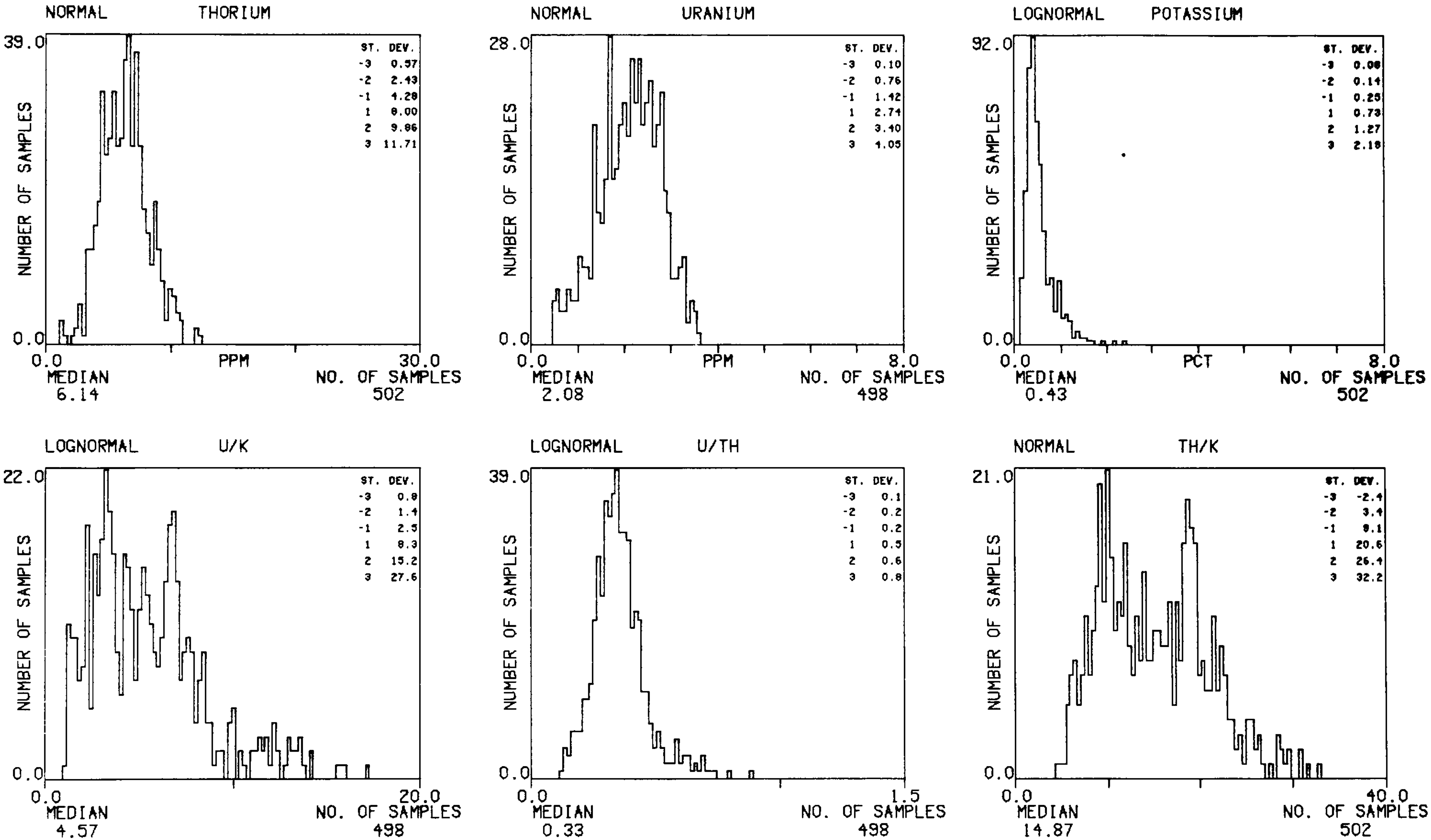

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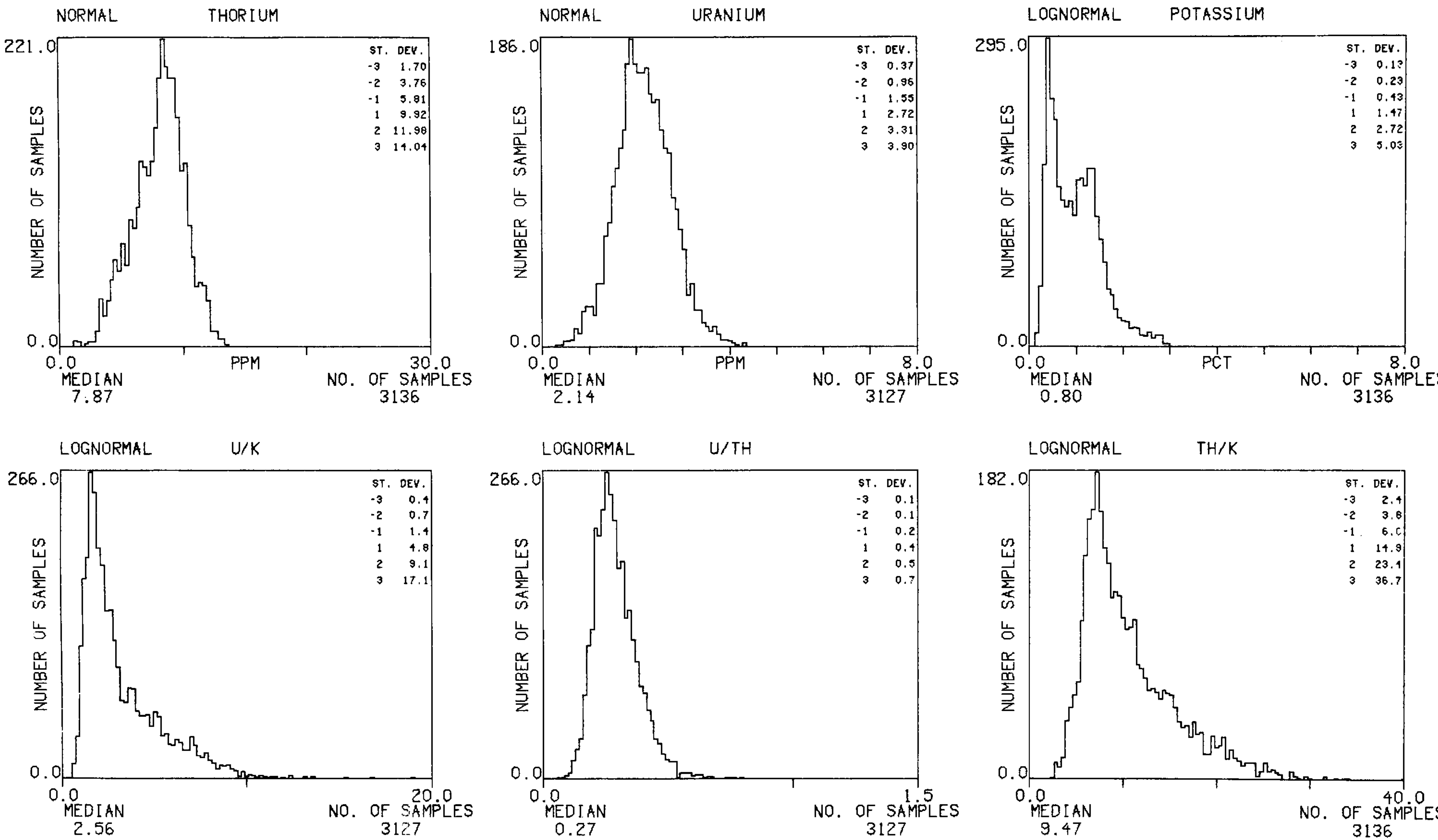

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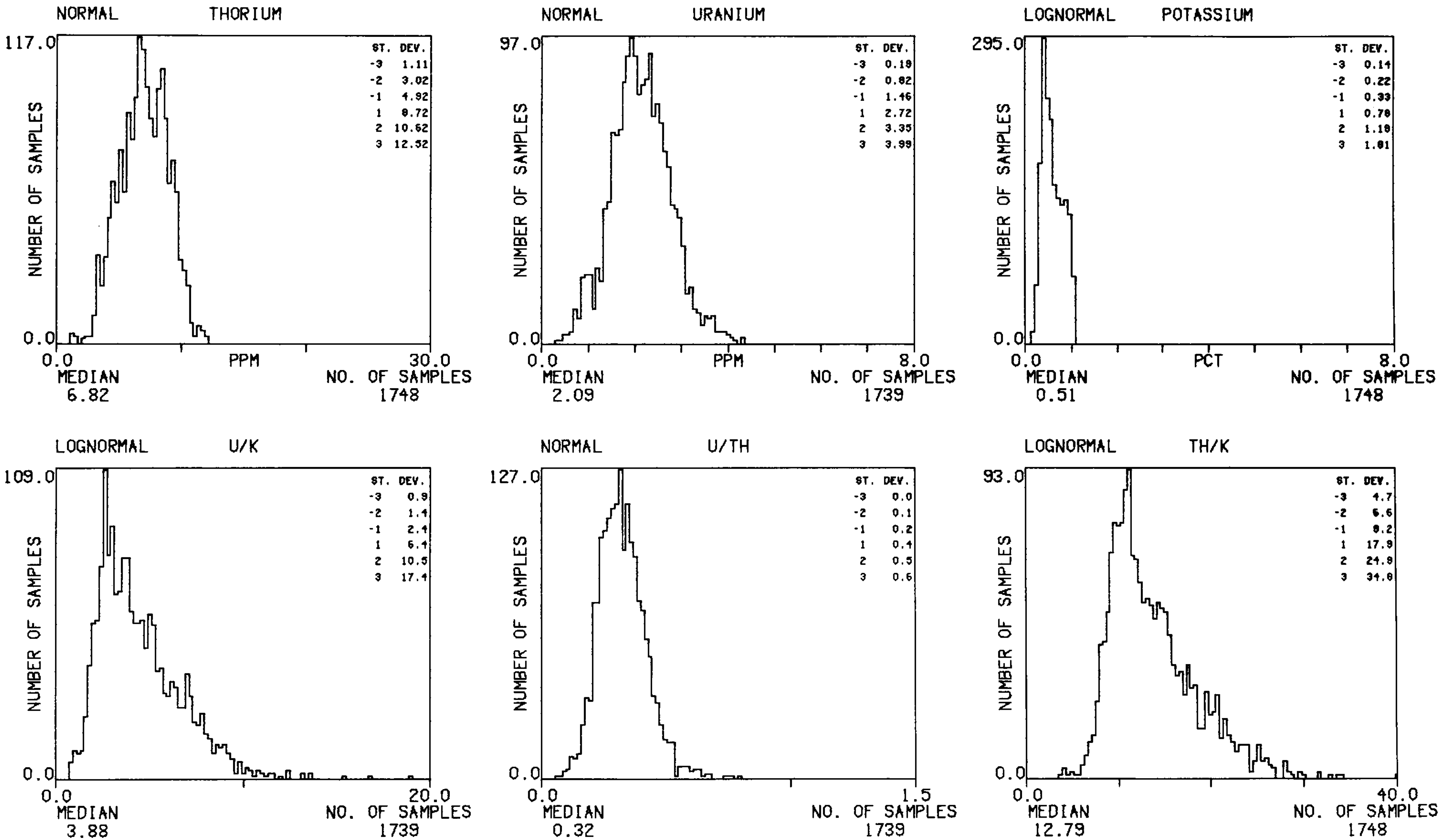

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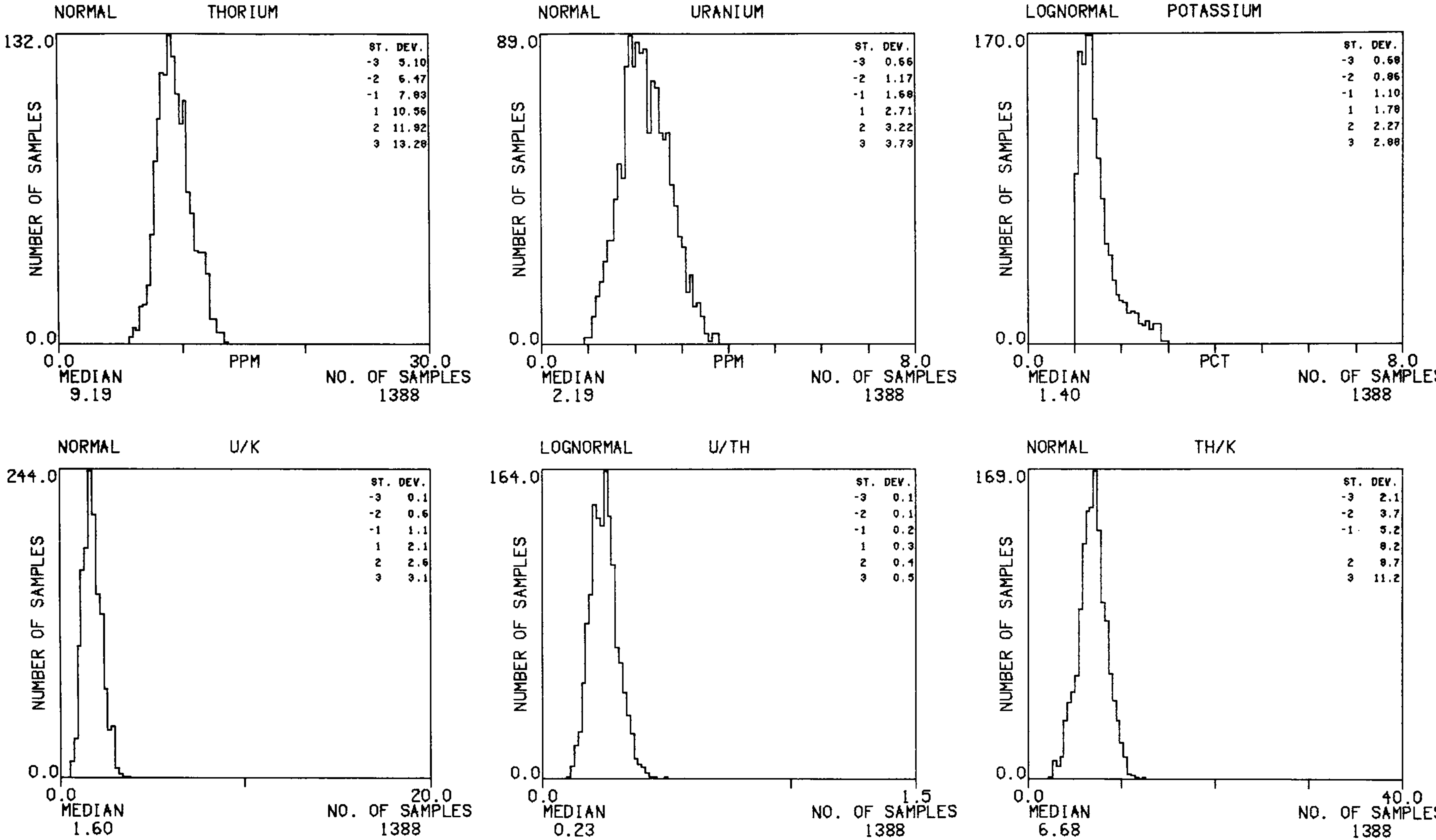

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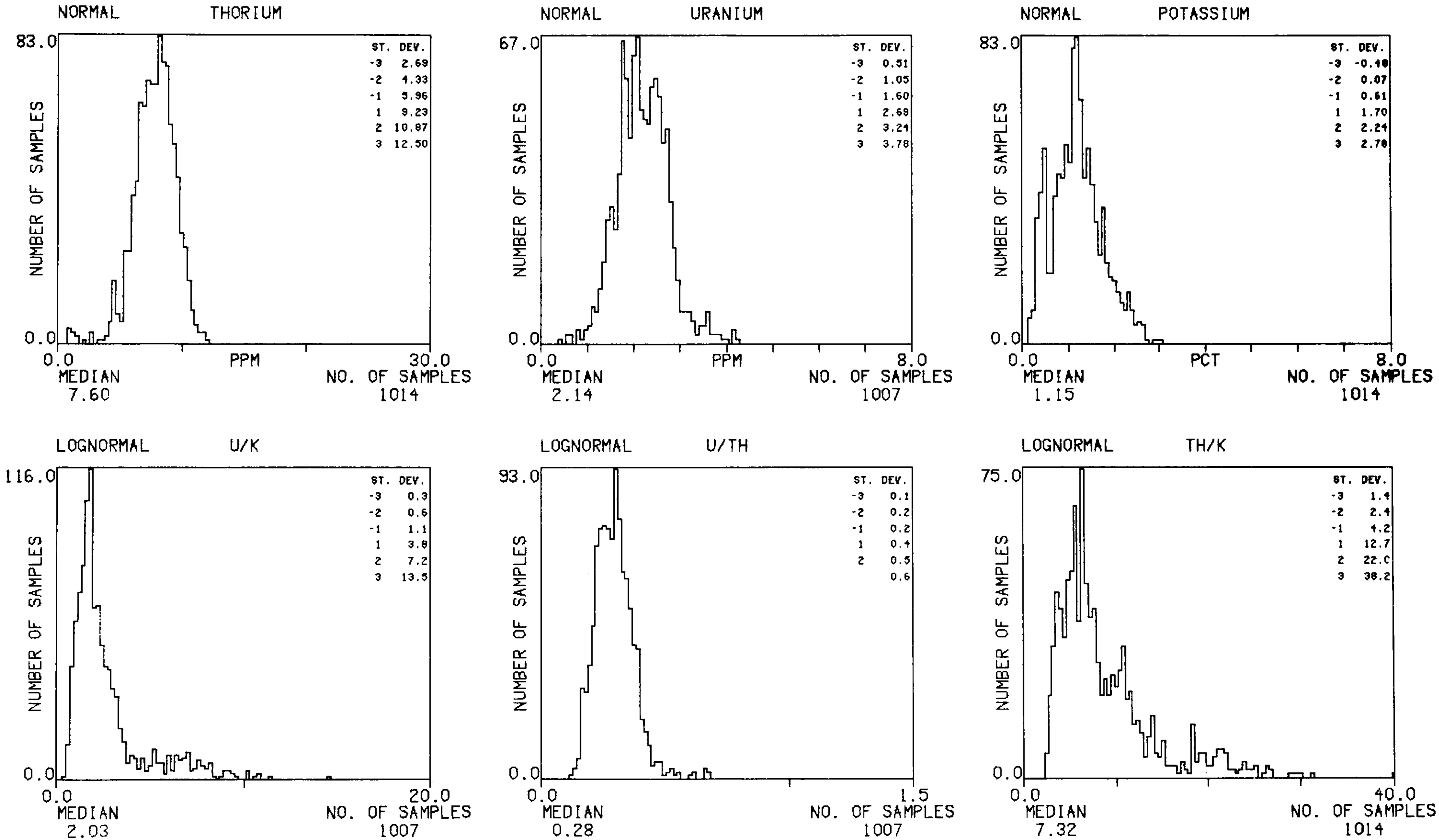

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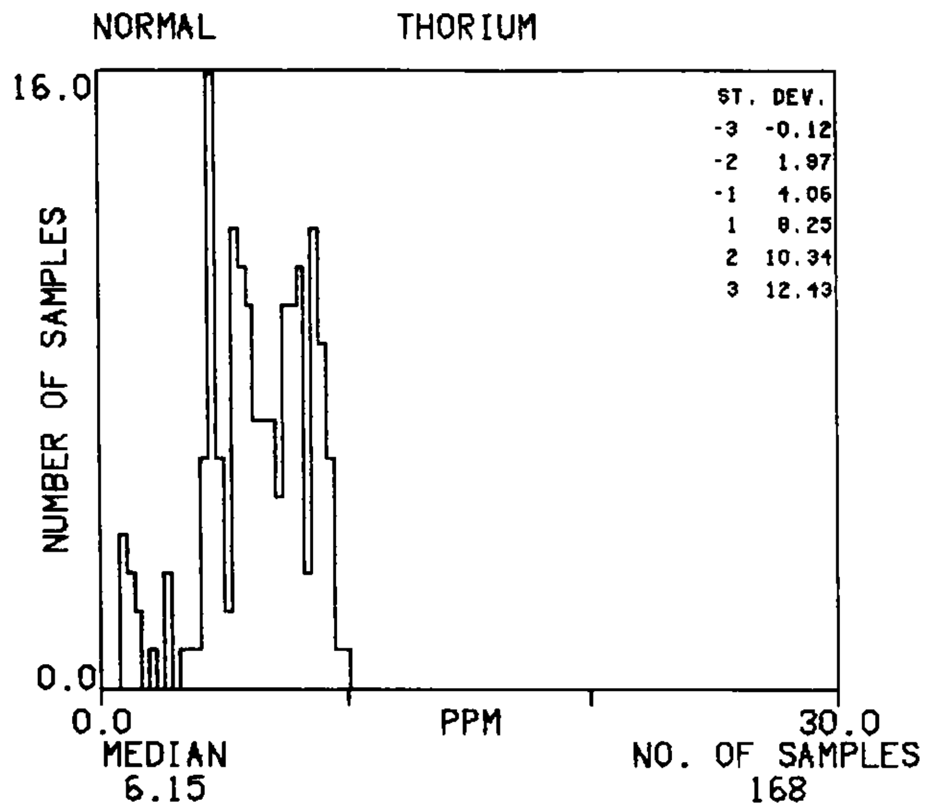
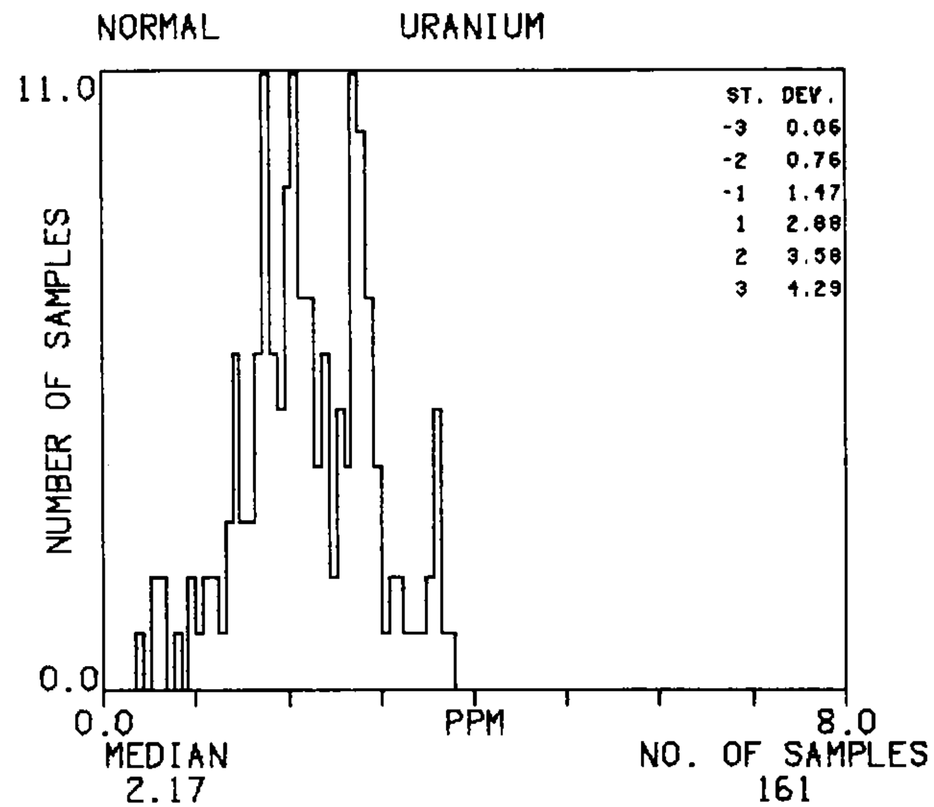
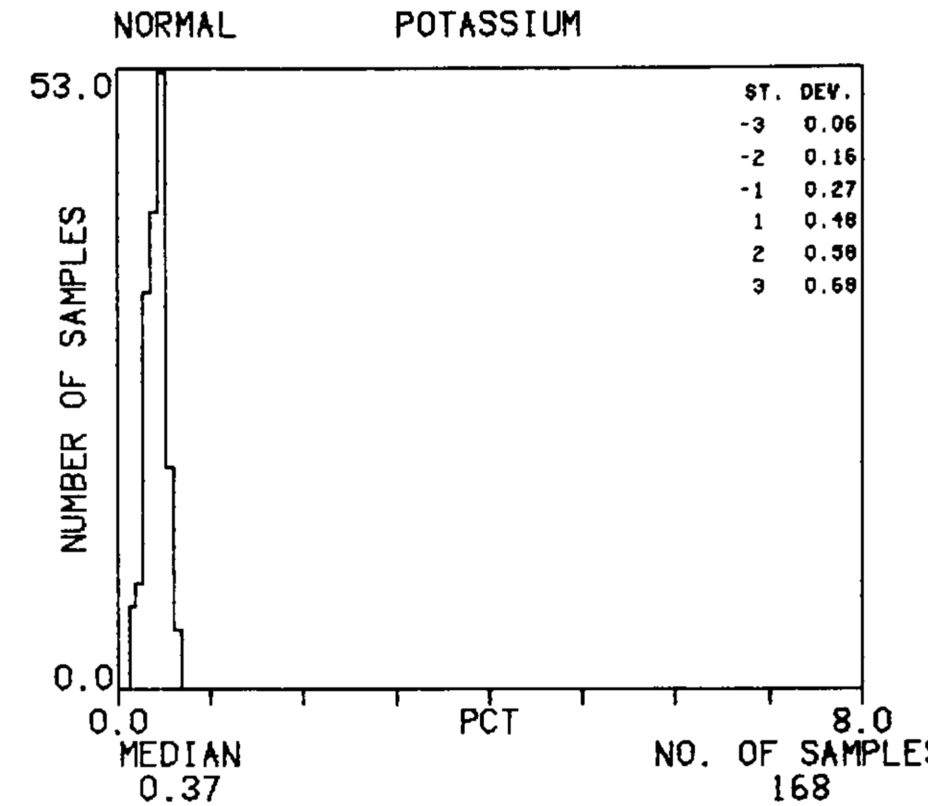
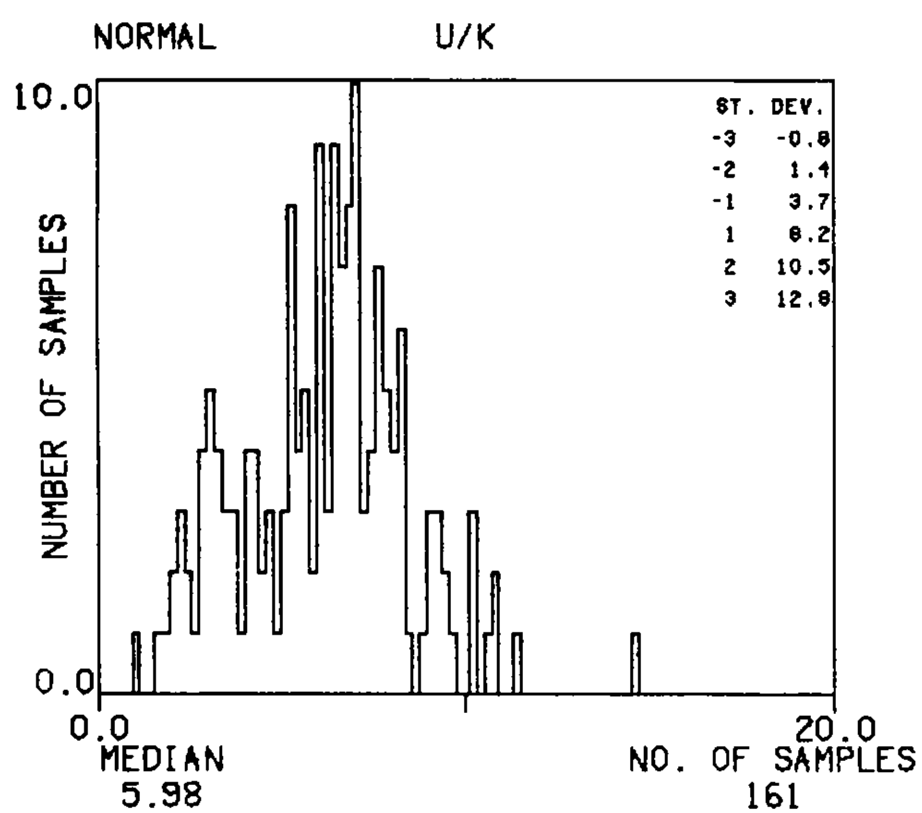
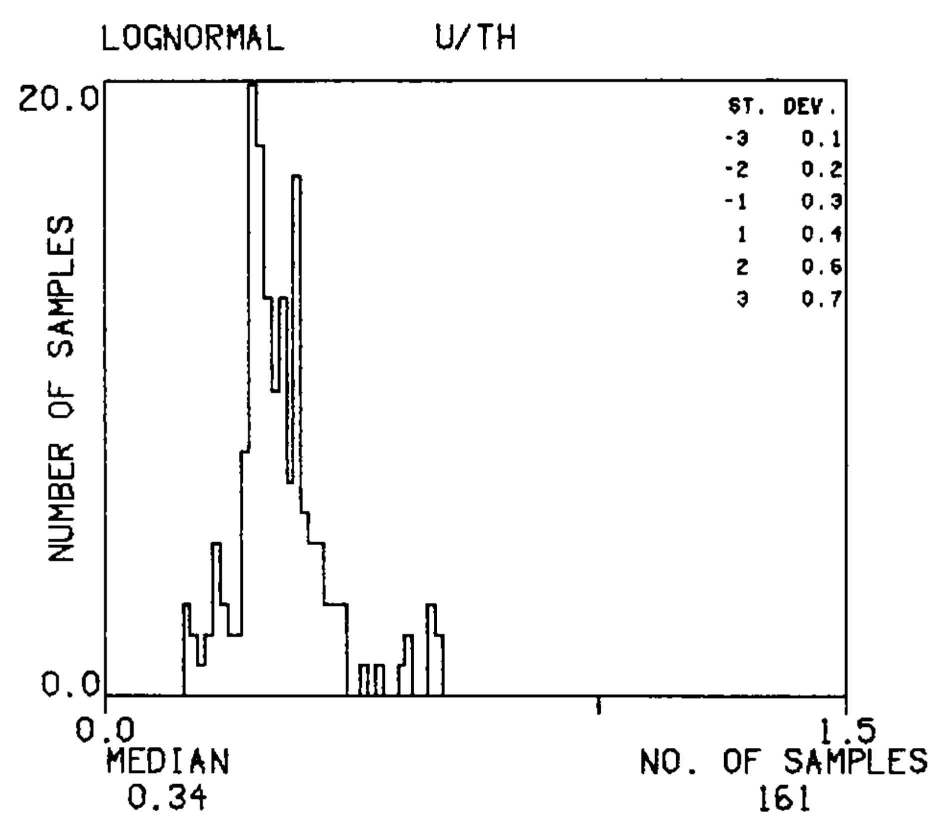
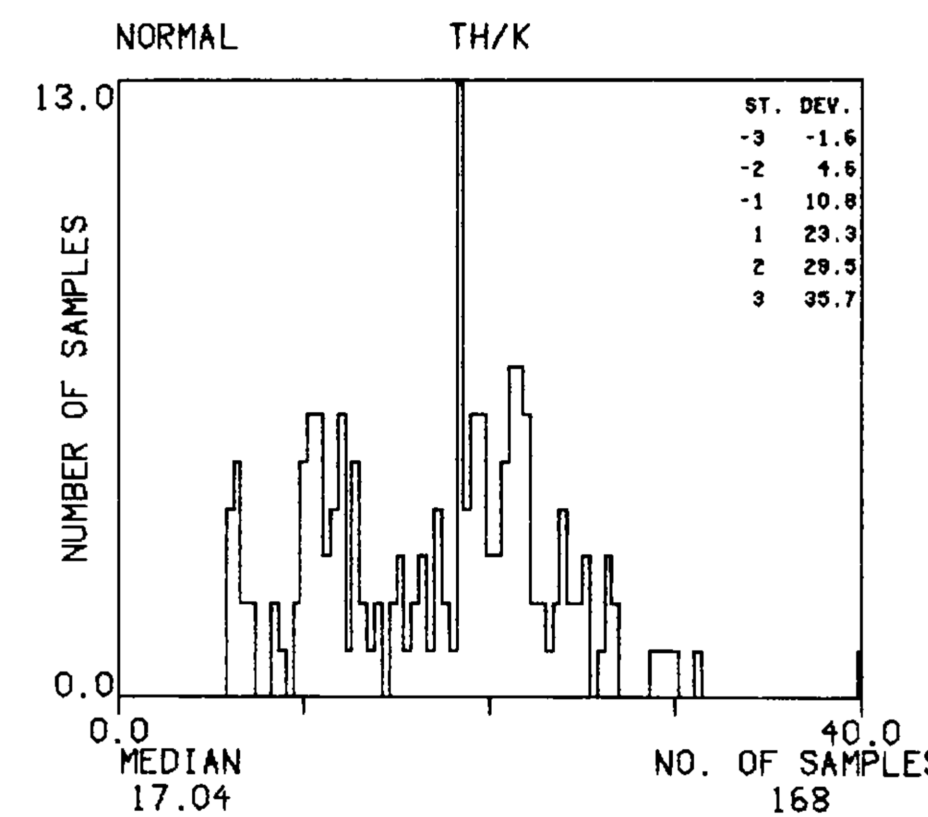






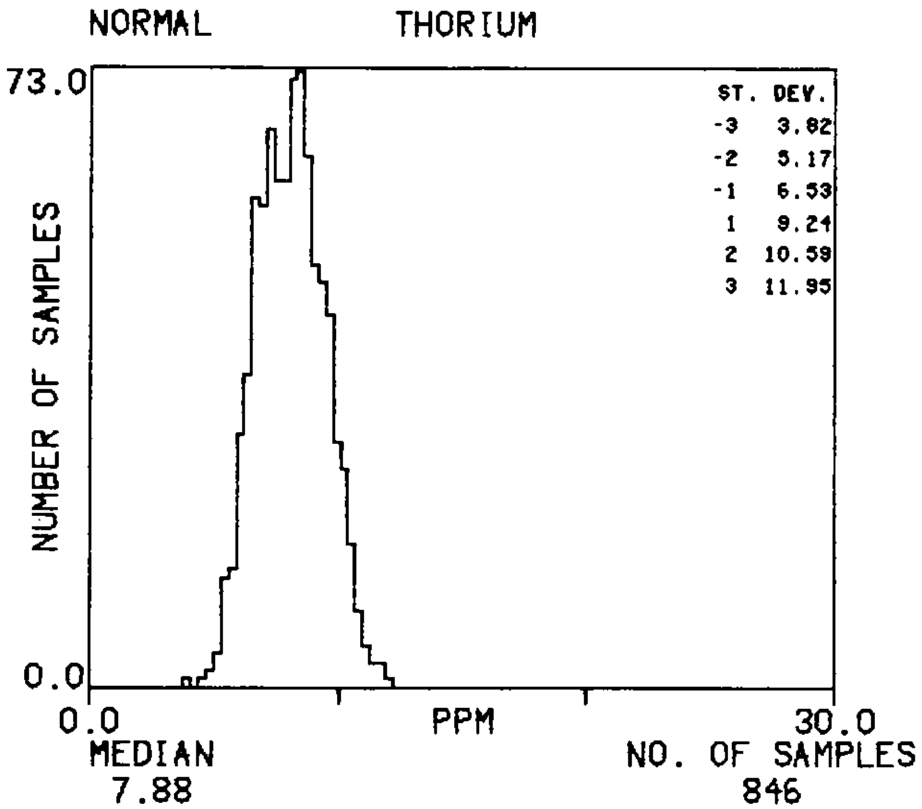


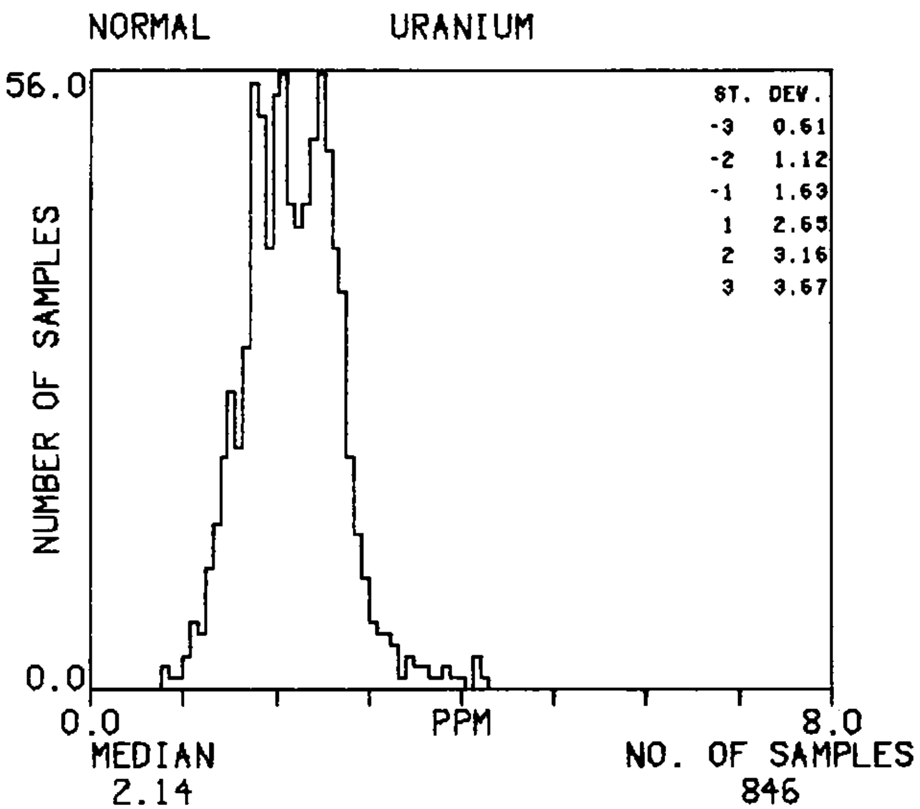


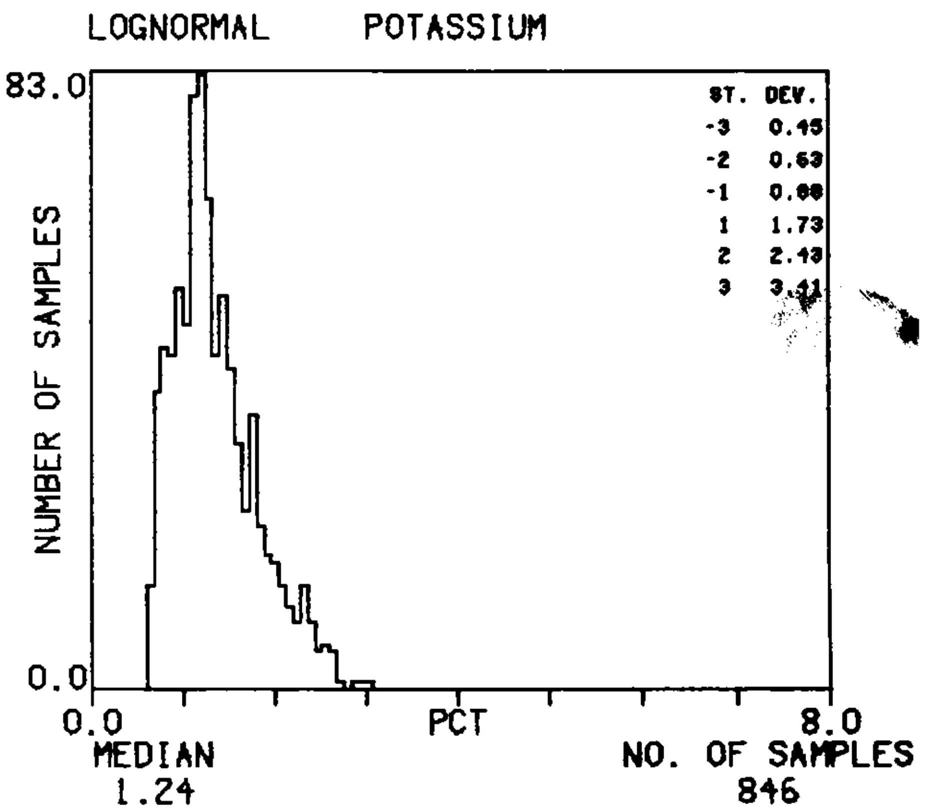


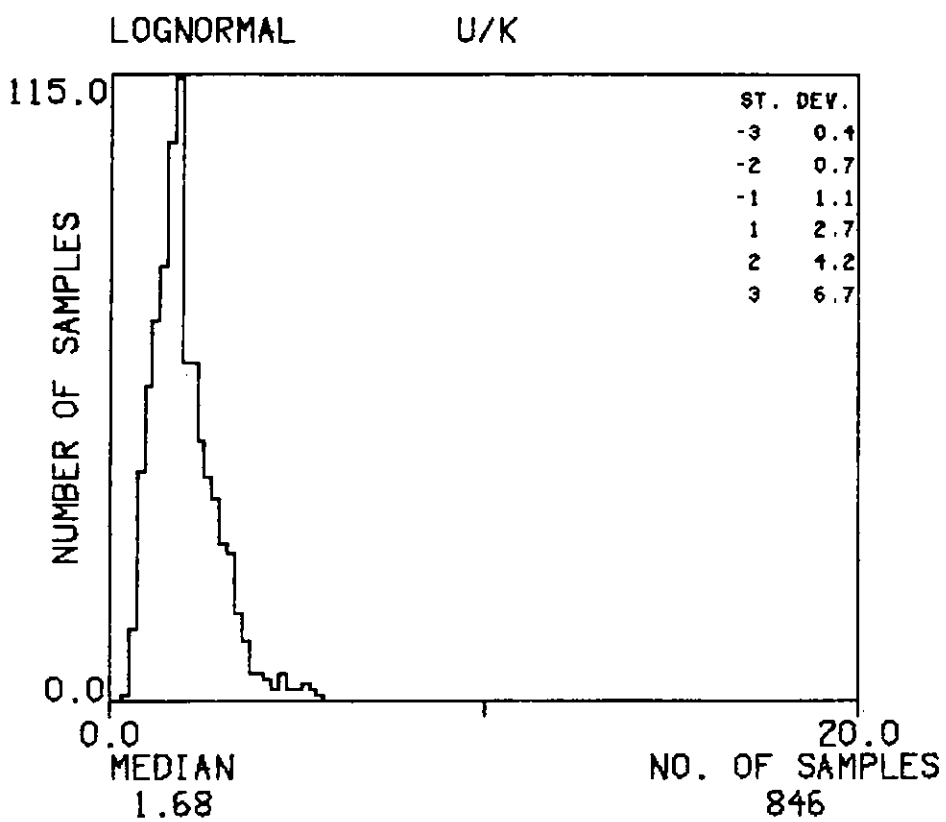
HISTOGRAMS : CR-2

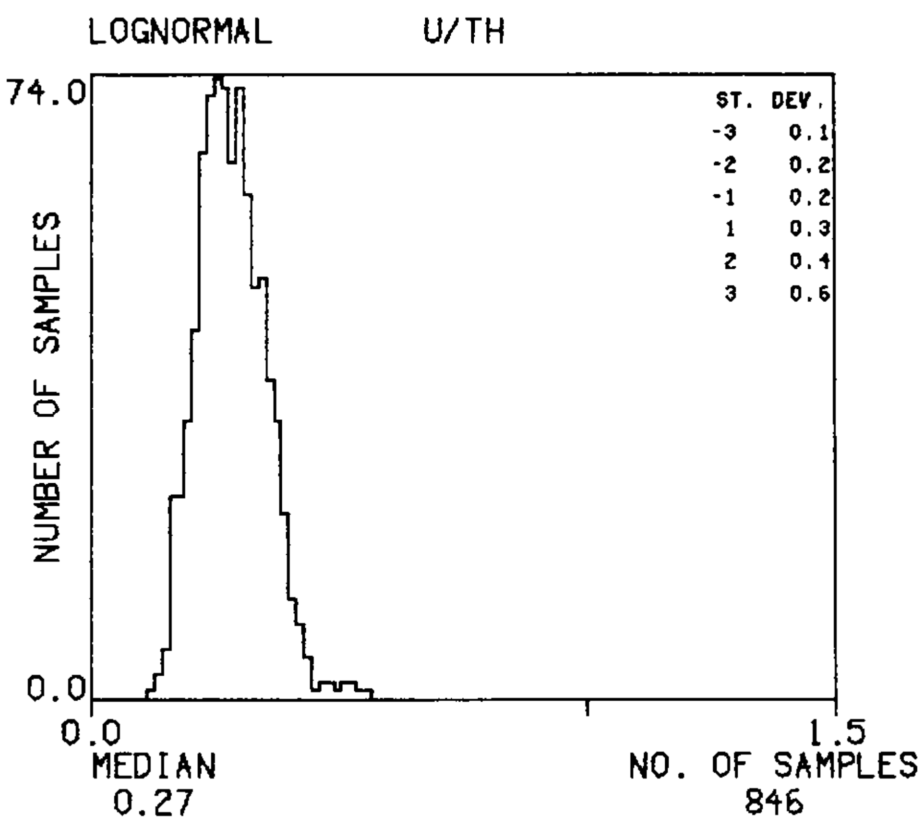
TEXAS INSTRUMENTS CHATTANOOGA NI16-3 APPALACHIAN BASIN SURVEY 1979

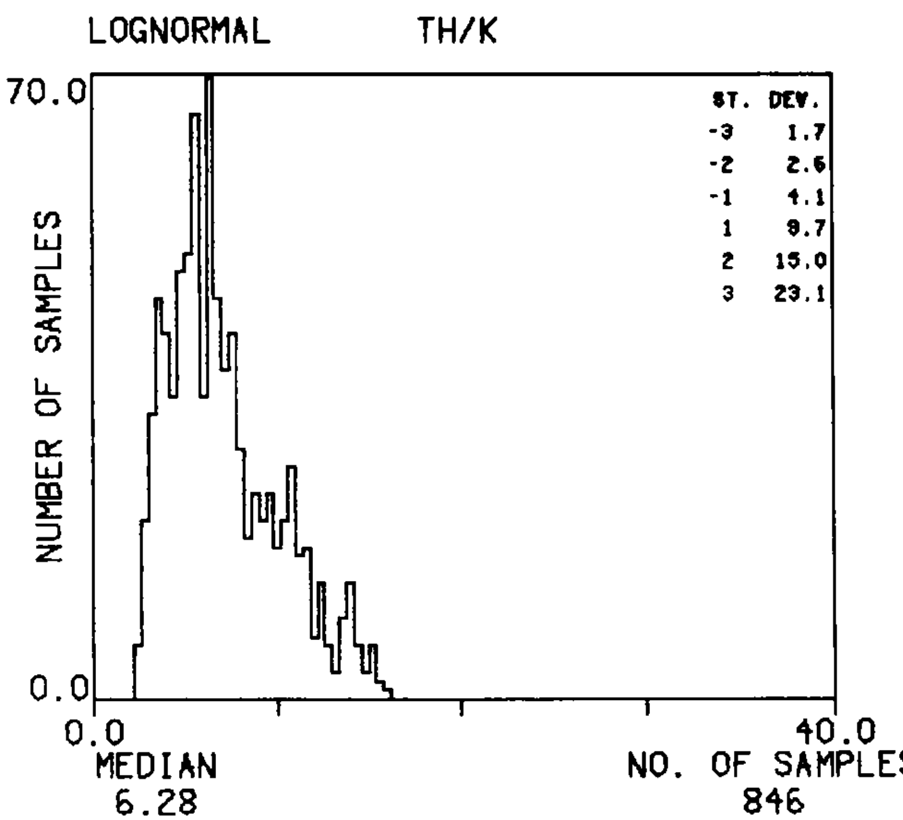












HISTOGRAMS : CS

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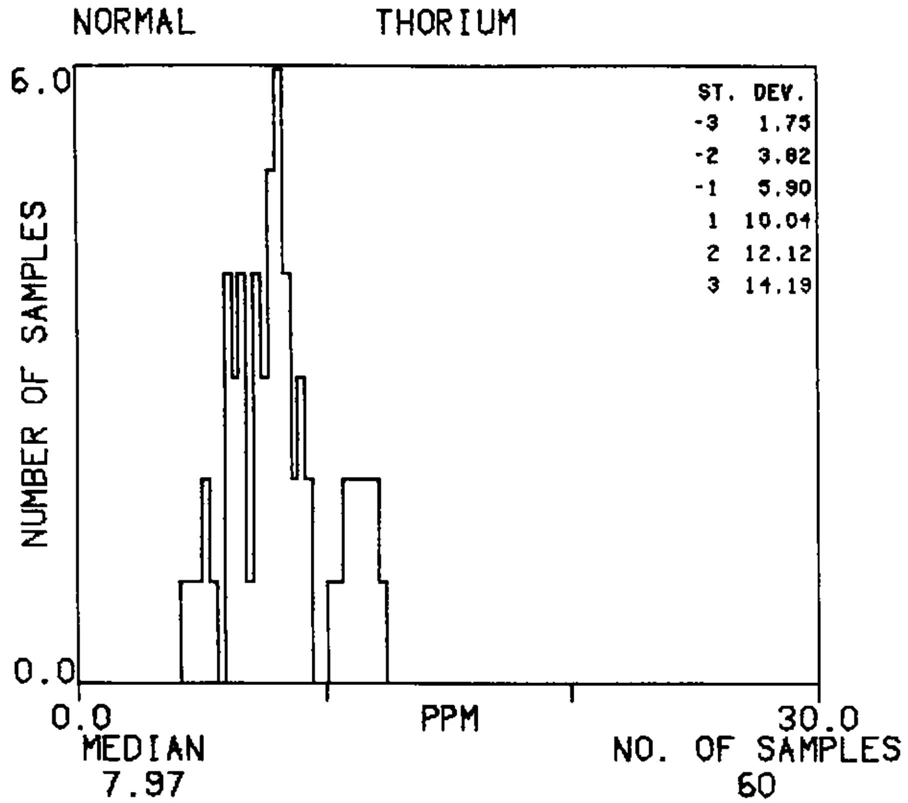

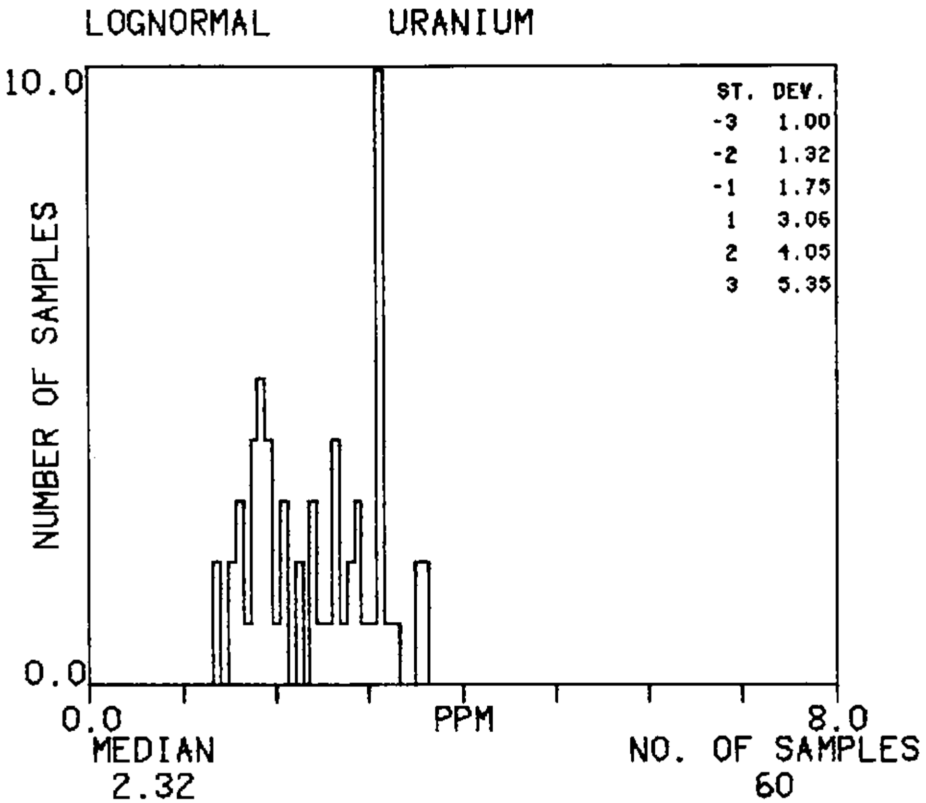

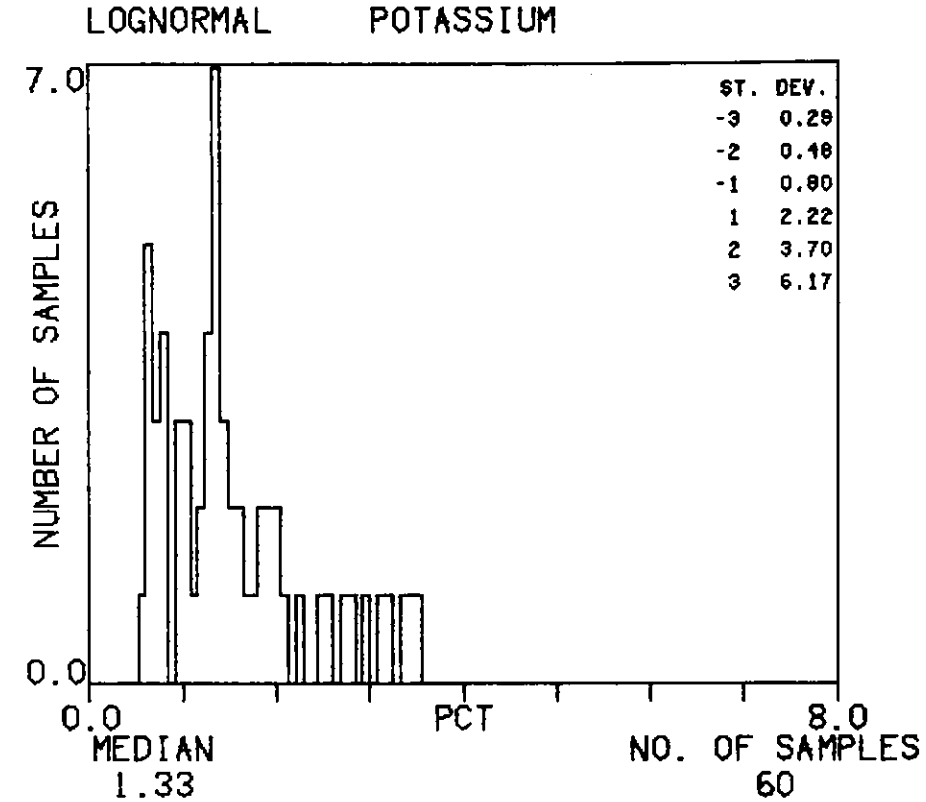

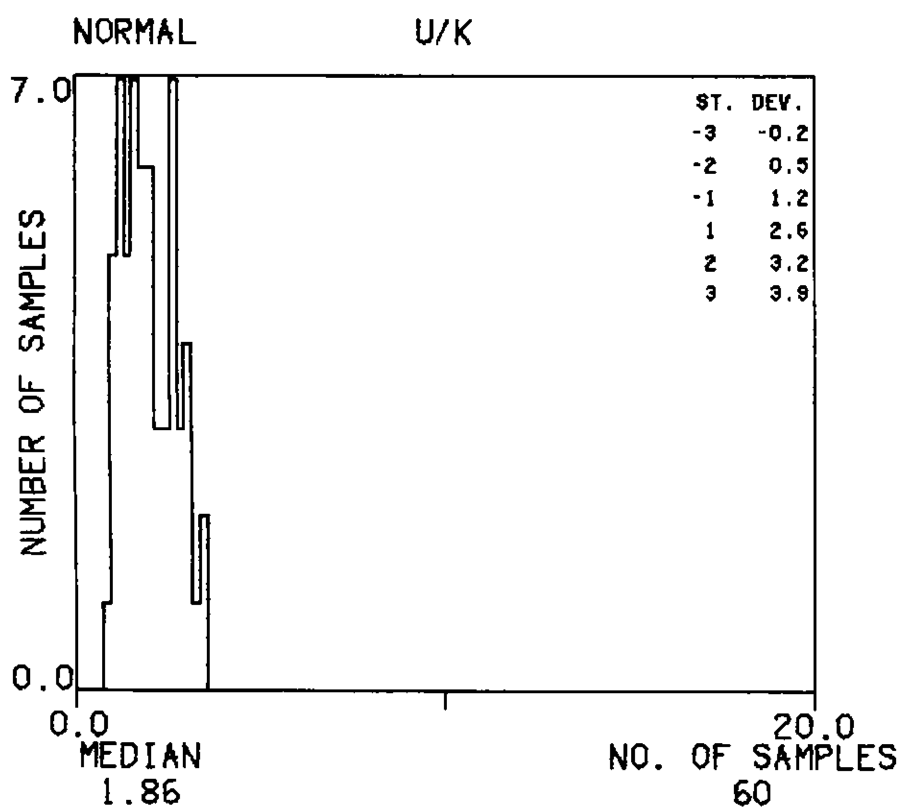

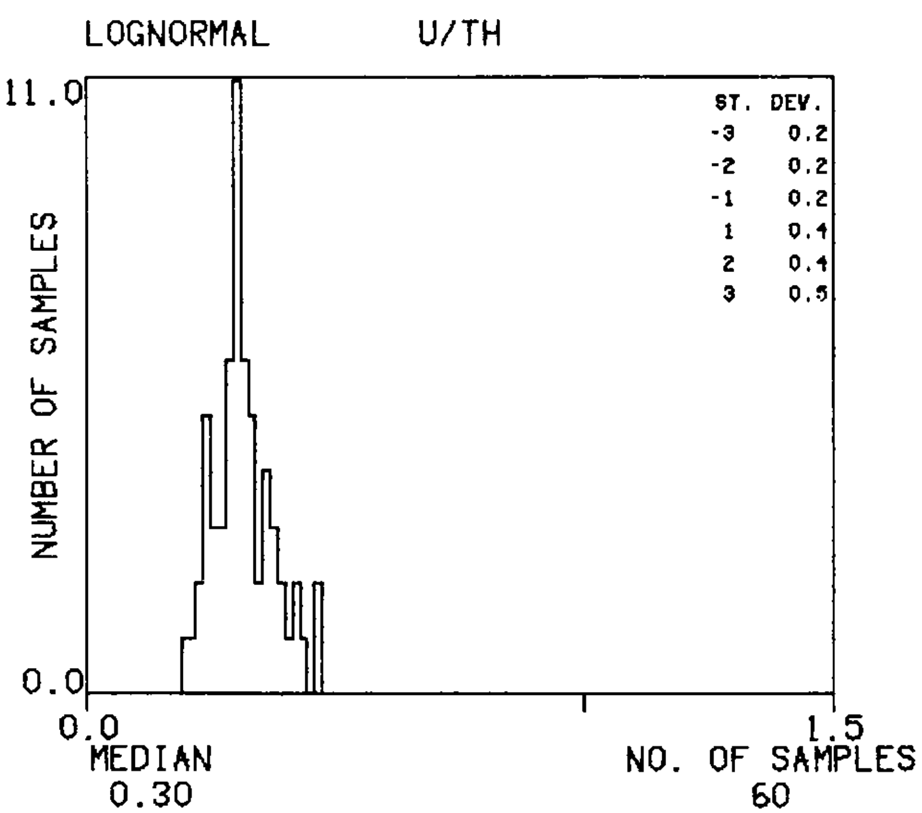

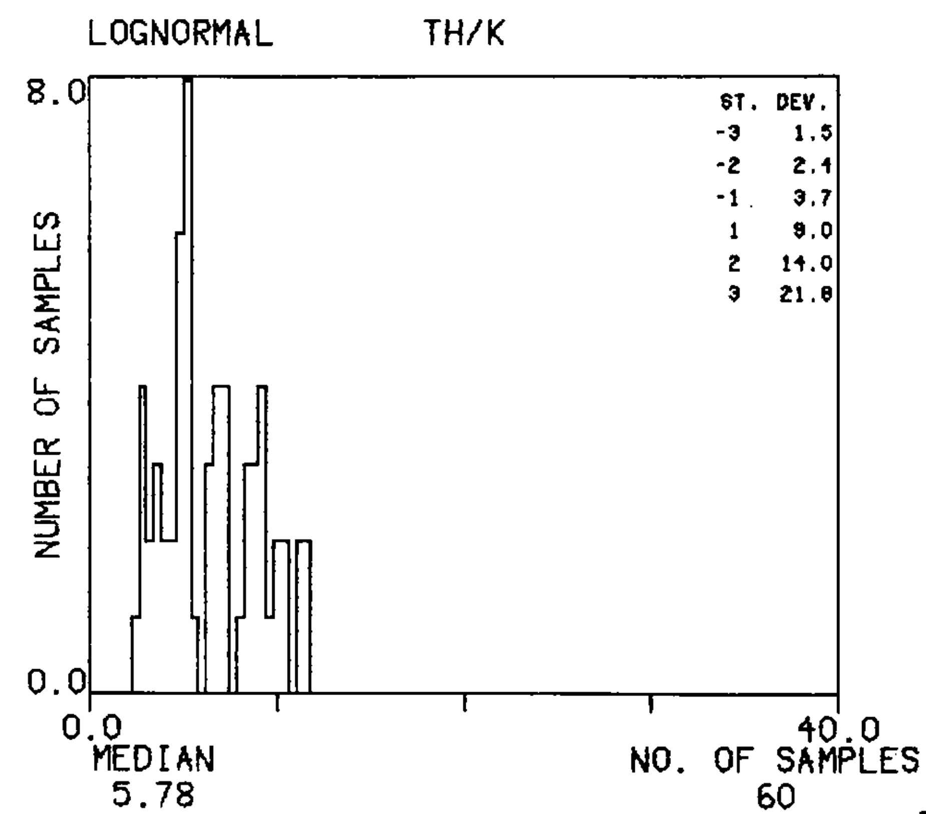

HISTOGRAMS : CH

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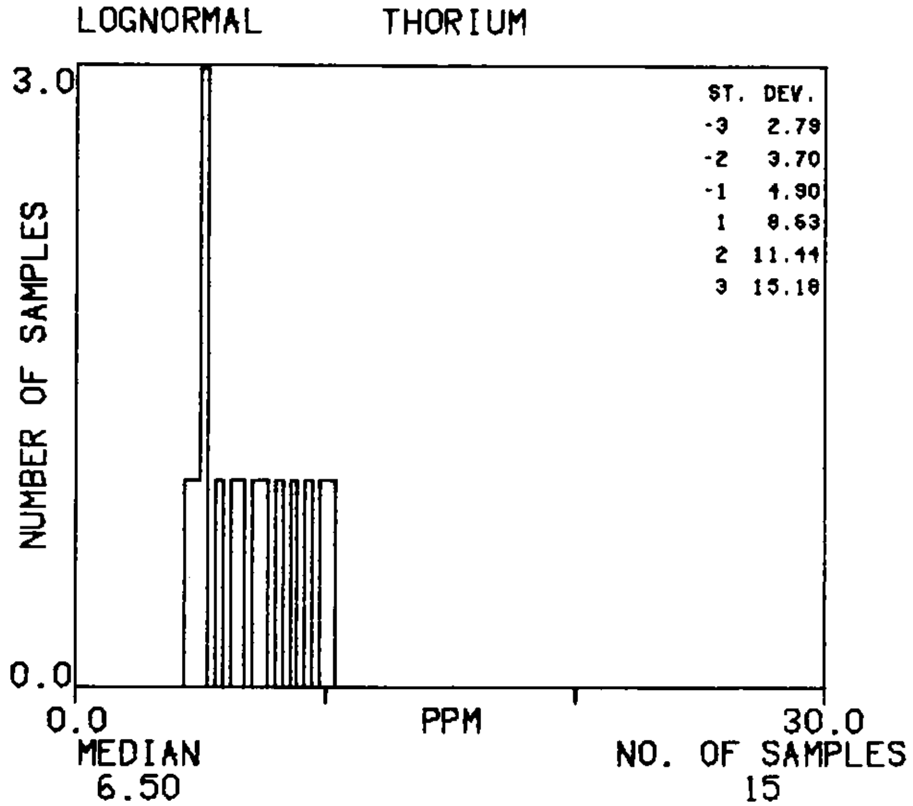
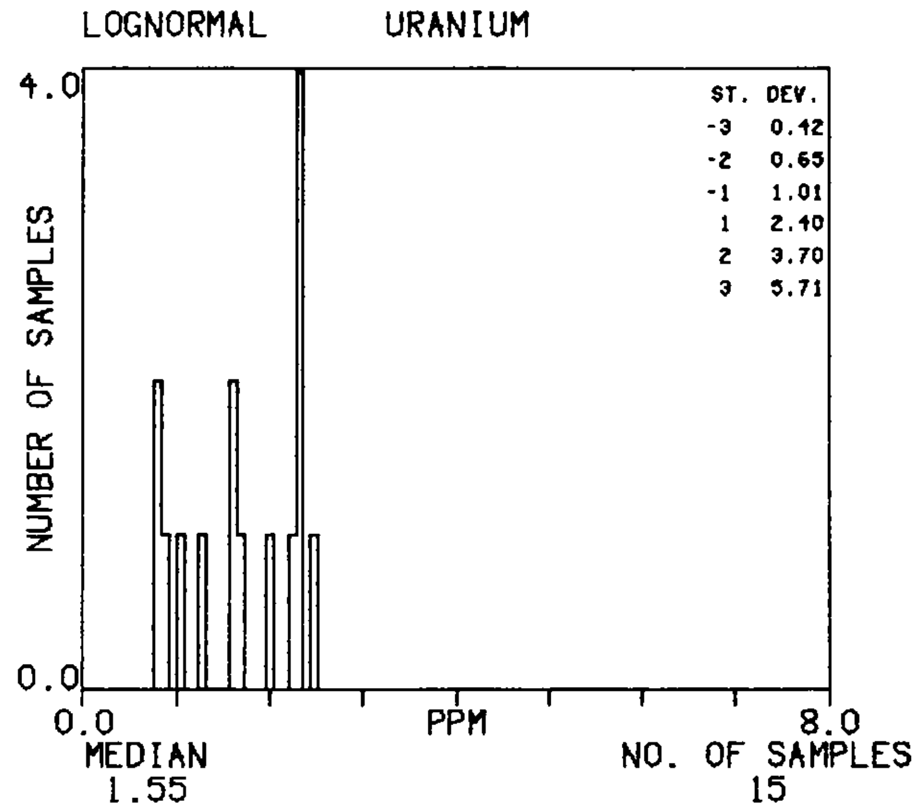
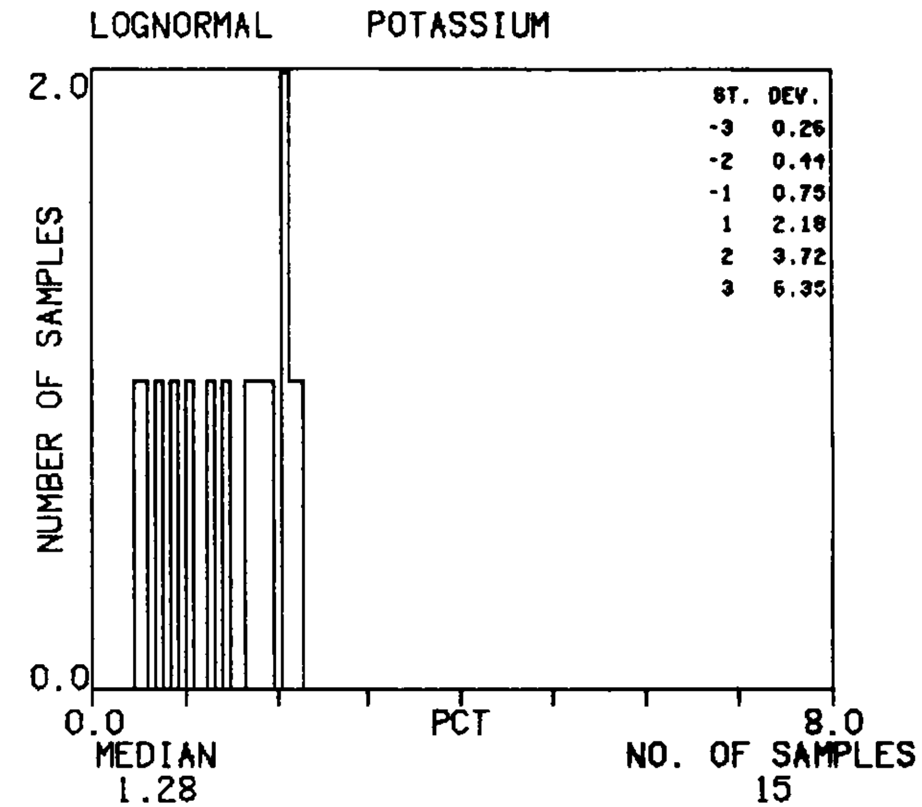
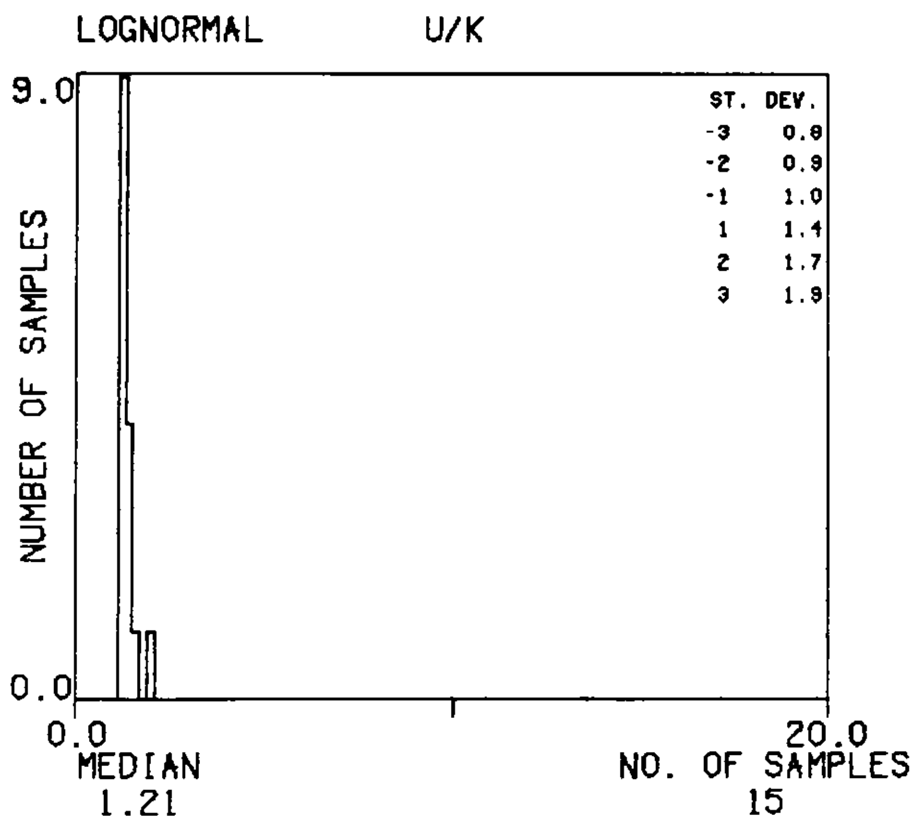
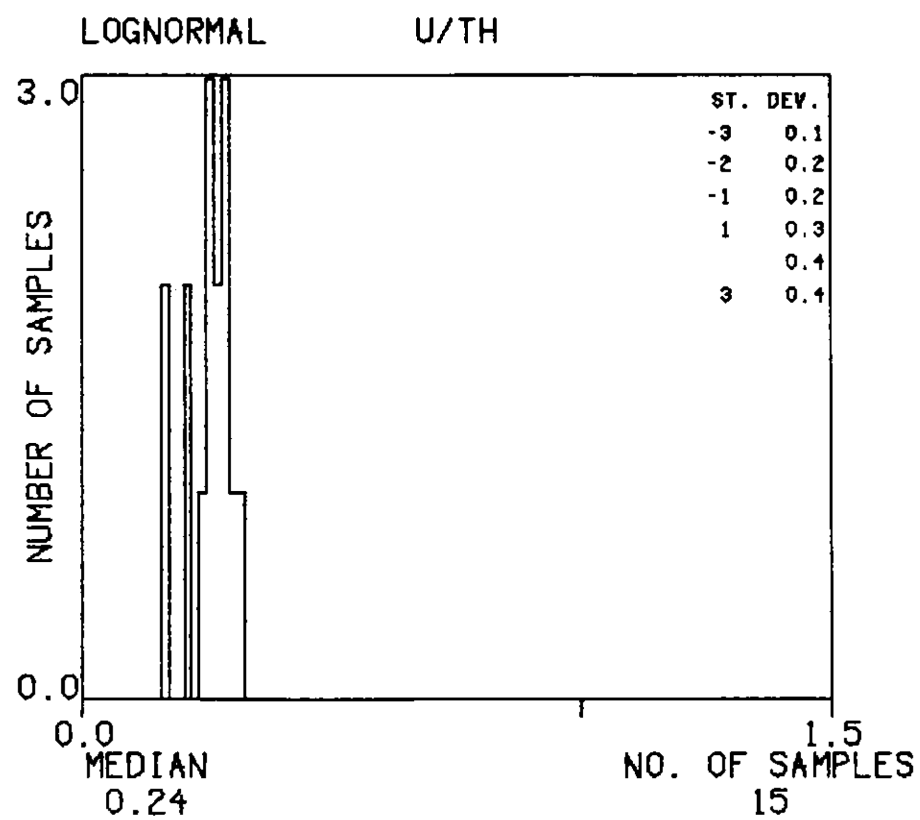
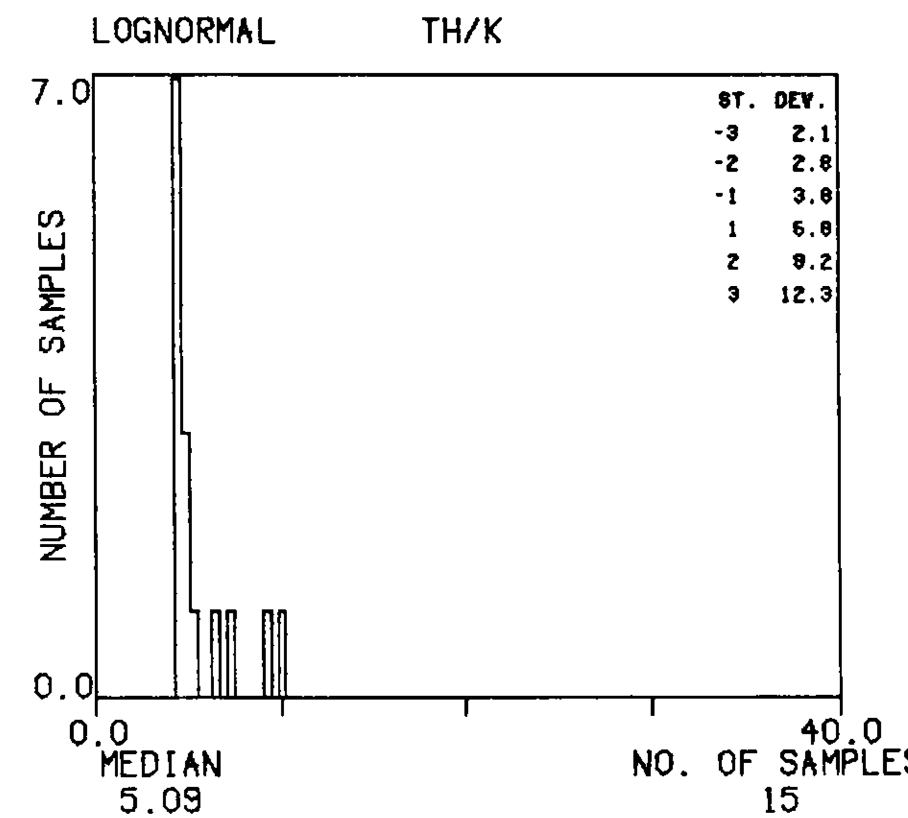








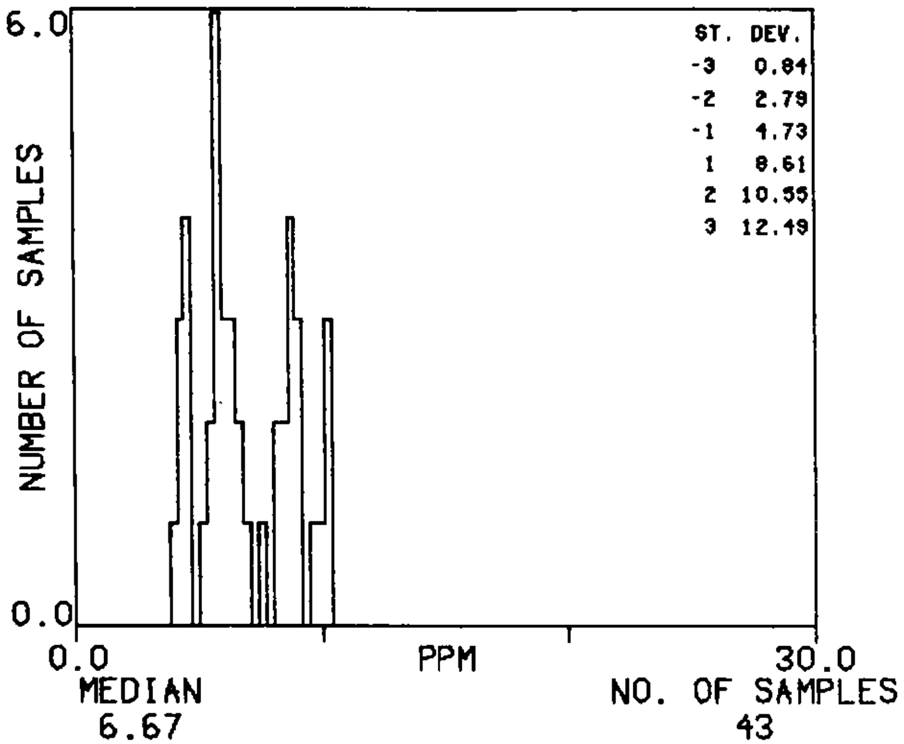




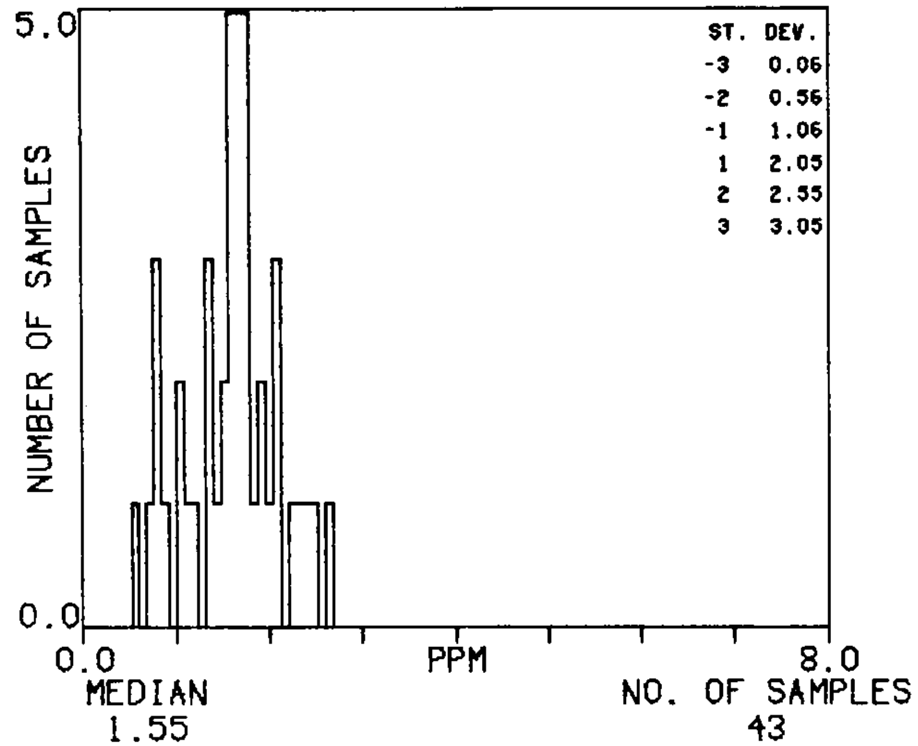
HISTOGRAMS : CM

TEXAS INSTRUMENTS CHATTANOOGA NI16-3 APPALACHIAN BASIN SURVEY 1979

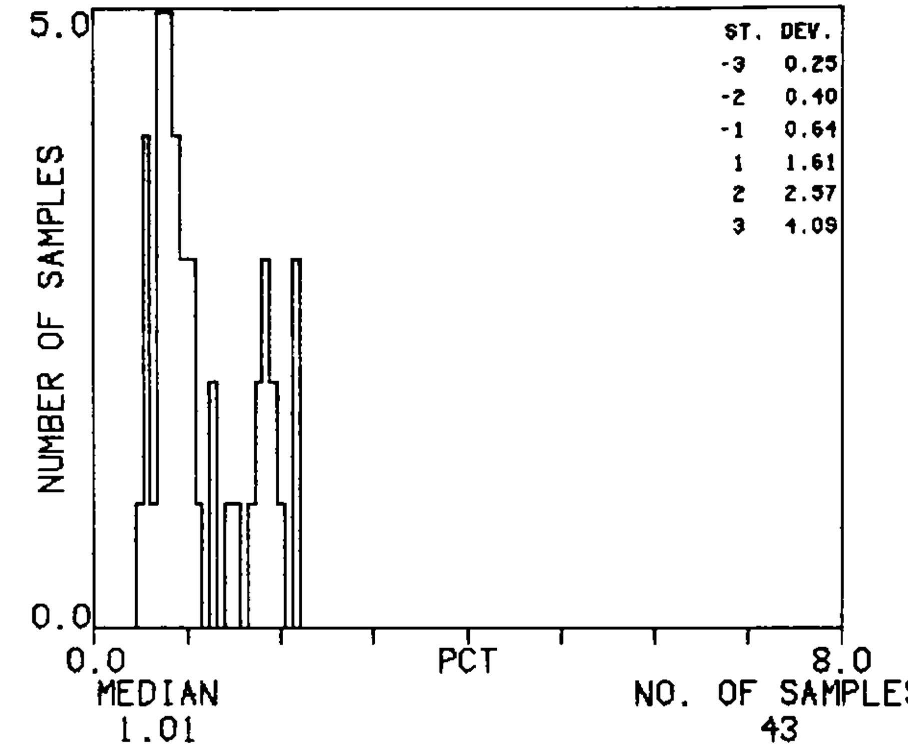
NORMAL THORIUM



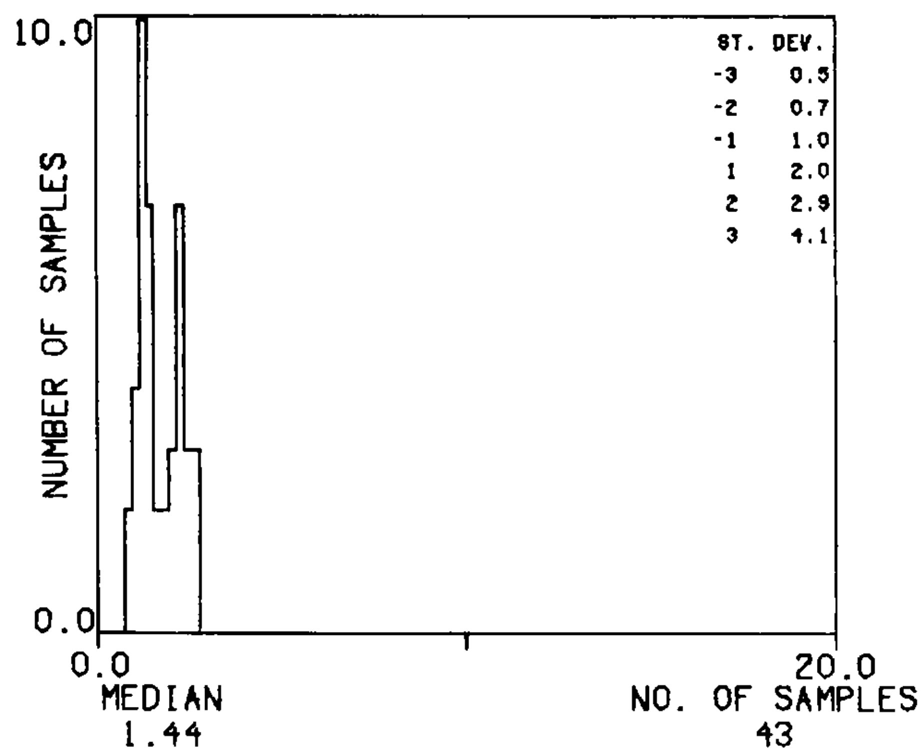
NORMAL URANIUM



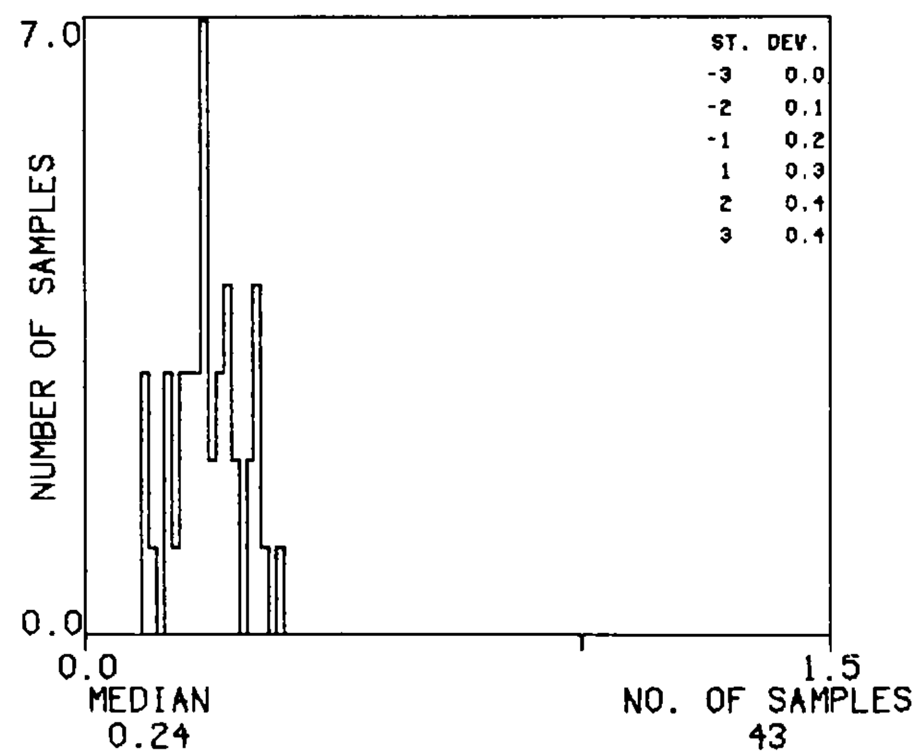
LOGNORMAL POTASSIUM



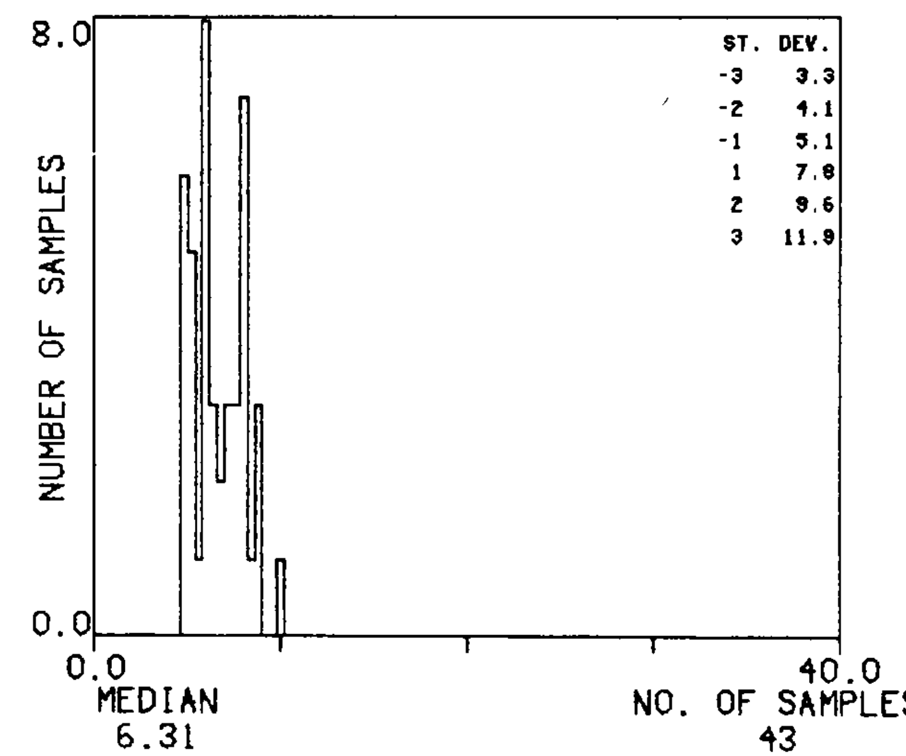
LOGNORMAL U/K



NORMAL U/TH



LOGNORMAL TH/K



HISTOGRAMS : CNB

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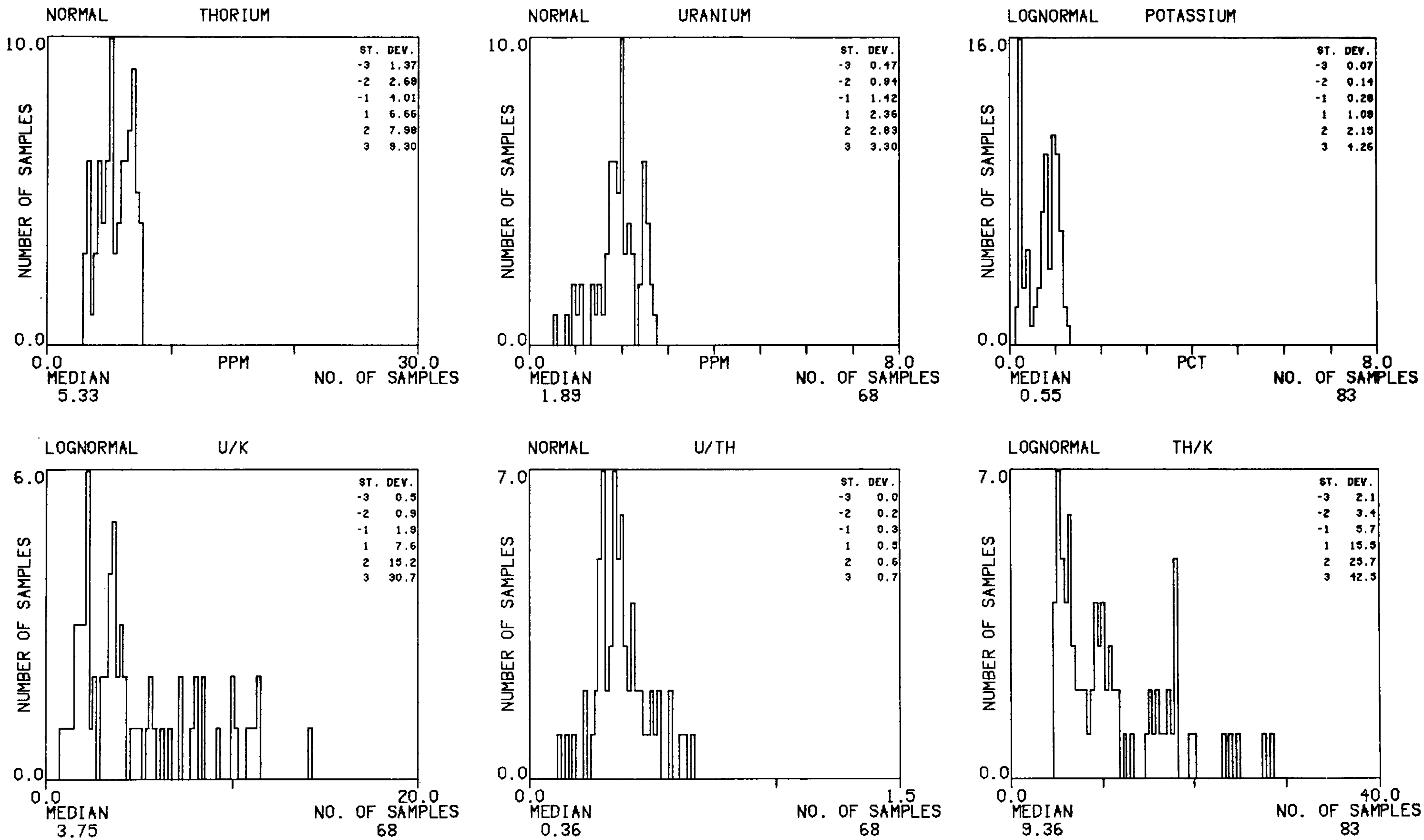

HISTOGRAMS : CNI

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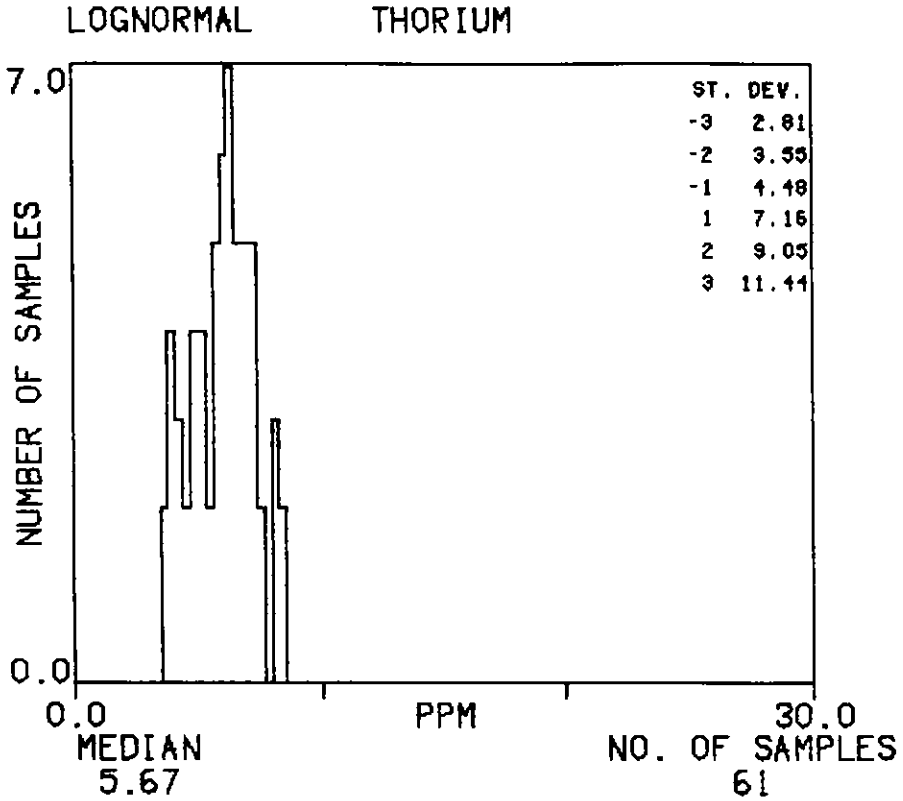

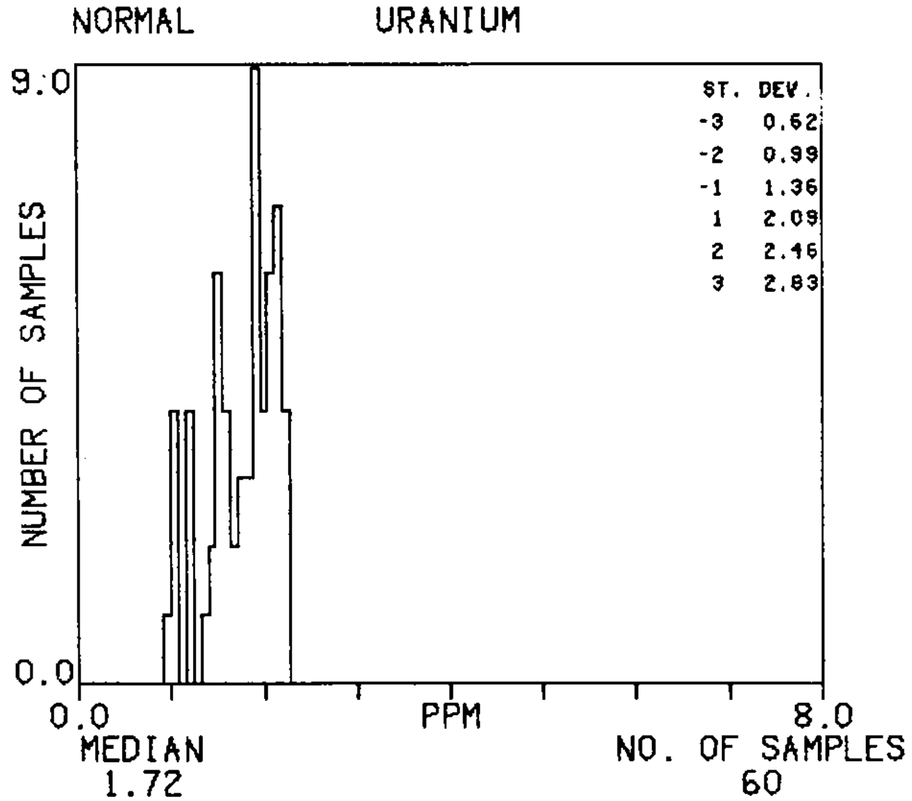

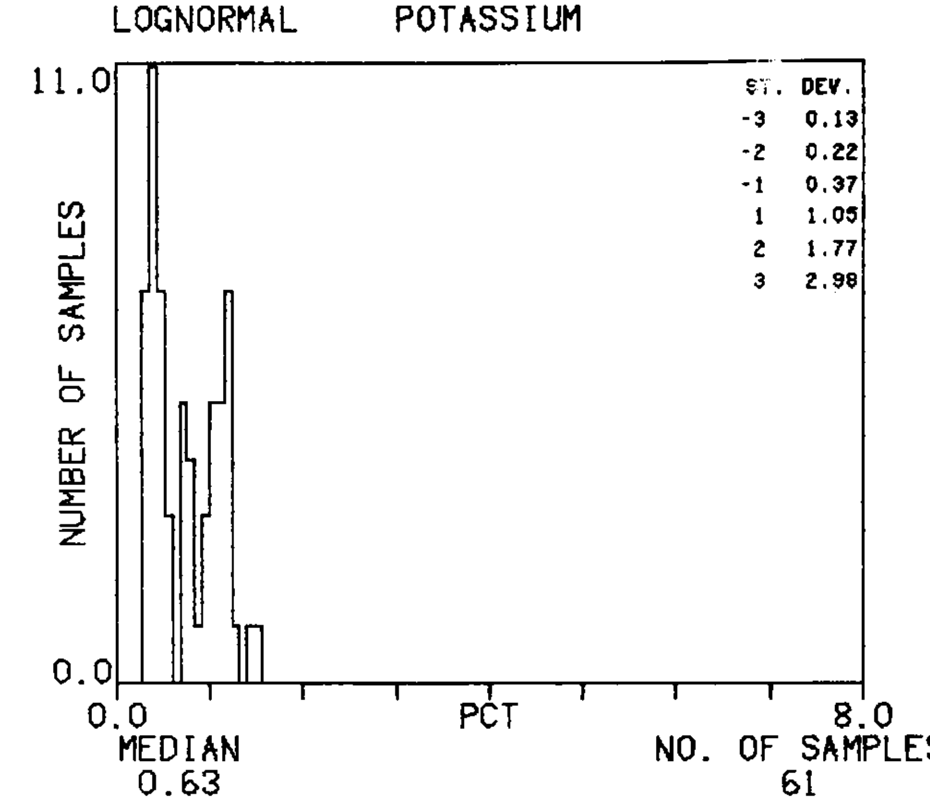

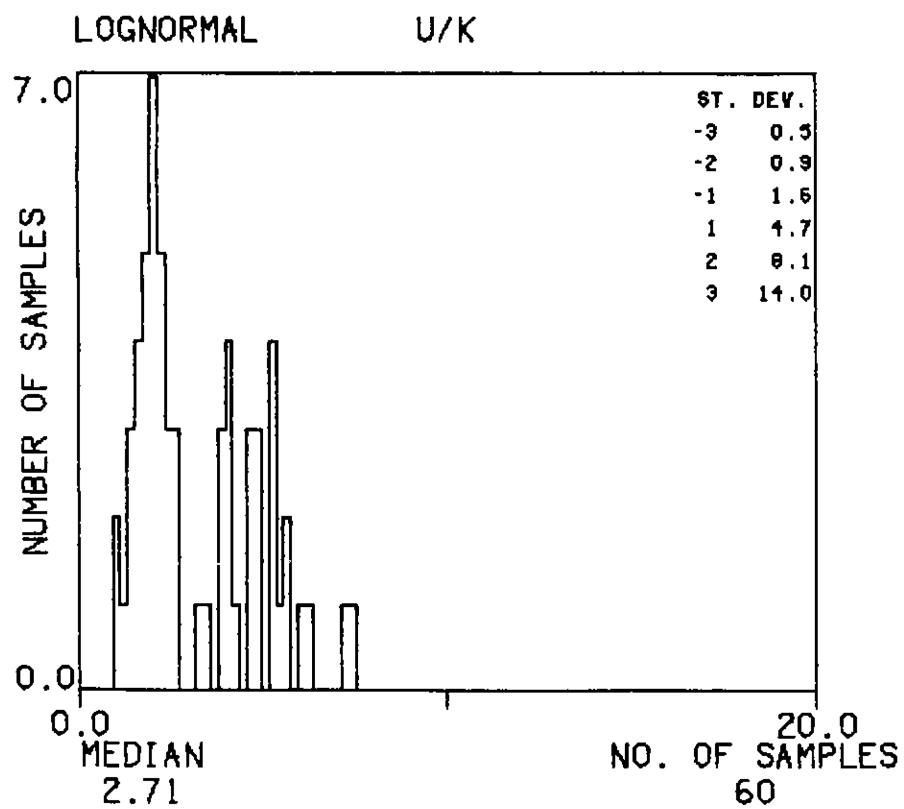

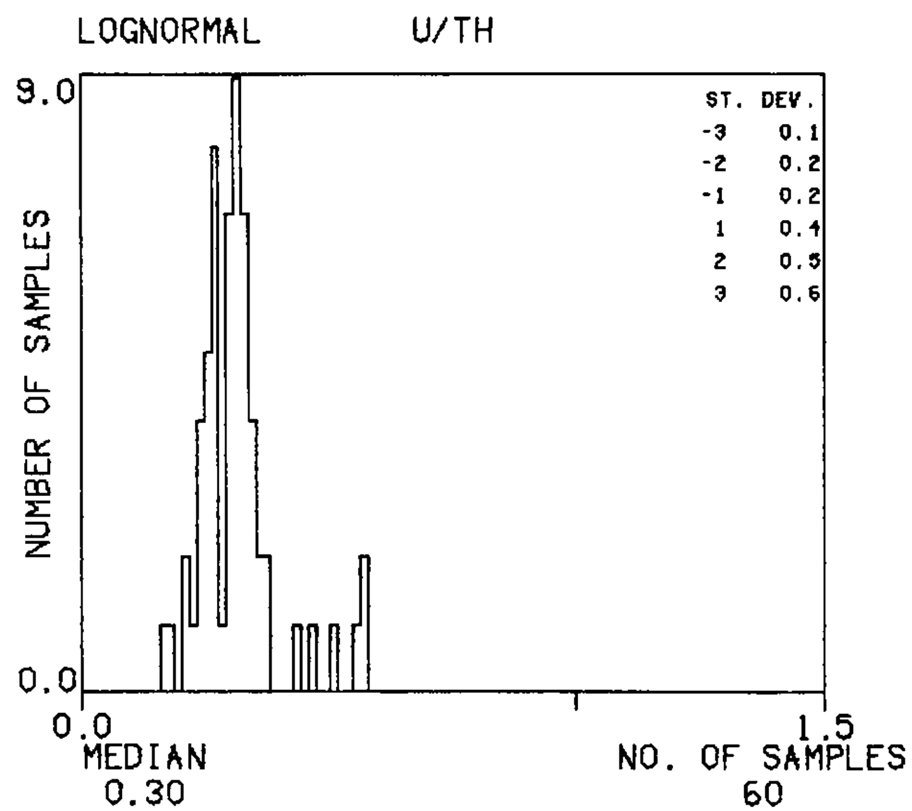

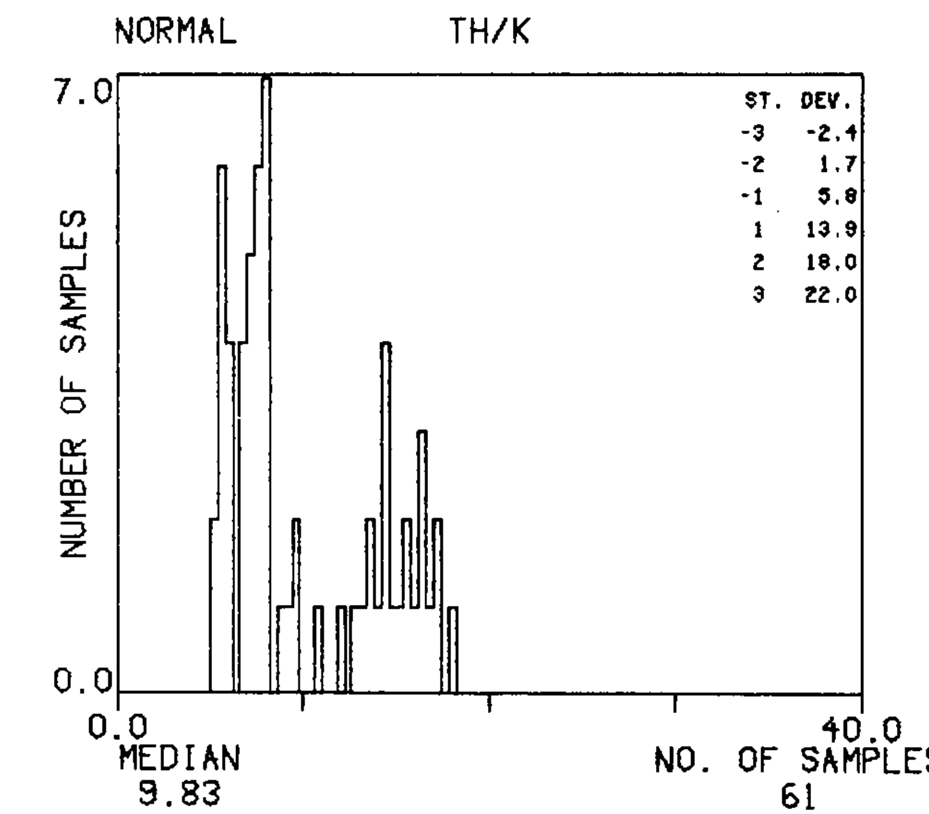

HISTOGRAMS : CCH

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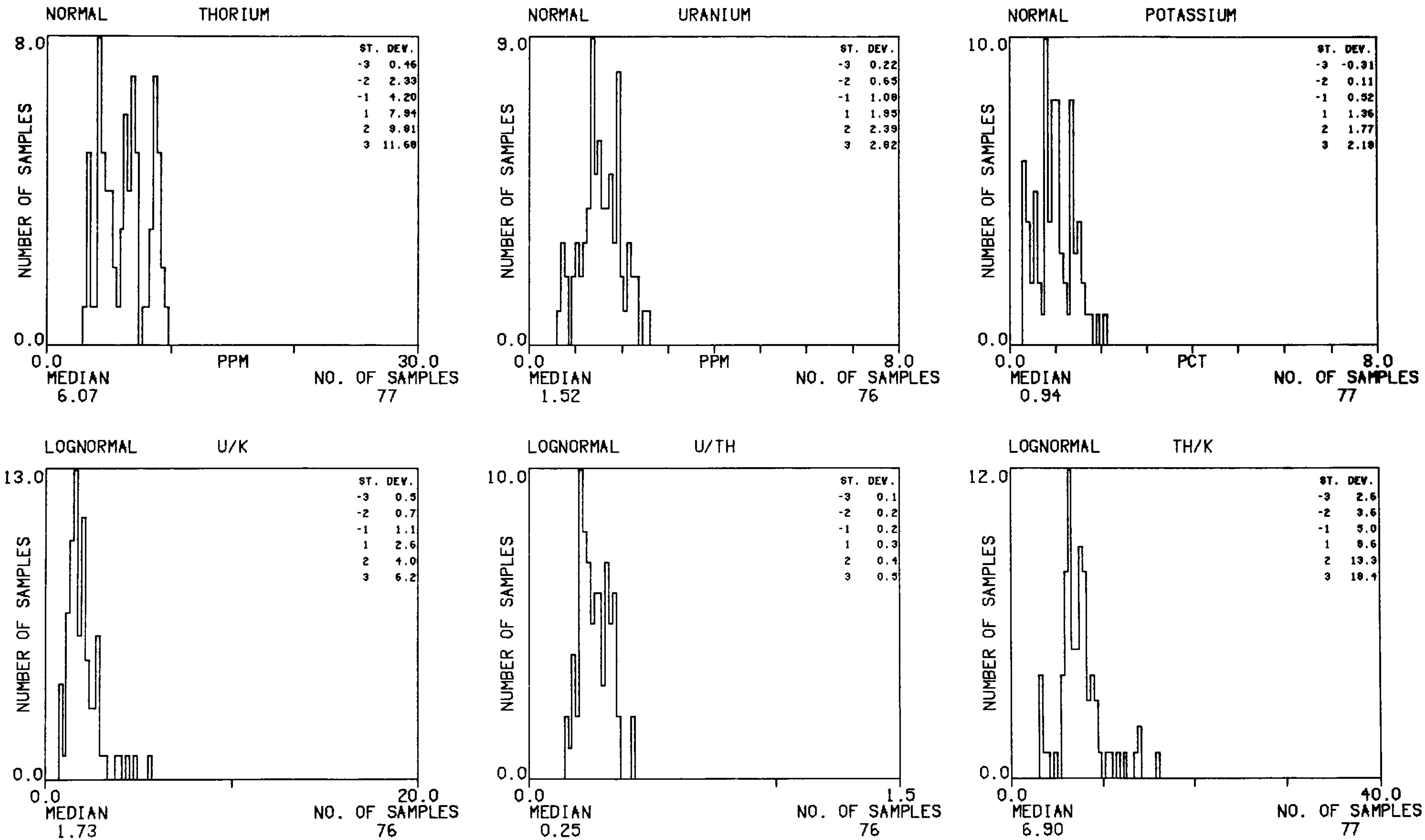

HISTOGRAMS : PCW

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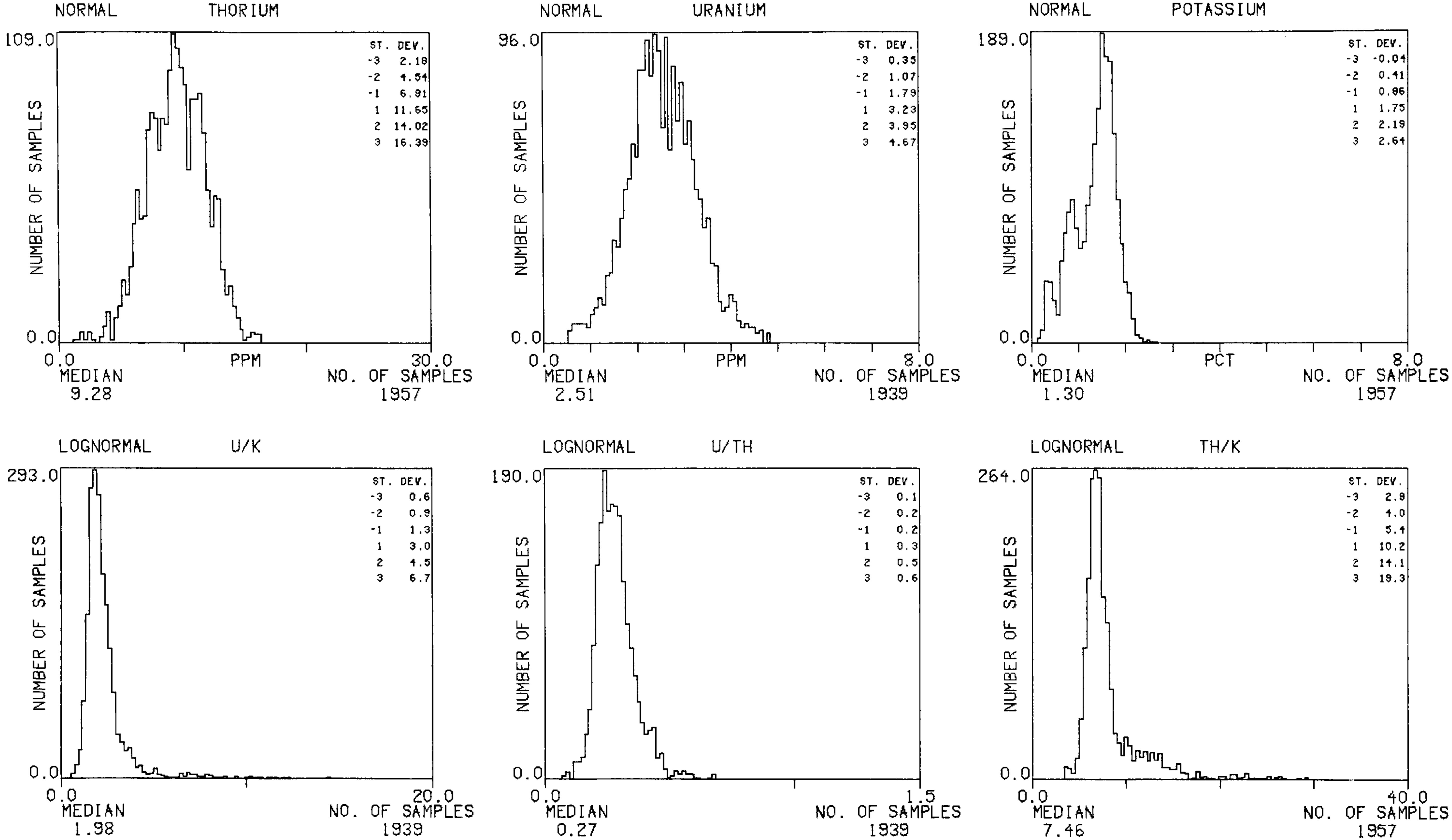

HISTOGRAMS : PCW-1

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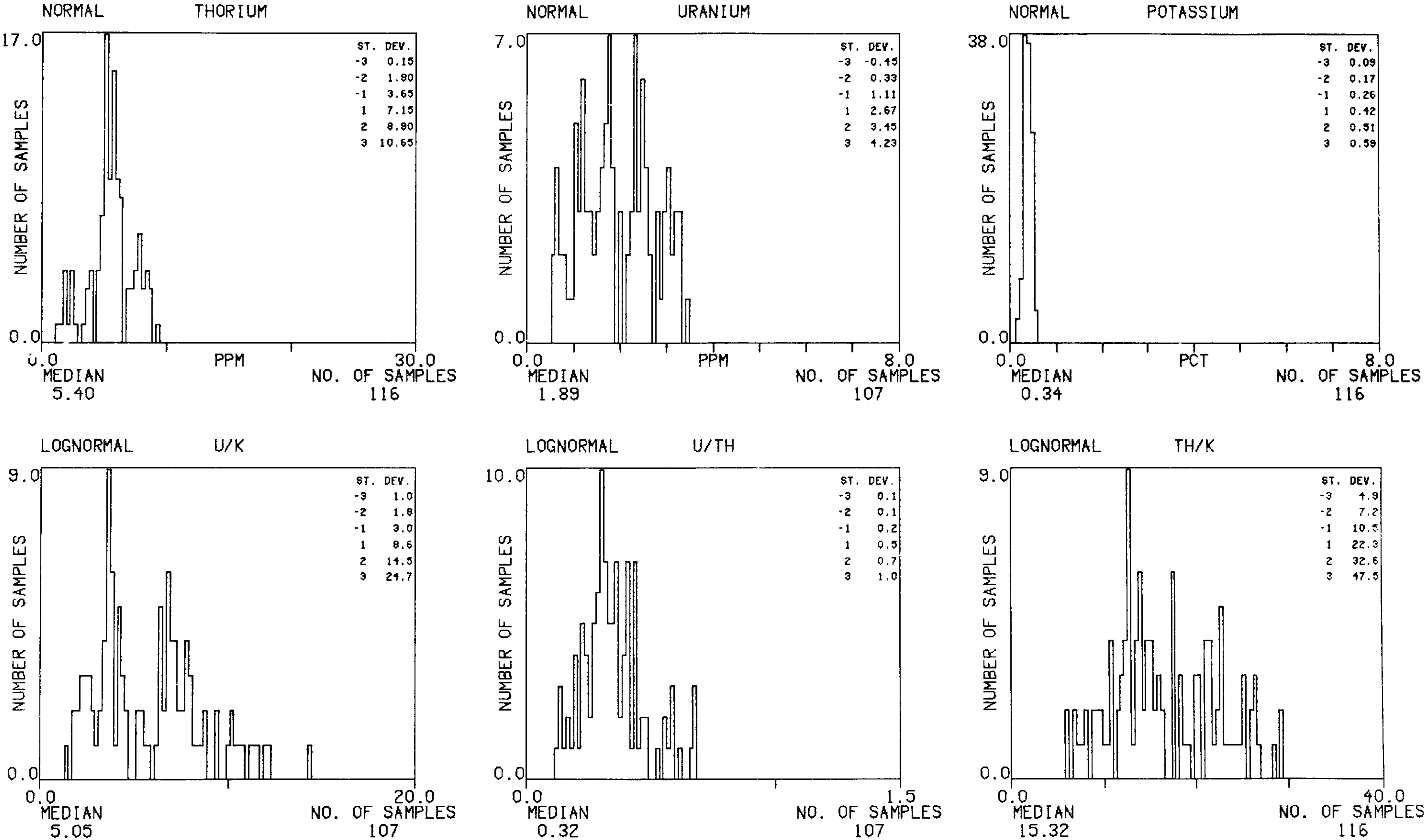
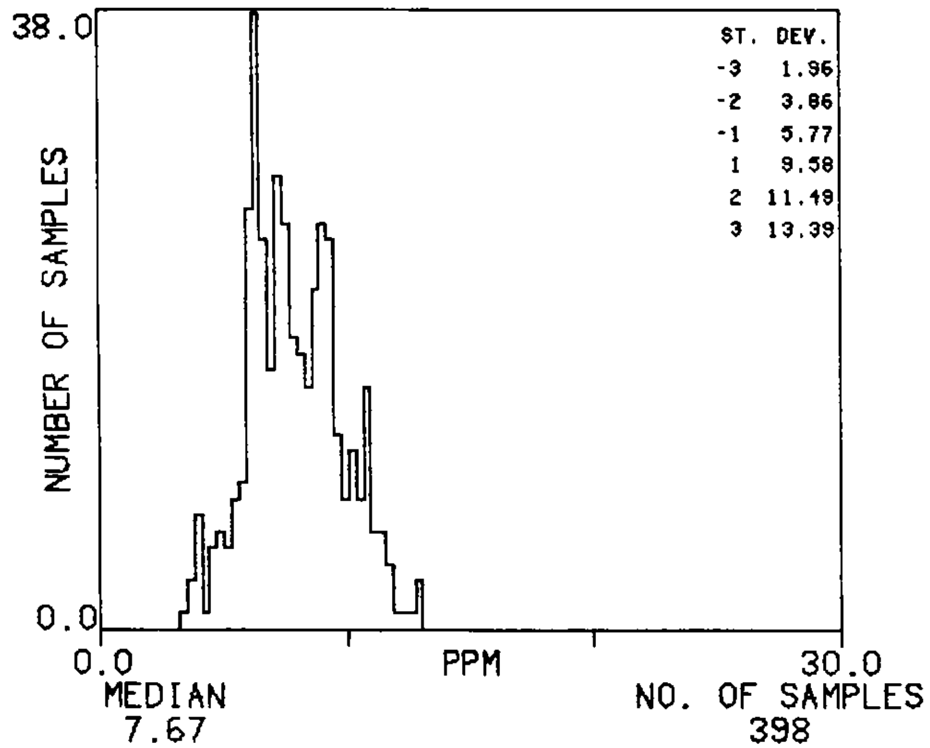


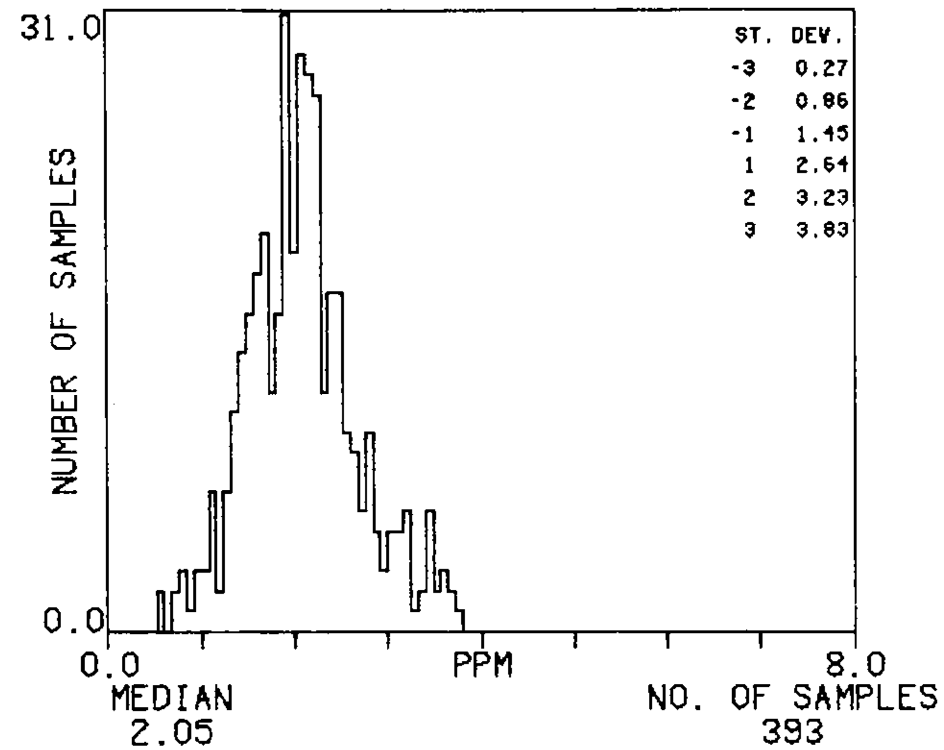
HISTOGRAMS : PCW-2

TEXAS INSTRUMENTS CHATTANOOGA NI16-3 APPALACHIAN BASIN SURVEY 1979

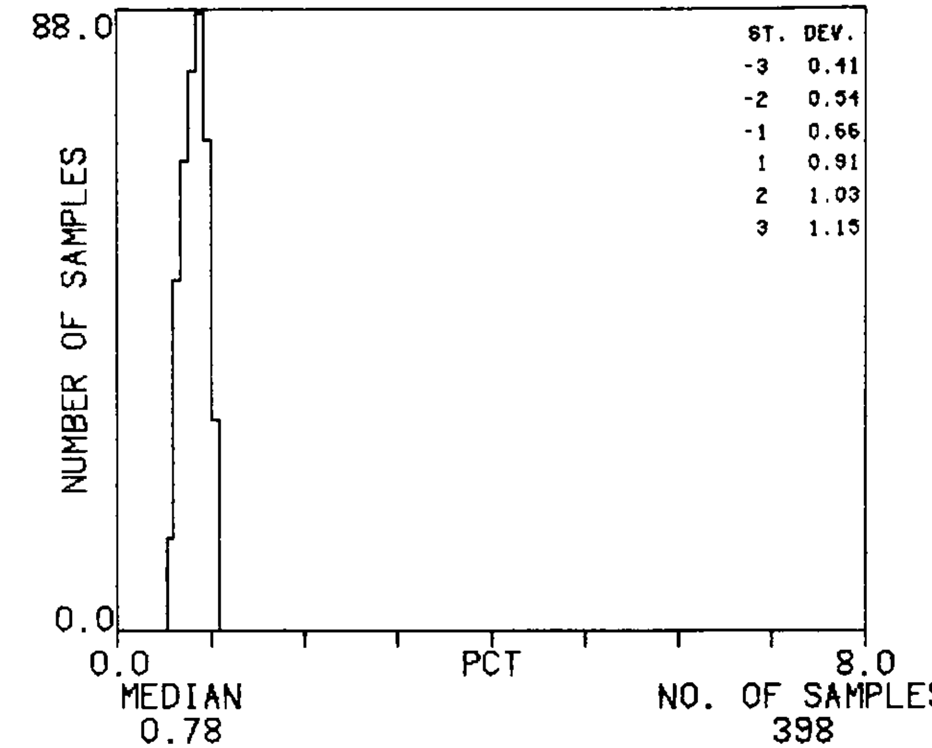
NORMAL THORIUM



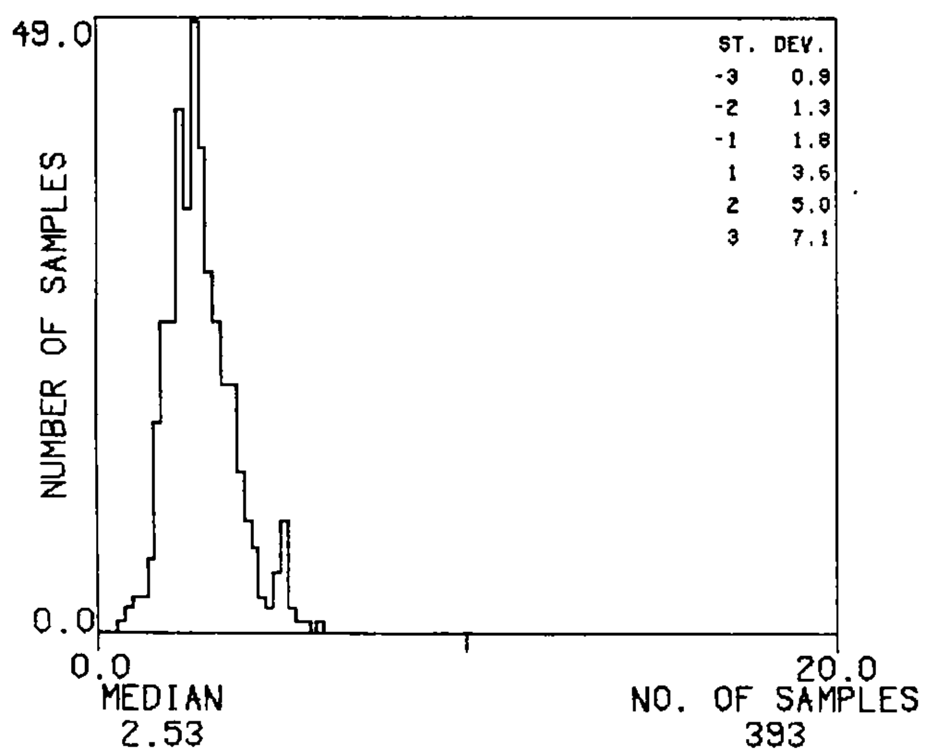
NORMAL URANIUM



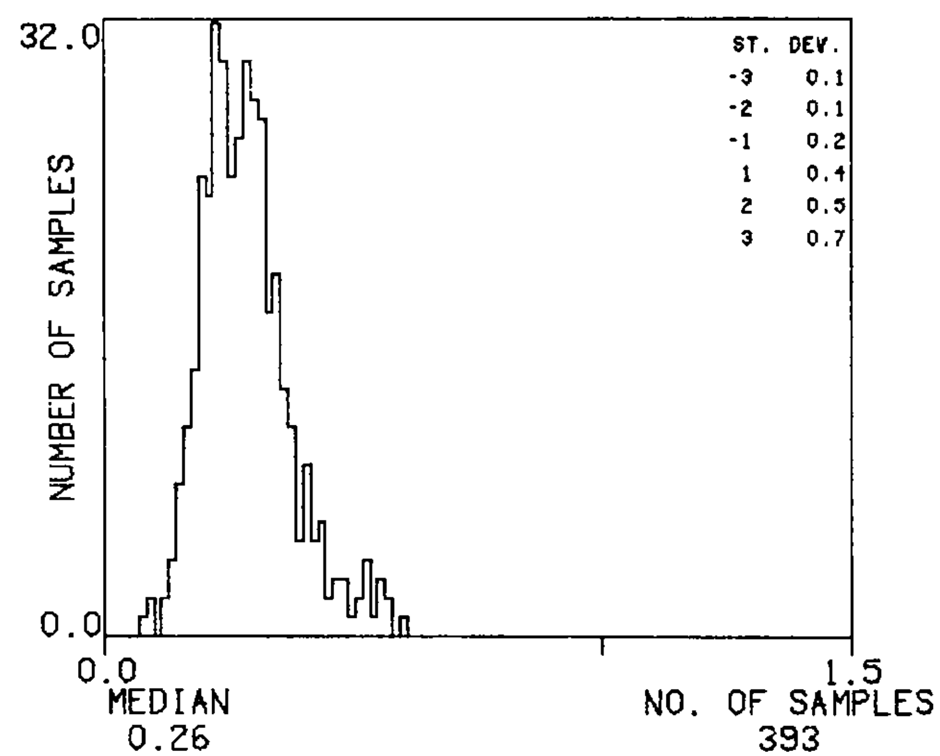
NORMAL POTASSIUM



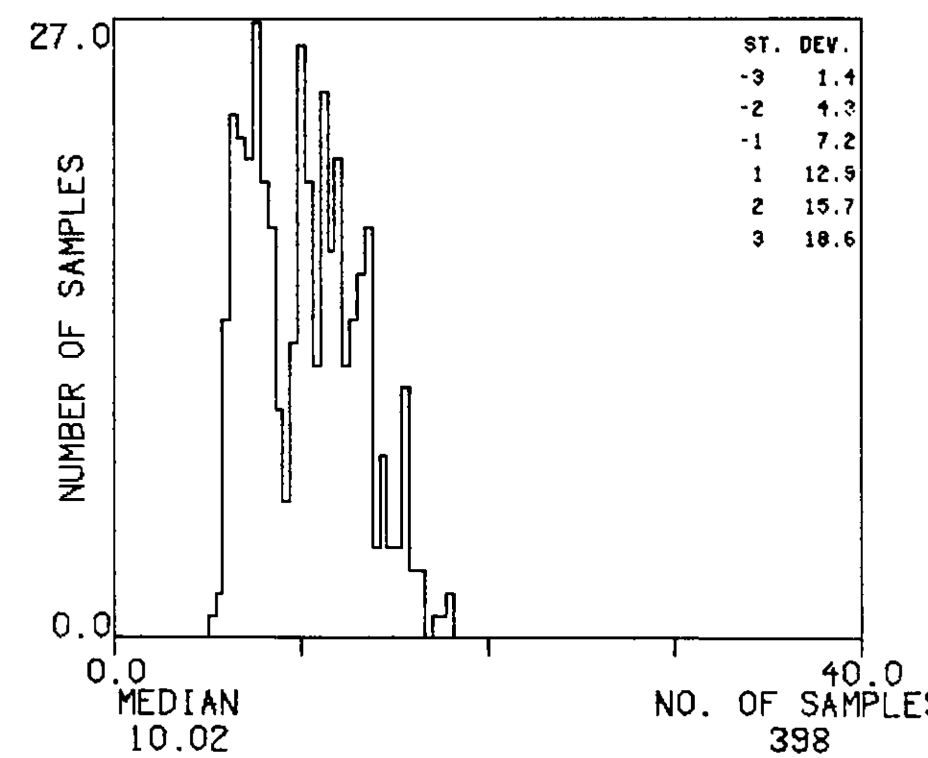
LOGNORMAL U/K



LOGNORMAL U/TH



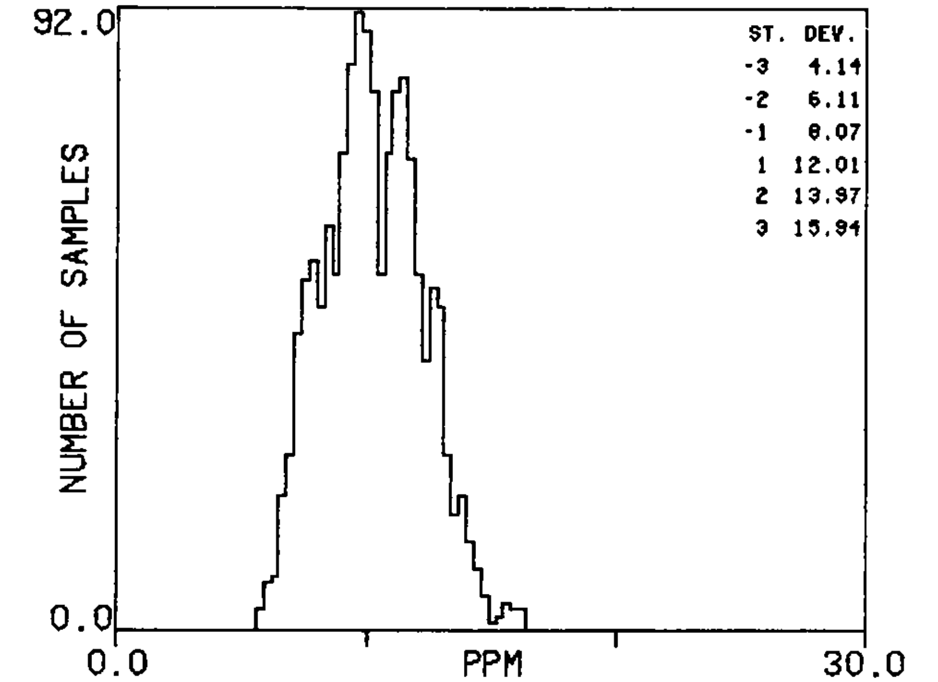
NORMAL TH/K



HISTOGRAMS : PCW-3

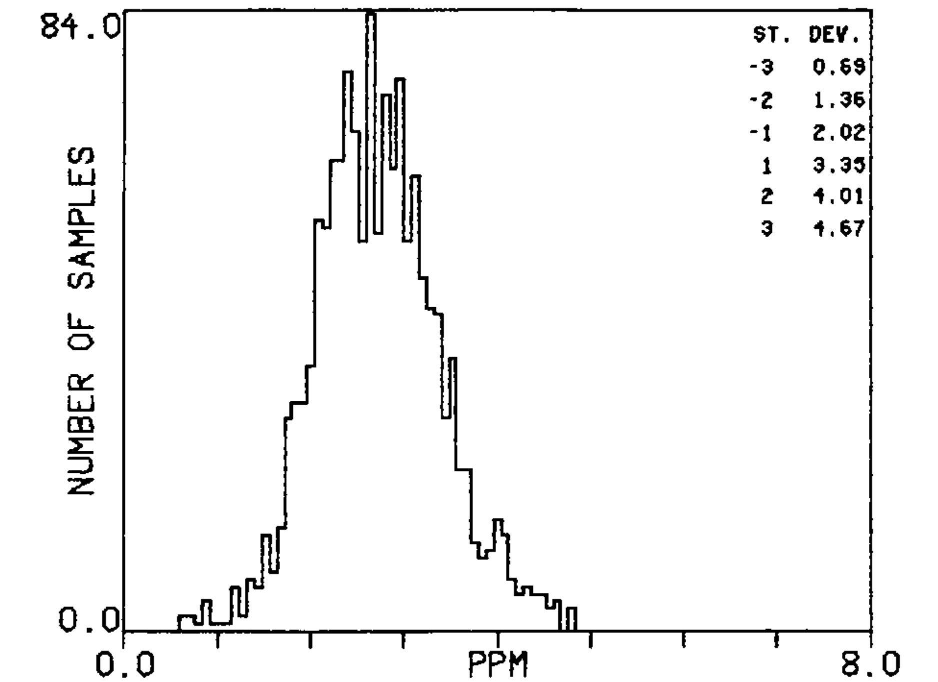
TEXAS INSTRUMENTS CHATTANOOGA NI16-3 APPALACHIAN BASIN SURVEY 1979

NORMAL THORIUM



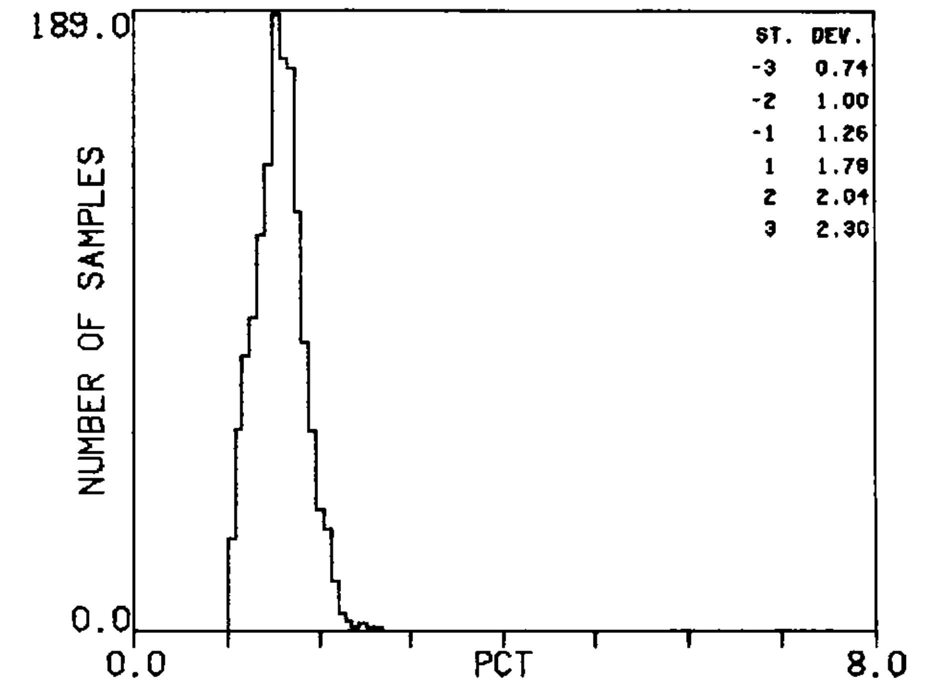
MEDIAN 10.04 NO. OF SAMPLES 1443

NORMAL URANIUM



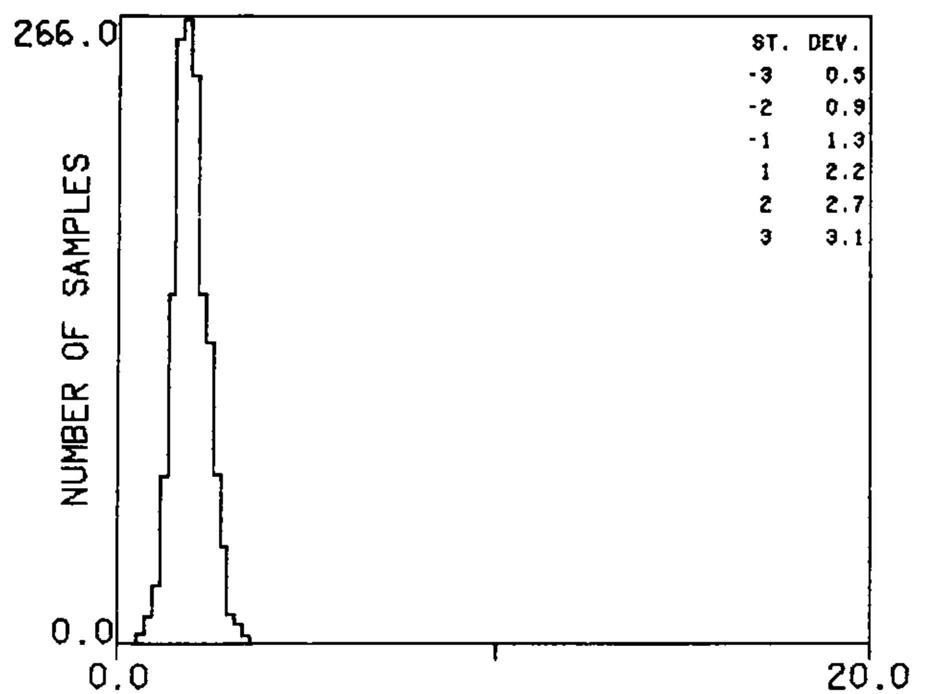
MEDIAN 2.68 NO. OF SAMPLES 1439

NORMAL POTASSIUM



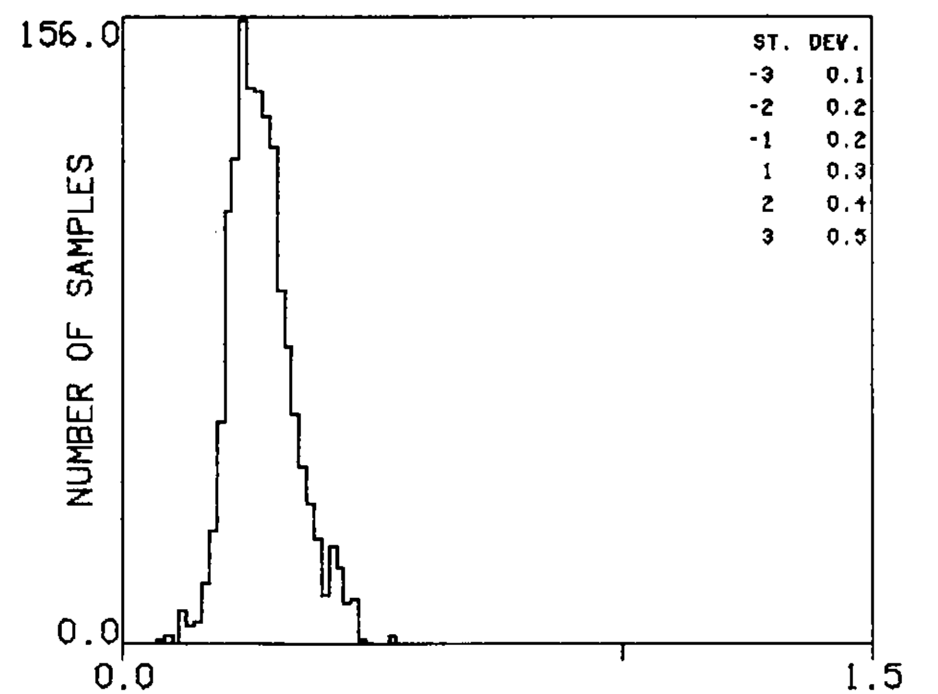
MEDIAN 1.52 NO. OF SAMPLES 1443

NORMAL U/K



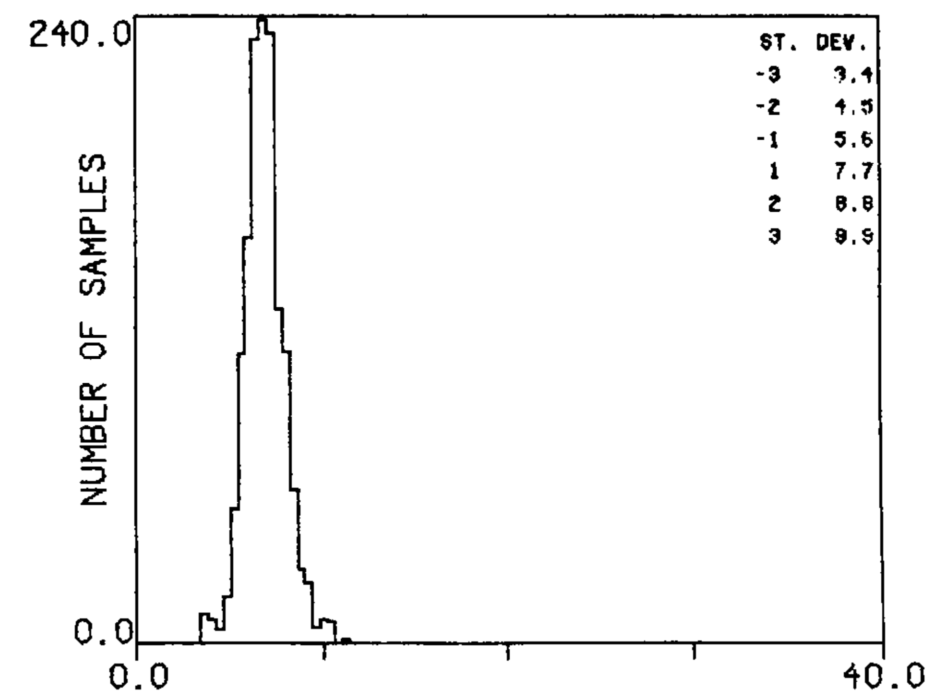
MEDIAN 1.79 NO. OF SAMPLES 1439

LOGNORMAL U/TH



MEDIAN 0.26 NO. OF SAMPLES 1439

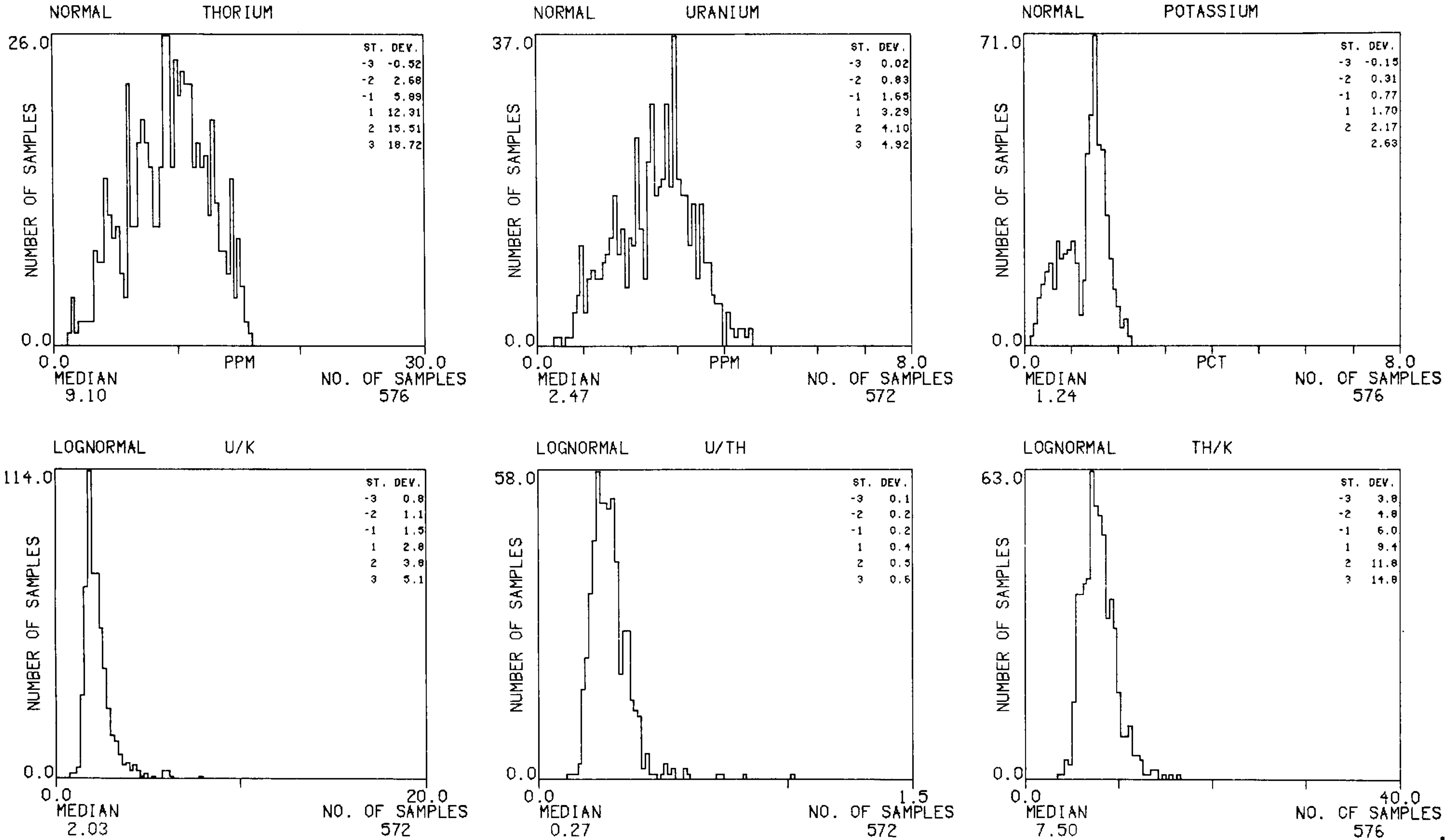
NORMAL TH/K



MEDIAN 6.65 NO. OF SAMPLES 1443

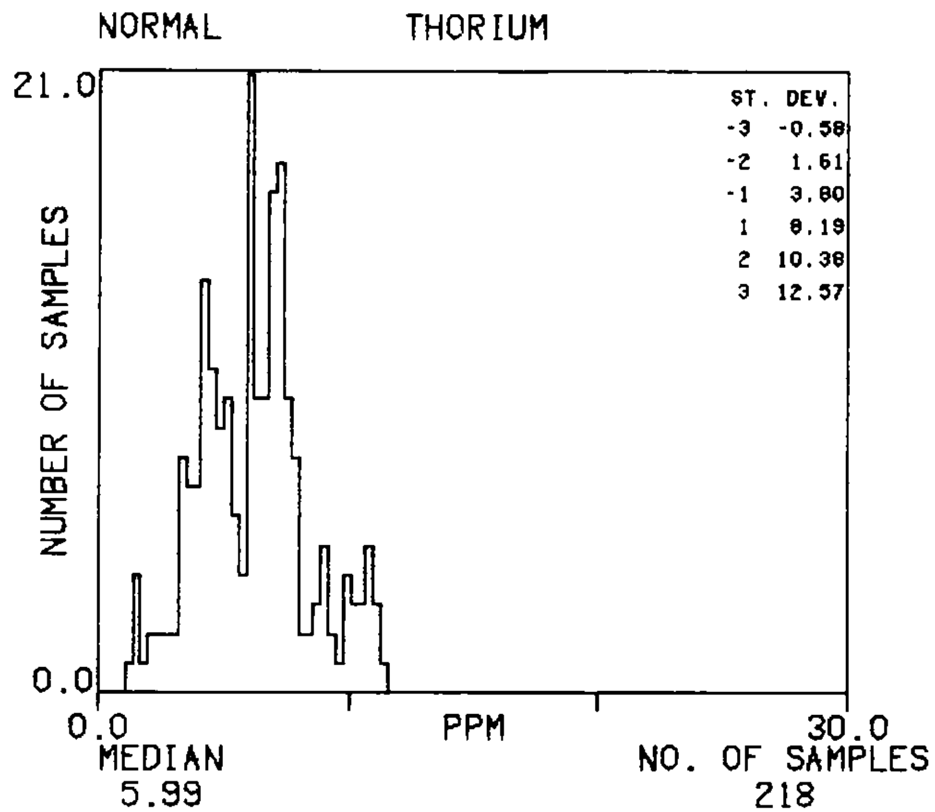
HISTOGRAMS : PCS

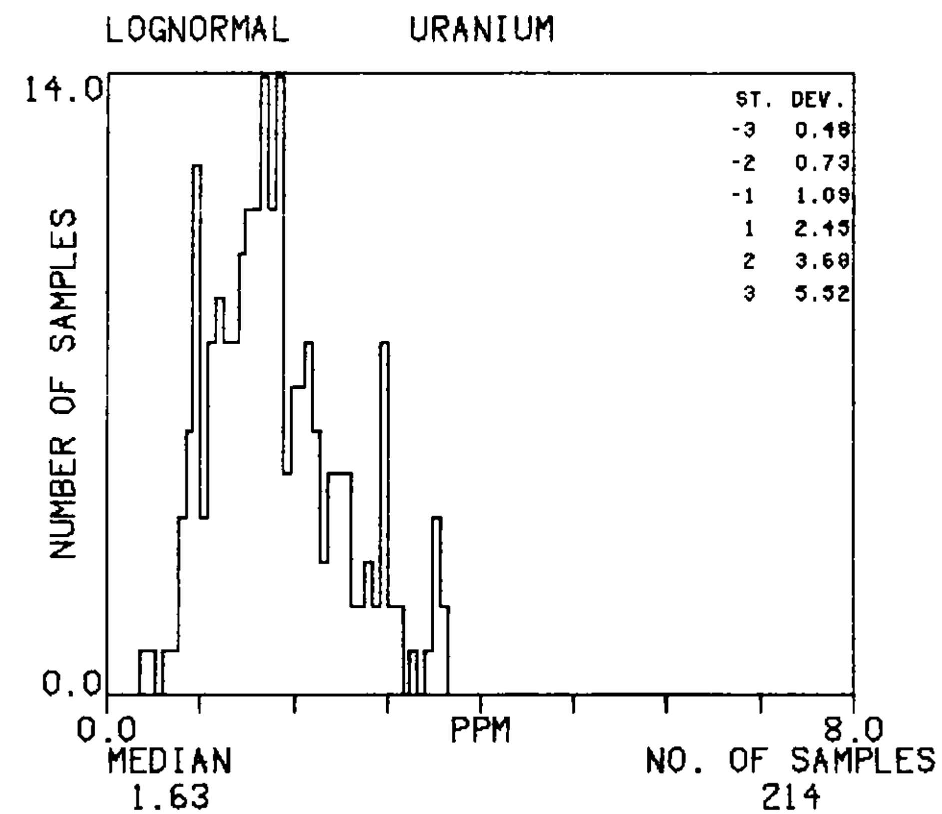
TEXAS INSTRUMENTS CHATTANOOGA NI16-3 APPALACHIAN BASIN SURVEY 1979

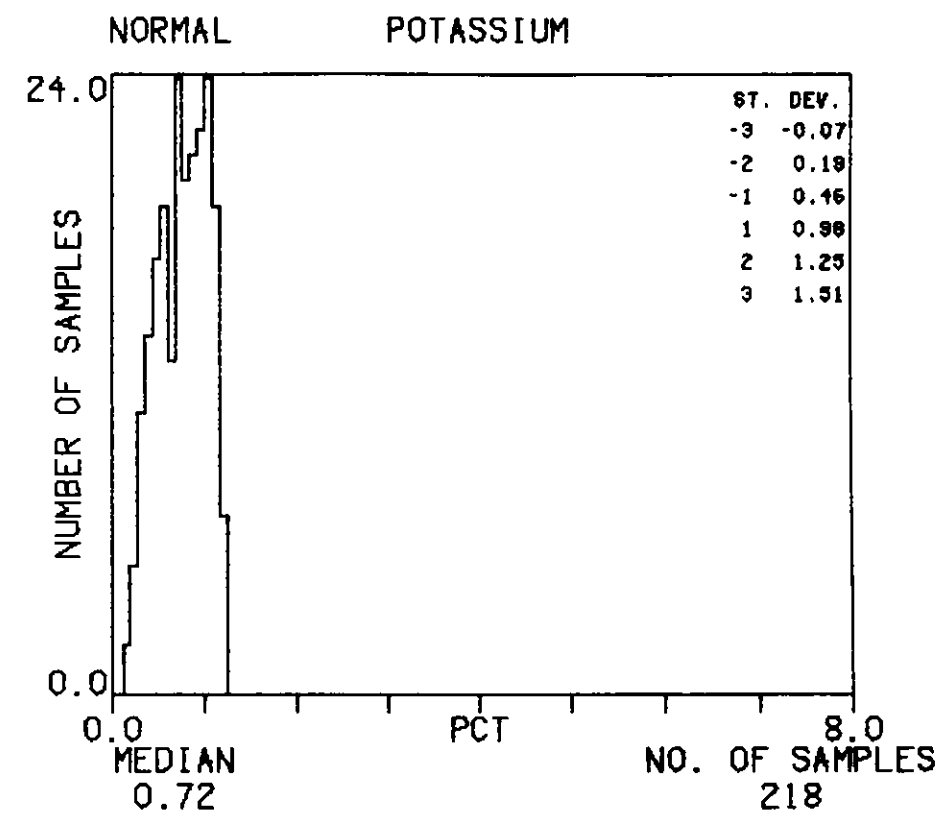


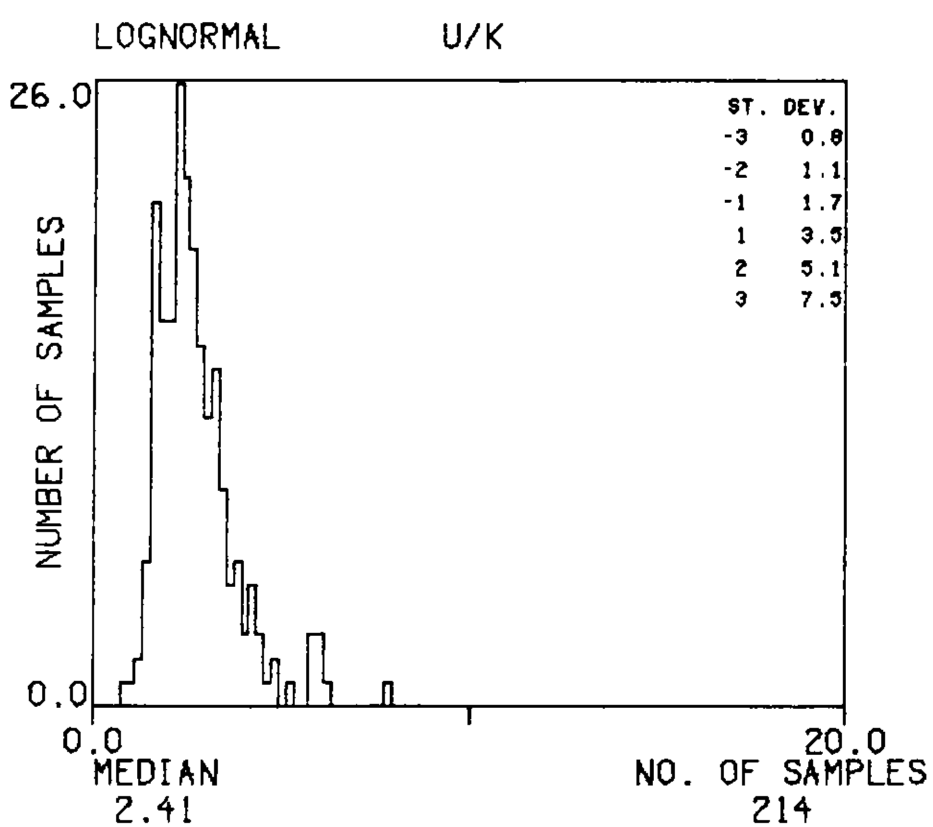
HISTOGRAMS : PCS-1

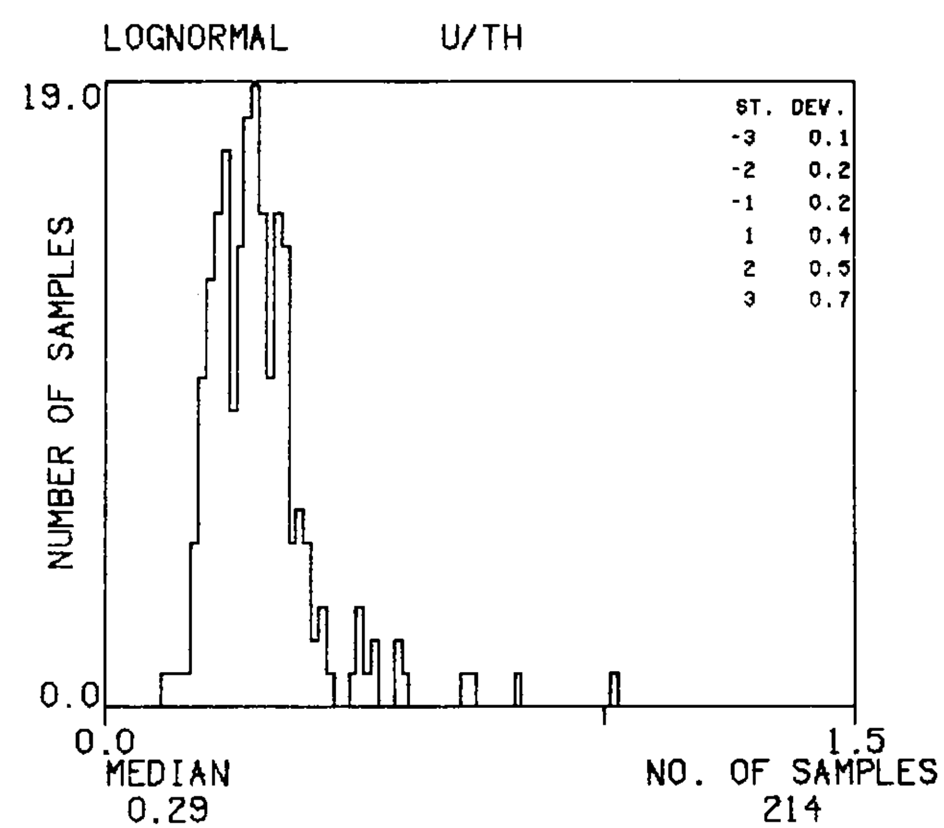
TEXAS INSTRUMENTS CHATTANOOGA NI16-3 APPALACHIAN BASIN SURVEY 1979

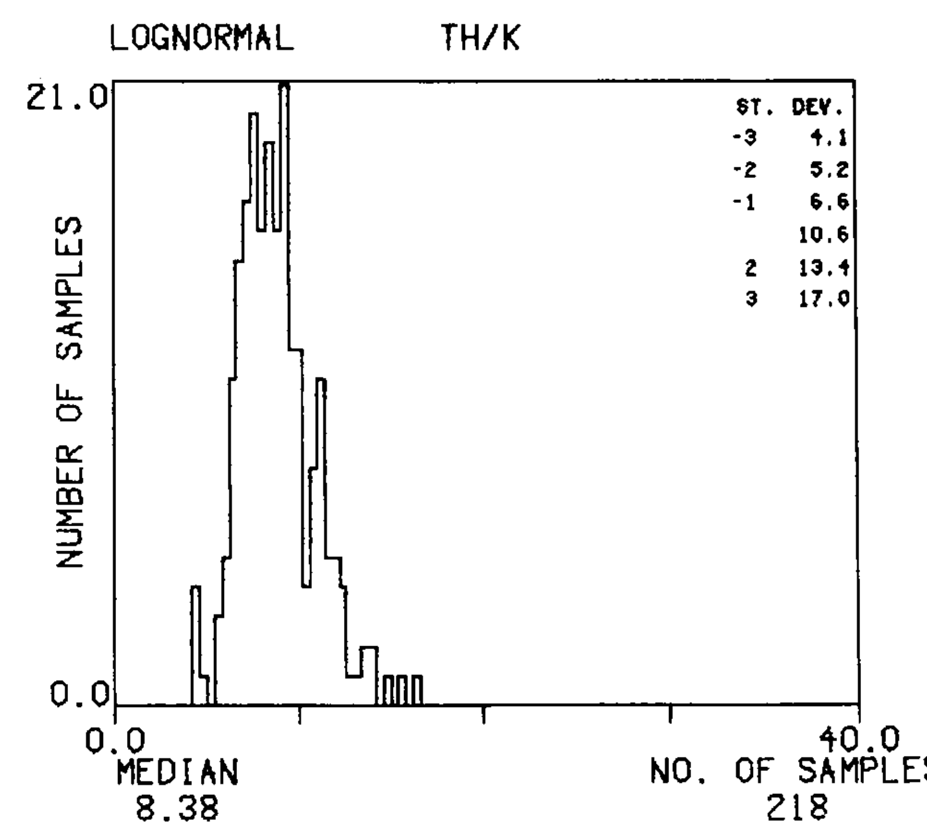






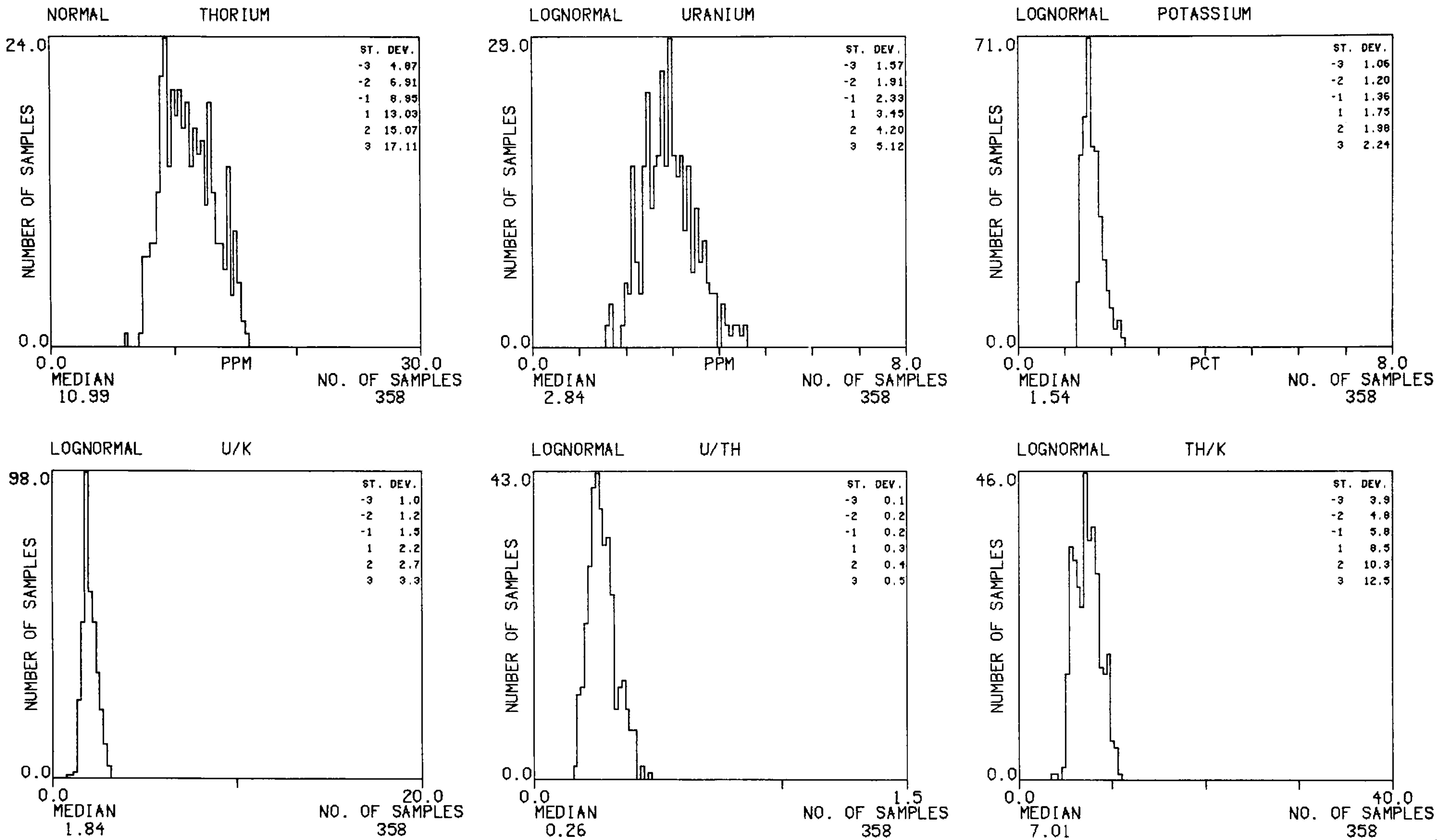






HISTOGRAMS : PCS-2

TEXAS INSTRUMENTS CHATTANOOGA NI16-3 APPALACHIAN BASIN SURVEY 1979



HISTOGRAMS : PCG2

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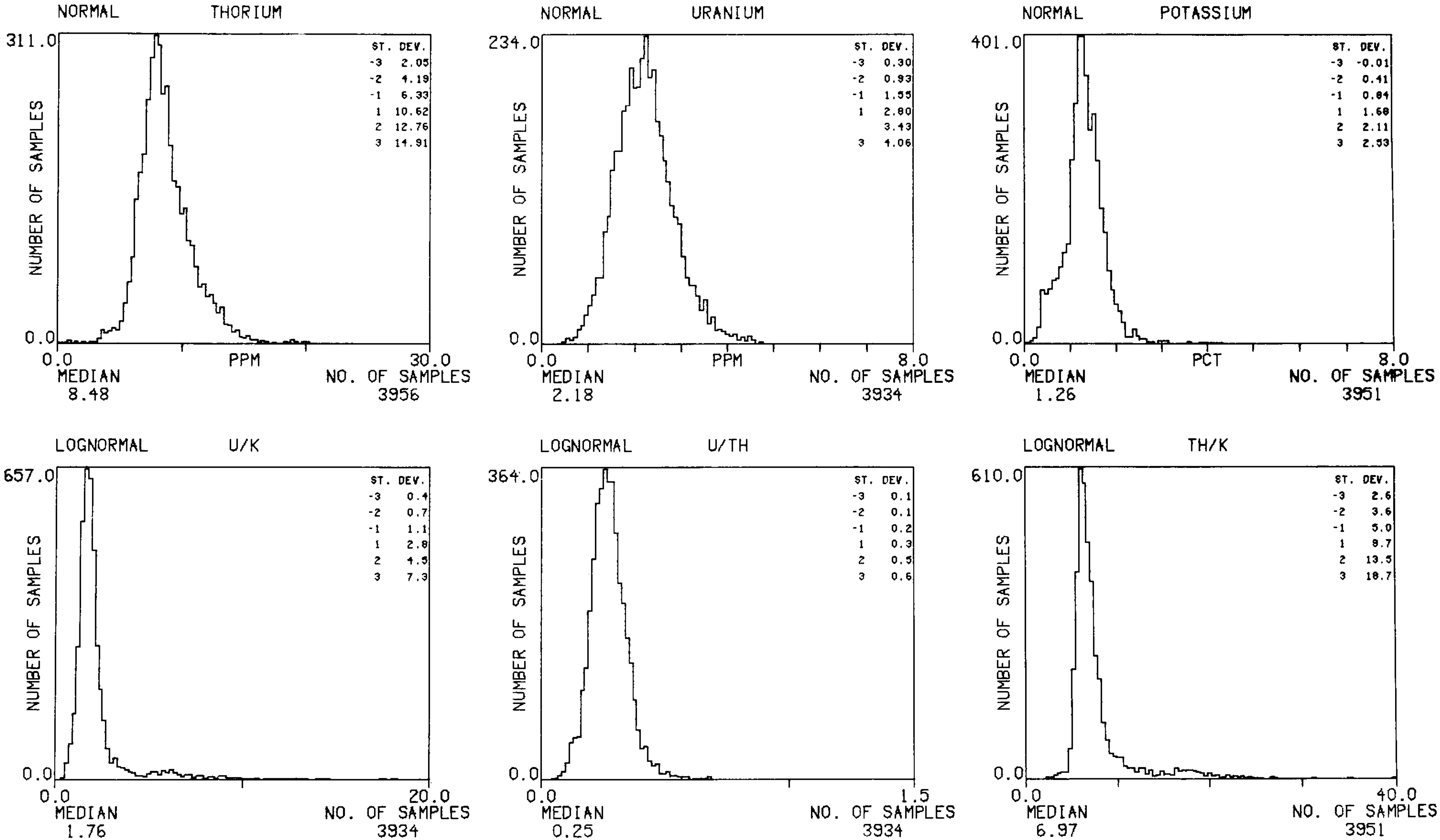
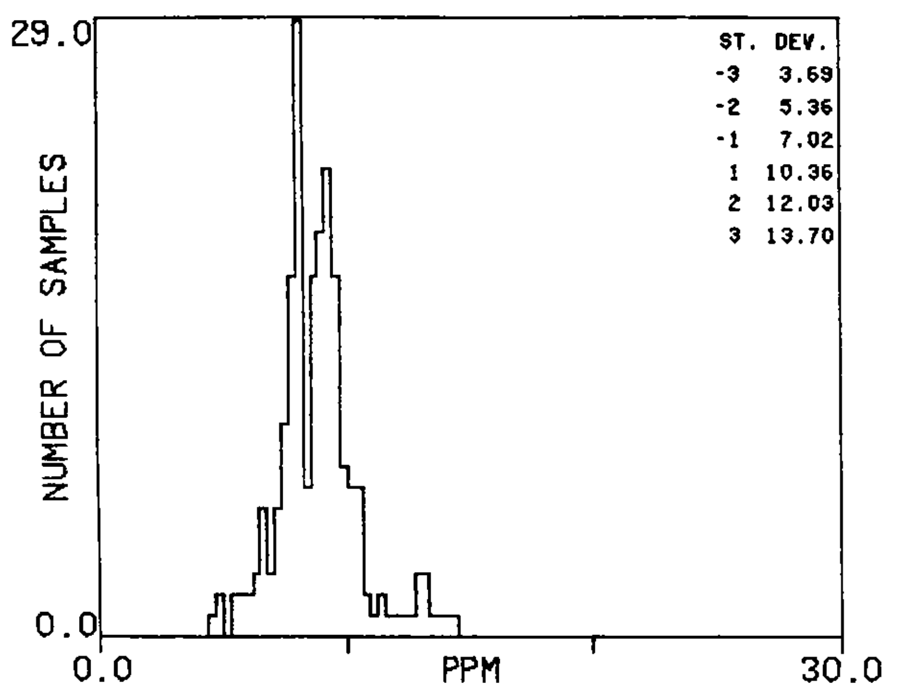


HISTOGRAMS : PCA

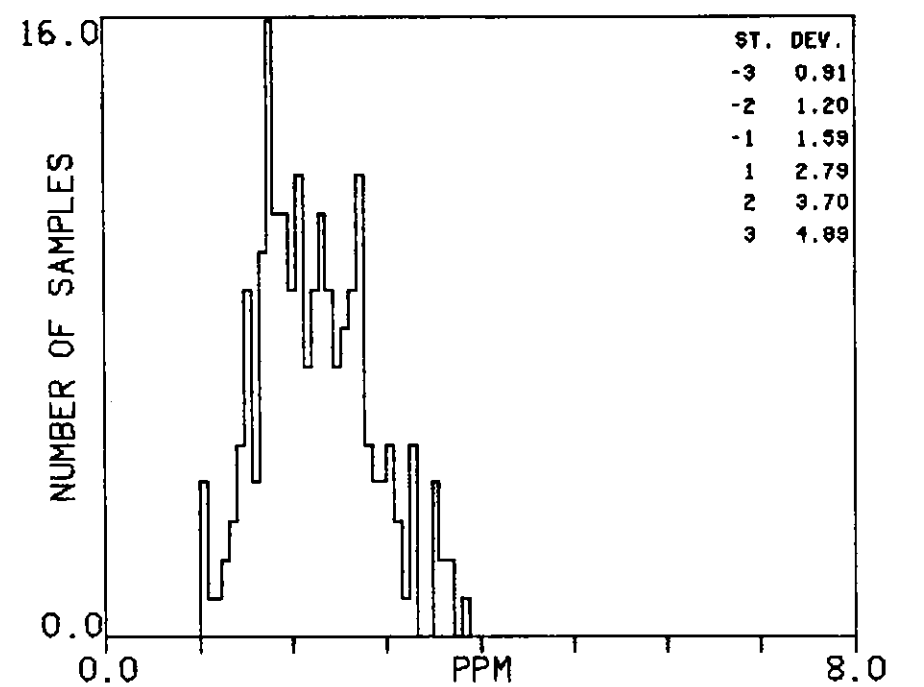
TEXAS INSTRUMENTS CHATTANOOGA NI16-3 APPALACHIAN BASIN SURVEY 1979

NORMAL THORIUM



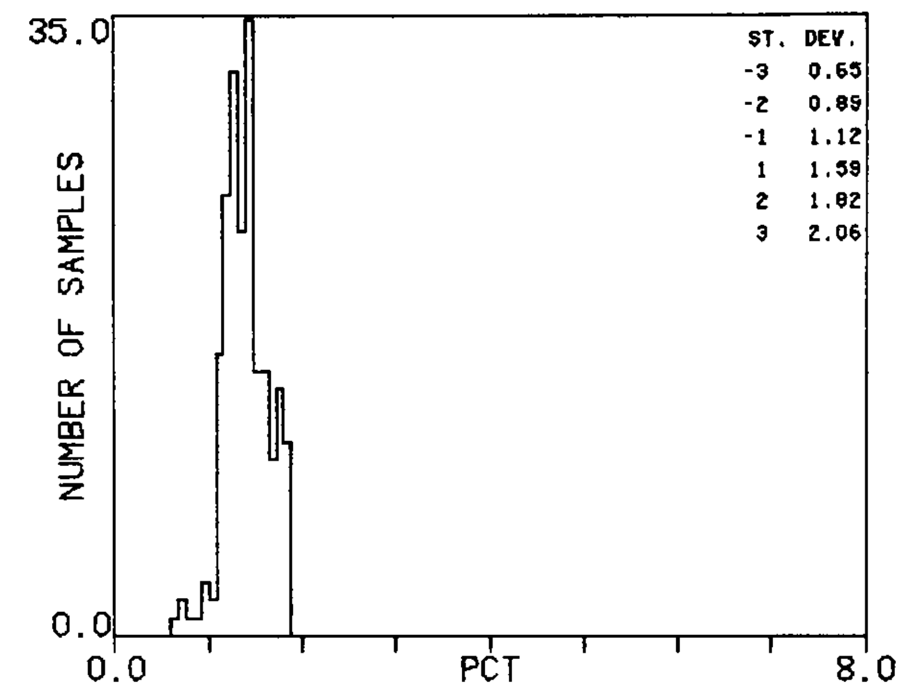
MEDIAN 8.69 NO. OF SAMPLES 206

LOGNORMAL URANIUM



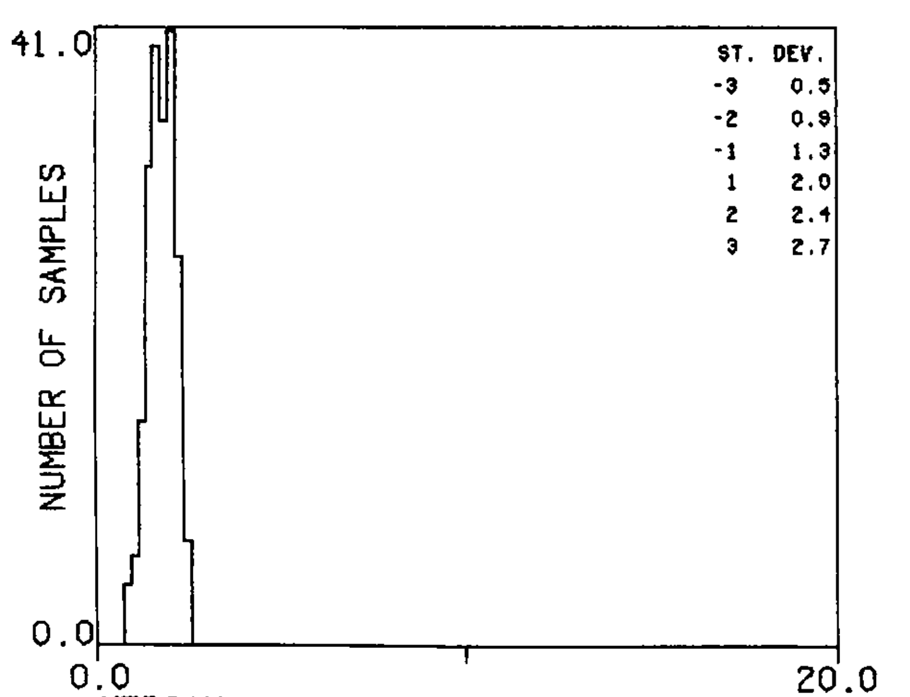
MEDIAN 2.11 NO. OF SAMPLES 206

NORMAL POTASSIUM



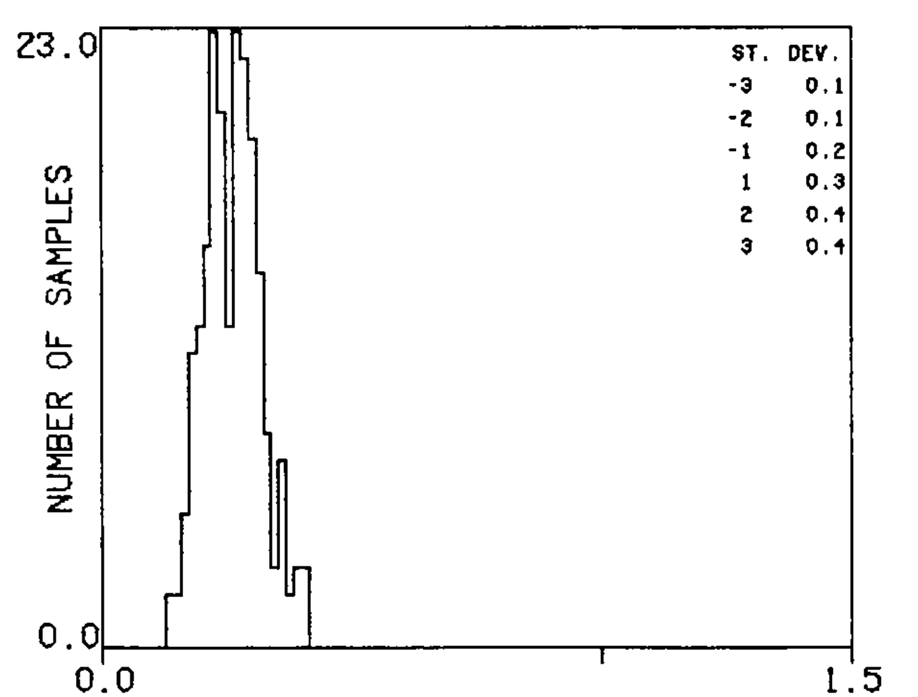
MEDIAN 1.35 NO. OF SAMPLES 206

NORMAL U/K



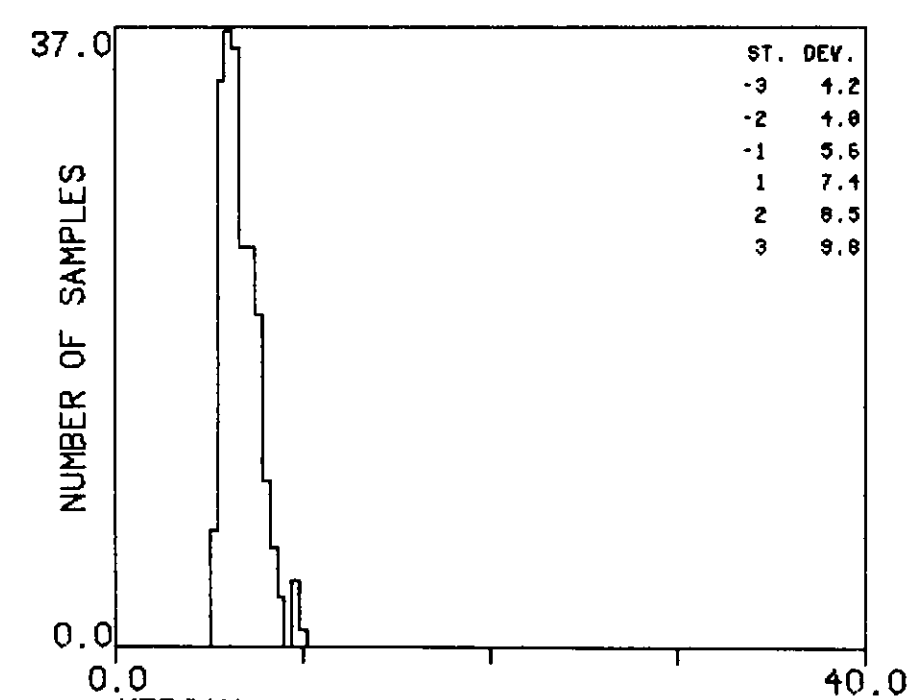
MEDIAN 1.63 NO. OF SAMPLES 206

NORMAL U/TH



MEDIAN 0.25 NO. OF SAMPLES 206

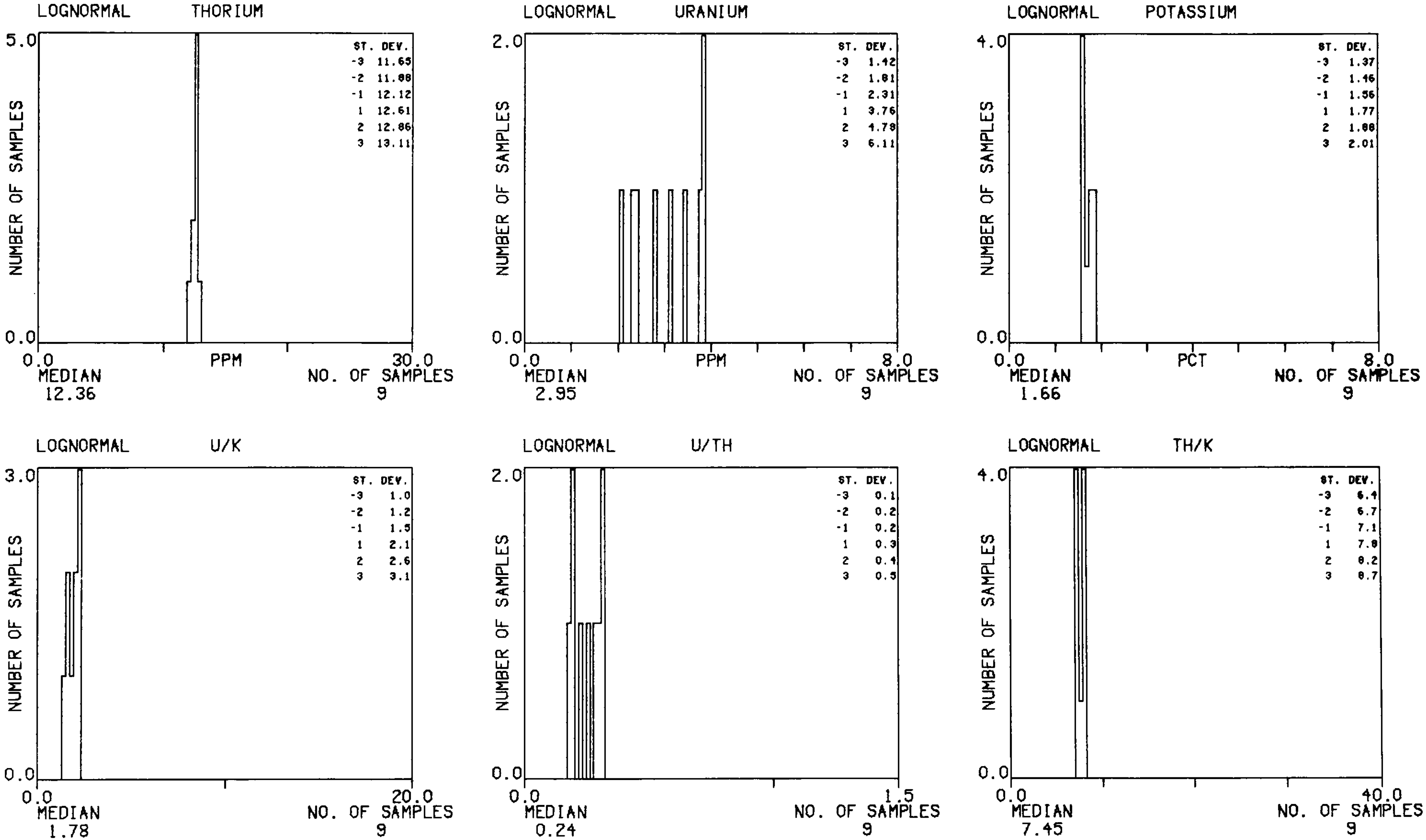
LOGNORMAL TH/K



MEDIAN 6.40 NO. OF SAMPLES 206

HISTOGRAMS : NY

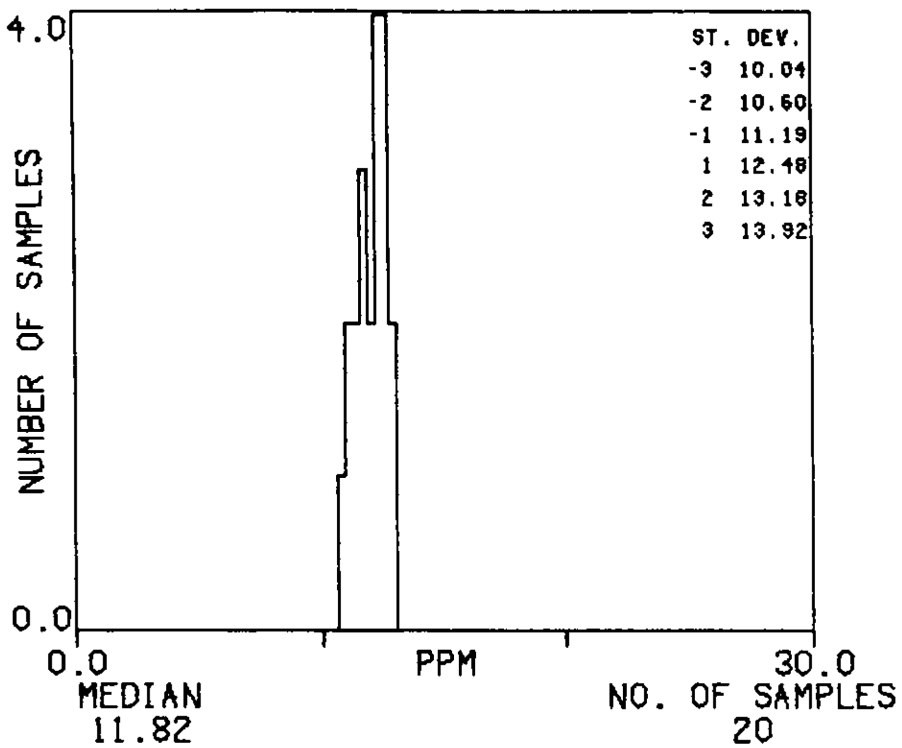
TEXAS INSTRUMENTS CHATTANOOGA NI16-3 APPALACHIAN BASIN SURVEY 1979



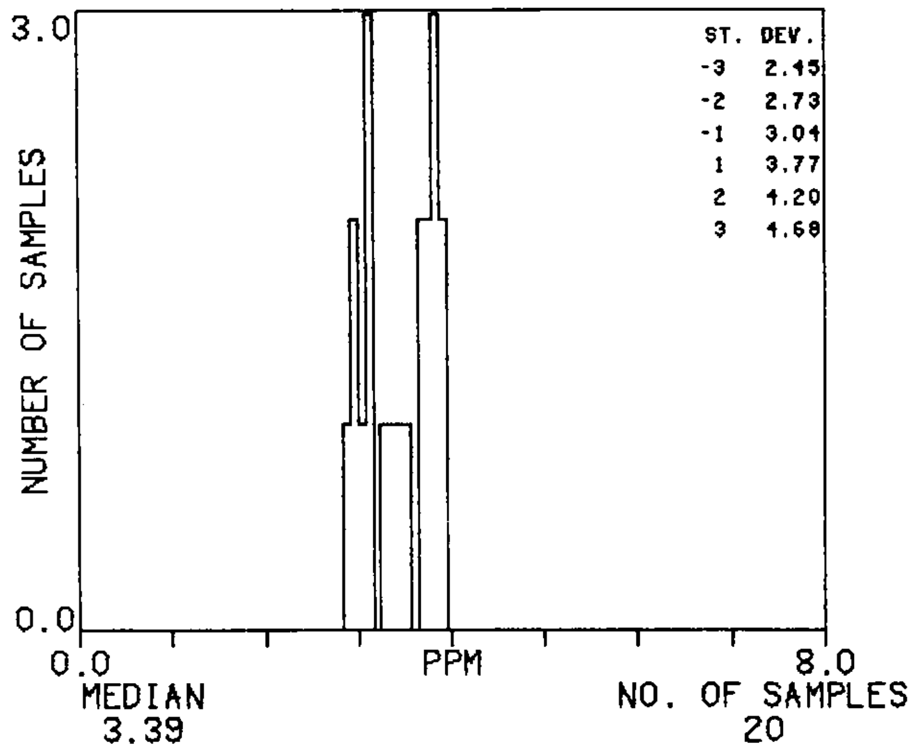
HISTOGRAMS : AD

TEXAS INSTRUMENTS CHATTANOOGA NI16-3 APPALACHIAN BASIN SURVEY 1979

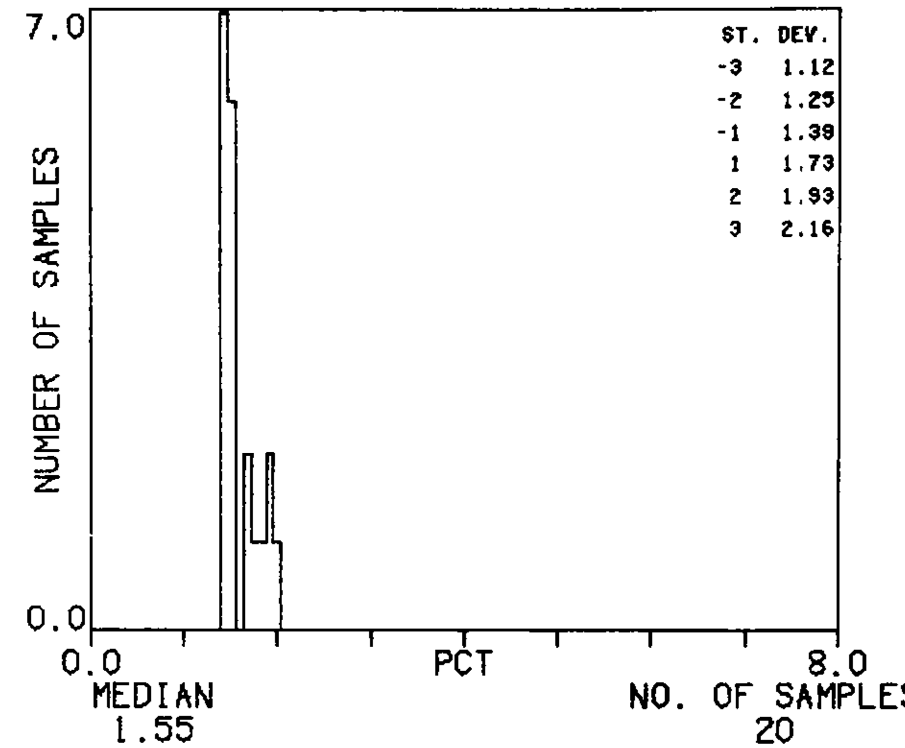
LOGNORMAL THORIUM



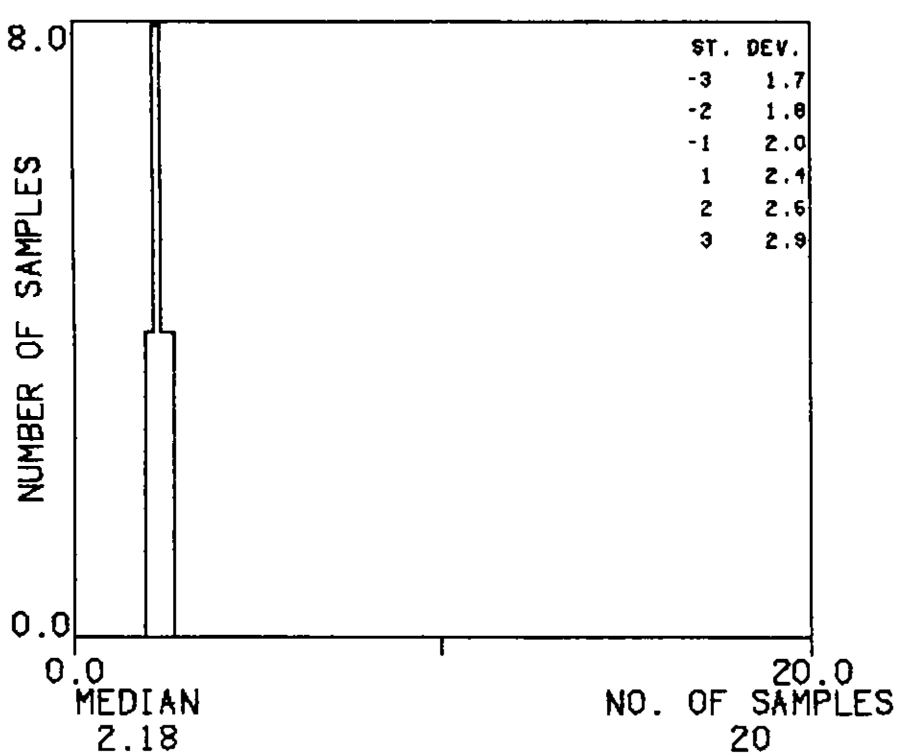
LOGNORMAL URANIUM



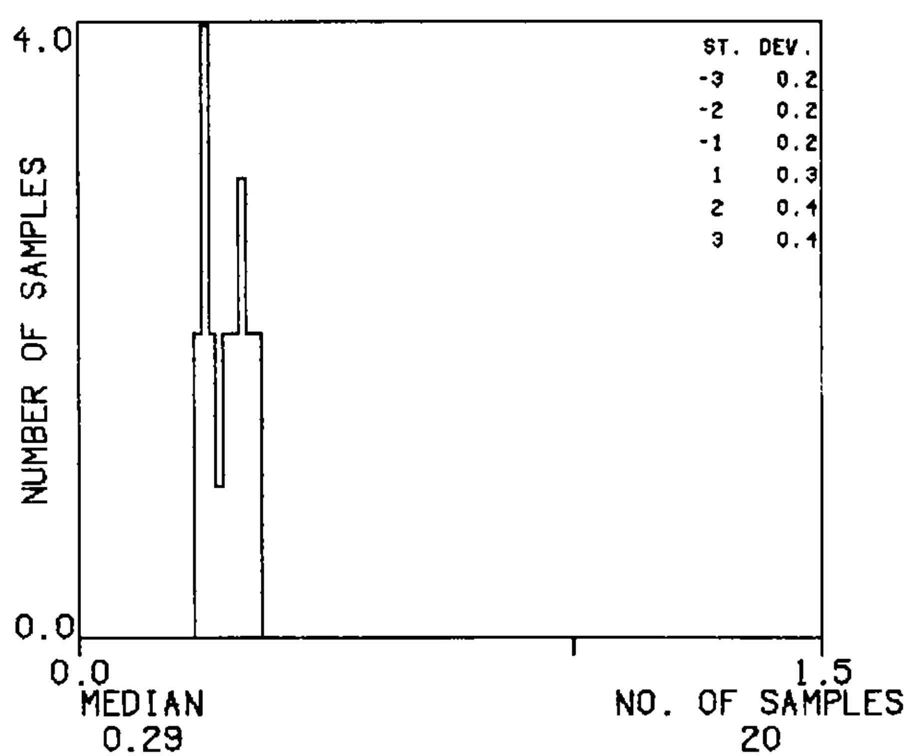
LOGNORMAL POTASSIUM



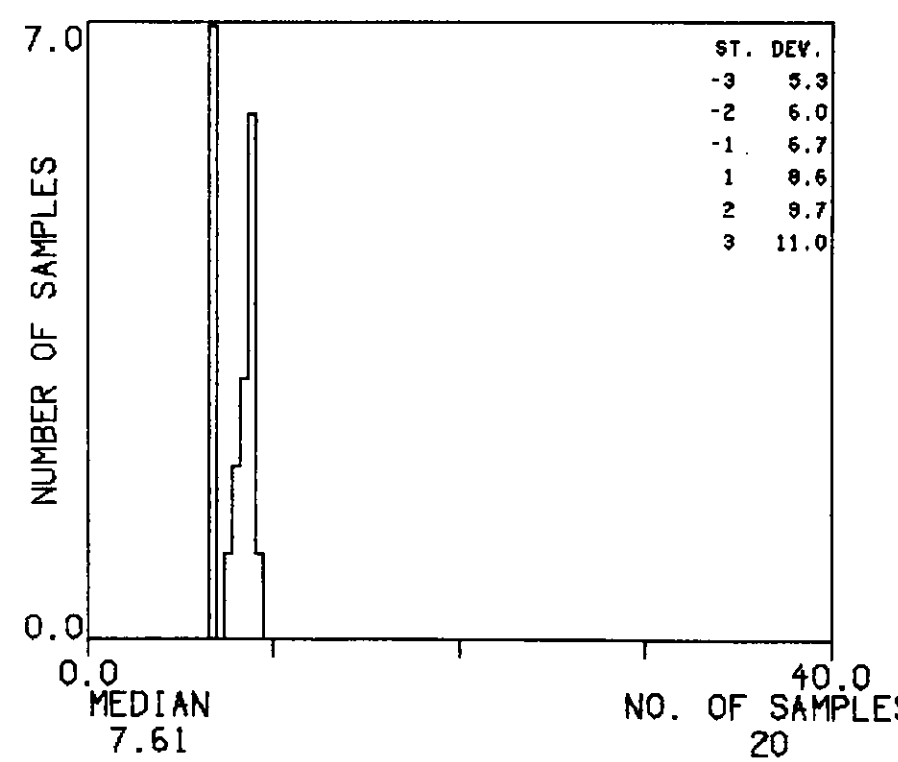
LOGNORMAL U/K



LOGNORMAL U/TH



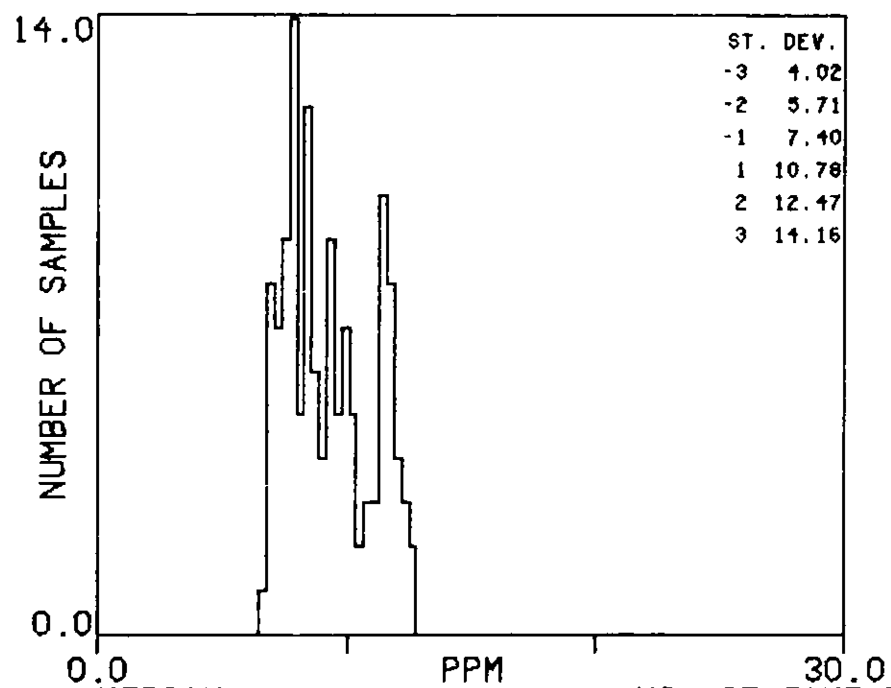
LOGNORMAL TH/K



HISTOGRAMS : VT

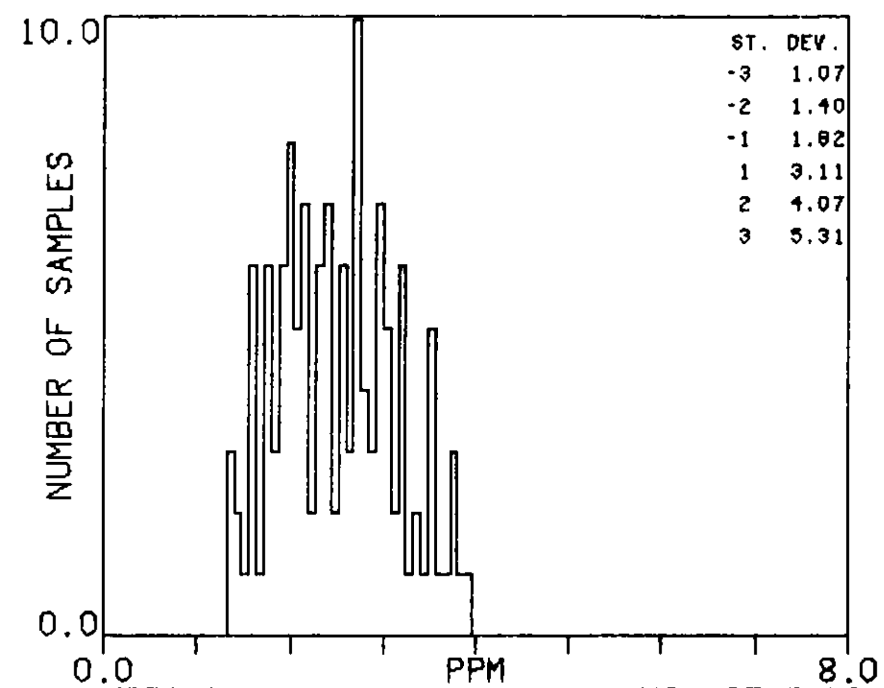
TEXAS INSTRUMENTS CHATTANOOGA NI16-3 APPALACHIAN BASIN SURVEY 1979

NORMAL THORIUM



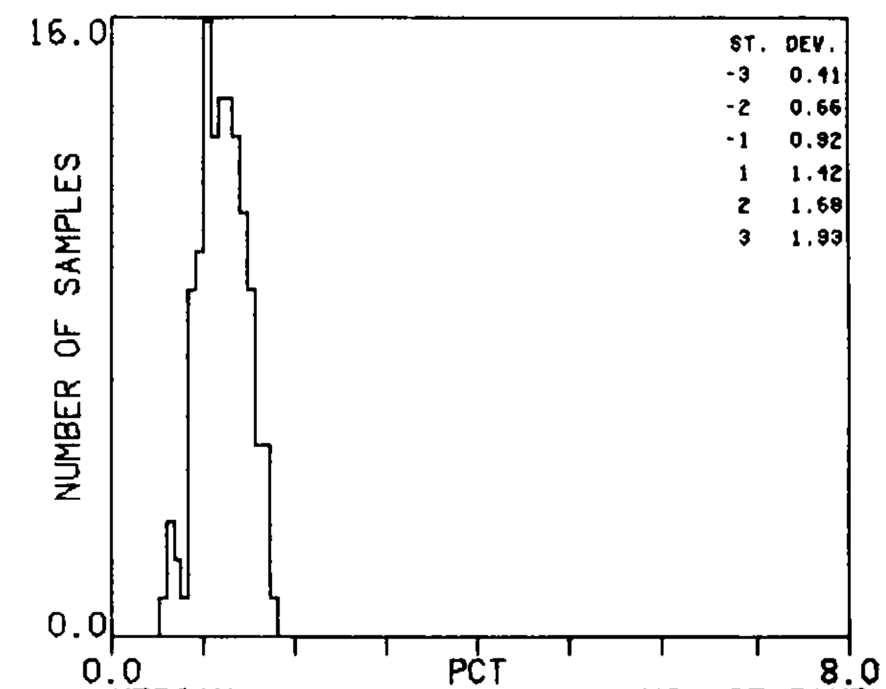
MEDIAN 9.09 NO. OF SAMPLES 127

LOGNORMAL URANIUM



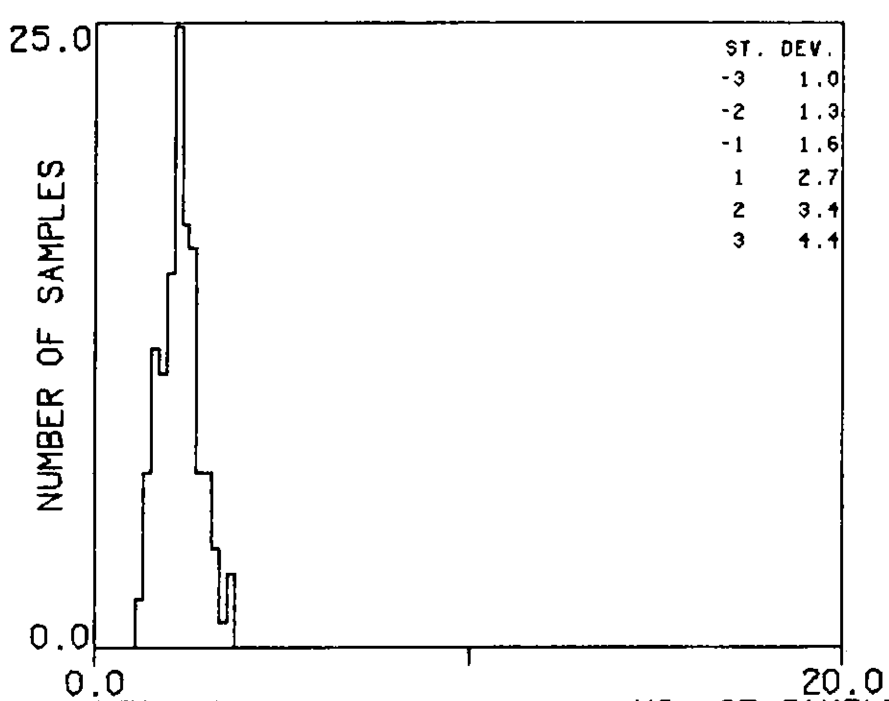
MEDIAN 2.38 NO. OF SAMPLES 127

NORMAL POTASSIUM



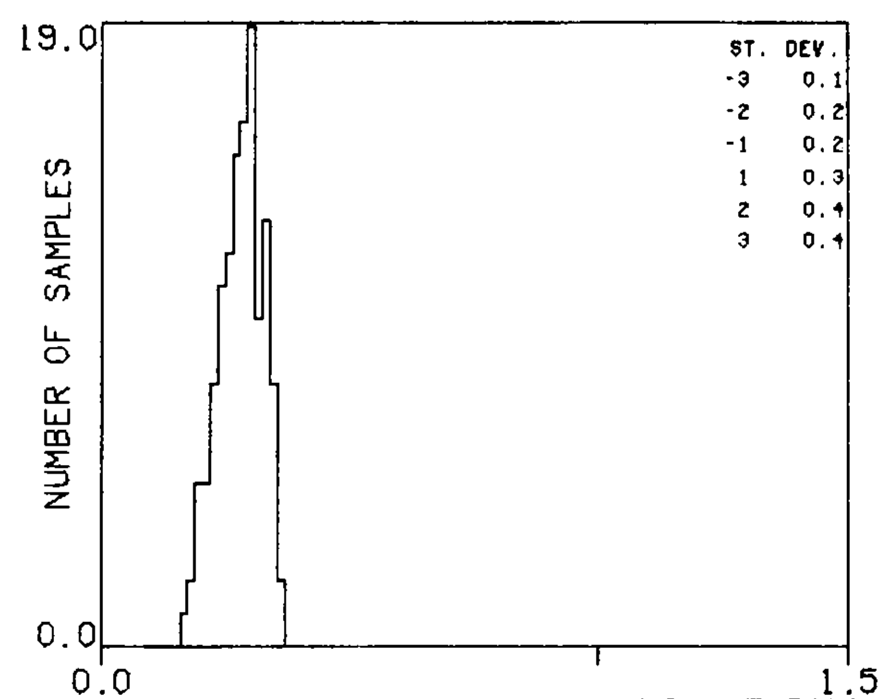
MEDIAN 1.17 NO. OF SAMPLES 127

LOGNORMAL U/K



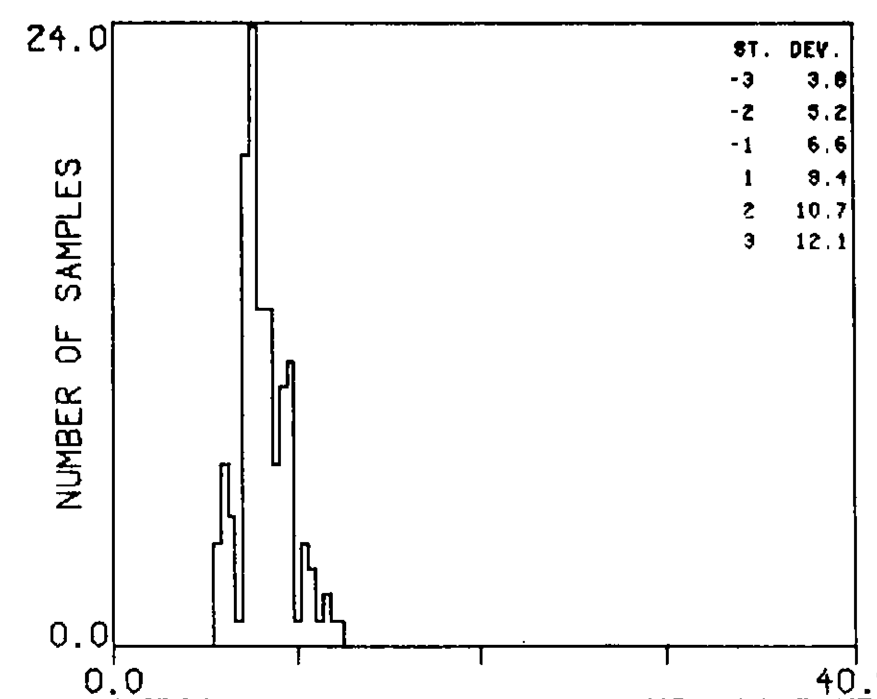
MEDIAN 2.09 NO. OF SAMPLES 127

NORMAL U/TH



MEDIAN 0.27 NO. OF SAMPLES 127

NORMAL TH/K

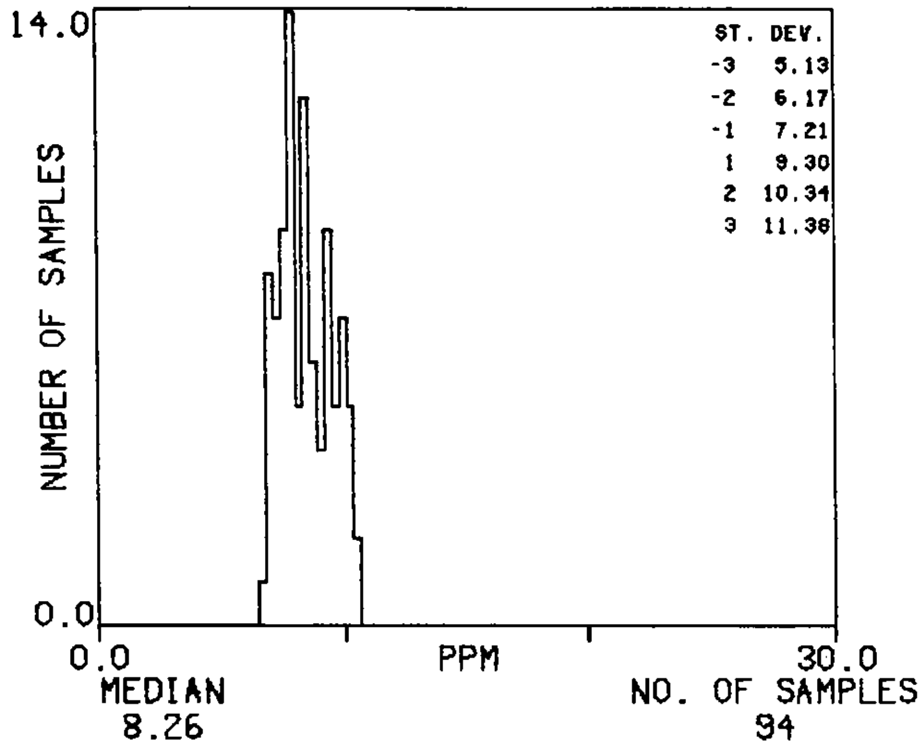


MEDIAN 7.96 NO. OF SAMPLES 127

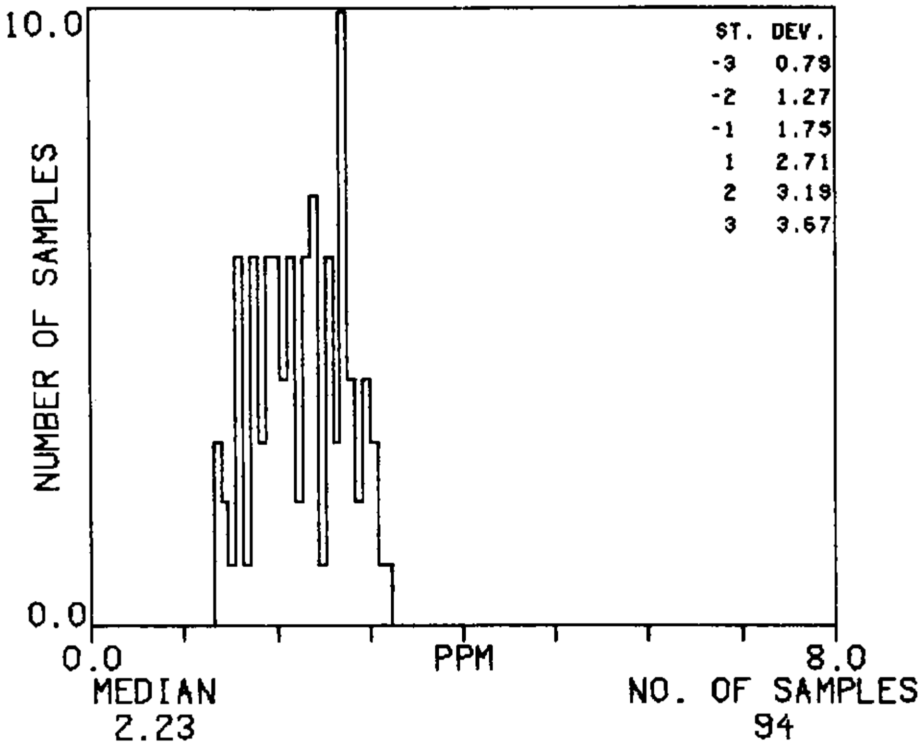
HISTOGRAMS : VT-1

TEXAS INSTRUMENTS CHATTANOOGA NI16-3 APPALACHIAN BASIN SURVEY 1979

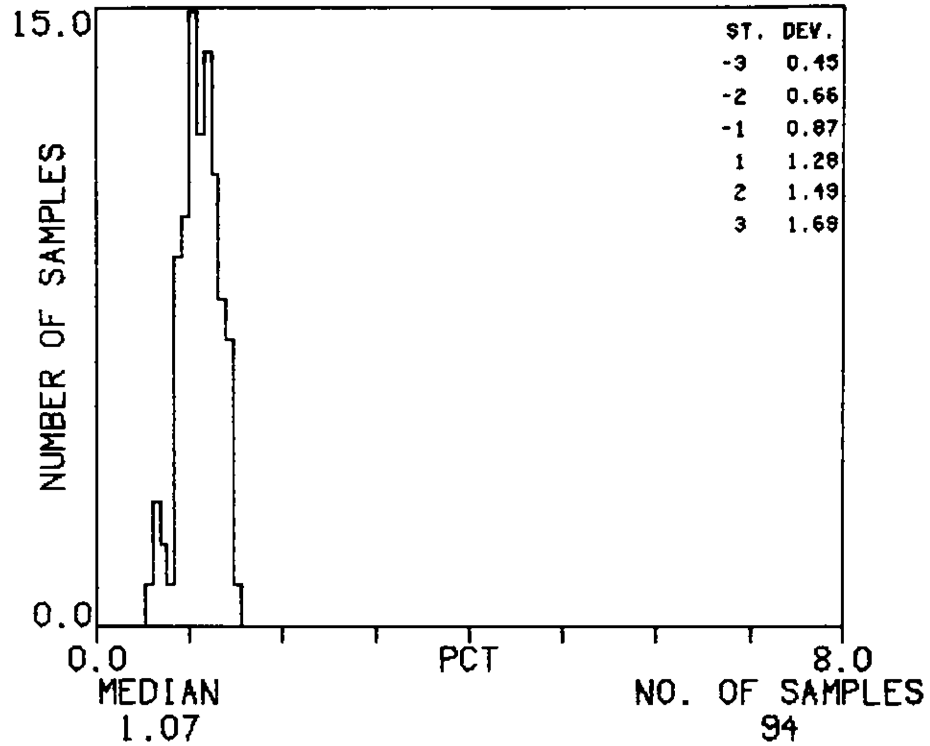
NORMAL THORIUM



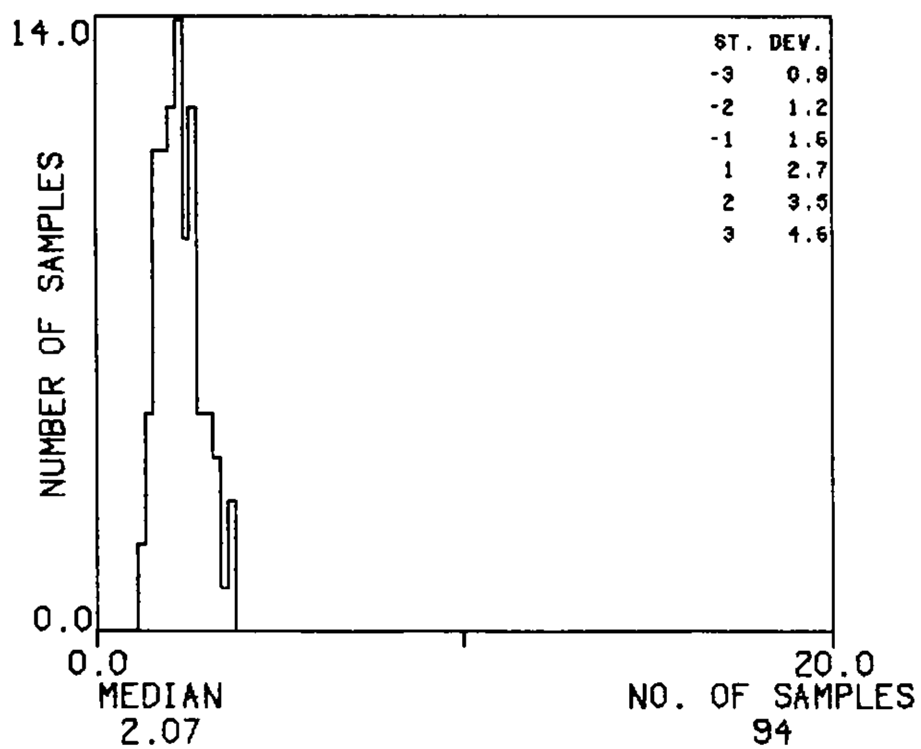
NORMAL URANIUM



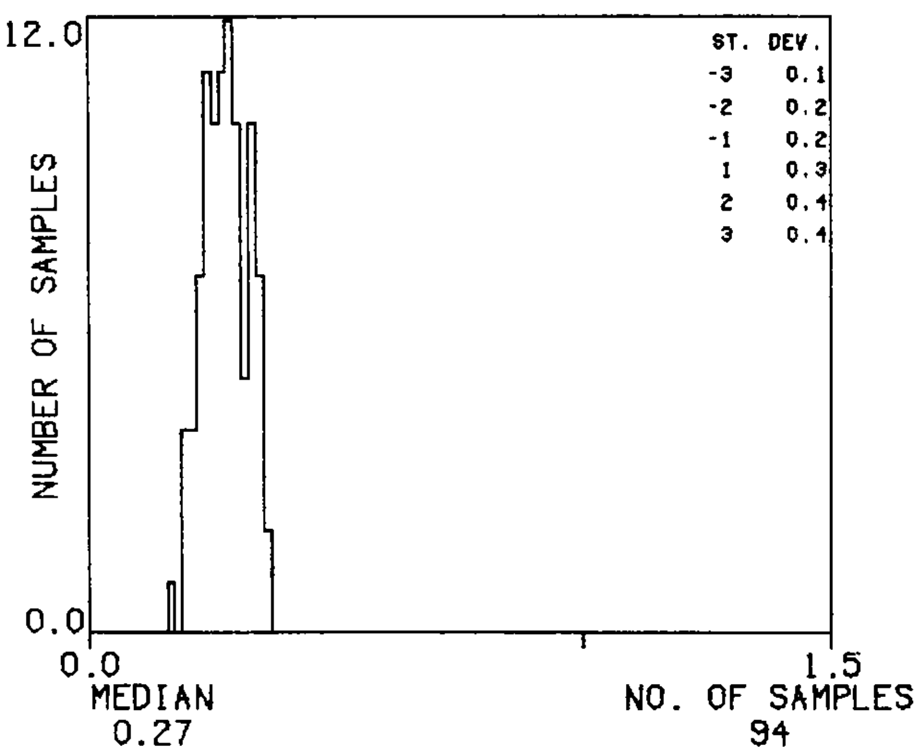
NORMAL POTASSIUM



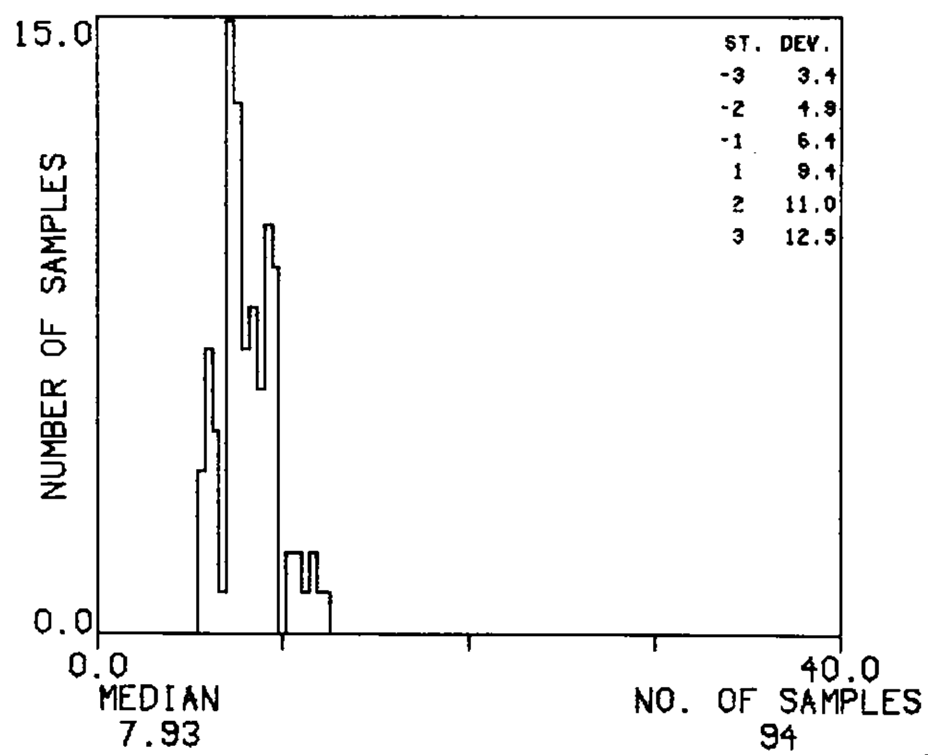
LOGNORMAL U/K



NORMAL U/TH

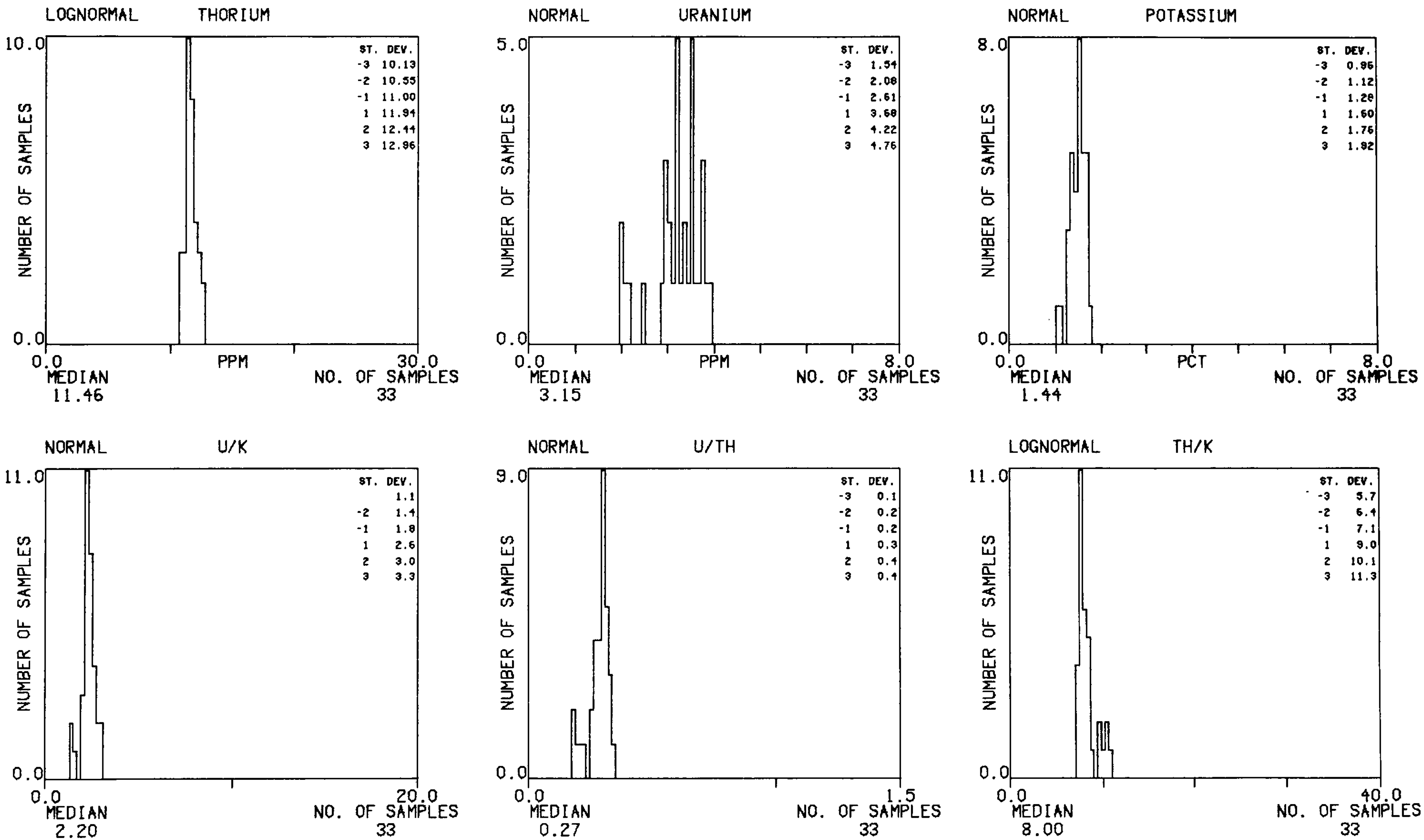


NORMAL TH/K



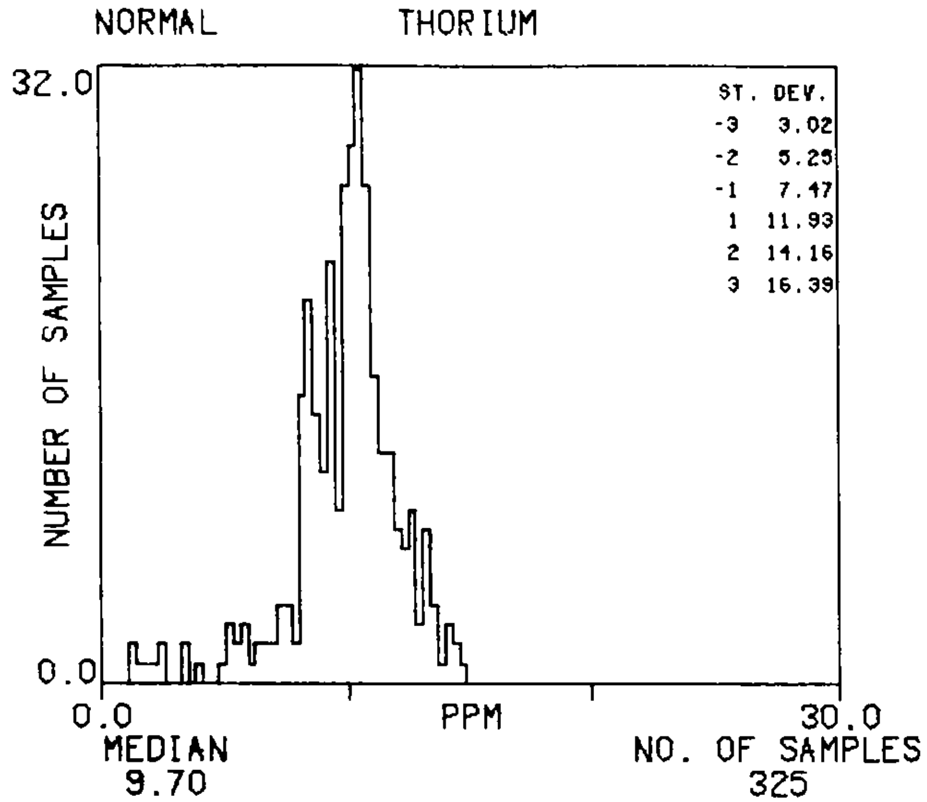
HISTOGRAMS : VT-2

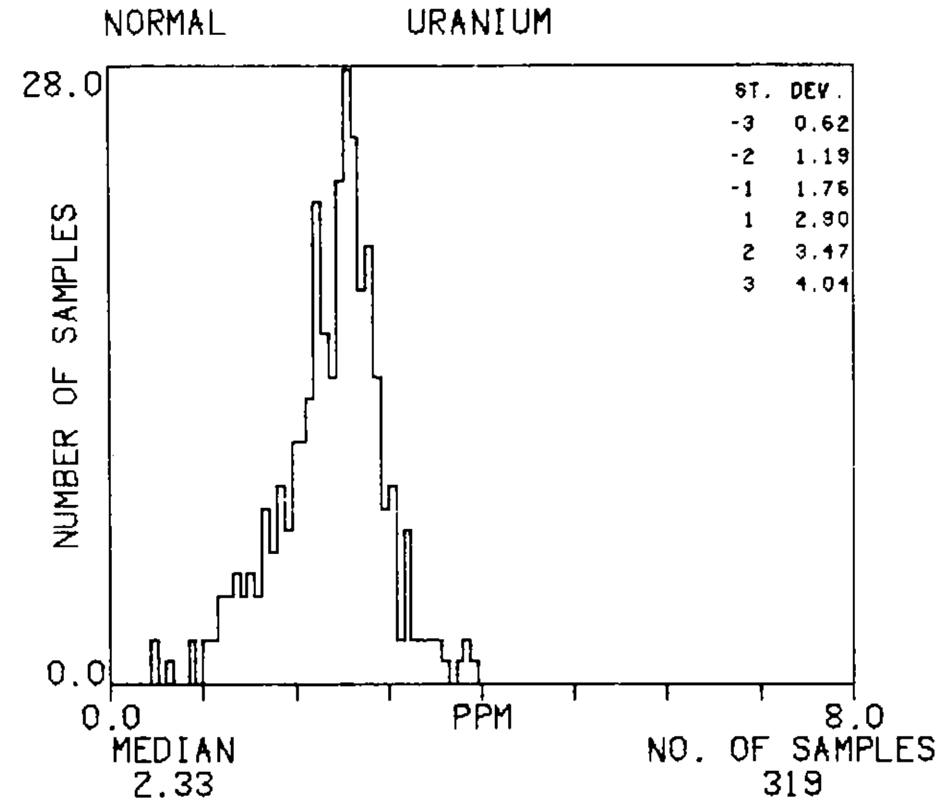
TEXAS INSTRUMENTS CHATTANOOGA NI16-3 APPALACHIAN BASIN SURVEY 1979

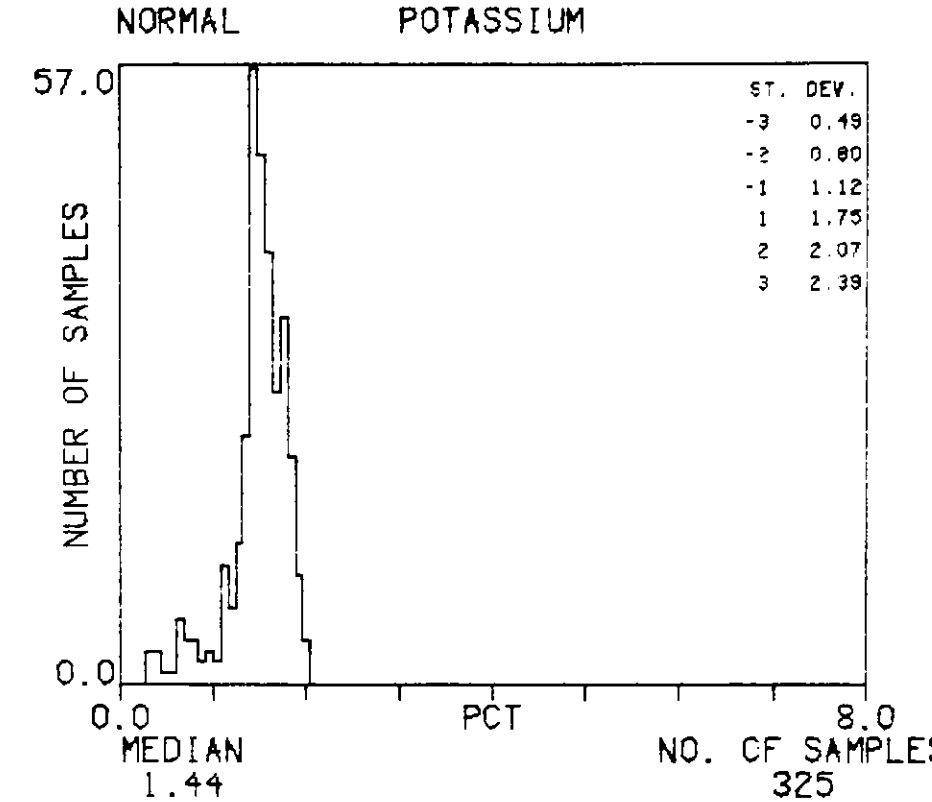


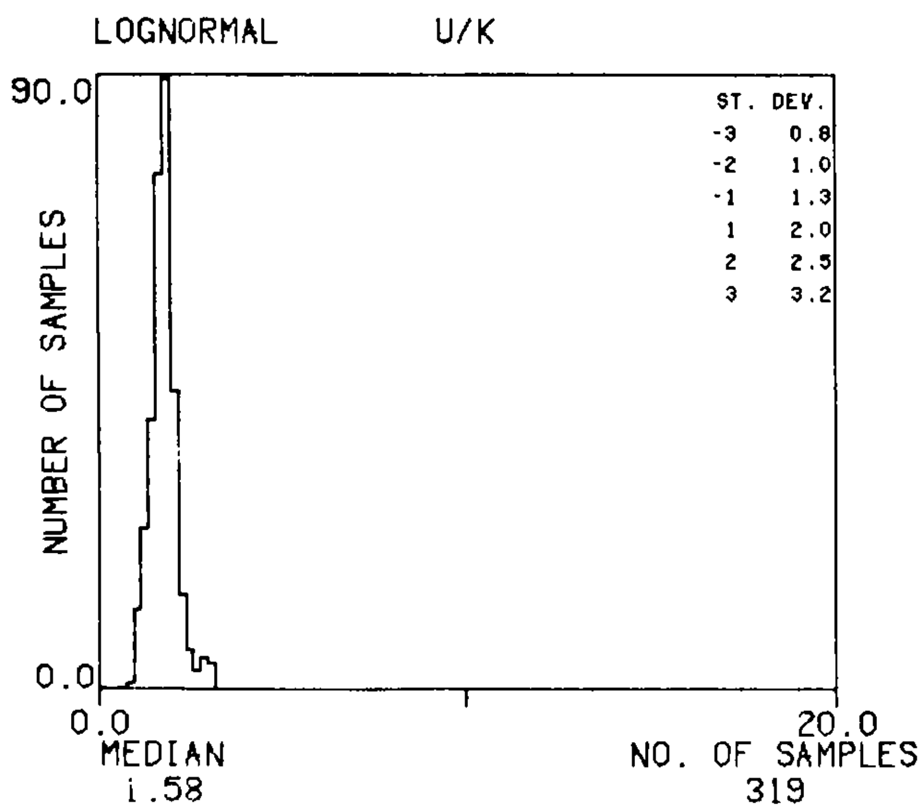
HISTOGRAMS : BT

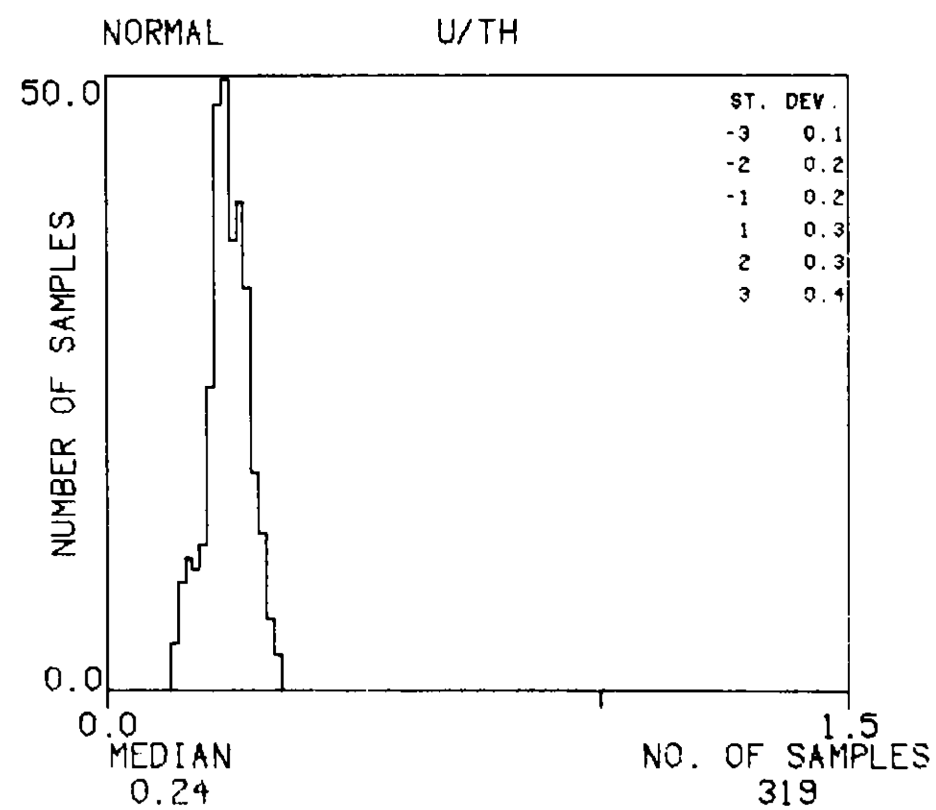
TEXAS INSTRUMENTS CHATTANOOGA NI16-3 APPALACHIAN BASIN SURVEY 1979

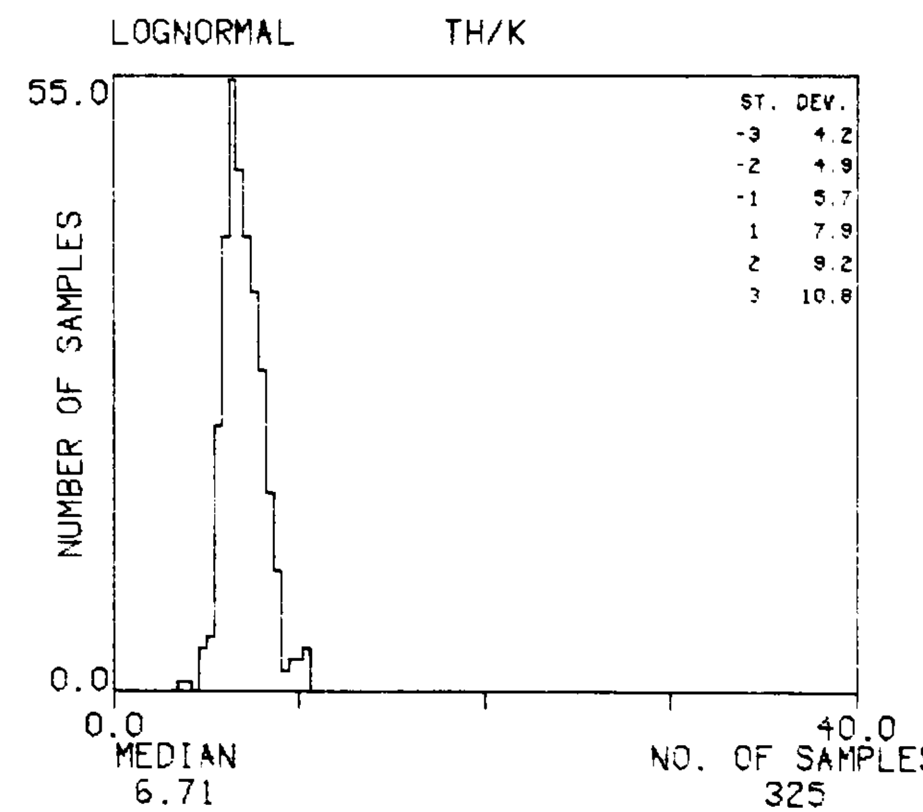












HISTOGRAMS : BT-1

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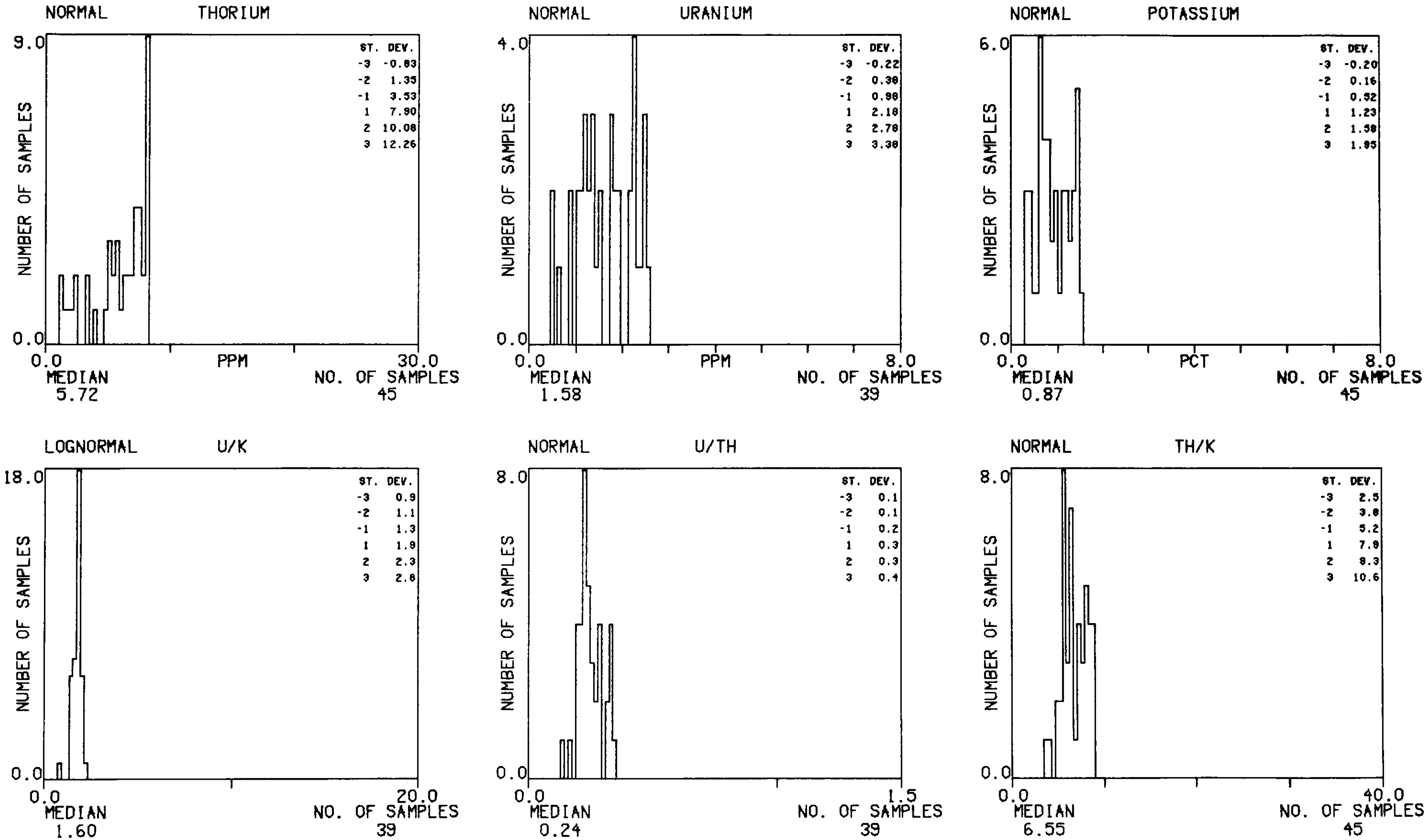

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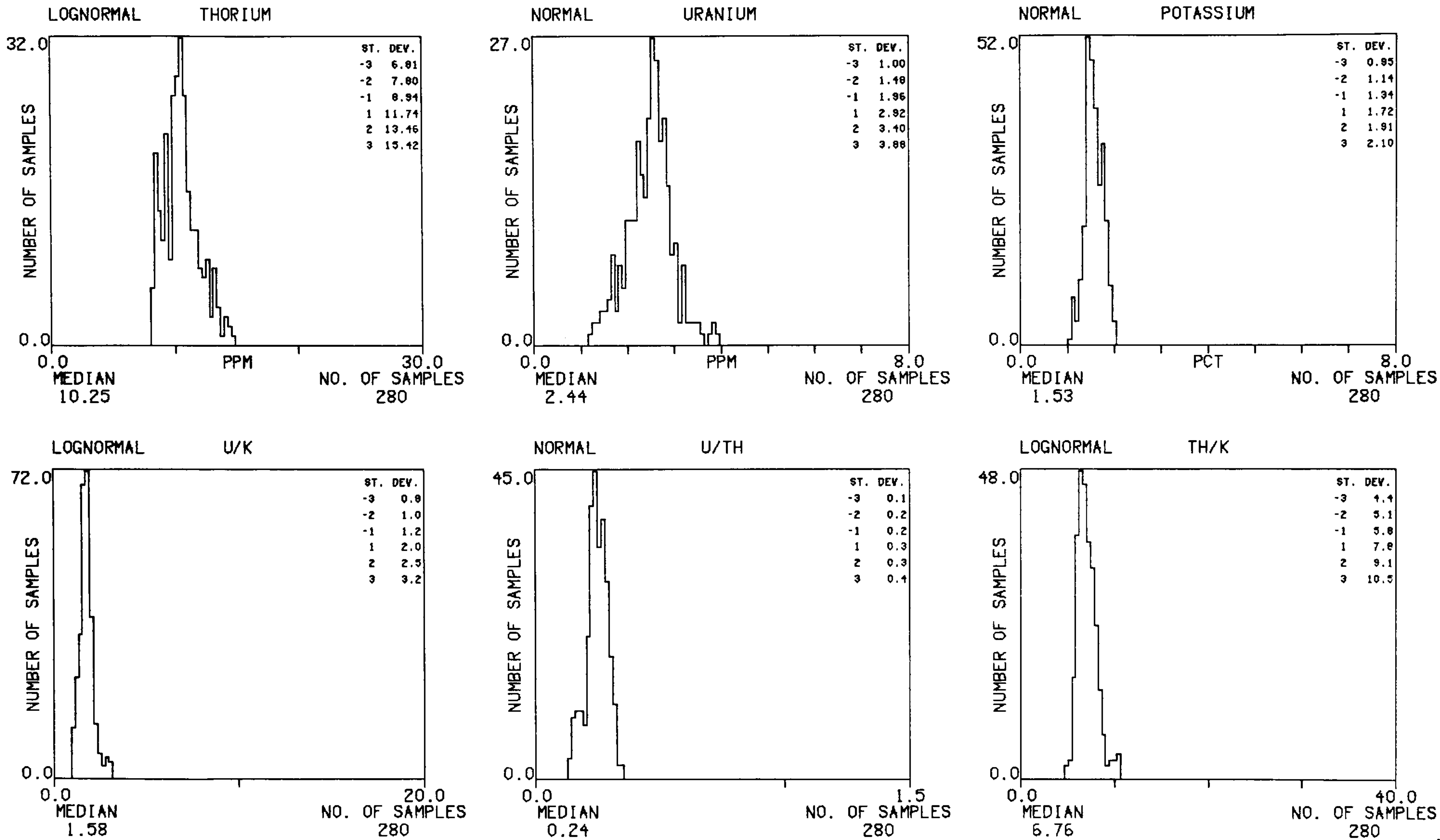

HISTOGRAMS : TG

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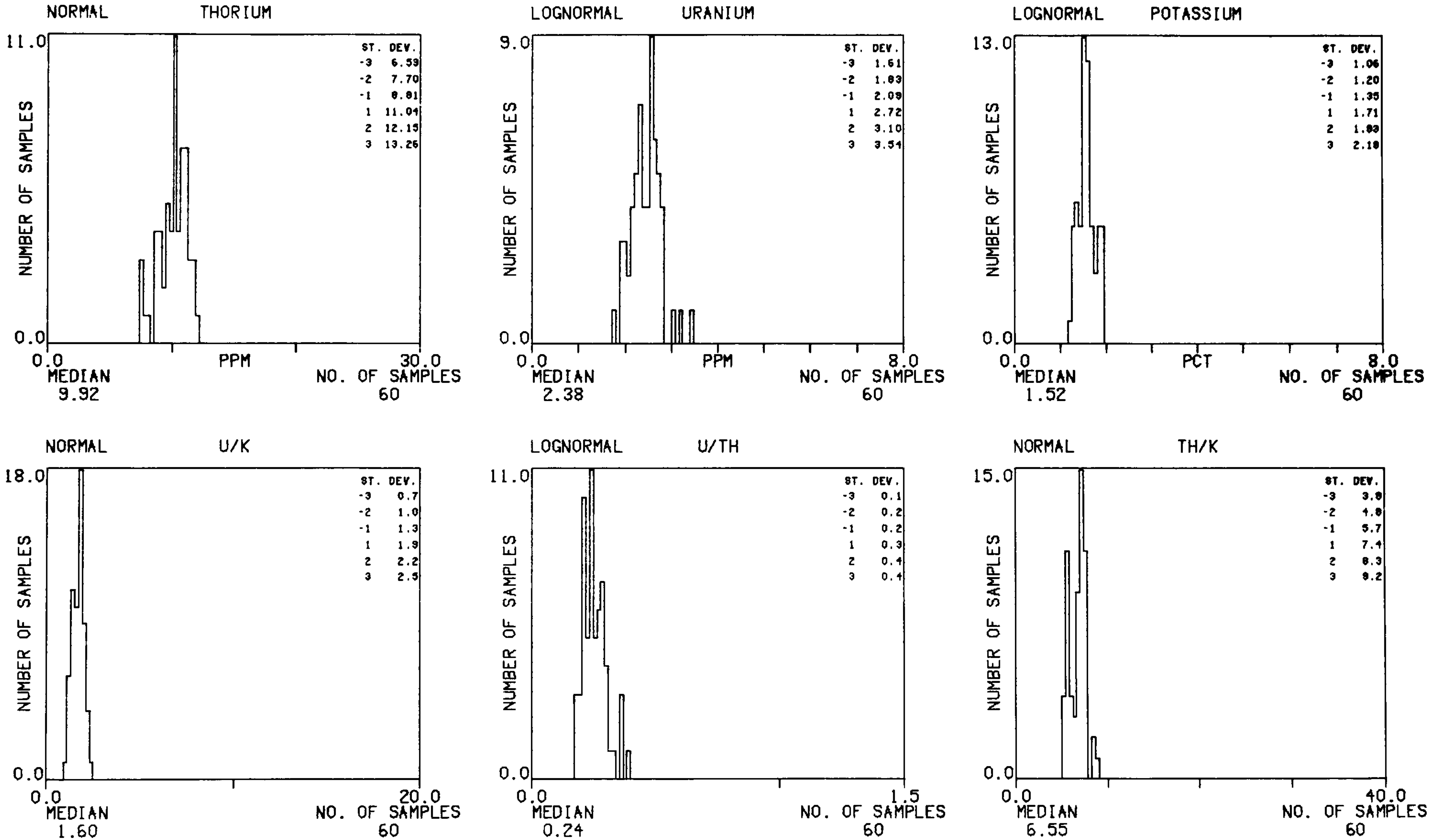

HISTOGRAMS : NT

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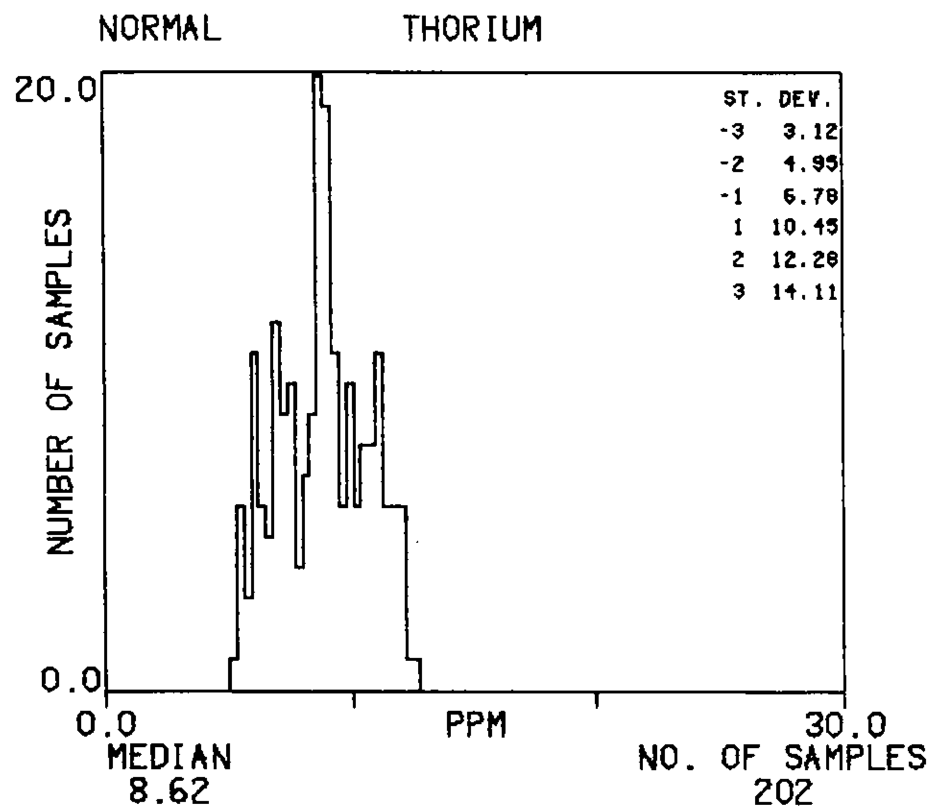

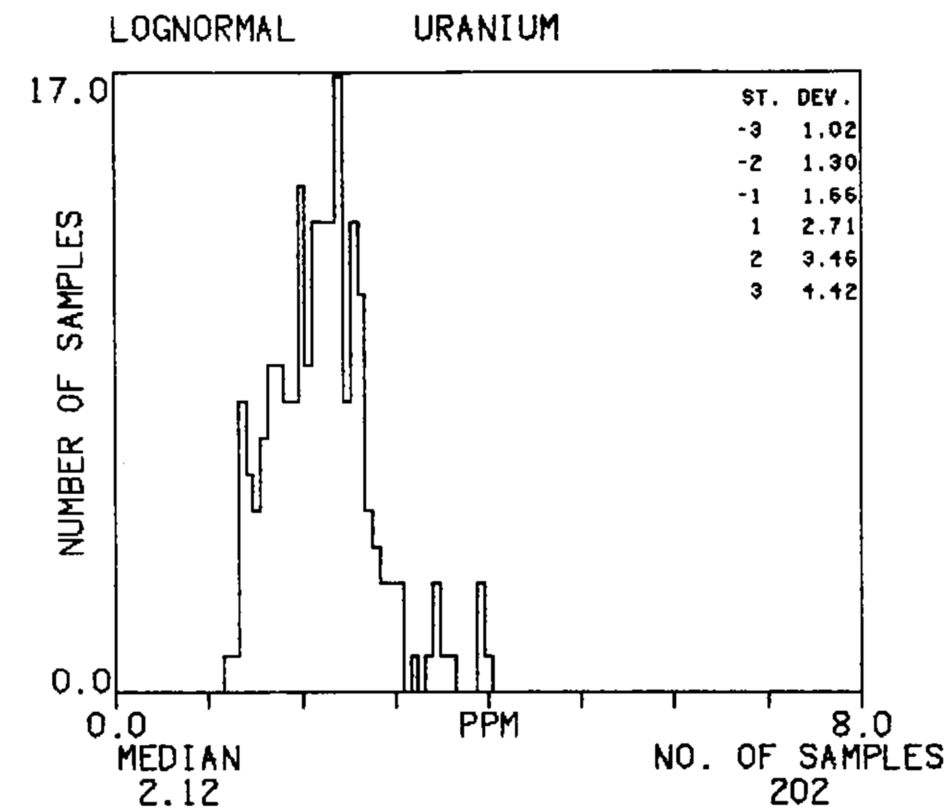

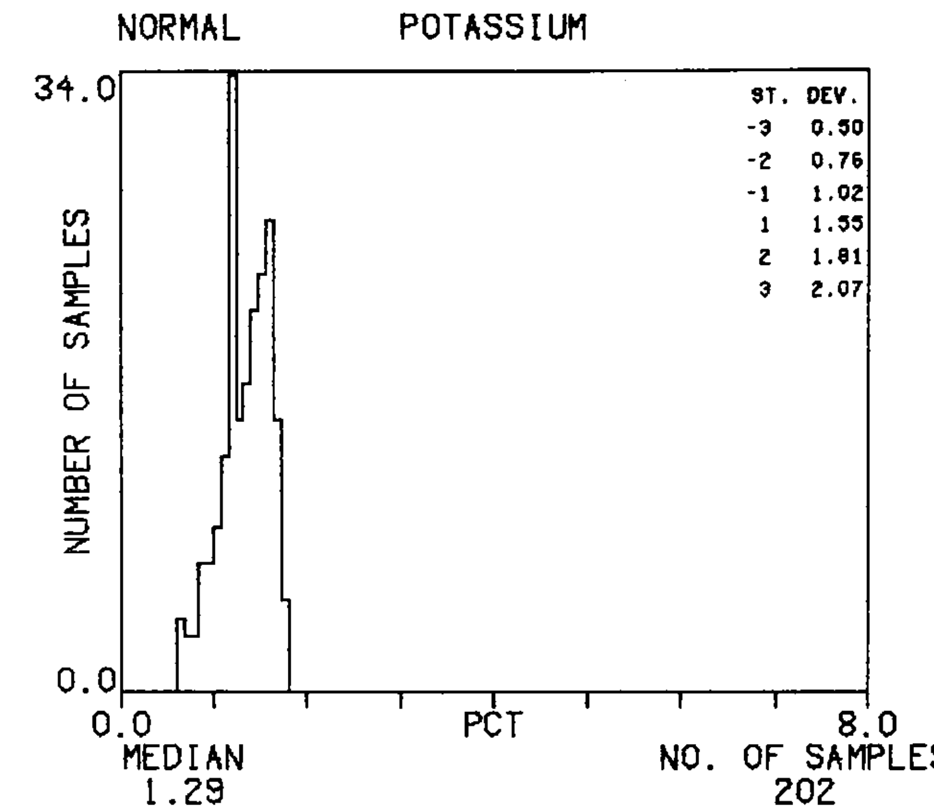

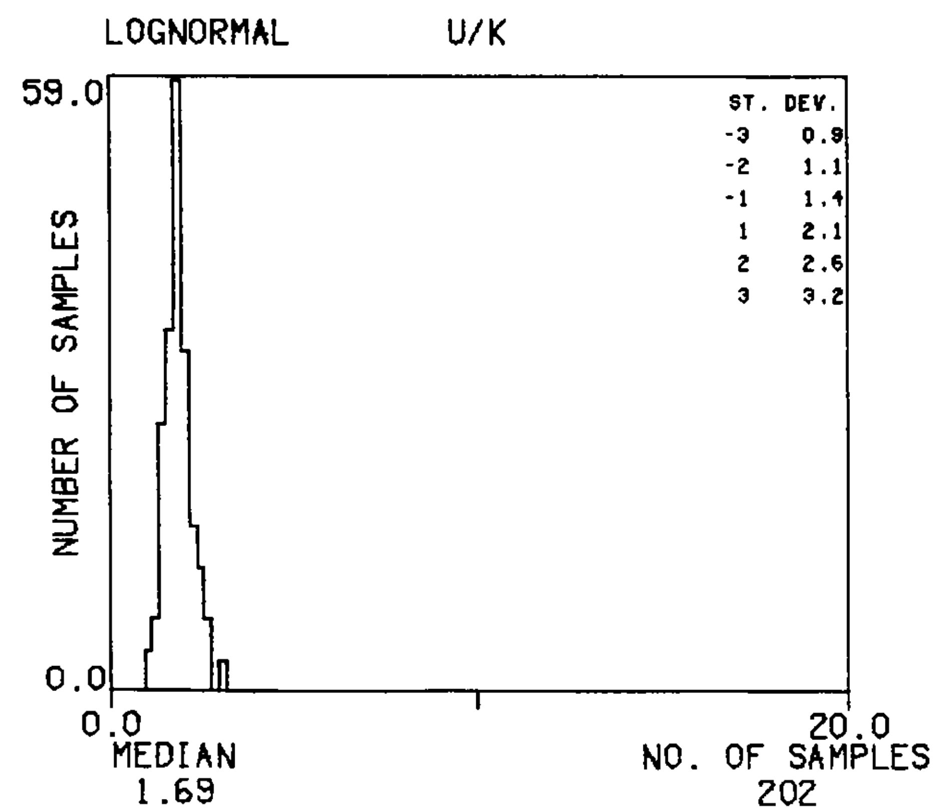

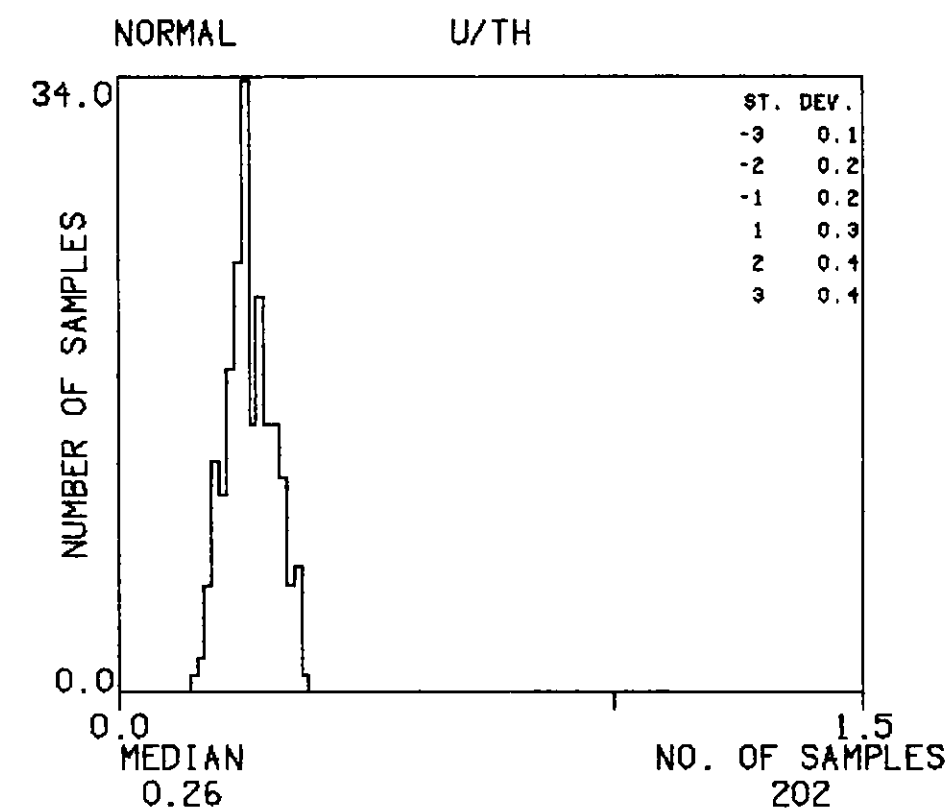

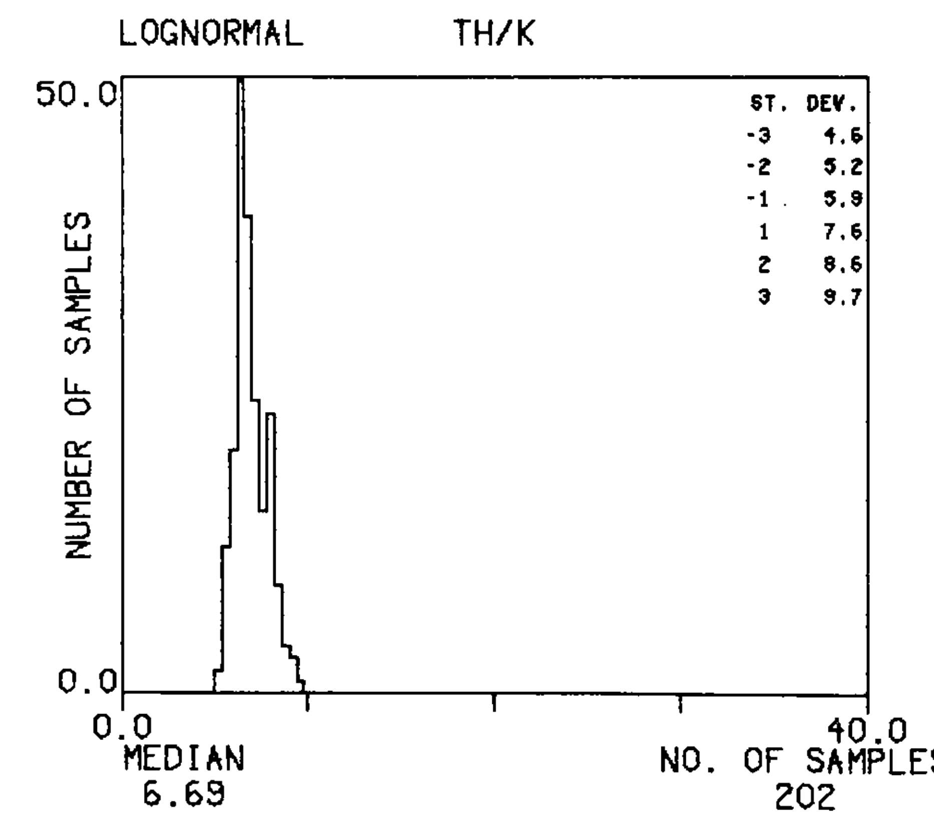

HISTOGRAMS : PG

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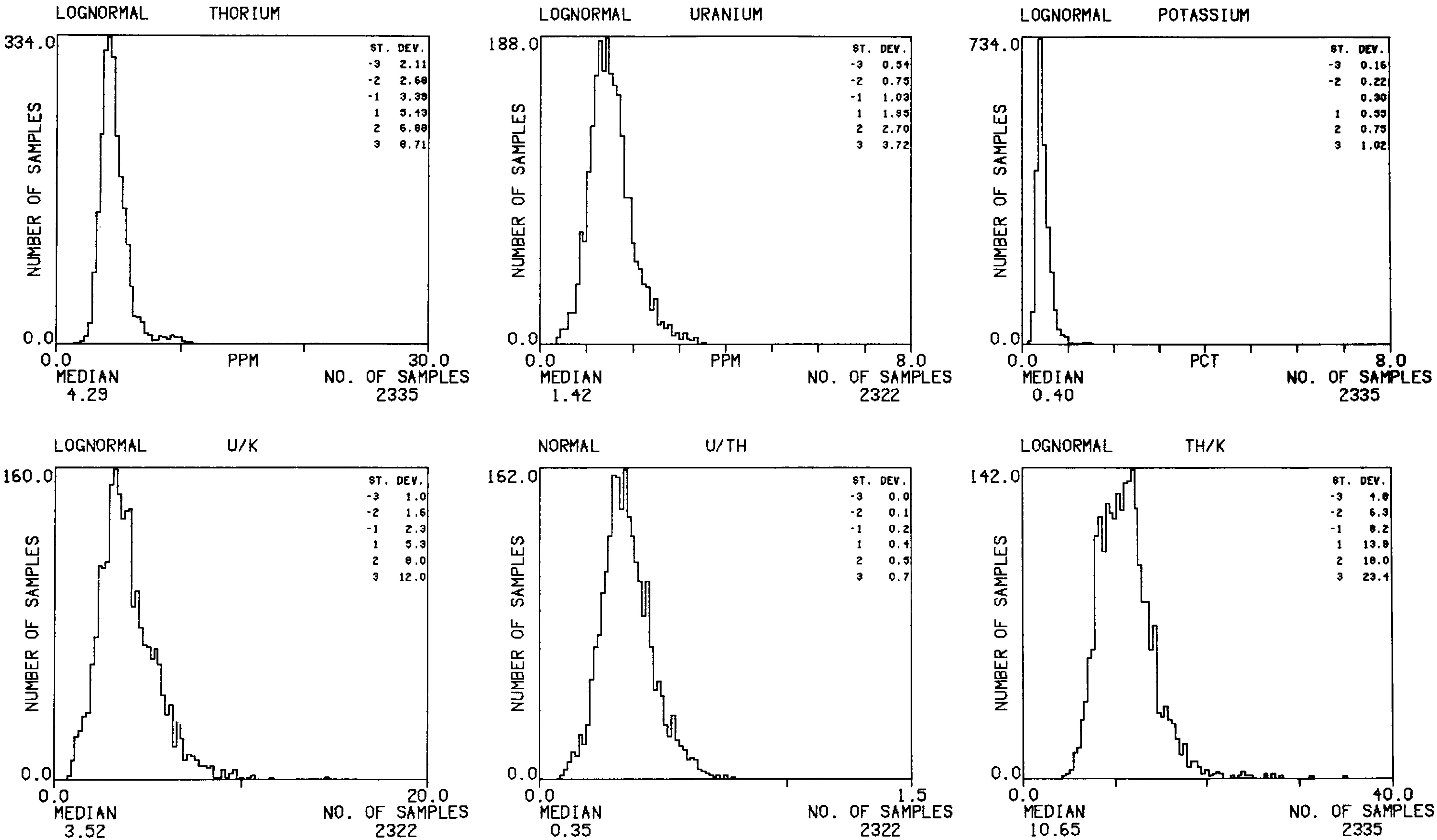

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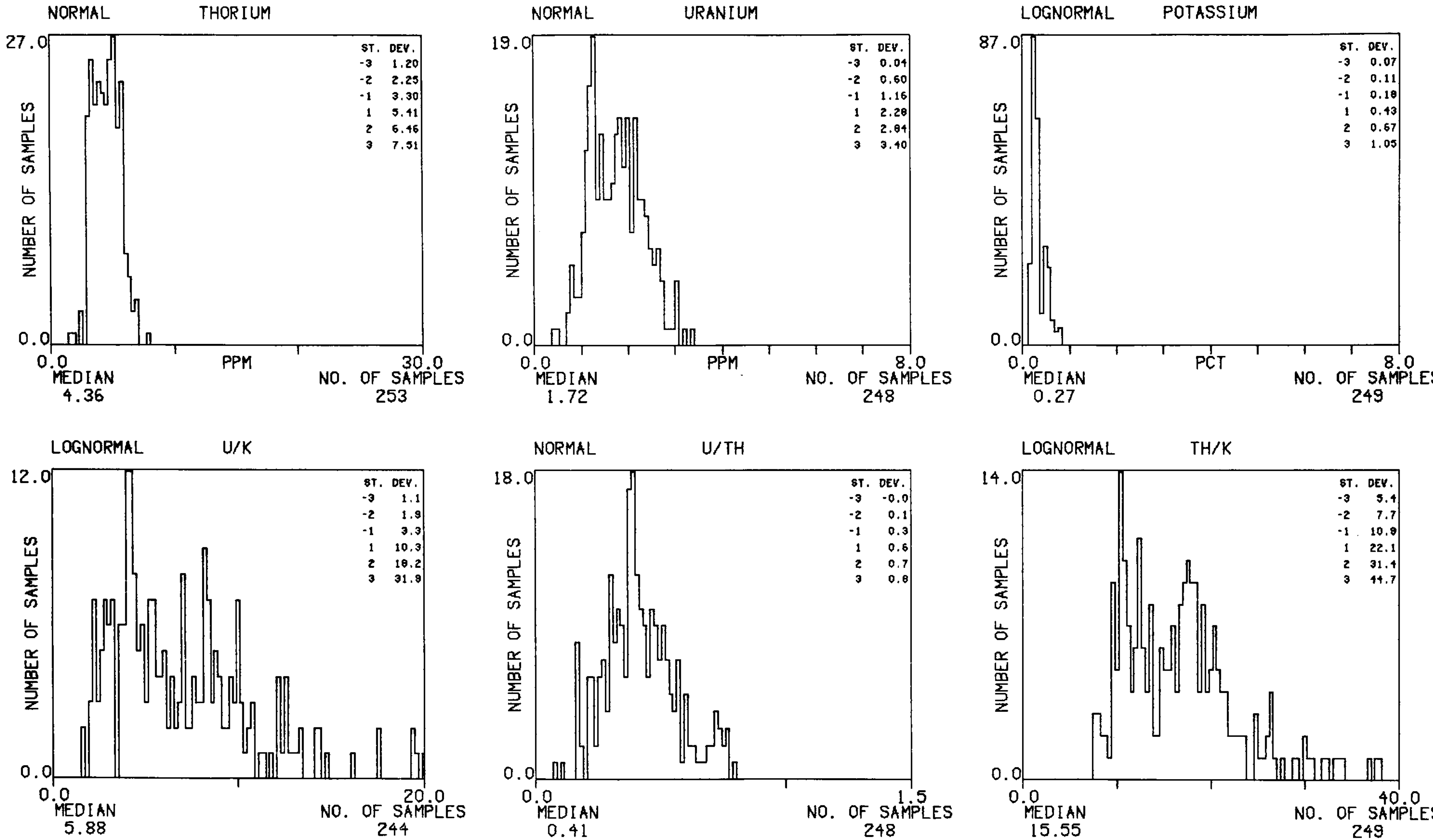

HISTOGRAMS : TA

TEXAS INSTRUMENTS CHATTANOOGA NI16-3 APPALACHIAN BASIN SURVEY 1979