Public-data File 91-22o

NATIONAL URANIUM RESOURCE EVALUATION GEOCHEMICAL DATA FOR STREAM- AND LAKE-SEDIMENT SAMPLES IN THE HEALY QUADRANGLE, ALASKA

by

M.A. Wiltse

Alaska Division of
Geological & Geophysical Surveys

December 1990

THIS REPORT HAS NOT BEEN REVIEWED FOR TECHNICAL CONTENT (EXCEPT AS NOTED IN TEXT) OR FOR CONFORMITY TO THE EDITORIAL STANDARDS OF DGGS.

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INTRODUCTION

Purpose:

In December of 1990 the Alaska Division of Geological and Geophysical Surveys (ADGGS) began a mineral resource evaluation of those lands still available for state selection under the Alaska Statehood Act. As part of that process ADGGS is reviewing the stream- and lake-sediment geochemical data generated during the U.S. Department of Energy, National Uranium Resource Evaluation (NURE) program.

This Public-data File has been released so that a summary of that data is available to interested persons. This publication has not been formally reviewed for technical accuracy or for conformity to the editorial standards of ADGGS.

Scope of data:

ADGGS has reviewed NURE geochemical data for the following 1:250,000 quadrangles:

Anchorage	ANC
Baird Mountains	XBM
Beaver	BVR
Bendeleben	BEN
Bering Glacier	XBG
Bettles	BET
Big Delta	XBD
Black River	BLR
Candle	CAN
Chandalar	CHN
Charley River	CHR
Circle	CIR
Eagle	EAG
Gulkana	GUL
Healy	HEA
Hughes	HUG
Iditarod	IDT
Kateel River	KAT
Lime Hills	LIM
Livengood	LIV
Medfra	MED
Melozitna	MLZ
Misheguk Mountain	MIS
Mount Hayes	XMH
Nabesna	NAB

Nome	NOM
Norton Bay	NOB
Nulato	NUT
Phillip Smith Mountains	PSM
Point Hope	XPH
Point Lay	XPL
Ruby	RUB
Selawik	SLK
Shungnak	SHU
Sleetmute	SLT
Solomon	SOL
Talkeetna Mountains	TLM
Tanacross	TNX
Tanana	TAN
Teller	TEL
Umiat	UMI
Unalakleet	UKT
Utukok River	XUR
Valdez	VAL
Wiseman	WIS

Limitations of data:

Our review has been limited to the following elements: Ag, As, Au, Ba, Be, Bi, Cd, Co, Cr, Cu, Fe, La, Mn, Mo, Ni, Pb, Sb, Sn, Ti, U, U/Th, V, W, Zn

The Nure data set also contains analyses for: Al, Ca, Ce, Cl, Cs, Dy, Eu, Hf, K, Li, Lu, Mg, Na, Nb, Rb, Sc, Sm, Sr, Ta, Tb, Th, Yb, Zr. These data have not been analyzed in the present study.

Because of the procedures used in generating the initial chemical analyses, the NURE geochemical data set has severe limitations. Many elements were determined at only a few sample sites resulting in many samples having incomplete data coverage. The detection limit for many elements is high, making those data of limited effectiveness in delineating mineral resources. Regardless of these and other shortcomings, however, the NURE data do provide information concerning mineralization in many poorly accessible parts of Alaska.

Contents:

This Public-data File (PDF), and the PDF's for the above listed quadrangles, contain a columnar ASCII file on a 5 1/4" high density floppy disk that includes: sample number, replicate code, sample type code, latitude, longitude, and the complete set of elemental analyses available for each sample in the quadrangle. These data are consistently ordered in the file as shown below:

Sample number, Replicate code, Latitude, Longitude, Sample-type code, U Ag Bi Cd Cu Nb Ni Pb Sn W As Zr Mo Be Li Al Au Ba Ca Ce Cl Co Cr Cs Dy Eu Fe Hf K La Lu Mn Mg Na Rb Sb Sc Sm Sr Ta Tb Th Ti V Yb Zn U/Th

All values are entered as parts per million. The data file bears a three letter identification and the extension "ASC" (eg. EAG.ASC for the Eagle Quadrangle data file).

A sample replicate code of "0" indicates that the sample is the initial sample taken at a site and is the code found for most samples. Subsequent samples collected from the same site have successively higher integer designations. Sample type codes range from "01" to "99". The definition of these codes is found in Appendix A "Key to Sample Types".

Within the elemental analysis fields of a sample, values of -999 indicate that no analyses was attempted for that element. Other negative numbers (eg. -5) in an elemental analysis field of a record indicate that the element was not detected at a level equal to the absolute value of the negative number tabulated.

TREATMENT OF DATA

Elements:

Although all the elemental NURE data available for a quadrangle is included in the digital ASCII file supplied with this PDF, only a 24 element subset of data was analyzed for this PDF: Ag, As, Au, Ba, Be, Bi, Cd, Co, Cr, Cu, Fe, La, Mn, Mo, Ni, Pb, Sb, Sn, Ti, U, U/Th, V, W, Zn.

Grouping of data:

The majority of the Alaska Nure geochemical data is derived from stream sediment or lake sediment samples. Many data sets, however, have a few samples that are subtypes of these two fundamental sample groups. For the purpose of the data review released in this PDF, all subtype samples have been recoded to either the stream sediment type or the lake sediment type, whichever type they most closely resembled. We estimate that less than 1 percent of the samples encountered in this review were recoded.

Following sample-type recoding, brief summary statistics were calculated separately for the stream sediment samples (type=12) and for the lake sediment samples (type=13). These statistics provide a quick reference to the number of samples that have analytical values exceeding the detection limit and provide an indication of the geochemical dispersion of the elements for each sample type.

Single-element Pseudomaps of the data have been made that show the location of all samples having analytical values greater than the mean. This was accomplished by separately standardizing the data for each sample type, recoding all standard scores that were less-than-or-equal-to-zero to zero and then plotting a symbol at each sample site, the size of which is proportional to the elemental standardized value (Z-score) at that sample site. Because Z-scores are measures of standard deviation, this procedure results in a psuedomap with varying symbol size that directly reflects how far a sample's element content is above the mean. The larger symbols correspond to element values that are farthest above the mean value for the element in question. A Symbol-size key is provided in figure 1 which indicates the symbol size for element abundances from 1 to 6 standard deviations above the mean.

Healy

THE FOLLOWING RESULTS ARE FOR:
TYPE = 12.000

TOTAL OBSERVATIONS: 830

	U	AG	BI	CD	CU
N OF CASES	829	6	81	88	772
MINIMUM	0.480	5.000	5.000	5.000	8.000
MAXIMUM	45.530	7.000	17.000	24.000	302.000
MEAN	4.983	5.500	6.136	7.045	51.035
STANDARD DEV	4.435	0.837	1.876	3.404	31.063

	NI	PB	SN	W	AS
N OF CASES	669	483	24	33	71
MINIMUM	9.000	5.000	10.000	15.000	6.000
MAXIMUM	437.000	341.000	1310.000	117.000	138.000
MEAN	48.637	13.878	79.875	25.364	32.676
STANDARD DEV	36.375	17.878	264.069	22.799	29.543

	MO	BE	AU	BA	CO
N OF CASES	0	744	7	812	813
MINIMUM	.	1.000	0.170	280.000	3.400
MAXIMUM	.	6.000	0.620	10240.000	321.500
MEAN	.	2.043	0.344	1267.587	18.851
STANDARD DEV	.	0.671	0.187	912.136	13.861

	CR	FE	MN	SB	TI
N OF CASES	806	829	829	206	809
MINIMUM	10.000	7123.000	51.000	2.000	565.000
MAXIMUM	1624.000	311100.000	15440.000	42.000	22950.000
MEAN	123.128	44485.484	890.891	6.383	5164.340
STANDARD DEV	106.359	23087.910	765.055	4.352	1979.506

	V	ZN	UTH	LA
N OF CASES	826	432	808	771
MINIMUM	15.000	46.000	0.142	11.000
MAXIMUM	405.000	1301.000	9.008	337.000
MEAN	137.148	180.199	0.532	40.720
STANDARD DEV	58.445	118.294	0.569	23.949

THE FOLLOWING RESULTS ARE FOR:
TYPE = 13.000

TOTAL OBSERVATIONS: 519

	U	AG	BI	CD	CU
N OF CASES	519	2	33	34	471
MINIMUM	0.340	5.000	5.000	5.000	7.000
MAXIMUM	92.530	8.000	12.000	12.000	214.000
MEAN	3.789	6.500	5.939	6.147	43.677
STANDARD DEV	6.013	2.121	1.749	1.617	25.993

	NI	PB	SN	W	AS
N OF CASES	387	220	8	6	24
MINIMUM	15.000	5.000	10.000	16.000	5.000
MAXIMUM	235.000	66.000	25.000	49.000	39.000
MEAN	37.432	11.109	15.125	26.167	15.750
STANDARD DEV	22.816	7.656	6.058	13.992	9.162

	MO	BE	AU	BA	CO
N OF CASES	0	311	2	485	464
MINIMUM	.	1.000	0.380	223.000	3.100
MAXIMUM	.	4.000	1.080	3585.000	71.400
MEAN	.	1.810	0.730	950.373	14.330
STANDARD DEV	.	0.647	0.495	413.767	8.288

	CR	FE	MN	SB	TI
N OF CASES	473	519	519	35	474
MINIMUM	15.000	3130.000	83.000	2.000	731.000
MAXIMUM	417.000	174000.000	3878.000	26.000	11570.000
MEAN	96.085	30581.563	622.210	7.629	3840.949
STANDARD DEV	48.810	17686.850	423.611	5.750	1521.996

	V	ZN	UTH	LA
N OF CASES	515	256	440	317
MINIMUM	16.000	53.000	0.167	10.000
MAXIMUM	361.000	823.000	19.687	119.000
MEAN	108.775	183.668	0.649	30.697
STANDARD DEV	54.296	79.500	1.103	13.951

THE FOLLOWING RESULTS ARE FOR:
TYPE = 14.000

TOTAL OBSERVATIONS: 3

	U	AG	BI	CD	CU
N OF CASES	3	0	1	0	3
MINIMUM	2.440	.	9.000	.	32.000
MAXIMUM	4.320	.	9.000	.	43.000
MEAN	3.447	.	9.000	.	39.000
STANDARD DEV	0.947	.	.	.	6.083

	NI	PB	SN	W	AS
N OF CASES	3	3	0	0	1
MINIMUM	25.000	6.000	.	.	33.000
MAXIMUM	47.000	25.000	.	.	33.000
MEAN	34.667	14.000	.	.	33.000
STANDARD DEV	11.240	9.849	.	.	.

	MO	BE	AU	BA	CO
N OF CASES	0	3	0	3	3
MINIMUM	.	2.000	.	1126.000	8.100
MAXIMUM	.	2.000	.	1550.000	12.400
MEAN	.	2.000	.	1269.000	10.633
STANDARD DEV	.	0.000	.	243.366	2.250

	CR	FE	MN	SB	TI
N OF CASES	3	3	3	0	3
MINIMUM	95.000	21280.000	361.000	.	3816.000
MAXIMUM	165.000	33900.000	825.000	.	4496.000
MEAN	128.000	29566.667	589.000	.	4099.333
STANDARD DEV	35.171	7178.979	232.103	.	353.883

	V	ZN	UTH	LA
N OF CASES	3	0	3	3
MINIMUM	87.000	.	0.315	27.000
MAXIMUM	110.000	.	0.387	53.000
MEAN	100.667	.	0.357	37.333
STANDARD DEV	12.097	.	0.037	13.796

THE FOLLOWING RESULTS ARE FOR:
TYPE = 97.000

TOTAL OBSERVATIONS: 1

	U	AG	BI	CD	CU
N OF CASES	1	0	0	0	1
MINIMUM	3.120	.	.	.	53.000
MAXIMUM	3.120	.	.	.	53.000
MEAN	3.120	.	.	.	53.000
STANDARD DEV	.	.	.	.	.

	NI	PB	SN	W	AS
N OF CASES	1	1	0	0	0
MINIMUM	46.000	23.000	.	.	.
MAXIMUM	46.000	23.000	.	.	.
MEAN	46.000	23.000	.	.	.
STANDARD DEV	.	.	.	.	.

	MO	BE	AU	BA	CO
N OF CASES	0	1	0	1	1
MINIMUM	.	2.000	.	1087.000	20.700
MAXIMUM	.	2.000	.	1087.000	20.700
MEAN	.	2.000	.	1087.000	20.700
STANDARD DEV	.	.	.	.	.

	CR	FE	MN	SB	TI
N OF CASES	1	1	1	1	1
MINIMUM	150.000	55130.000	1250.000	4.000	4467.000
MAXIMUM	150.000	55130.000	1250.000	4.000	4467.000
MEAN	150.000	55130.000	1250.000	4.000	4467.000
STANDARD DEV	.	.	.	.	.

	V	ZN	UTH	LA
N OF CASES	1	1	1	1
MINIMUM	168.000	271.000	0.416	27.000
MAXIMUM	168.000	271.000	0.416	27.000
MEAN	168.000	271.000	0.416	27.000
STANDARD DEV	.	.	.	.

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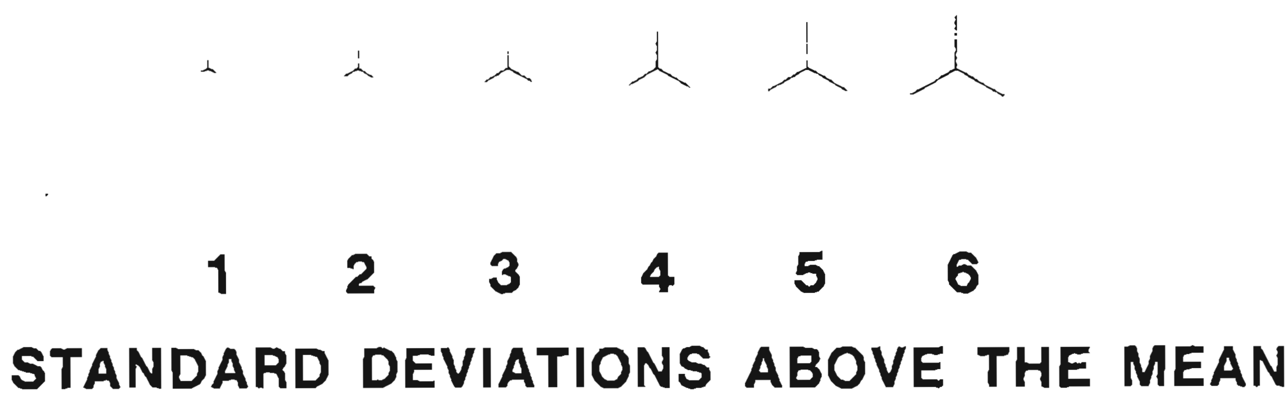
Figure 1. Symbol-size key for single element pseudomaps indicating the size of plotted symbols for values that are from 1 to 6 standard deviations above the mean.



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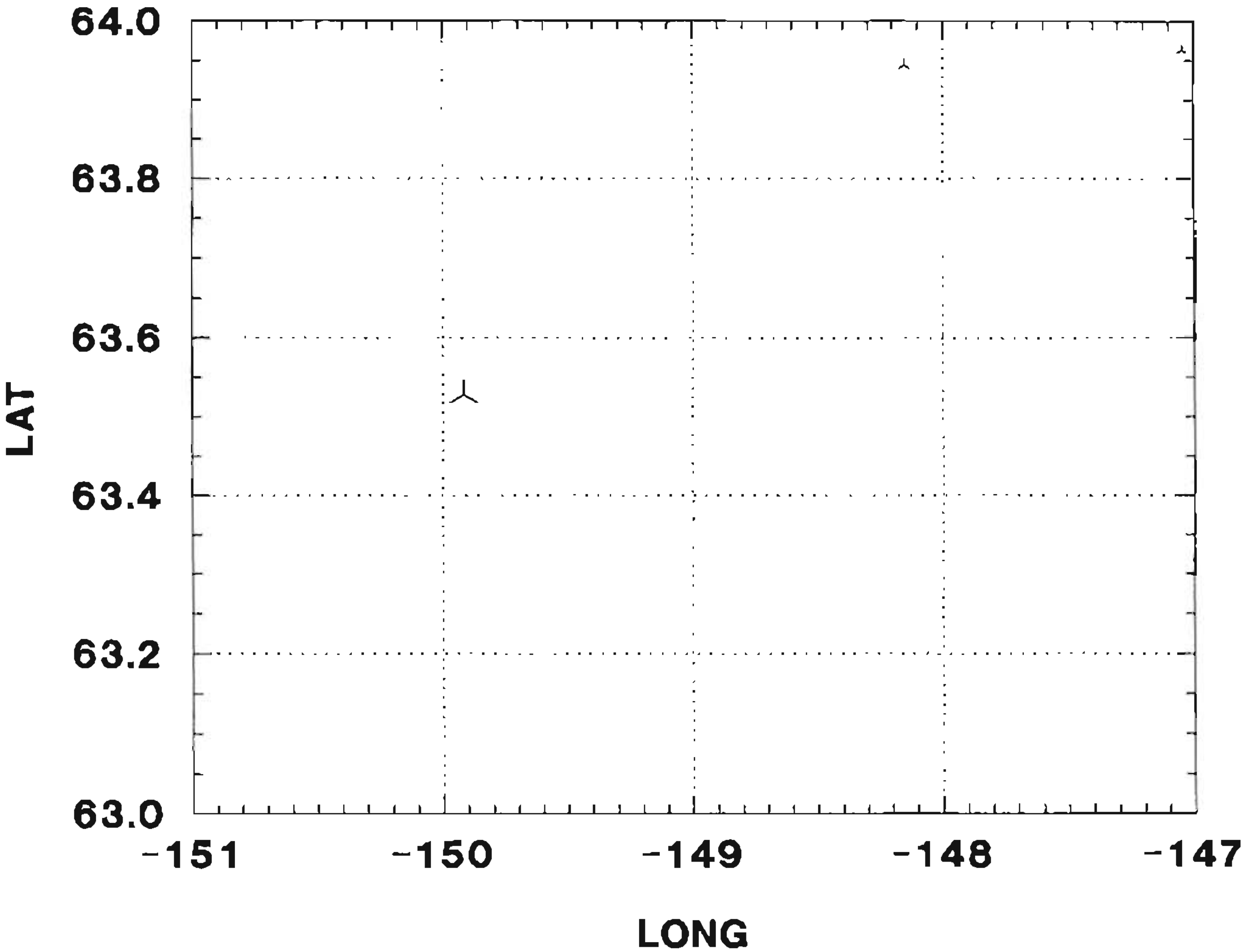

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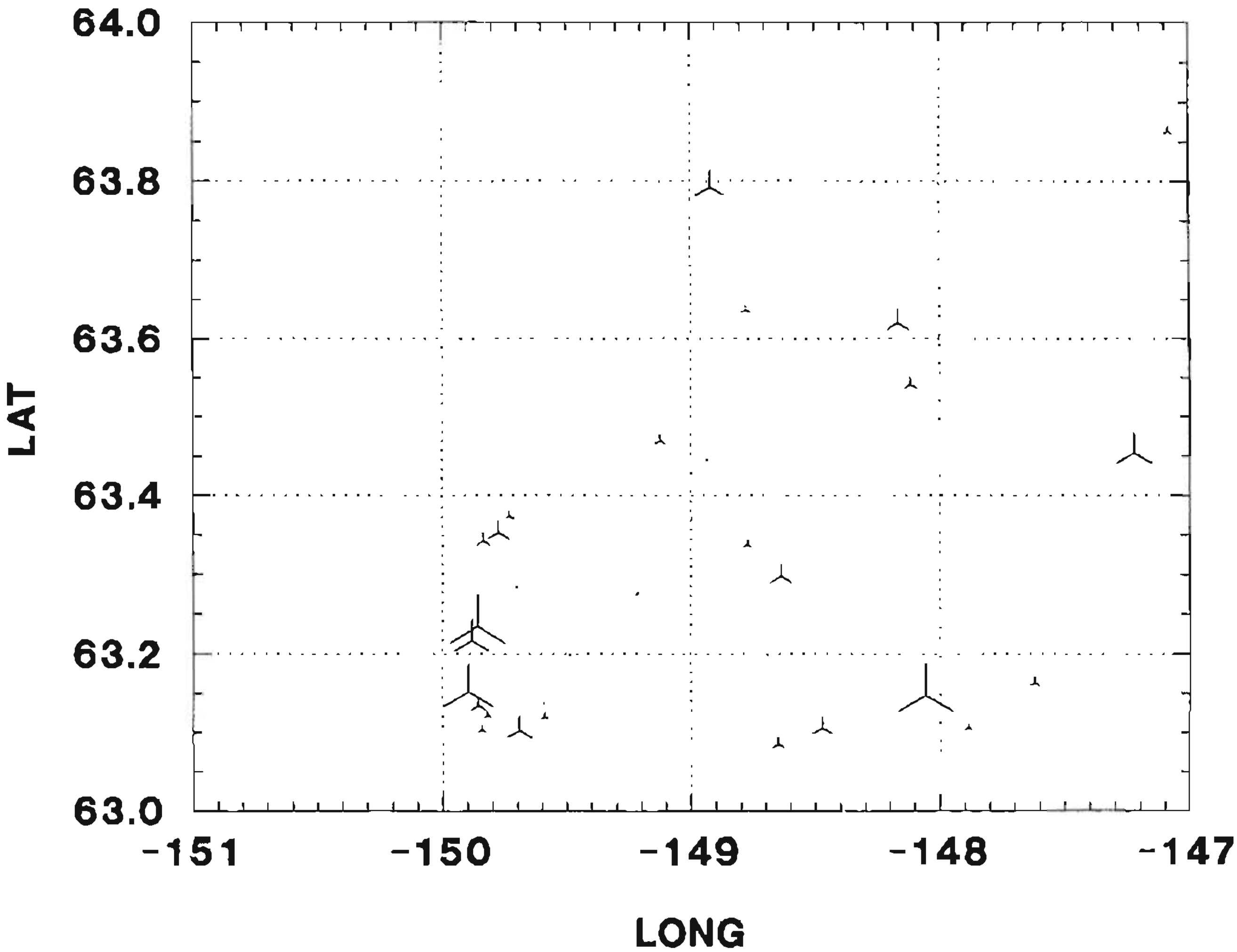

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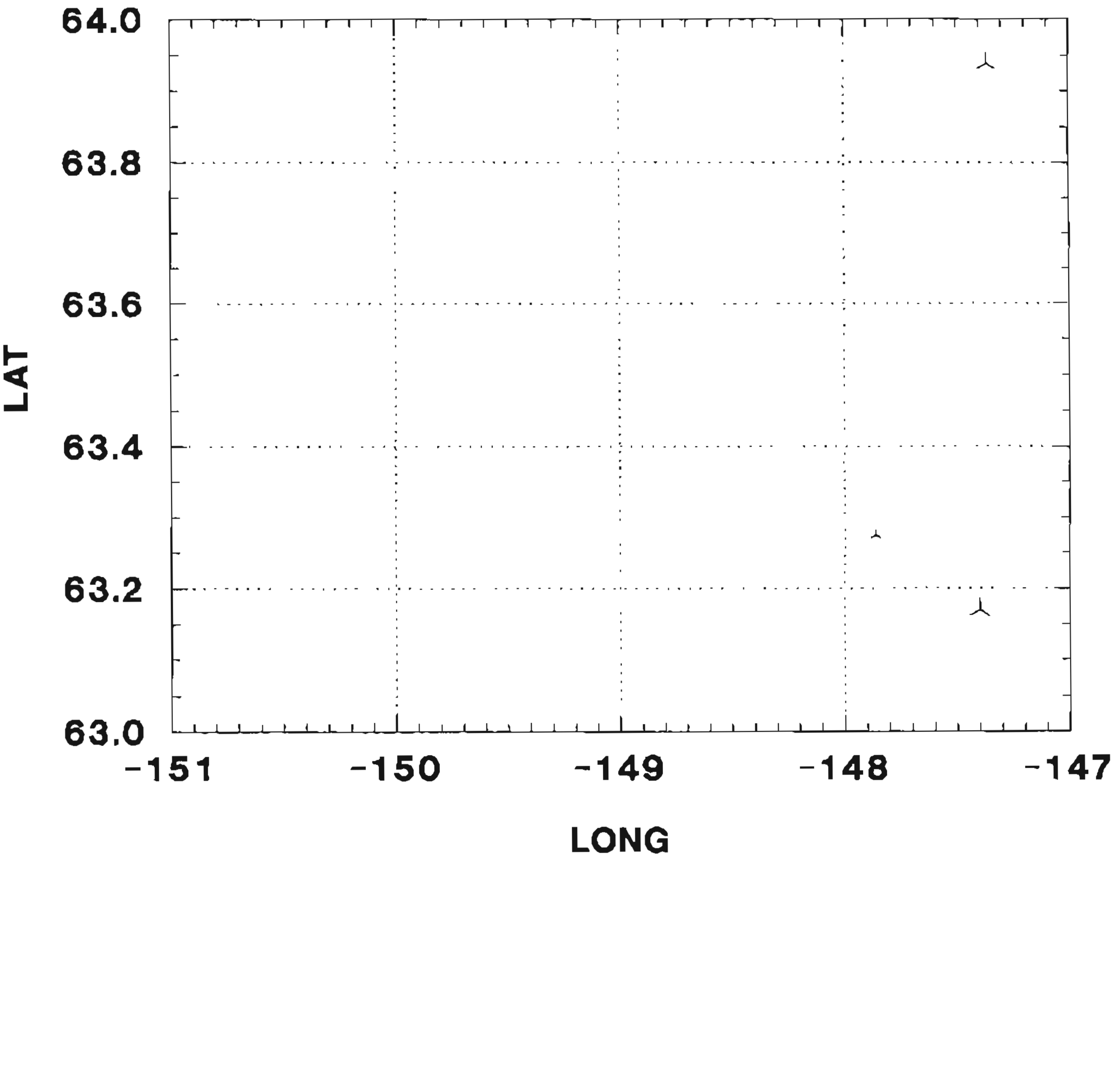

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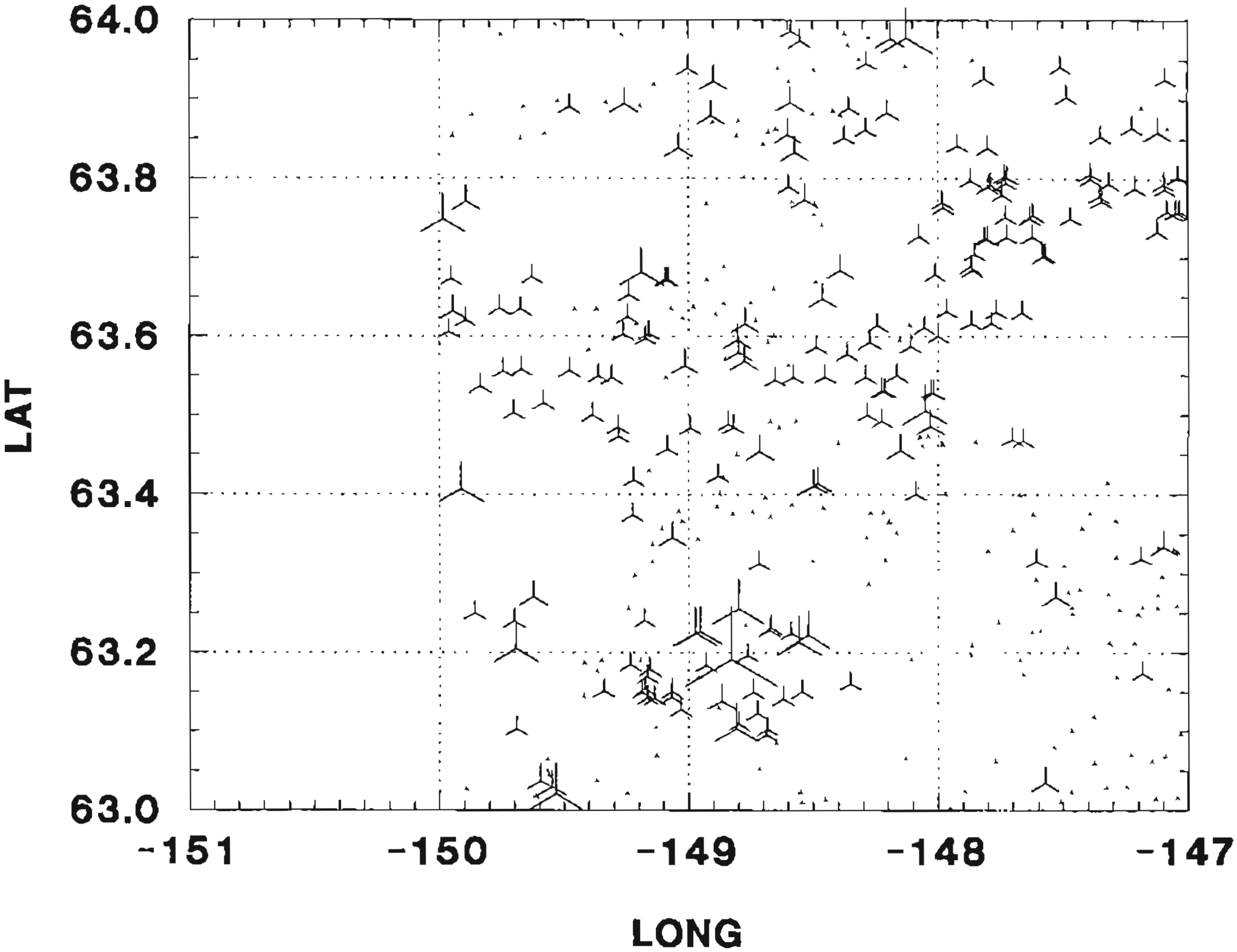

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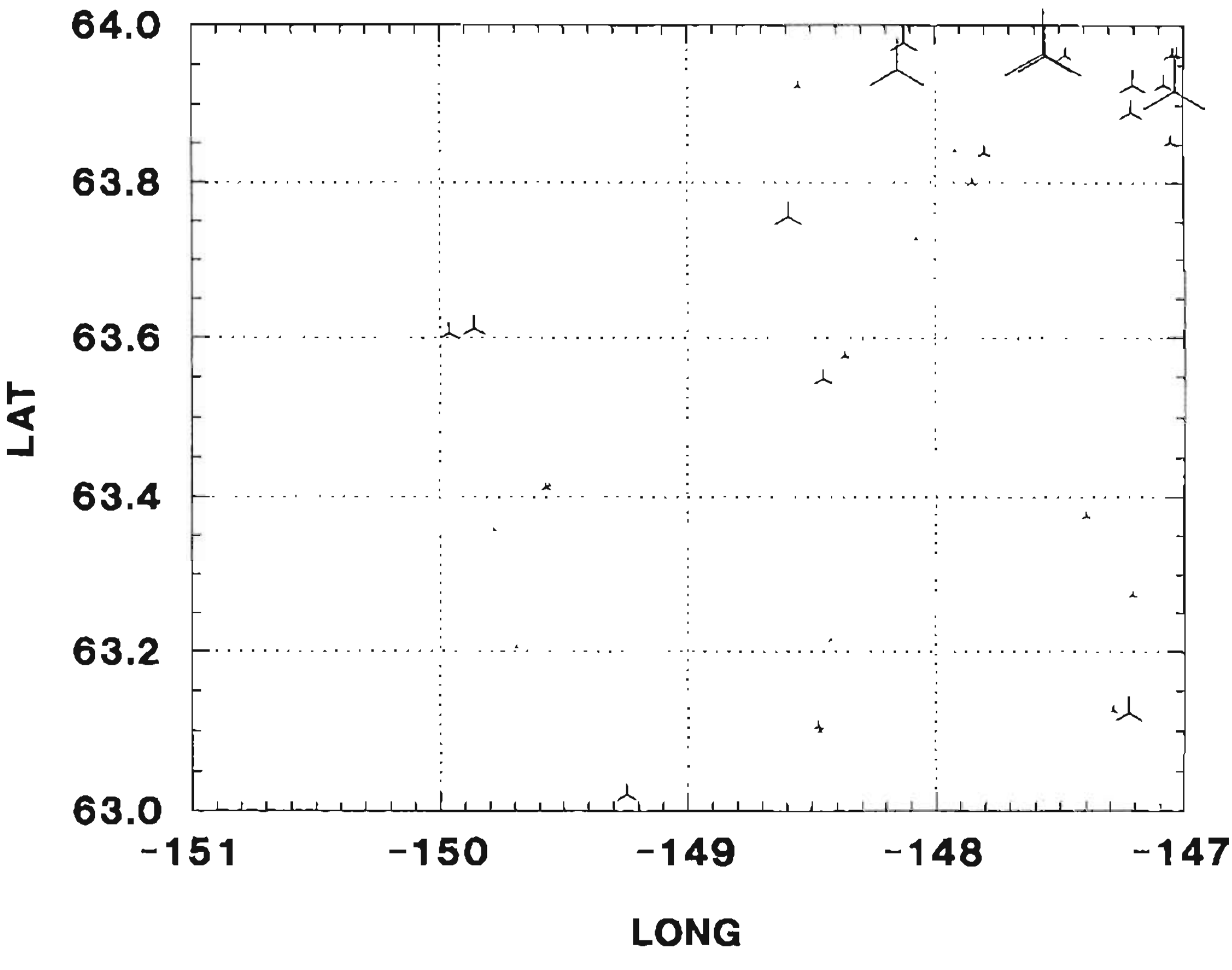

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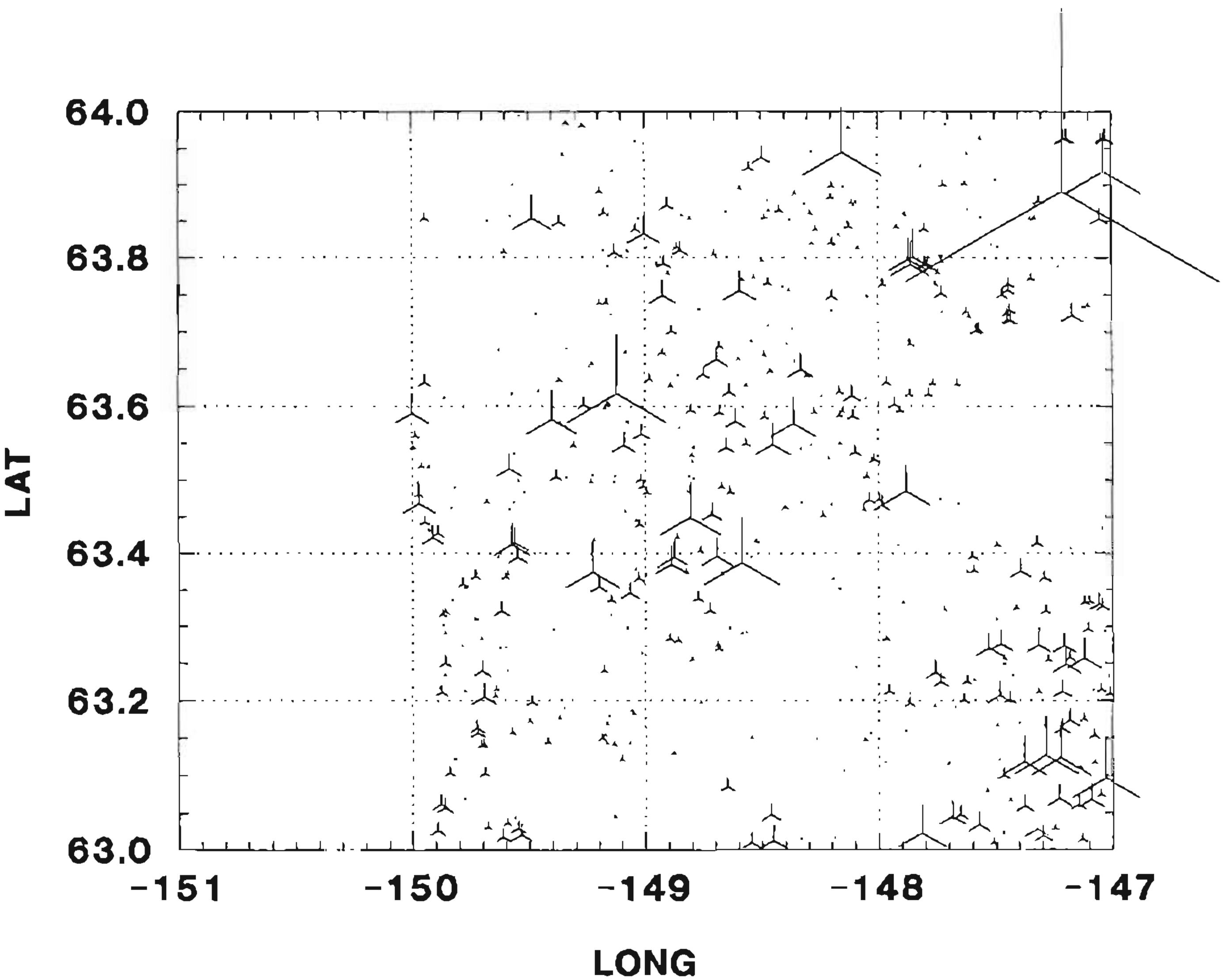

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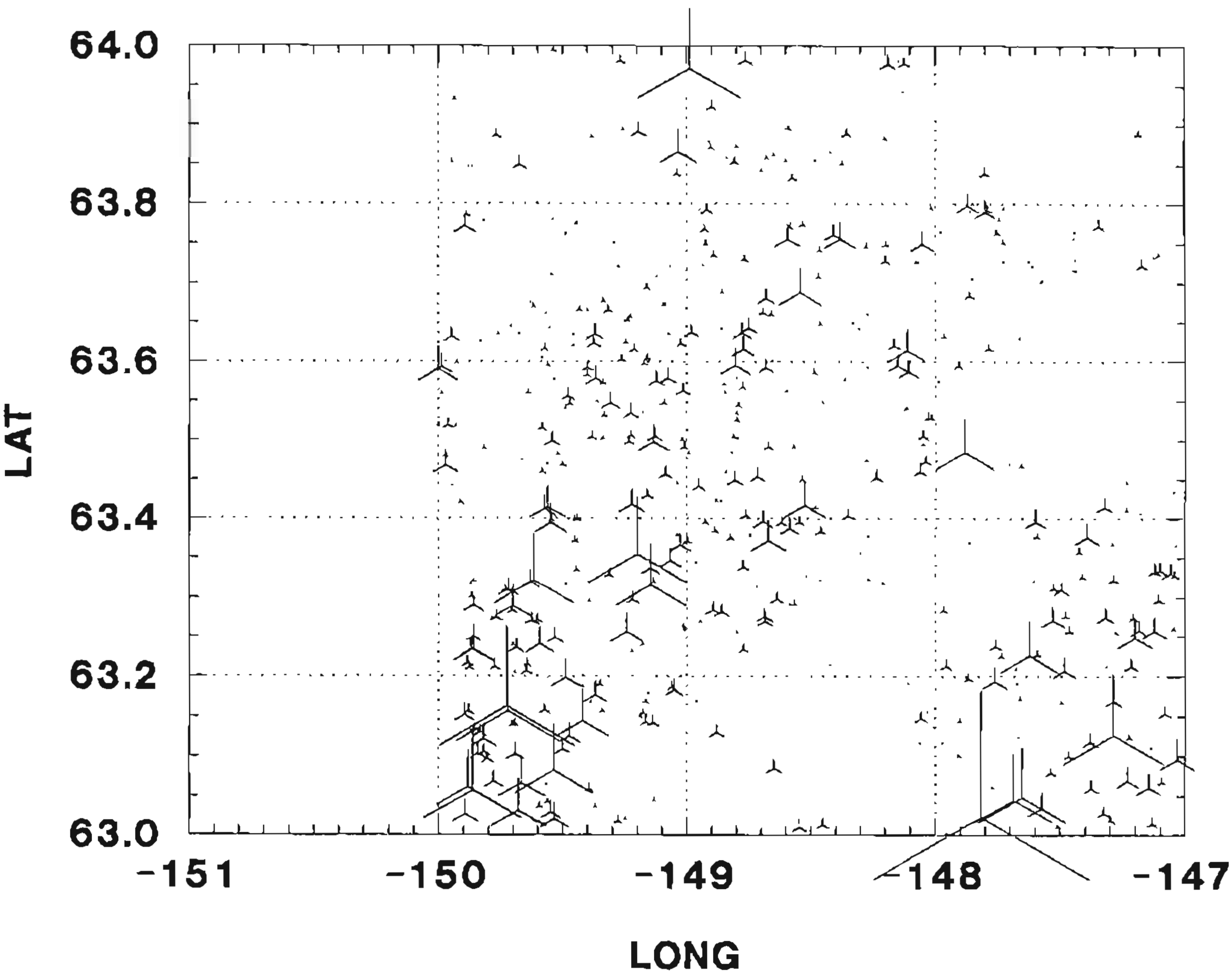

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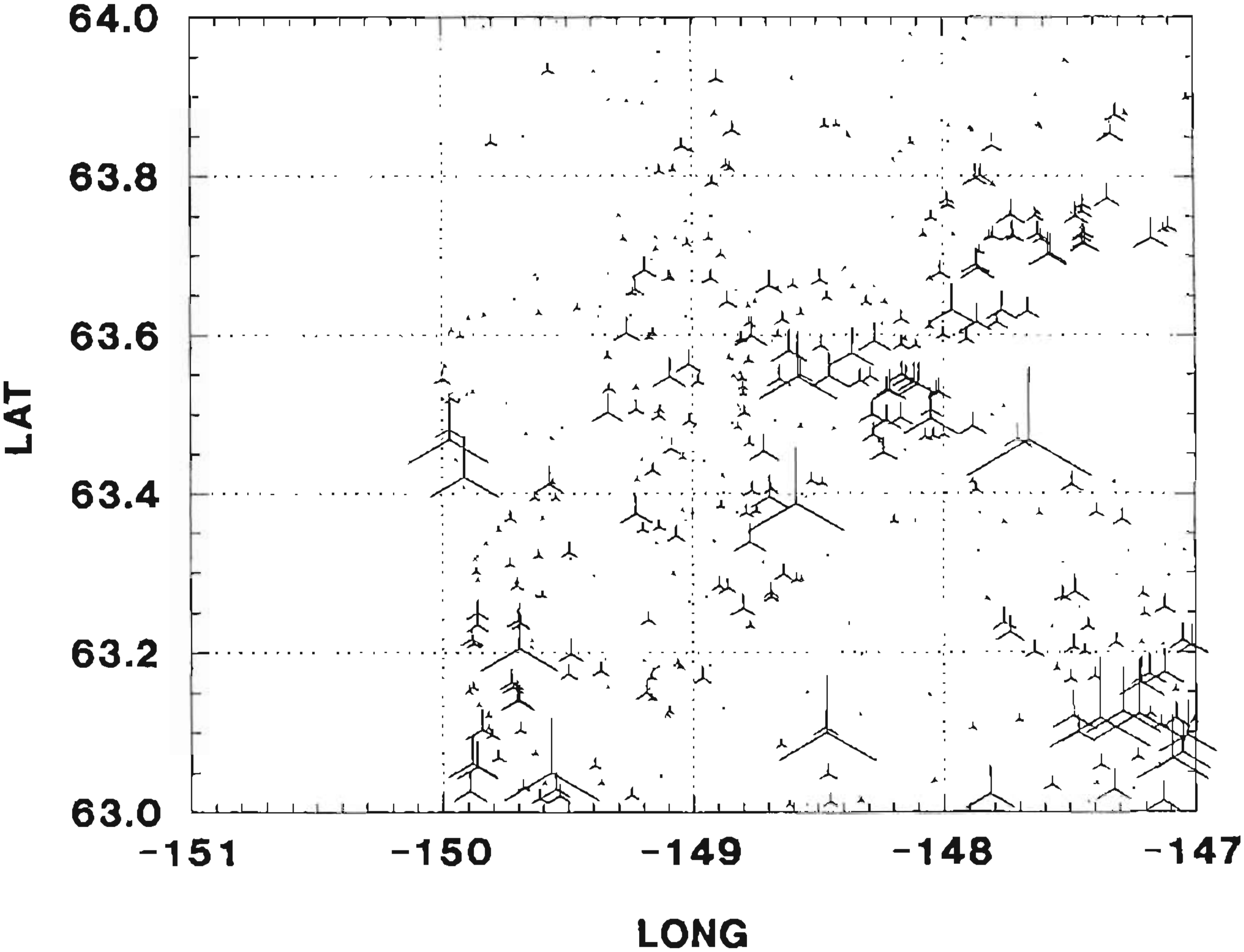

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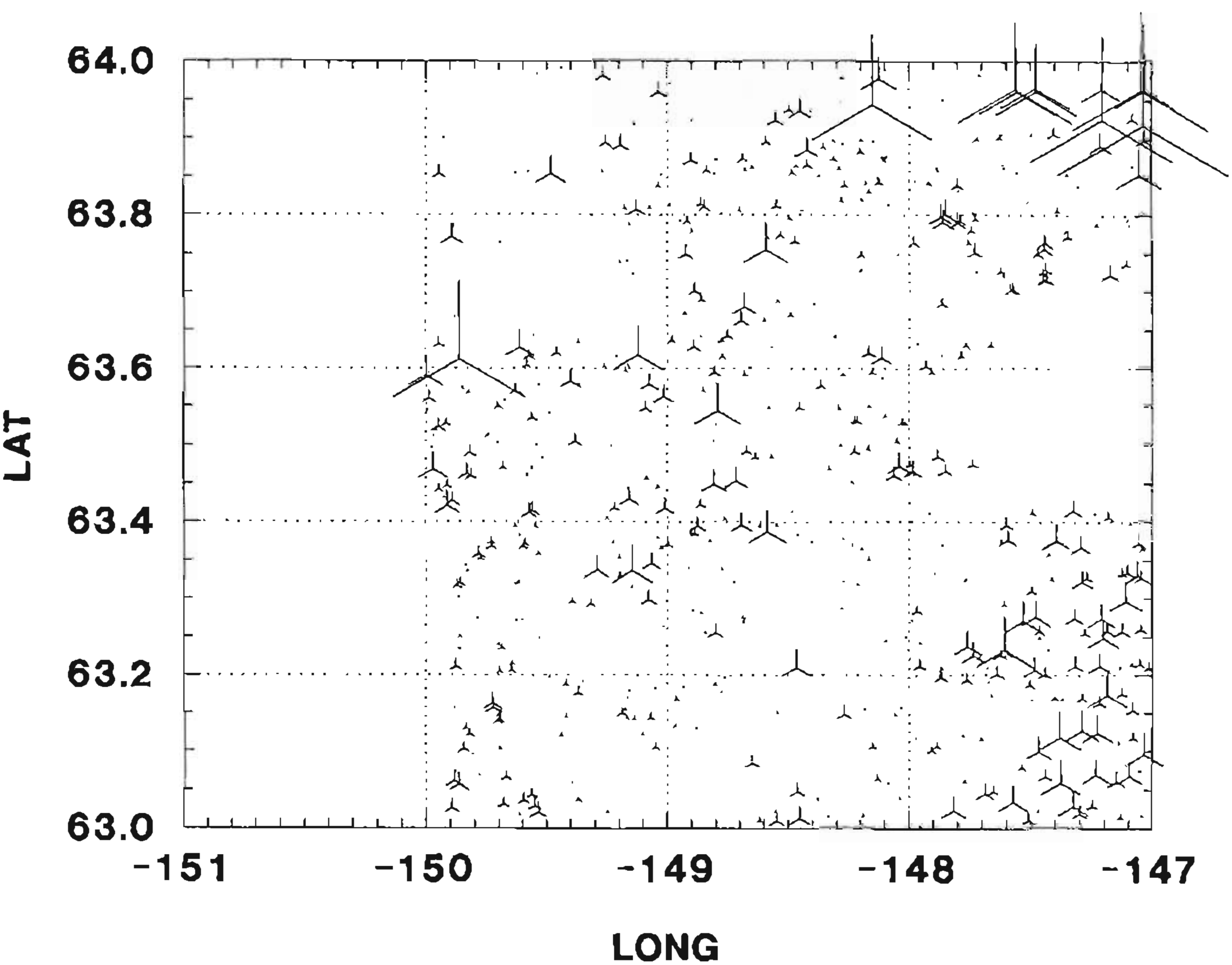

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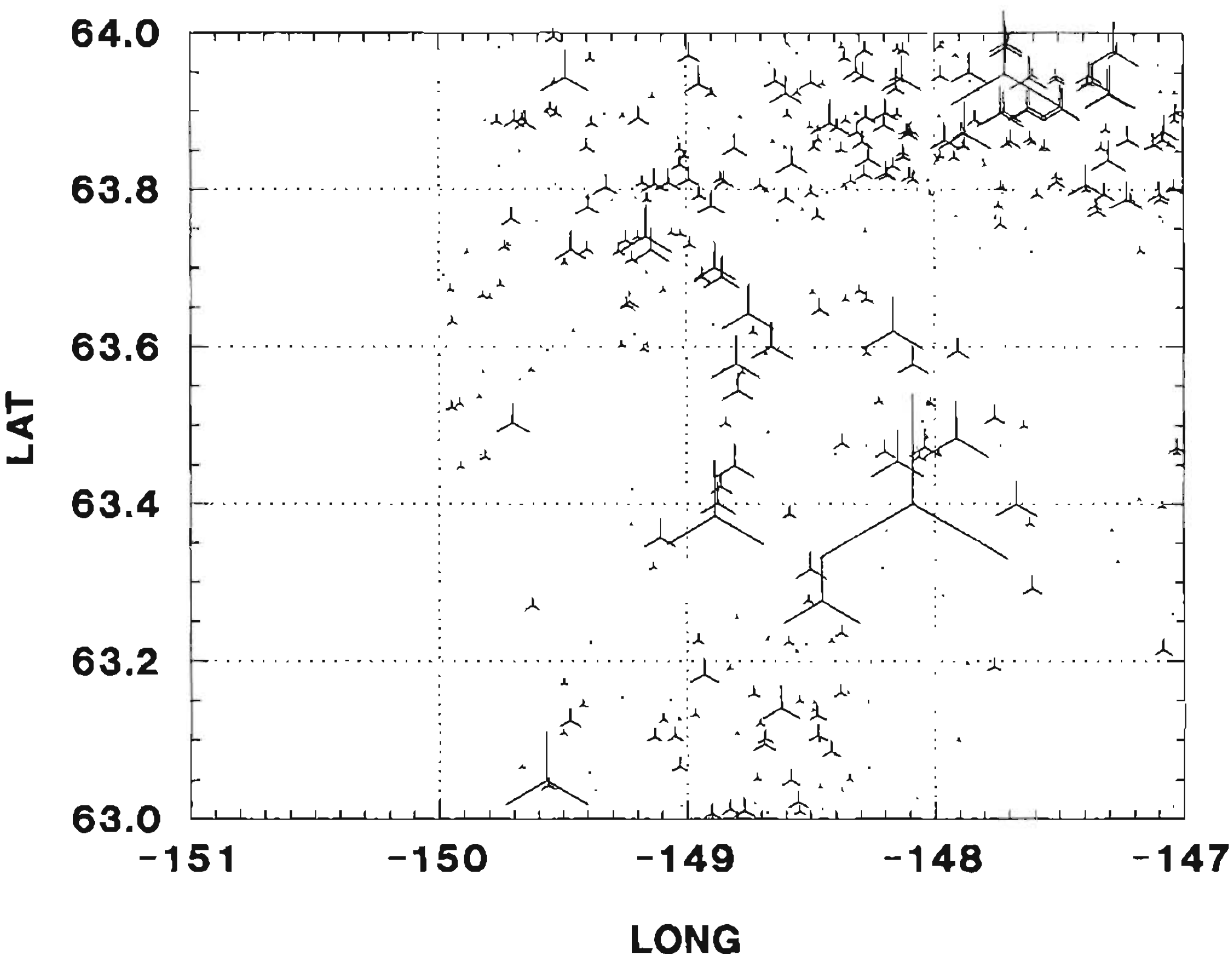

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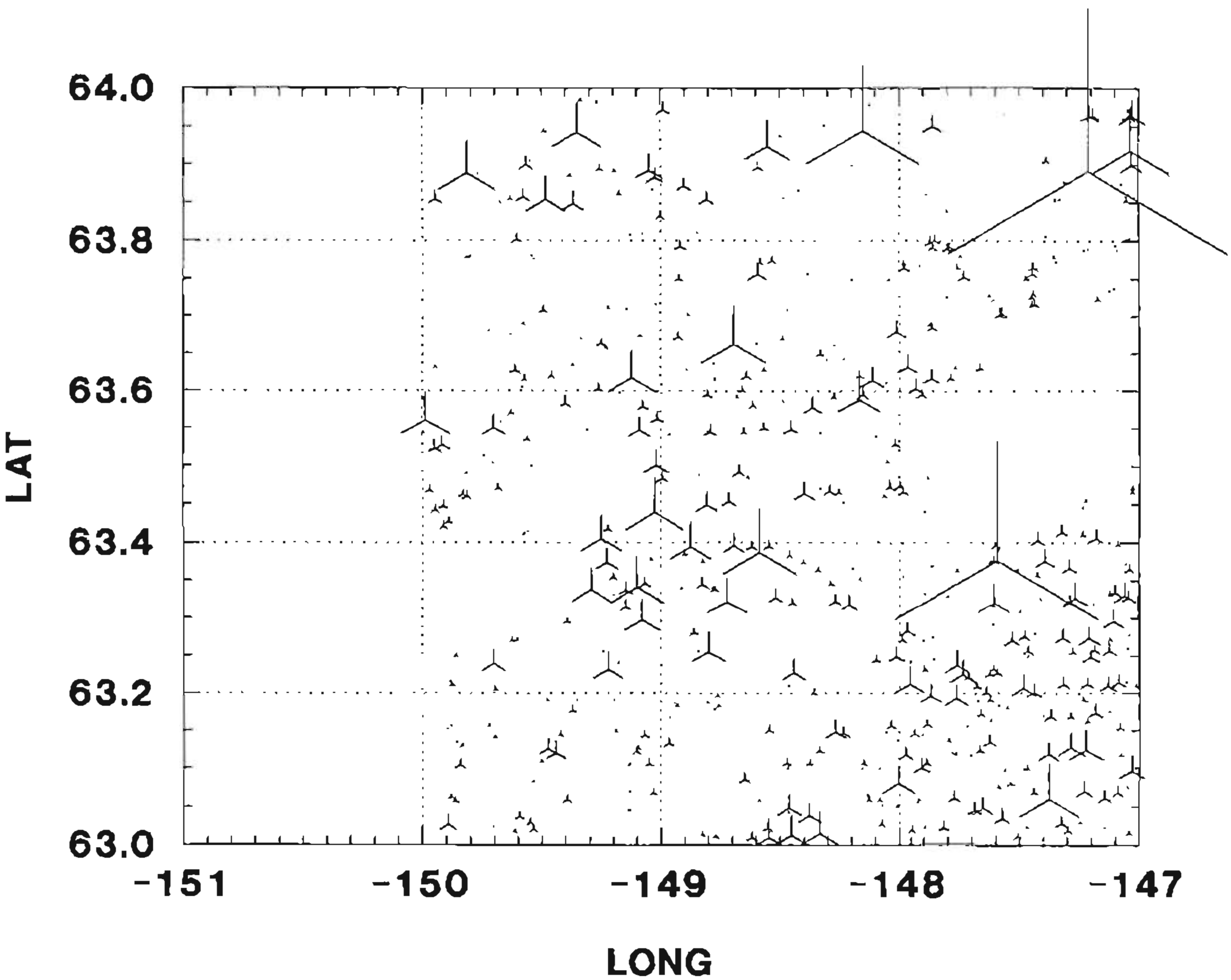

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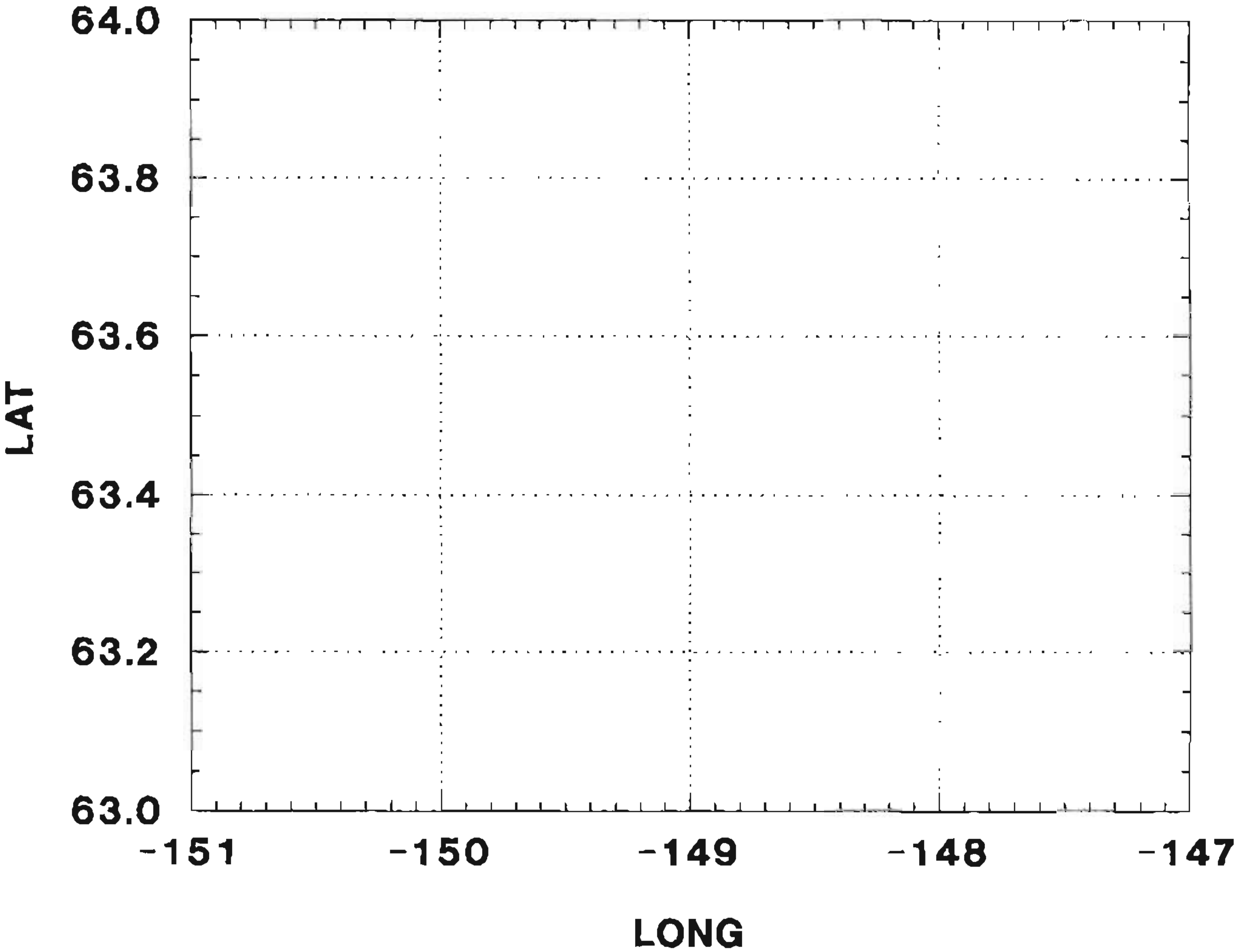

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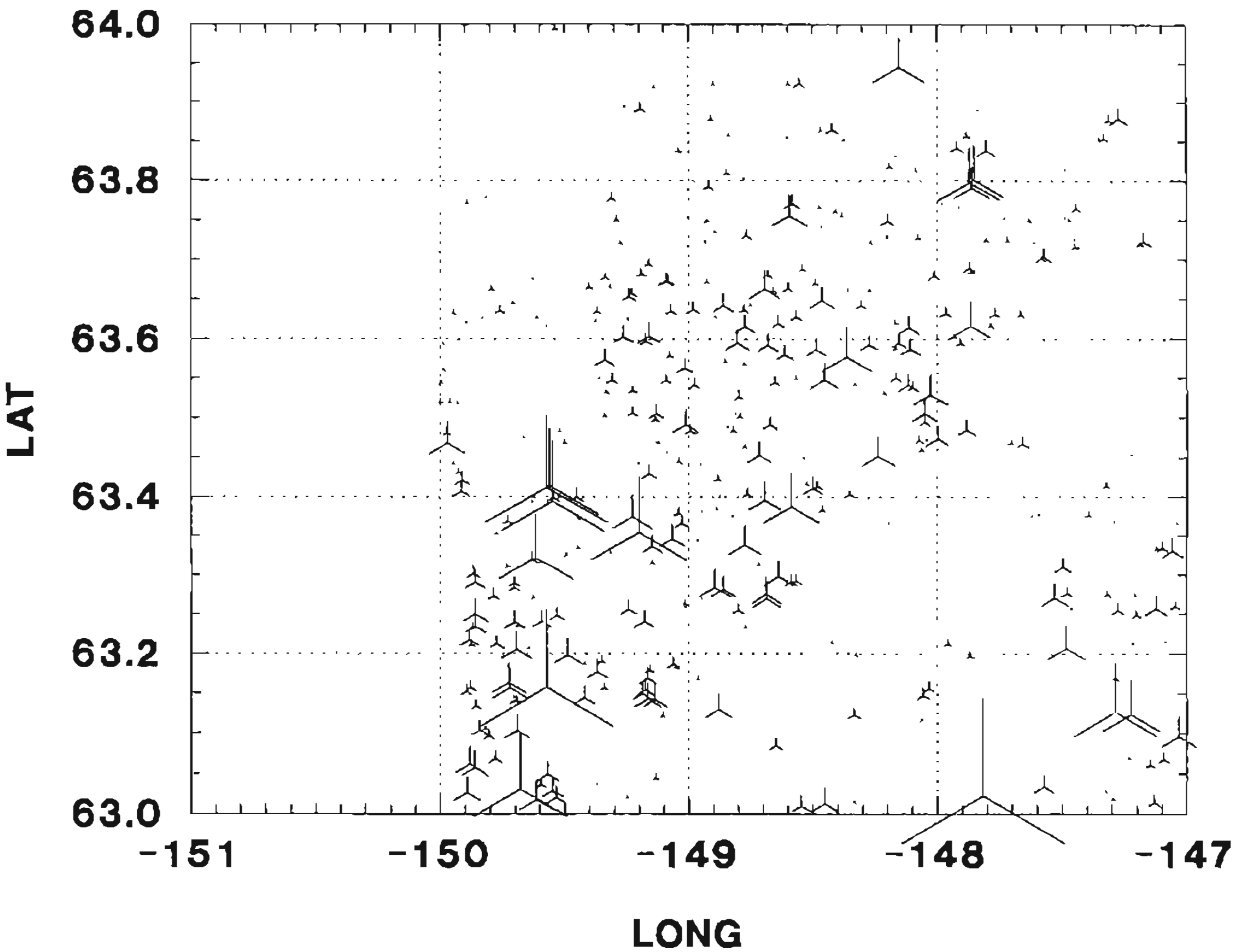

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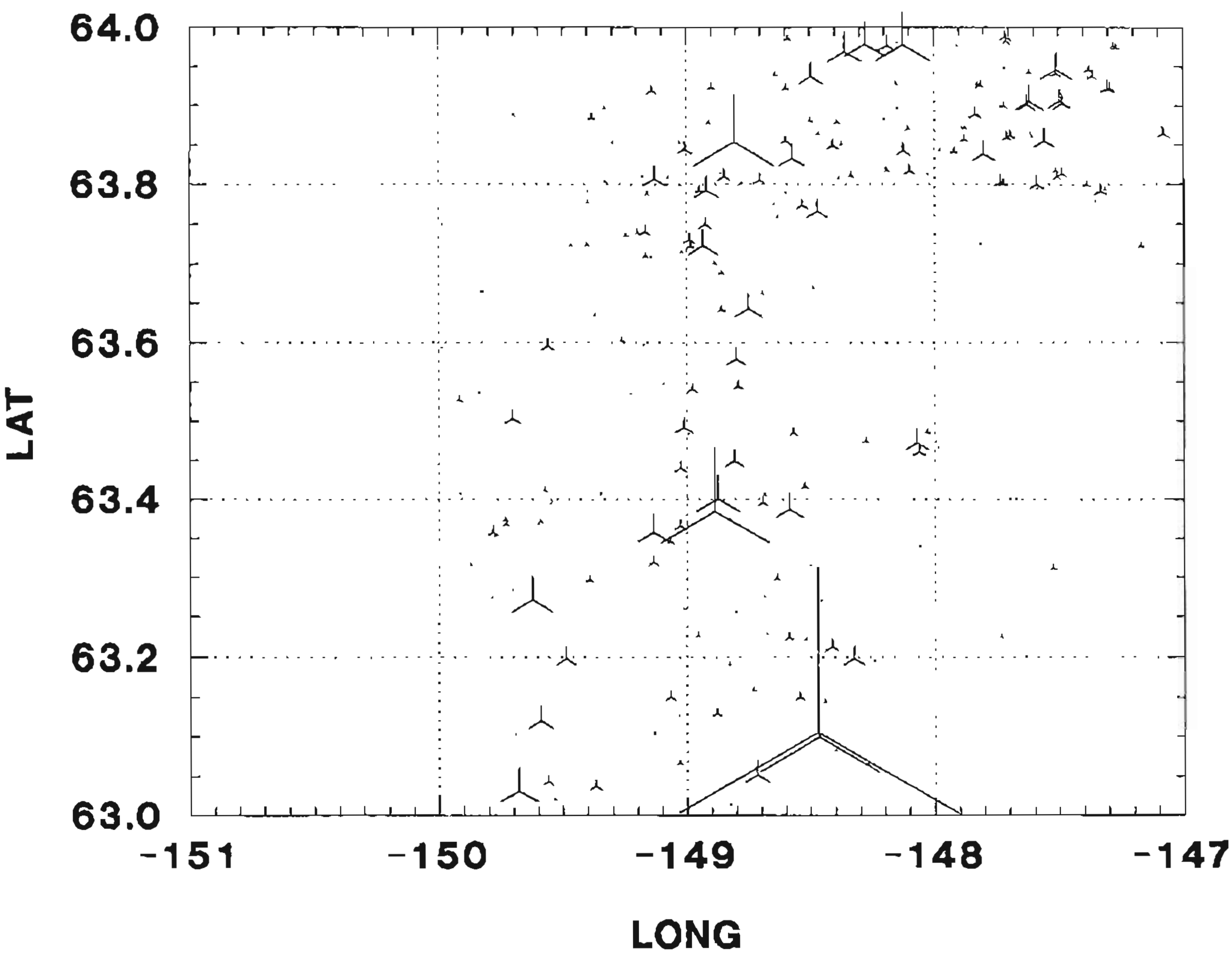

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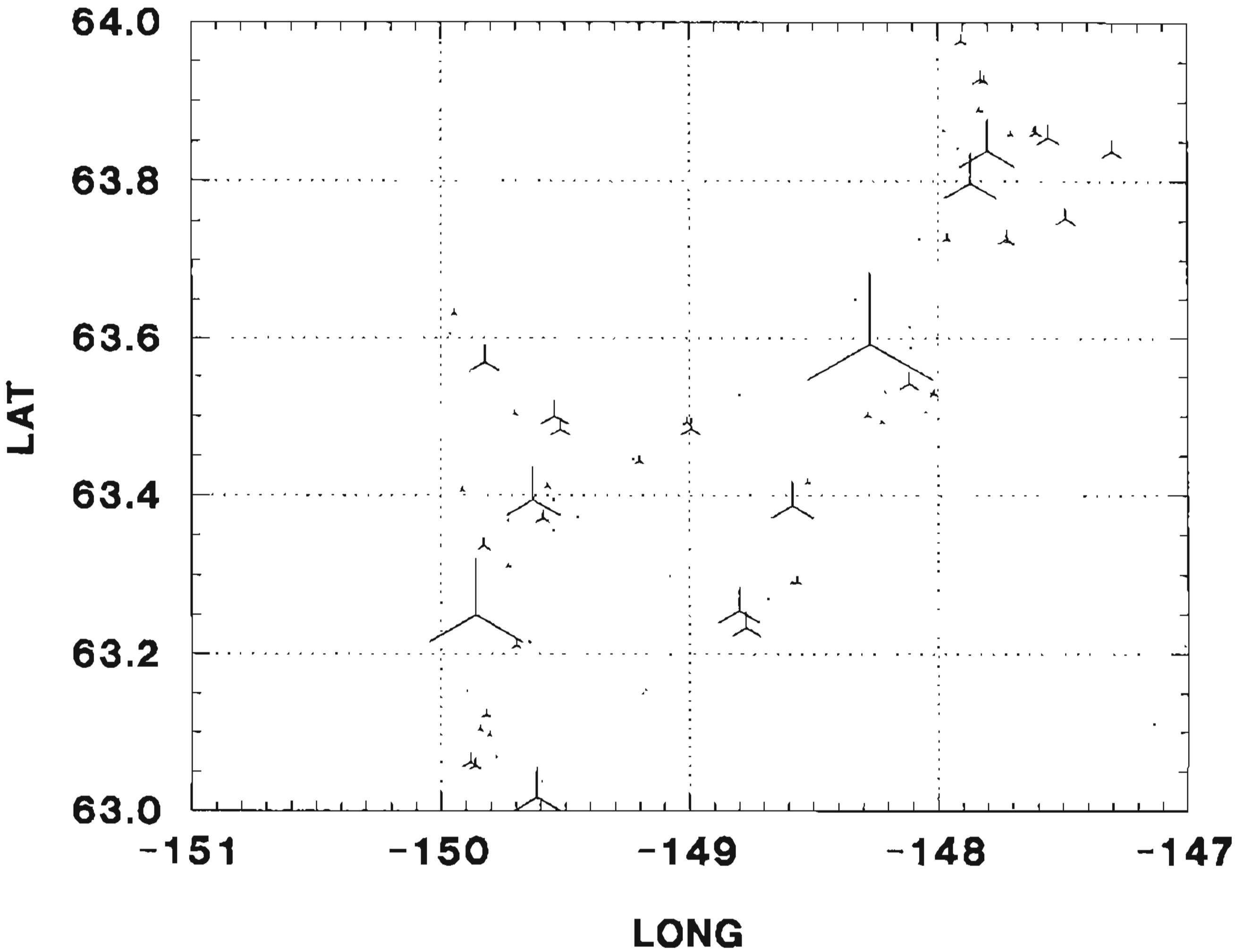

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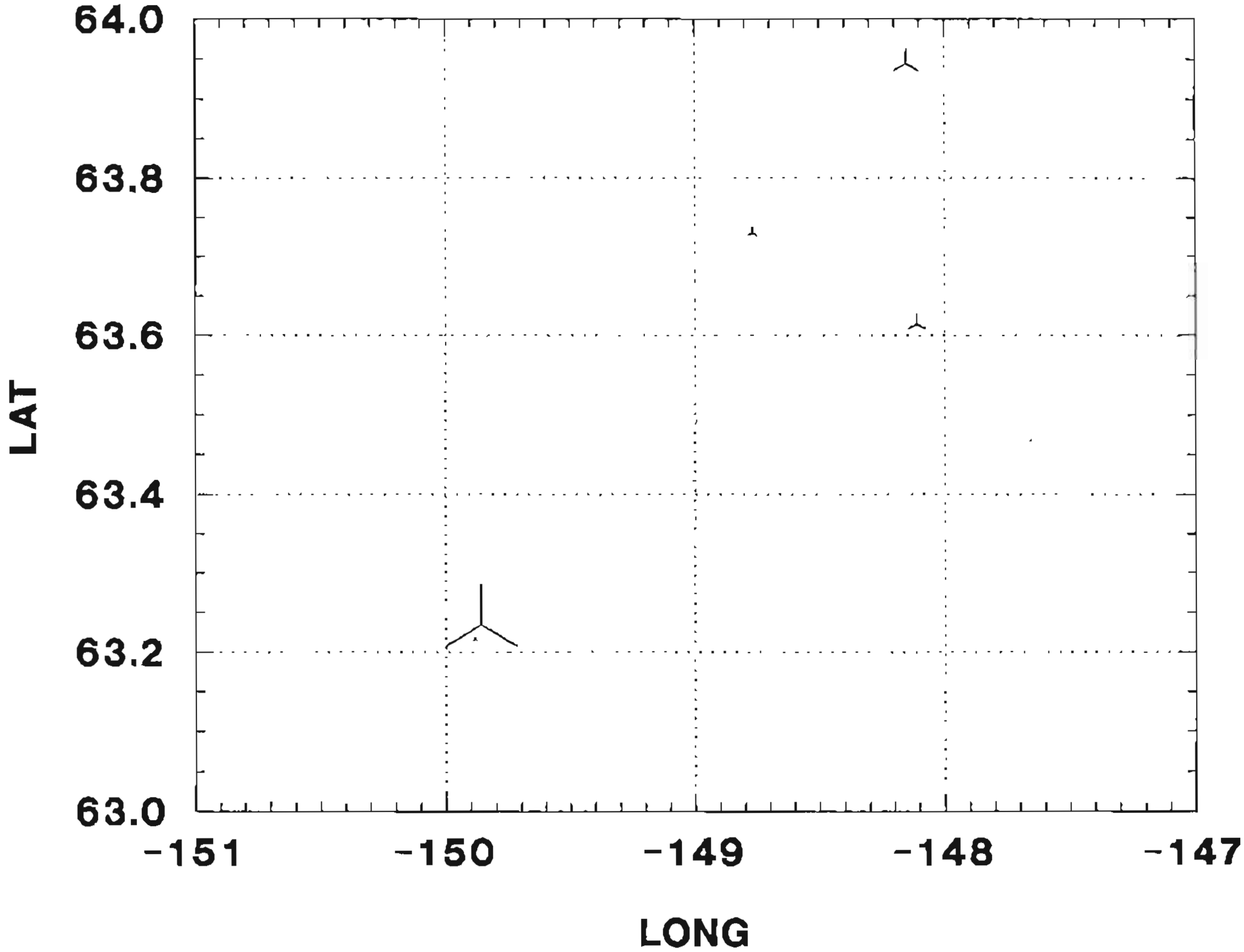

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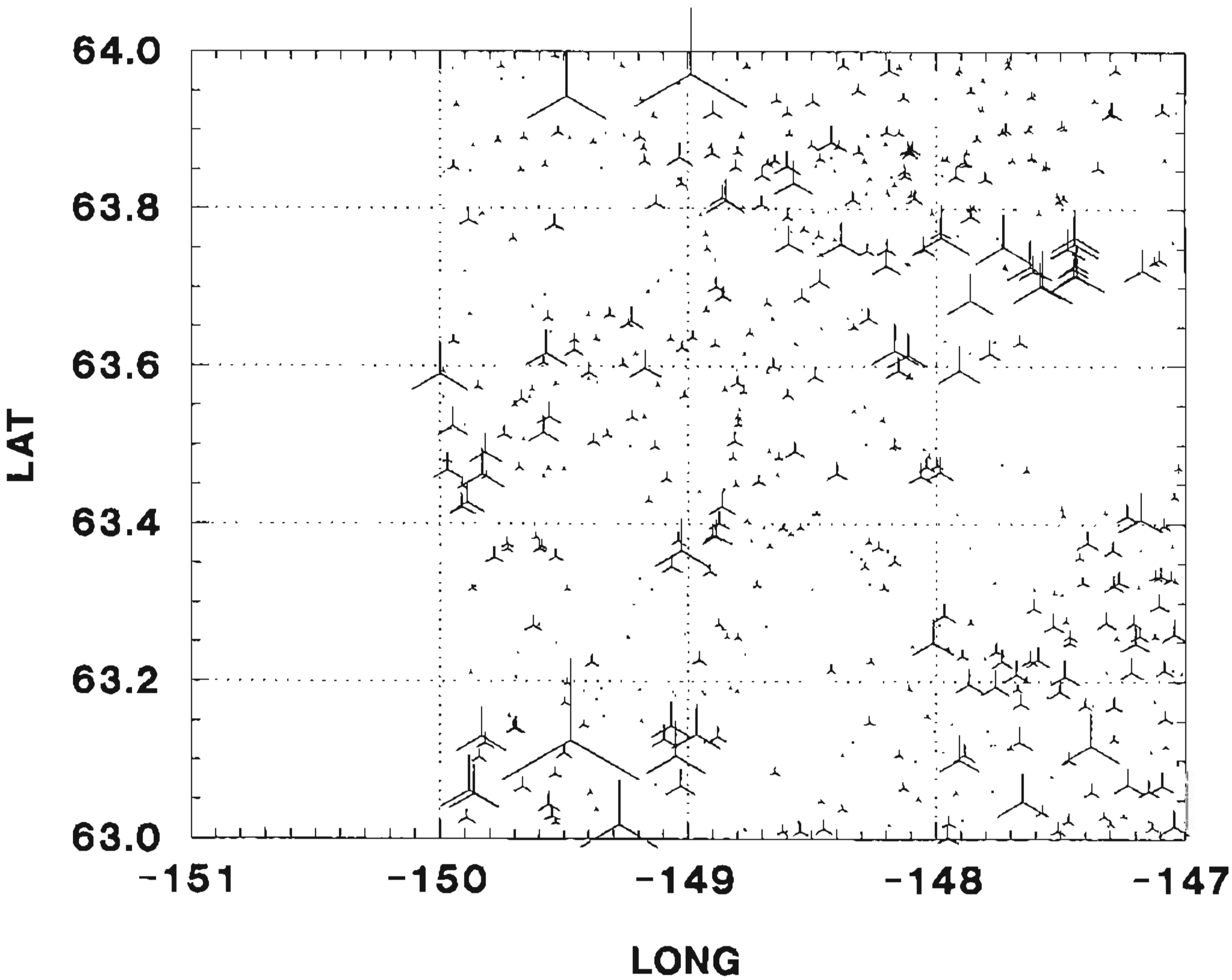

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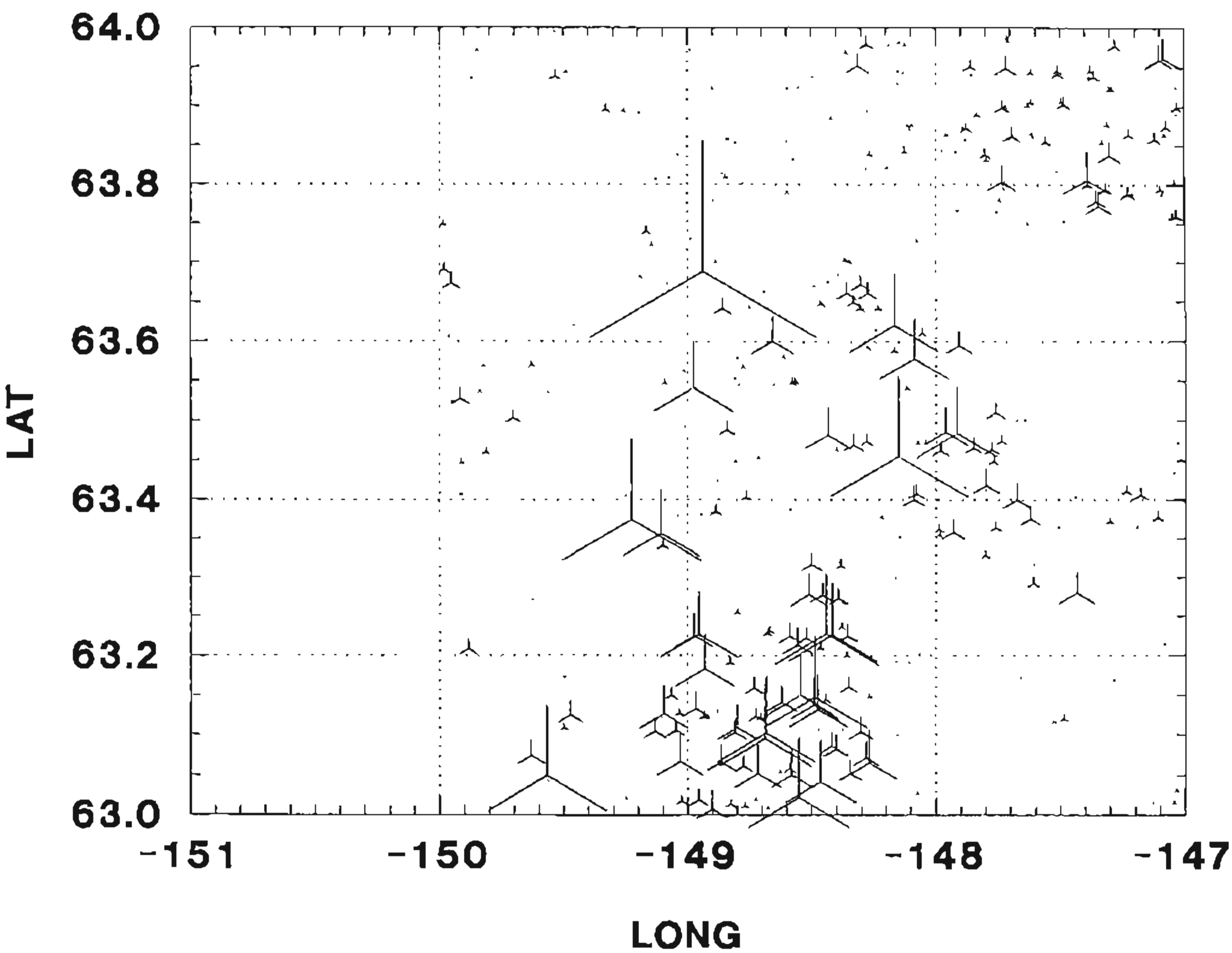

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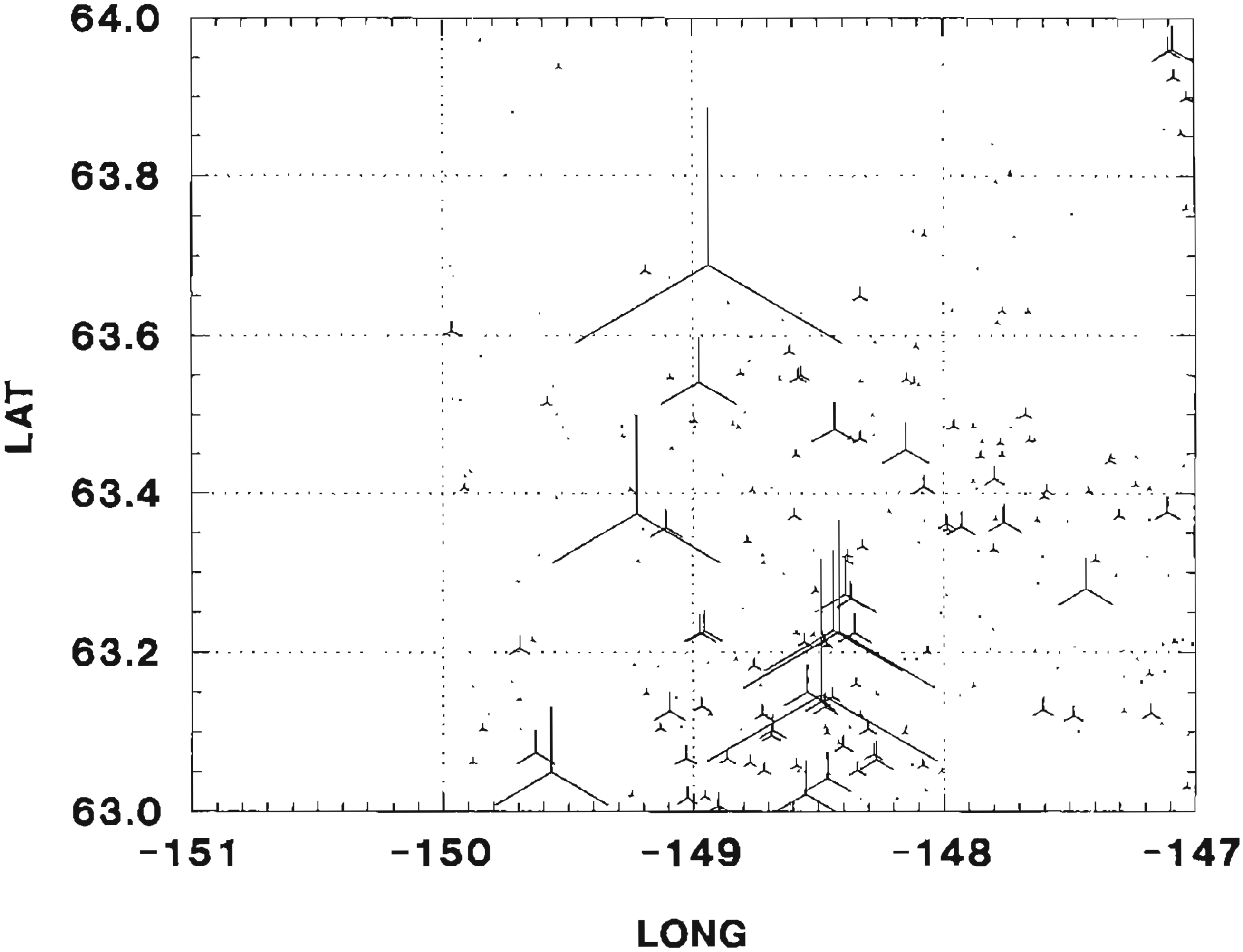

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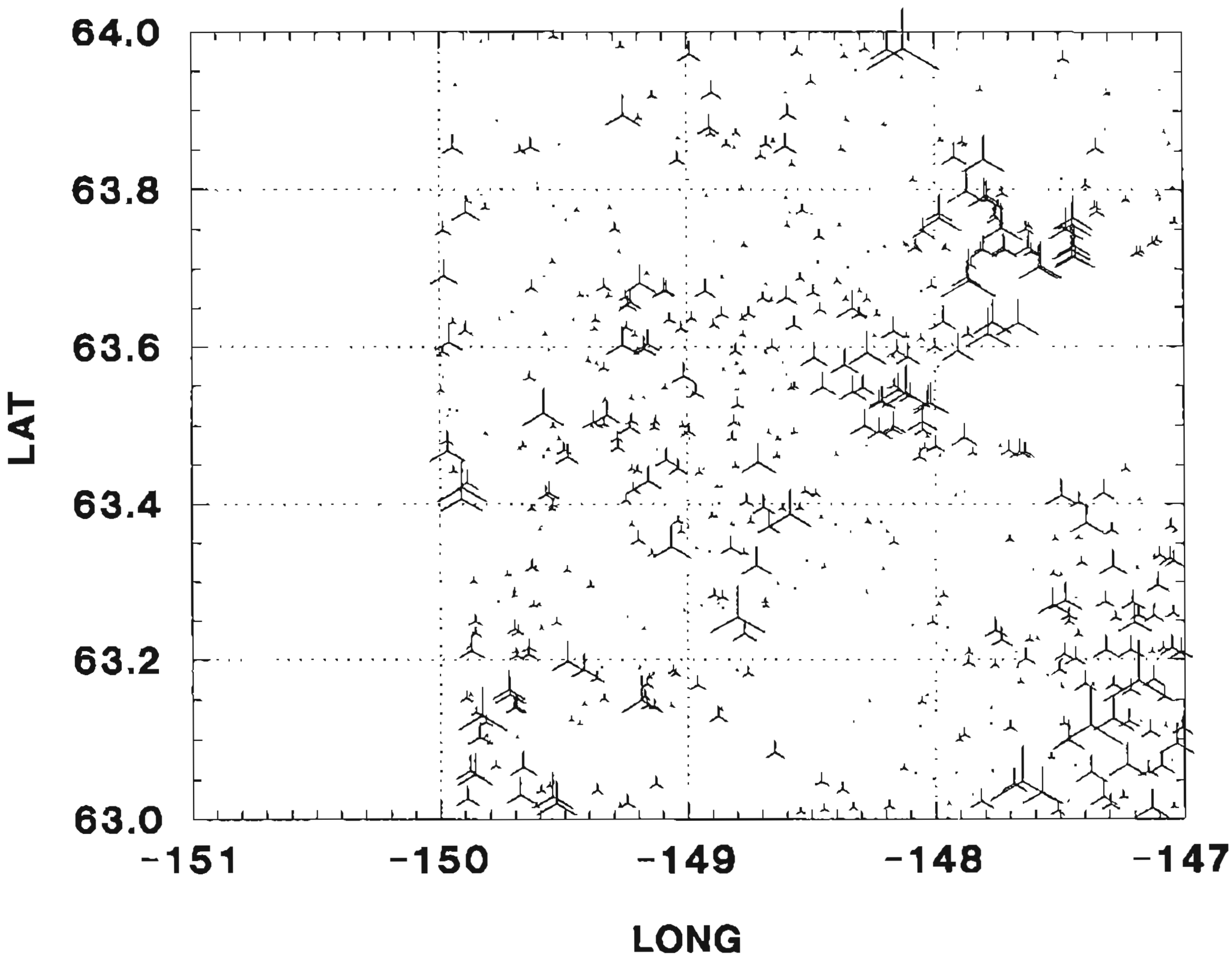

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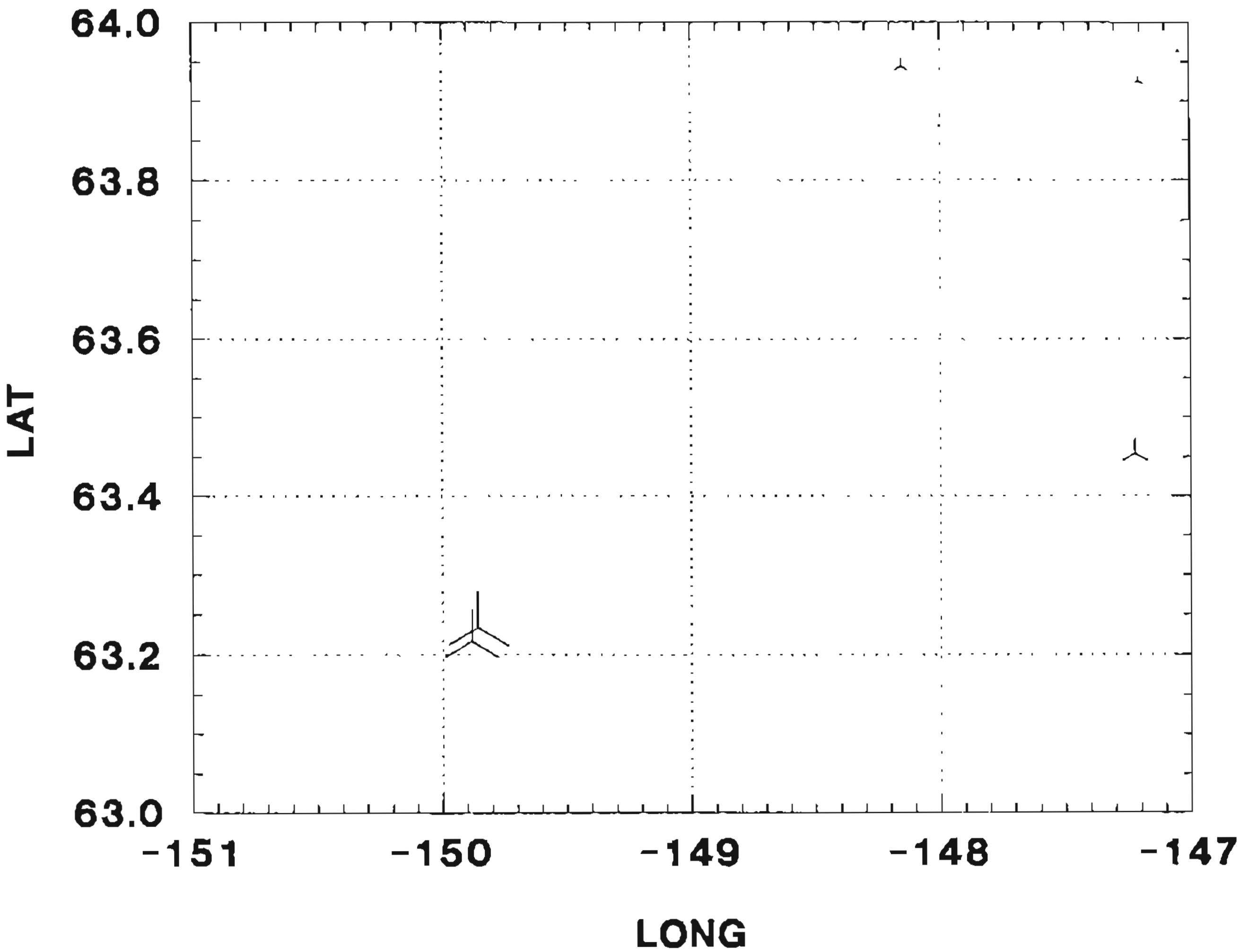

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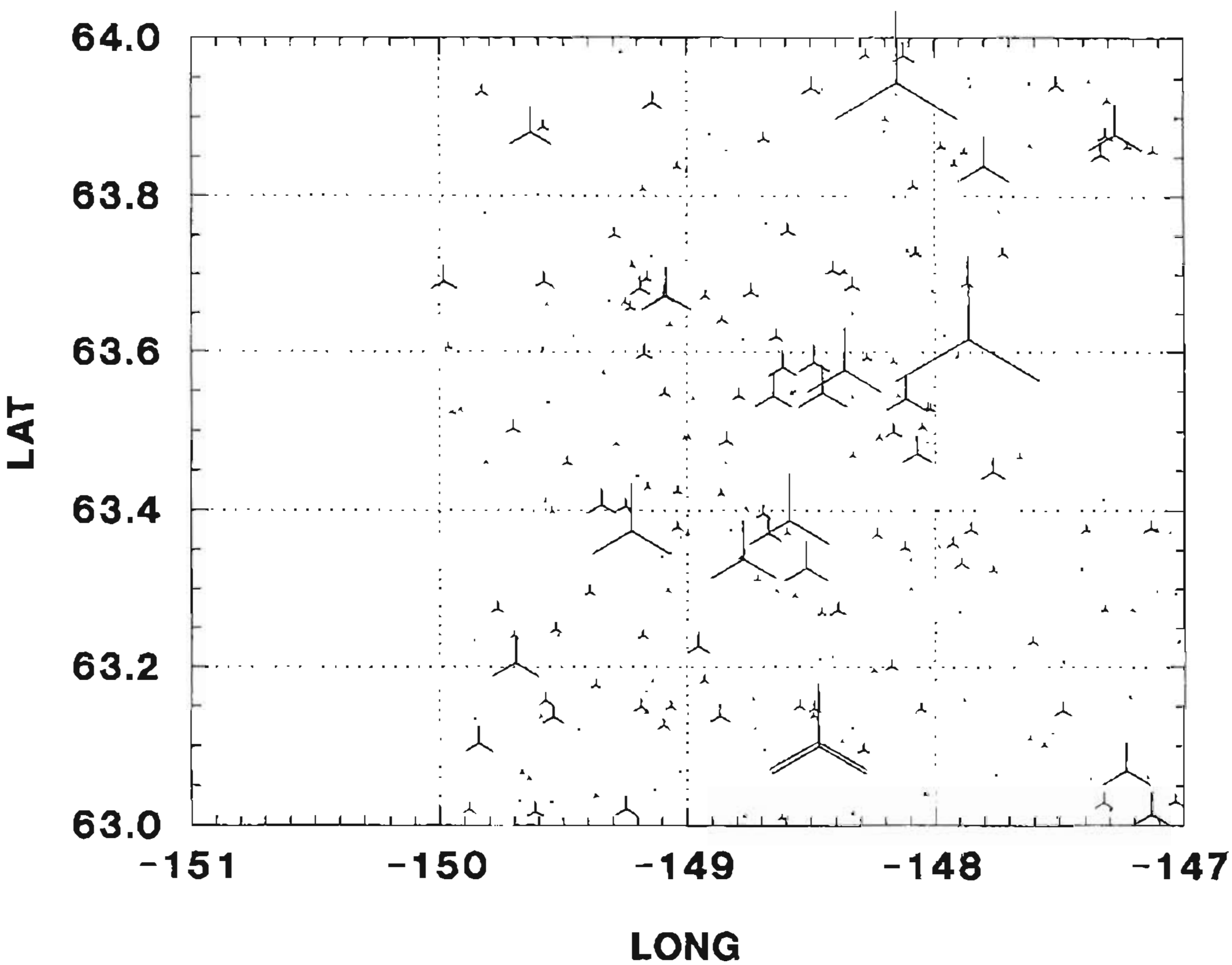

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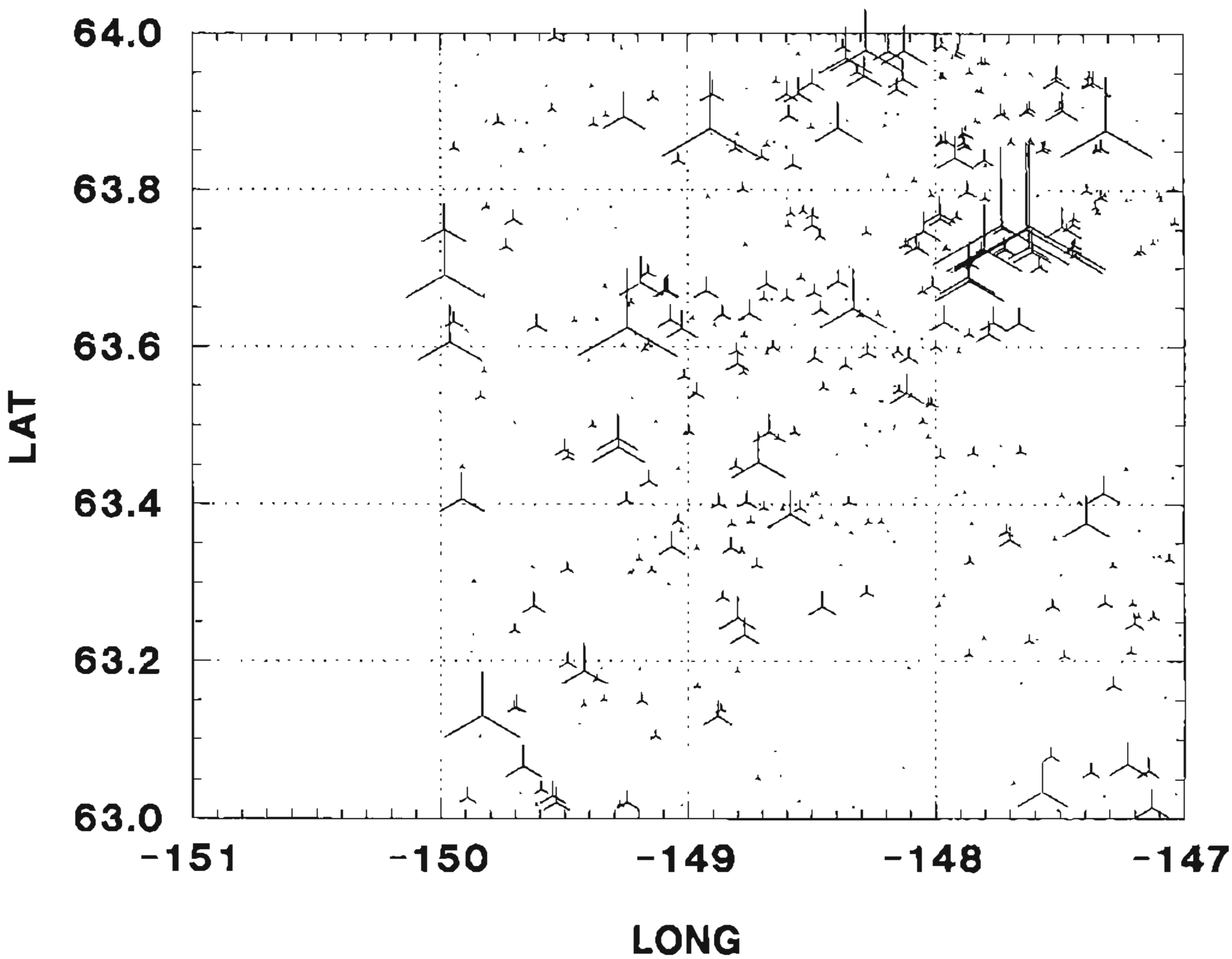

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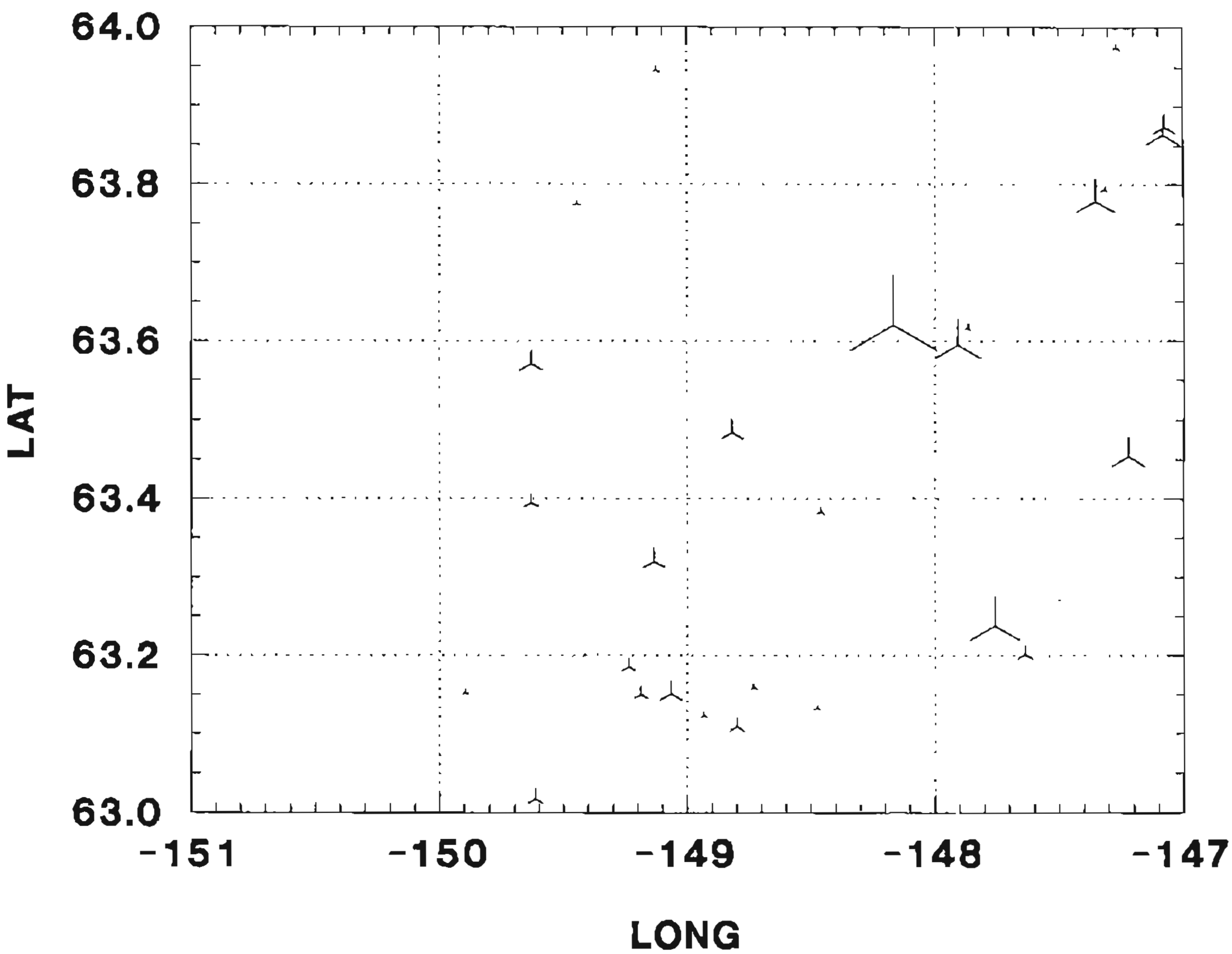

APPENDIX A

KEY TO SAMPLE TYPES

This numerical key provides the necessary tie between the specific type or form of each sample taken and each individual suite of field and laboratory data to which the sample relates. It defines the various sample types collected by the LASL in the DOE HSSR for uranium.

The two-digit key number assigned to each sample type designates three distinct properties of the samples taken. These properties are: (a) The general sample source (spring, stream, dry stream, etc.); (b) The sample medium (water or sediment); and (c) The treatment given the sample in the field or laboratory prior to its analysis by the LASL.

The key numbers are inserted in the sample type columns of the specially formatted DOE sample numbering system to positively identify the sample type for all LASL sample data submitted.

KEY NO. SOURCE / MEDIUM / TREATMENT

01 - Spring water sample untreated.

02 - Stream water sample untreated.

03 - Well water sample untreated.

04 - Natural pond water sample untreated.

05 - Artificial pond water sample untreated.

06 - Spring water sample filtered through a 0.45-μ membrane filter and acidified to a pH of ≤1 with reagent-grade nitric acid (HNO_3).

07 - Stream water sample filtered through a 0.45-μ membrane filter and acidified to a pH of ≤1 with reagent-grade nitric acid (HNO_3).

08 - Well water sample filtered through a 0.45-μ membrane filter and acidified to a pH of ≤1 with reagent-grade nitric acid (HNO_3).

09 - Natural pond water sample filtered through a 0.45-μ membrane filter and acidified to a pH of ≤1 with reagent-grade nitric acid (HNO_3).

10 - Artificial pond water sample filtered through a 0.45-μ membrane filter and acidified to a pH of ≤1 with reagent-grade nitric acid (HNO_3).

11 - Wet spring sediment sample dried at ≤100°C and sieved to -100 mesh through stainless steel sieves.

12 - Wet stream sediment sample dried at ≤100°C and sieved to -100 mesh through stainless steel sieves.

13 - Wet natural pond sediment sample dried at ≤100°C and sieved to -100 mesh through stainless steel sieves.

14 - Wet artificial pond sediment sample dried at ≤100°C and sieved to -100 mesh through stainless steel sieves.

15 - Dry stream sediment sample dried at ≤100°C (if necessary) and sieved to -100 mesh through stainless steel sieves.

26 - Spring water sample acidified to a pH of ≤1 with reagent-grade nitric acid (HNO_3).

27 - Stream water sample acidified to a pH of ≤1 with reagent-grade nitric acid (HNO_3).

29 - Natural pond or lake water sample acidified to a pH of ≤1 with reagent-grade nitric acid (HNO_3).

31- Wet spring sediment sample dried at ≤100°C and sieved to -40 mesh through stainless steel sieves.

32- Wet stream sediment sample dried at ≤100°C and sieved to -40 mesh through stainless steel sieves.

33- Wet natural lake sediment sample dried at ≤100°C and sieved to -40 mesh through stainless steel sieves.

35- Dry stream sediment sample dried at ≤100°C and sieved to -40 mesh through stainless steel sieves.

41- Wet spring sediment sample dried at ≤100°C and sieved to -80 mesh through stainless steel sieves.

42- Wet stream sediment sample dried at ≤100°C and sieved to -80 mesh through stainless steel sieves.

43- Wet natural lake sediment sample dried at ≤100°C and sieved to -80 mesh through stainless steel sieves.

45- Dry stream sediment sample dried at ≤100°C and sieved to -80 mesh through stainless steel sieves.

51- Wet spring sediment sample dried at ≤100°C and sieved to -170 mesh through stainless steel sieves.

52- Wet stream sediment sample dried at ≤100°C and sieved to -170 mesh through stainless steel sieves.

53- Wet natural lake sediment sample dried at ≤100°C and sieved to -170 mesh through stainless steel sieves.

55- Dry stream sediment sample dried at ≤100°C and sieved to -170 mesh through stainless steel sieves.

61- Wet spring sediment sample dried at -100°C and sieved to -230 mesh through stainless steel sieves.

62- Wet stream sediment sample dried at -100°C and sieved to -230 mesh through stainless steel sieves.

63- Wet natural lake sediment sample dried at -100°C and sieved to -230 mesh through stainless steel sieves.

65- Dry stream sediment sample dried at -100°C and sieved to -230 mesh through stainless steel sieves.

71- Sediment sample collected from the stream bank, dried at ≤100°C, and sieved to -40 mesh through stainless steel sieves.

72- Sediment sample collected from the stream bank, dried at ≤100°C, and sieved to -80 mesh through stainless steel sieves.

73- Sediment sample collected from the stream bank, dried at ≤100°C, and sieved to -100 mesh through stainless steel sieves.

74- Sediment sample collected from the stream bank, dried at ≤100°C, and sieved to -170 mesh through stainless steel sieves.

75- Sediment sample collected from the stream bank, dried at ≤100°C, and sieved to -230 mesh through stainless steel sieves.

96 - Dry natural pond sediment sample dried at ≤100°C (if necessary) and sieved to -100 mesh through stainless steel sieves.

97 - Dry artificial pond sediment sample dried at ≤100°C (if necessary) and sieved to -100 mesh through stainless steel sieves.

98 - Other water

99 - Other sediment

These key numbers are to be used only for water (98) or sediment (99) samples coming from a special source and/or given a special treatment not described for any of the types of samples above.

PDF 91 - 22: ERRATA

ONE ELEMENT WAS OMITTED FROM LISTING OF ELEMENTS ON DISK. THAT ELEMENT WAS ....SE.....IT SHOULD GO BETWEEN AS AND ZR.

CORRECT ORDER OF ELEMENTS ON FILE IS:

U	AG	BI	CD	CU	NB	NI	PB	SN
W	AS	SE	ZR	MO	BE	LI	AL	AU
BA	CA	CE	CL	CO	CR	CS	DY	EU
FE	HF	K	LA	LU	MN	MG	NA	RB
SB	SC	SM	SR	TA	TB	TH	TI	V
YB	ZN	and	U/TH					

PDF 91-22 - UPDATE

The section of PDF 91-22 which describes the format of the NURE data as it is available on computer disk has changed. Instead of all data on one file/quadrangle in columnar format separated by blanks, it is now split into 3 files/quadrangle with commas and blanks separating the fields. The new files are named "NXXX#.ASC". N is for NURE data, XXX is the 3 character quadrangle identification, and # is 1, 2, or 3. This new version will make it easier for users to input the data directly into Quatro-Pro, Lotus, or other spread sheets with a 250 character limit on record length. In Quatro-Pro use IMPORT option, ASCII file, QUOTE & COMMA delimited. Two records were added in front of the data:

1.) a header record which says

"Part <n>, Quadrangle: <name>"

2.) a record with column headings so users can tell which elements are in the file and the order. The column headings are comma and blank delimited too. The data is still in ASCII format and the commas can be eliminated by using a variety of text editors.

Following are the formats of the 3 files. Column 1 was left blank for all records so that all data in the files could be printed even when the first item is interpreted as a carriage control character.

FILE 1:

Record 1: 55 Characters of text. - starts col 2 and length depends on length of quadrangle name. It is enclosed in quotes.

Record 2: col 2-39

"Samp-Id","RC", "Lat.", "Long.", "ST" (Sample Type--see main text)

Starting in col 40, 14 groups of: , "Xx" which are the elements names for the columns. For this record they are: U, Ag, Bi, Cd, Cu, Nb, Ni, Pb, Sn, W, As, Se, Zr, and Mo. NOTE: There is NOT a comma after the last item and all items are enclosed in quotes.

Record 3 to end:

col 2-8. 7 digit sample number.

col 9-10 ", " - a comma followed by a blank

col 11-13 replicate code - 3 digits allowed, most values will be 0 or 1 digit.

col 14-24 ", " followed by Latitude in decimal degrees with 5 decimal places

col 25-35 ", " followed by Longitude in decimal degrees with 5 decimal places

col 36-39 ", " followed by 2 digit sample type

Starting in col 40, 17 groups of "," (comma) followed by 8 digit value of element in ppm. Decimal point is present. None of the values require all 8 digits so that leaves a blank space after the comma. NOTE: no comma after the last item.

FILE 2:

Record 1: - Same as for file 1

Record 2: col 2 to 8 - "Samp-Id"

Starting in col 9, 17 groups of: , "Xx", which are element names for the columns. For this file they are: Be, Li, Al, Au, Ba, Ca, Ce, Cl, Co, Cr, Cs, Dy, Eu, Fe, Hf, K, and La. NOTE: no comma at end and items enclosed in quotes.

Record 3 to end:

Col 2-8 7 digit sample number.

Starting in col 9, 17 groups of ",", followed by 8 eight digit value of element. As in File 1.

FILE 3: Same format as file 2 with different elements. The elements are: Lu, Mn, Mg, Na, Rb, Sb, Sc, Sm, Sr, Ta, Tb, Th, Ti, V, Yb, Zn, and U/Th

NOTE: In the original listing of the elements, Se was accidently left out. It goes between As and Zr.

A copy of this file is included on disk. It is labeled README.NUR. If there are any problems reading this data contact Shirley Liss at DGGS. (907) - 474 - 7147.