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PRELIMINARY CATALOG OF EARTHQUAKES IN NORTHERN IMPERIAL VALLEY, CALIFORNIA

JULY 1977 - SEPTEMBER 1977

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Geological Survey standards and nomenclature.

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INTRODUCTION

The northern section of the Imperial Valley region in southern California is an area of known geothermal resources and an area of high seismicity. To study in detail the relationship between geothermal areas and earthquakes, the U.S. Geological Survey has been monitoring seismicity in the Imperial Valley with a 16 - station network since 1973. Six new stations were added to the network in November 1976. This catalog contains a description of the network and a list of preliminary data on earthquakes recorded by the network from July 1977 through September 1977.

AREA COVERED AND INSTRUMENTATION

Earthquakes reported in this catalog are located in the area indicated in Figure 1. Major faults are shown. Locations of most of the seismographic stations used in locating earthquakes reported here are shown on Figure 8 and are listed in Table 1.

The telemetered seismographic network in the Imperial Valley employs the same type of instrumentation developed by the U.S. Geological Survey for use in the central California network (see Wesson and others, 1973). Seismometers are vertical-component L-4C Mark Products [1/] seismometers (T_{seis} = 1 sec.). Signals from these instruments are filtered in the field (T_{filter} = 0.1 sec) and telemetered to the California Institute of Technology in Pasadena, California, where they are recorded on 16 mm films along with a WWVB time code in Develocorders [1/] (T_{galvo} = 0.06 sec). Peak magnification

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[1/] Any use of trade names and trademarks in this publication is for descriptive purposes only and does not constitute endorsement by the U.S. Geological Survey.

ranges from 10^5 to about 10^8 and occurs at $T_{peak} = 0.06$ sec (or 14 hz). (Refer to Wesson and others, 1973, or Hill and others, 1975, for a somewhat more detailed description of this instrumentation.) In addition to film recordings, digital recordings are made by the Caltech Earthquake Detection and Recording System (CEDAR) (Johnson, 1977). An earthquake detection algorithm is used in CEDAR, and only "detected" earthquakes are saved. CEDAR is described more fully below.

DATA ANALYSIS

During this quarter, a transition has been made from analysis based on film recordings (see, e.g., Jenkins and Fuis, 1977) to analysis based on digital recordings by CEDAR. The new data reduction procedure is as follows:

1) On-line processing. "On-line" processing refers to computer manipulation of signals at the time they are received. Signals from all stations are digitized continuously at 50 bits per second. The signal amplitude at each station is averaged in a 40-second interval of time which moves continuously keeping its leading edge at the present time. In addition, an average of amplitudes in the leading 5 seconds of this interval is made. Whenever the 5 second average exceeds the 40-second average by 50 percent for a given station, that station is considered to be triggered. Whenever 4 stations in a subarray of stations are simultaneously triggered, a "detection" is considered to be made. When a detection is made, digitigized signals from all stations in southern California are transferred from a magnetic disc, which is being continuously erased, to a magnetic tape, from which they can be played back and examined by a data analyst at a later time. The subarrays of stations used for the detection of earthquakes in the Imperial Valley are indicated in Figures 2 - 7.

2) Off-line processing. "Off-line" processing refers to interactive computer-human manipulation of signals from detected events at some time after they have been saved and stored on magnetic tape by the on-line system. (Separate computers are used for on-line processing (Data General Eclipse S/230 with 32K core) and off-line processing (Data General Nova 820 with 32K core); but their roles can be interchanged.) All events detected in a day by the on-line system are played back the following day on the off-line system; hard copies of the seismograms from each triggered station are made for each event. A data analyst reviews these seismograms to determine which events are noise events and which are earthquakes. Earthquakes are then played back a second time onto a cathode ray tube viewer (CRT) equipped with movable vertical and horizontal cross-hairs. The data are played back in 2 stages. First, seismograms from all stations in southern California are displayed on the screen, 32 at a time. During this stage the data analyst selects stations to be reviewed for timing during the second stage. During the second stage, seismograms from individual stations are played back onto the CRT, and P and S wave arrivals are timed. During this stage it is possible to amplify or attenuate the signals for visual inspection so that optimum picks can be made.

3) At the completion of timing of a day's worth of earthquakes, arrival time data are processed using a version of the computer program HYPO71 (Lee and Lahr, 1972) that has been abbreviated and modified to be accommodated by the off-line computer (Johnson, C.E., personal communication). During this step, a simple velocity structure is used in the location of all events in southern California (see Kanamori and Hadley, 1975); no station delays are used. The preliminary epicenters that result from this step determine in

which geographic areas the events fall and hence which velocity structures and associated station delays should be used for subsequent refinement of the locations.

4) Signal durations are measured according to Lee and others (1972a) from Develocorder films for all events in the Imperial Valley. CEDAR recordings have not yet been calibrated for determining magnitudes from signal durations.

5) All events in Imperial Valley are reprocessed using the computer program HYPO71 and an appropriate velocity structure with associated station delays (see Discussion). Epicentral parameters determined during this step are listed in this catalog in Table 2; and the epicenters are plotted on a map (Figure 8).

DISCUSSION

Earthquake locations are strongly dependent on the velocity model used in the location program. Epicentral determinations are less strongly dependent on the model than depth determinations, unless the earthquake occurs outside of the perimeter of the station group used in the location. The velocity model used for the earthquake locations in this catalog is based on a seismic refraction study of the Imperial Valley by Biehler and others (1964):

VELOCITY (km/sec)	DEPTH TO TOP OF LAYER (km)
2.0	0.0
2.6	1.0
3.6	2.0
4.7	3.0
6.1	6.0
8.0	20.0

The P-wave delay times assigned to each station (Table 1) were established from a calibration blast detonated by the U.S. Geological Survey on March 23, 1976, at 33° 05.30' N. Latitude and 115° 37.87' W. Longitude, 5 kilometers north of Westmorland. This calibration shot is very near the epicenters of most of the earthquakes of the November 1976 earthquake swarm. Our studies indicate that, in this area, epicentral locations are probably as accurate as ± 0.5 km; hypocentral locations (depths) are probably accurate only to ± 2 km. The hypocentral locations of these earthquakes relative to one another is probably more accurate, however.

Magnitudes reported in this catalog are based on the method of signal duration described by Lee and others (1972a). The magnitude of a given earthquake is the average at several stations of magnitudes determined by

$$M = - 0.87 + 2.00 \log (\tau) + 0.0035\Delta$$

where

Δ is epicentral distance in km, and

τ is signal duration in seconds.

Signal duration is the time interval in seconds from the onset of the P wave arrival to a point where the trace amplitude (peak-to-peak) falls below 1 cm as it is seen on the Geotech film viewer. A 0.0 magnitude (Table 2) indicates that the magnitude was not calculated. In some cases an earthquake signal is truncated by the onset of a larger event or extended by the onset of smaller events. In these cases the method of determining magnitude using signal duration can not be used.

The hypocentral parameters listed in Table 2 are the following:

1) Y, year of occurrence
2) M, month of occurrence
3) D, day of occurrence

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$$\left.\begin{array}{l}\text{4) H, hour of occurrence}\\ \text{5) M, minute of occurrence}\\ \text{6) SEC, second of occurrence}\end{array}\right\}\ \text{GCT}$$

7) LAT, north latitude of epicenter, in degrees

8) LONG, west longitude of epicenter, in degrees

9) DEP, depth of hypocenter, in kilometers

10) MAG, magnitude

11) N, number of P arrivals used in locating the earthquake

12) GAP, maximum azimuthal gap, in degrees, between stations contributing P-arrivals

13) DM, distance from epicenter to nearest station used in locating the earthquake

14) RMS, root mean square of travel time residuals, R_i, in seconds

$$\text{RMS} = \sqrt{\sum_{i=1}^{N} R_i \;/\; N}$$

15) ERH, standard error of the epicenter, in kilometers

16) ERZ, standard error of the focal depth, in kilometers

17) Q, solution quality of the hypocenter

18) M, model used in location. M = 1 throughout this preliminary catalog

A filter is applied to the events in this catalog to eliminate very bad hypocenter solutions. A solution was not listed or plotted unless RMS $\leq$ 0.50 seconds.

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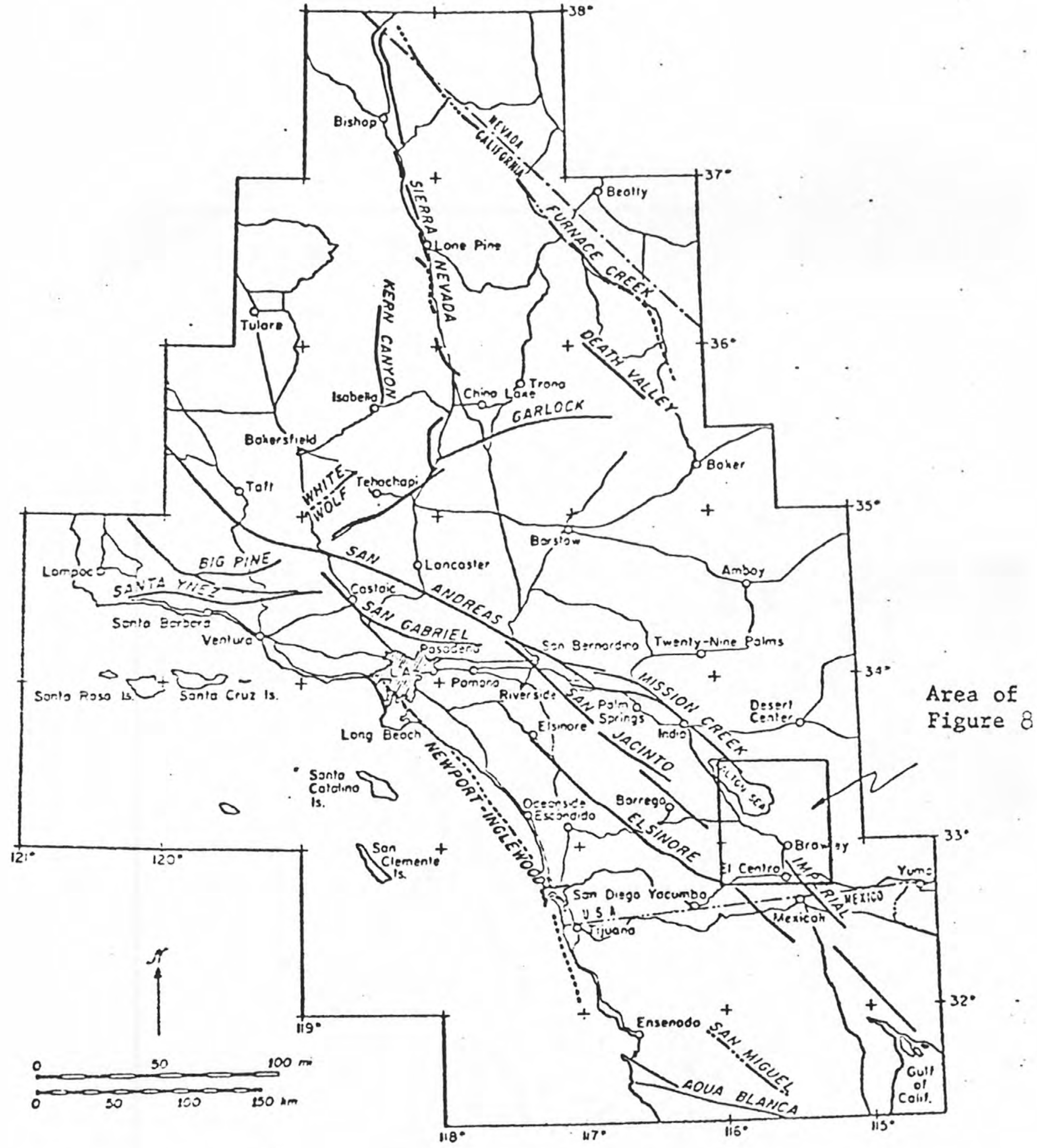
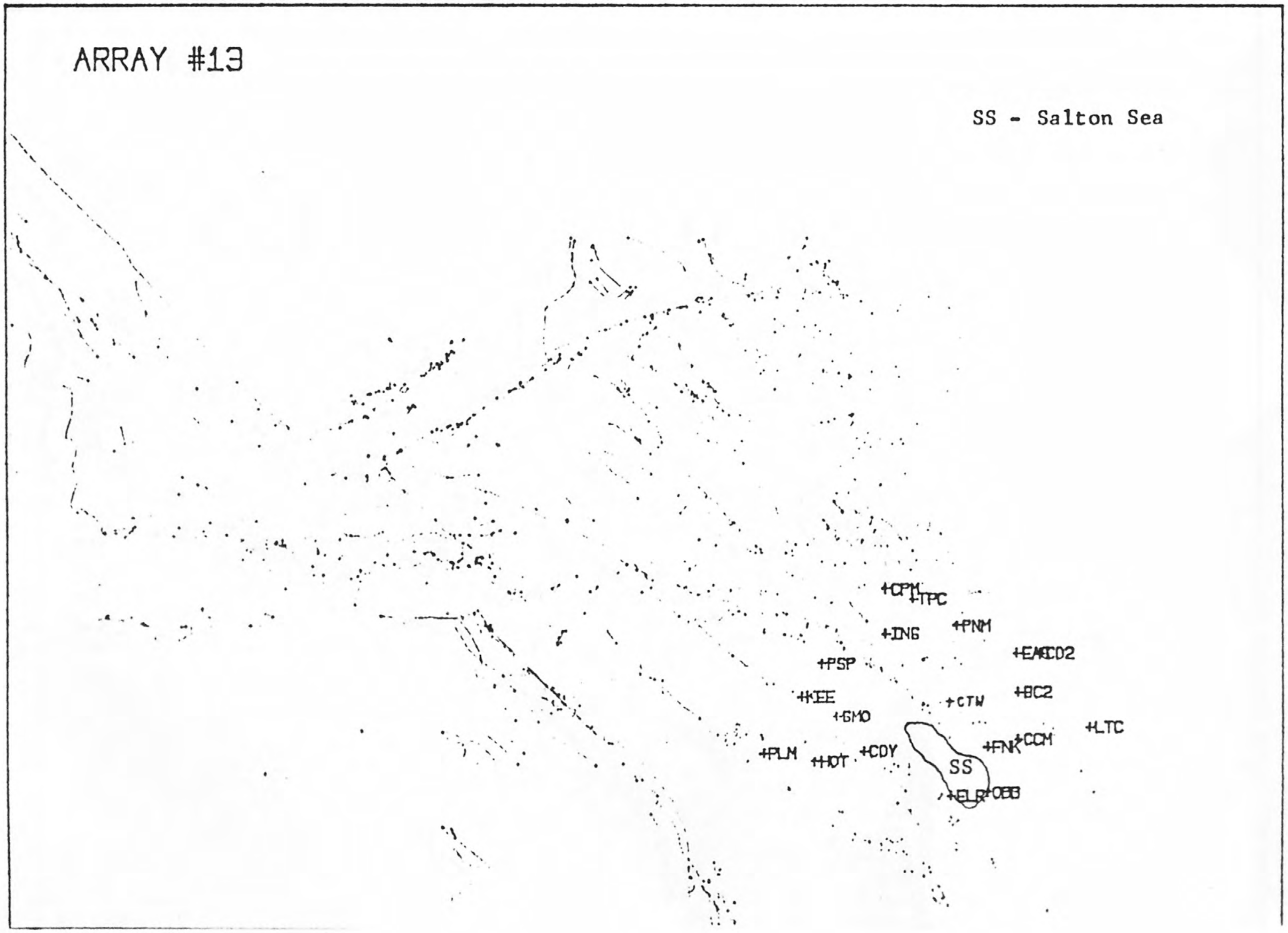


Figure 1. Base map of southern California region with major faults. Area of Figure 8 is shown.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+TPC
+ING
+PNM
+EAMCD2
+PSP
+KEE
+GMO
+CTW
+BC2
+LTC
+PLM
+HOT
+CDY
SS
+FNK
+CCM
+ELR
+OBB

Figure 2.

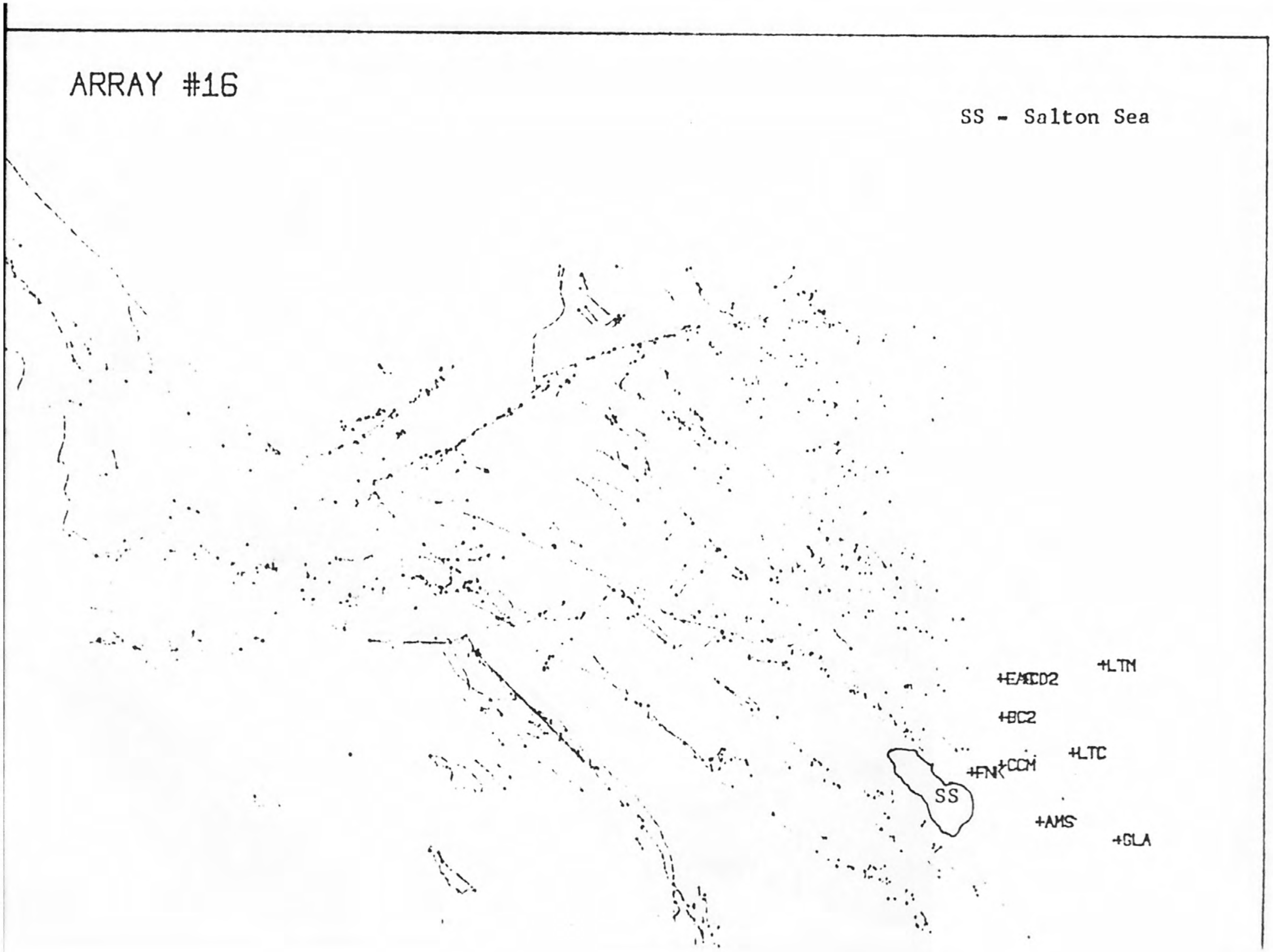
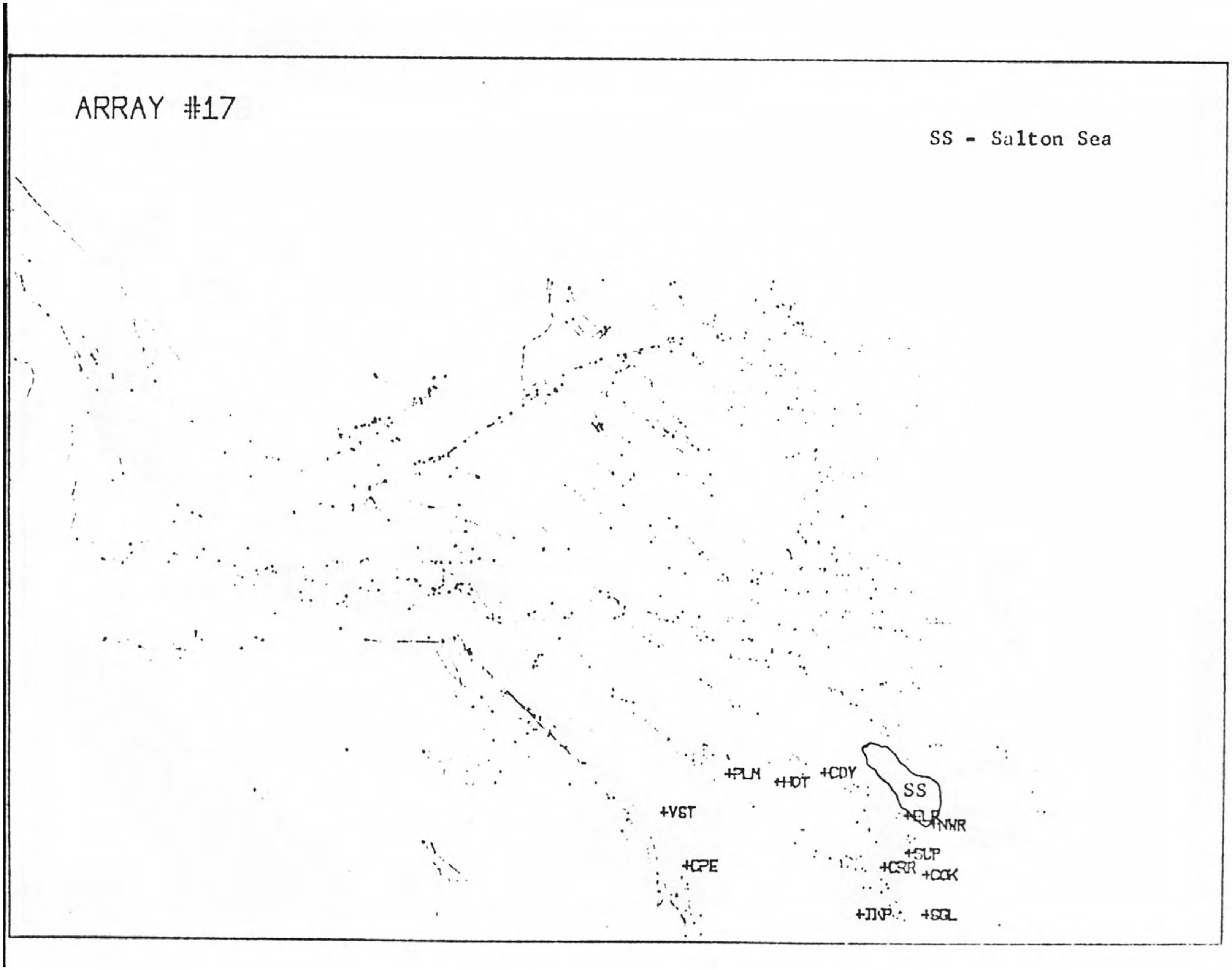


Figure 3.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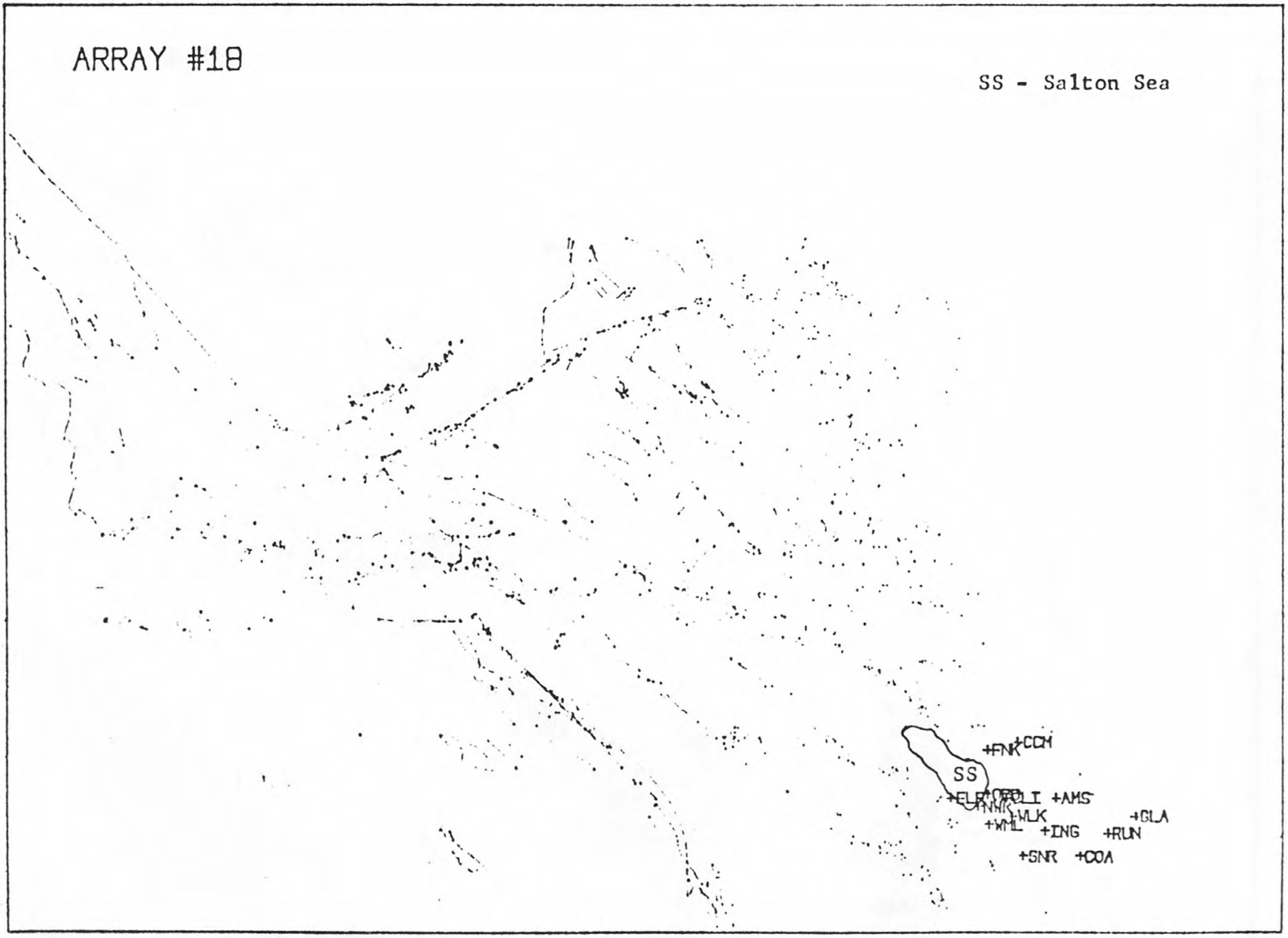
+IMP
+SGL

Figure 4.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OLI
+AMS
NWK
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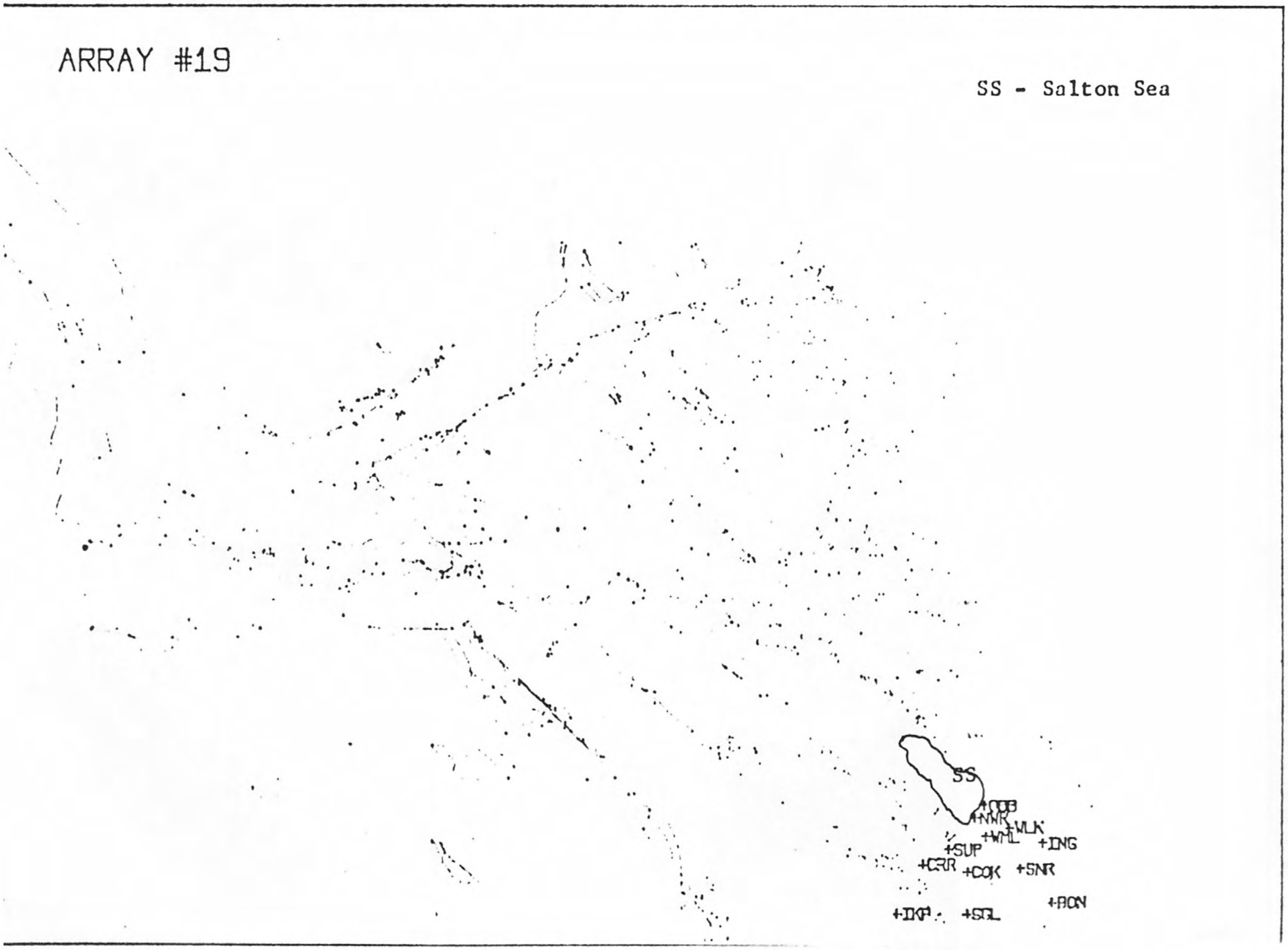
+RUN
+SNR
+COA

Figure 5.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+SGL

Figure 6.

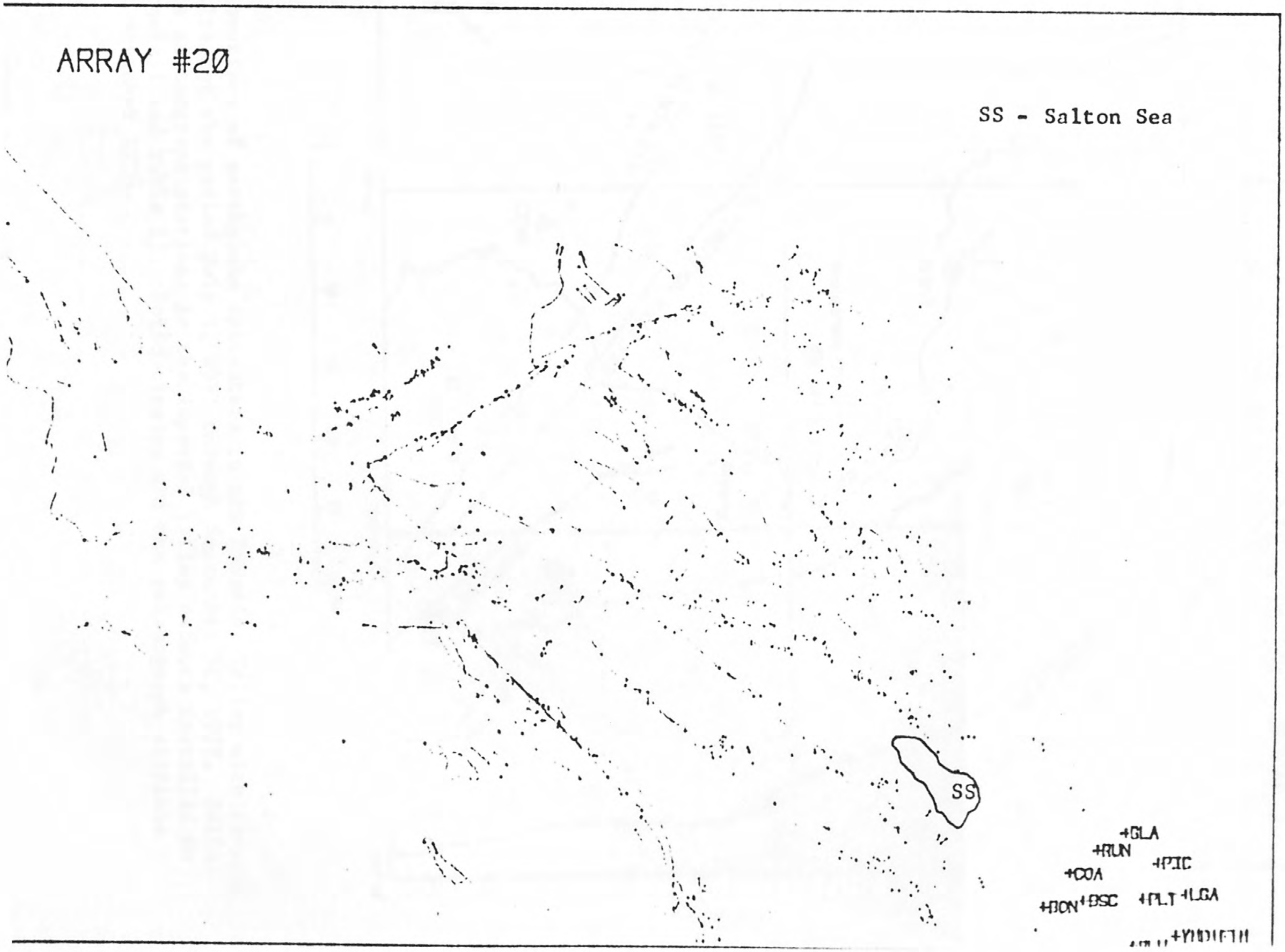

Figure 7.

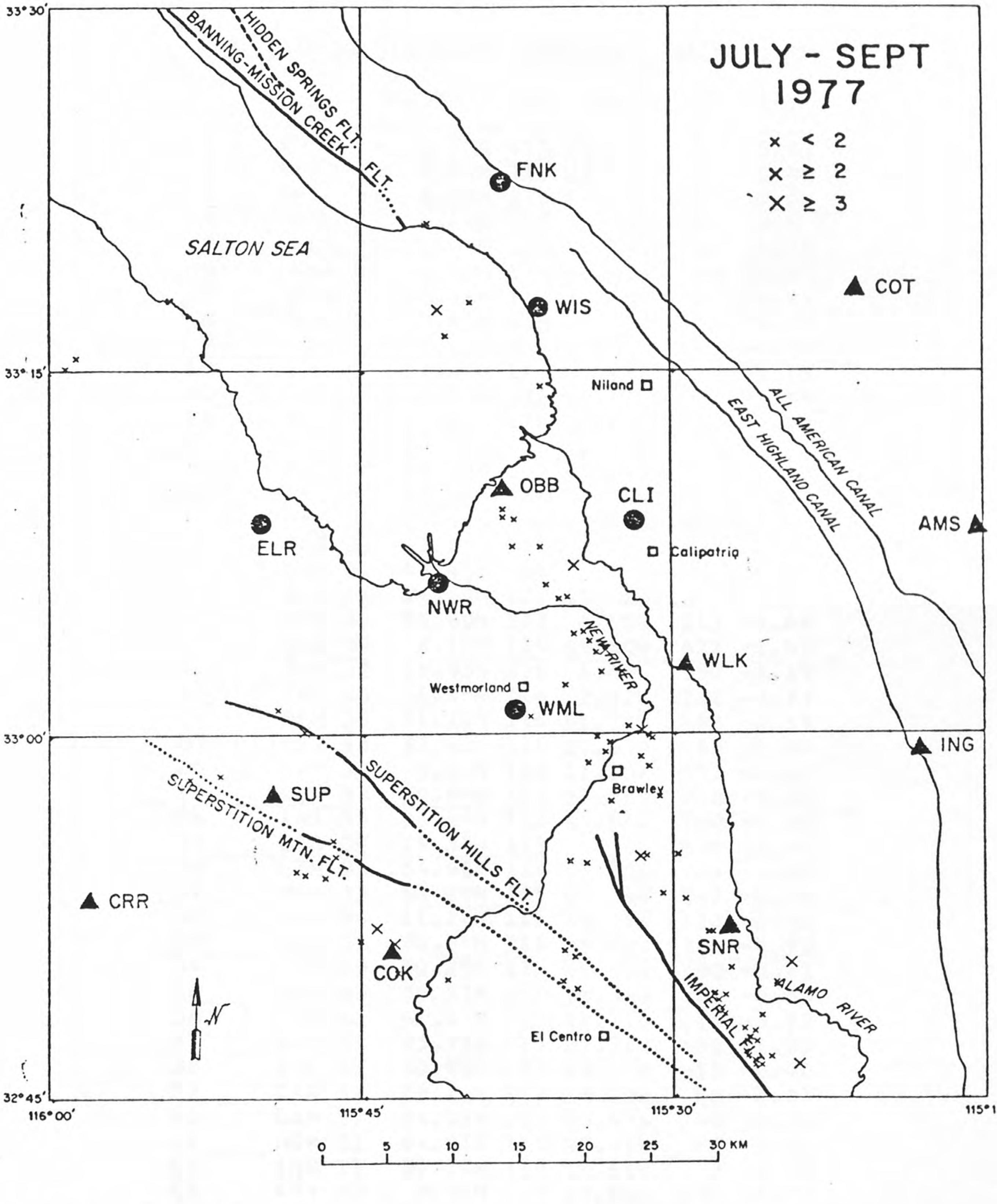

Figure 8. Locations of earthquake epicenters in the Imperial Valley with respect to major faults for the period July 1, 1977 through September 30, 1977. Solid triangles are seismograph stations in the Imperial Valley network installed in 1973 (see Figure 1 and Table 1). Solid circles are the seismograph stations installed in November 1976.

Table 1. Station Data

NO.	STATION	LATITUDE		LONGITUDE		ELEV	DELAY
		DEG	MIN	DEG	MIN	FEET	SEC
1	RUGR	33	2.73N	115	34.10W	-47	-0.02
2	VERD	33	7.07N	115	33.76W	-61	0.02
3	EPIC	33	5.28N	115	36.28W	-61	0.0
4	BANG	33	5.29N	115	37.84W	-62	0.0
5	ELR	33	8.84N	115	49.95W	-63	-0.55
6	NWR	33	6.10N	115	41.01W	-69	-0.64
7	WIS	33	16.56N	115	35.58W	-68	-0.91
8	WML	33	0.91N	115	37.35W	-44	-0.29
9	CLI	33	8.45N	115	31.64W	-59	-0.20
10	FNK	33	22.98N	115	38.26W	12	-1.13
11	COY	33	21.84N	116	18.63W	210	-1.58
12	HOT	33	18.84N	116	34.89W	1975	-1.39
13	SMO	33	32.15N	116	27.70W	0	-1.34
14	PLT	32	43.87N	114	43.76W	61	-1.52
15	SLU	32	30.10N	114	46.64W	41	-0.97
16	AMS	33	8.48N	115	15.25W	140	-1.13
17	* COA	32	51.81N	115	7.36W	-35	0.0
18	* BSC	32	43.49N	115	2.64W	43	0.0
19	* BLU	34	24.40N	117	43.61W	1880	0.0
20	CPE	32	52.80N	117	6.00W	213	-0.65
21	GLA	33	3.10N	114	49.60W	627	-1.05
22	IKP	32	38.93N	116	6.48W	957	-1.17
23	TPC	34	6.35N	116	2.92W	761	-0.77
24	PLM	33	21.20N	116	51.70W	1692	-0.59
25	BC2	33	39.42N	115	27.67W	1185	-1.05
26	CPM	34	9.24N	116	11.80W	937	-0.61
27	CO2	33	50.83N	115	20.68W	276	-1.10
28	INS	33	56.14N	116	11.66W	1700	-1.35
29	LTC	33	29.34N	115	4.20W	458	-1.21
30	LTM	33	54.90N	114	55.10W	744	-0.66
31	PNM	33	58.64N	115	48.05W	1147	-0.75
32	SHH	34	11.26N	115	39.27W	1122	-0.66
33	KEE	33	38.30N	116	39.19W	1366	-0.92
34	VGR	33	50.25N	116	48.53W	1500	-0.71
35	WWR	33	59.51N	116	39.36W	702	-0.53
36	BON	32	41.67N	115	16.11W	14	-0.22
37	CCM	33	25.75N	115	27.88W	488	-1.30
38	COK	32	50.95N	115	43.61W	-15	-0.40
39	CRR	32	53.18N	115	58.10W	98	-1.07
40	DAH	32	44.07N	115	33.47W	-6	0.20
41	HSP	32	44.81N	115	33.71W	-6	0.13
42	ING	32	59.30N	115	18.61W	2	-0.37
43	KBY	33	2.41N	115	42.06W	-51	-0.27
44	OBB	33	10.04N	115	38.20W	-61	-0.62
45	RSE	32	55.53N	115	29.95W	-41	-0.22
46	RUN	32	58.33N	114	58.63W	152	-1.01
47	SGL	32	38.95N	115	43.52W	110	-1.08
48	SNR	32	51.71N	115	26.21W	-30	-0.32
49	SUP	32	57.31N	115	49.43W	219	-1.07

Table 1. (Cont'd.)

NO.	STATION	LATITUDE		LONGITUDE		ELEV	DELAY
		DEG	MIN	DEG	MIN	FEET	SEC
50	WLK	33	3.08N	115	29.44W	48	-0.11
51	FTM	32	33.29N	114	20.01W	263	-1.68
52	PIC	32	54.85N	114	38.59W	263	-0.95
53	YMD	32	33.28N	114	32.68W	76	-0.48
54	EA11	33	46.44N	115	35.83W	780	-1.13
55	HA10	33	42.80N	115	34.90W	536	-0.59
56	ORO9	33	37.05N	115	35.50W	555	-0.79
57	CH08	33	30.25N	115	35.68W	634	-1.14
58	CH07	33	27.21N	115	35.50W	585	-1.14
59	COA5	33	22.20N	115	36.10W	18	-1.16
60	HIL4	33	20.37N	115	35.73W	-40	-1.06
61	SAL2	33	15.82N	115	35.25W	-69	-0.83
62	MUD1	33	13.21N	115	35.16W	-70	-0.71
63	ROCX	33	10.58N	115	36.29W	-69	-0.74
64	YNGX	33	7.98N	115	36.61W	-64	-0.08

Table 2.

Preliminary hypocenter solutions for
earthquakes in southern California

July 1, 1977 through September 30, 1977

N	Y	M	D	H	M	SEC	LAT	LONG	DEP	MAG	N	GAP	DM	RMS	ERH	ERZ	Q
1	77	7	2	21	12	12.80	32-49.36	115-41.05	8.05	1.11	8	130	4.5	0.16	1.3	1.7	B
2	77	7	4	1	33	14.37	33- 1.07	115-49.18	2.13	1.45	7	129	7.0	0.14	0.8	1.3	B
3	77	7	4	5	9	6.66	33- 2.04	115-35.31	7.01	1.08	11	83	3.8	0.22	1.0	2.7	B
4	77	7	4	19	41	21.88	32-58.64	115-31.29	8.15	0.87	10	155	8.7	0.25	1.6	2.1	C
5	77	7	4	21	59	23.58	33-17.87	115-39.82	2.07	1.57	8	109	28.9	0.09	0.6	1.5	B
6	77	7	10	10	55	20.10	33- 4.24	115-34.42	7.85	1.06	11	131	26.3	0.16	0.9	2.1	C
7	77	7	10	20	42	21.33	33- 5.61	115-35.59	5.41	1.50	25	77	8.1	0.14	0.3	0.3	B
8	77	7	12	11	51	39.95	32-54.09	115-46.93	4.71	0.64	8	116	7.1	0.17	1.1	0.7	B
9	77	7	13	19	29	4.31	32-51.81	115-28.33	10.48	0.61	8	163	3.3	0.31	4.0	1.4	C
10	77	7	15	14	53	34.20	32-46.30	115-24.19	5.00	2.00	27	122	10.5	0.21	0.6	0.6	C
11	77	7	15	15	15	45.35	33- 0.75	115-37.00	5.61	1.01	5	202	20.4	0.37	73.0	16.6	D
12	77	7	19	8	33	25.49	32-47.80	115-26.82	3.22	1.09	9	142	30.8	0.08	0.6	1.3	B
13	77	7	19	8	39	41.97	32-47.42	115-26.53	9.33	1.38	14	181	7.9	0.14	0.7	1.7	C
14	77	7	22	4	33	32.81	32-46.28	115-26.28	6.17	1.18	9	125	18.0	0.12	0.7	56.4	C
15	77	7	25	5	45	52.90	33- 3.48	115-33.36	7.34	2.01	28	53	6.2	0.23	0.6	1.1	B
16	77	7	26	16	13	33.72	32-59.06	115-31.69	4.24	0.78	7	154	9.4	0.17	1.5	1.6	C
17	77	7	27	18	5	6.81	33- 7.00	115-34.85	1.99	2.14	22	47	5.7	0.39	0.7	0.8	C
18	77	7	28	8	6	29.89	32-53.19	115-29.56	10.86	1.20	13	155	5.9	0.23	1.1	0.8	C
19	77	7	30	3	26	28.50	32-48.98	115-28.05	6.33	1.46	17	107	23.0	0.13	0.5	1.1	B
20	77	7	30	3	33	34.29	32-51.81	115-27.48	12.80	0.91	9	150	2.0	0.33	5.3	1.1	D
21	77	7	30	3	34	34.00	32-48.65	115-27.90	7.76	1.72	17	136	6.2	0.17	0.7	1.2	C
22	77	7	30	3	48	7.20	32-49.27	115-28.22	8.52	1.30	22	105	5.5	0.20	0.6	1.1	B
23	77	7	30	3	50	22.47	32-49.21	115-28.28	11.62	0.92	10	181	5.6	0.20	2.6	1.2	D
24	77	7	30	10	25	3.54	32-51.99	115-44.48	9.92	2.45	21	31	2.3	0.19	0.7	0.7	B
25	77	7	30	23	13	54.79	32-50.13	115-43.48	3.48	0.85	4	215	16.2	0.06			C
26	77	7	30	23	19	55.41	32-51.46	115-45.24	5.00	0.89	3	169	2.7	0.01			C
27	77	7	31	11	36	31.14	32-49.70	115-25.25	5.16	1.15	10	191	4.0	0.05	0.4	0.2	C
28	77	7	31	12	25	5.94	32-48.33	115-25.95	8.20	1.20	12	141	6.3	0.24	1.0	1.2	C
29	77	8	3	1	2	46.02	32-54.94	115-31.75	6.59	2.05	35	77	10.5	0.32	0.7	1.7	C
30	77	8	6	18	56	45.07	33- 2.59	115-32.57	6.27	1.82	13	84	5.0	0.14	0.6	0.9	A
31	77	8	8	22	26	9.73	33-17.56	115-41.41	7.55	2.53	21	62	11.2	0.17	0.6	1.0	B
32	77	8	10	14	30	56.49	32-50.30	115-27.45	1.90	1.21	8	176	31.5	0.11	0.9	0.6	B
33	77	8	10	16	20	56.02	32-48.40	115-27.78	5.00	0.94	8	156	30.2	0.12	0.8	1.5	B
34	77	8	10	18	6	7.32	32-49.19	115-27.73	7.43	1.37	6	134	31.1	0.08	0.8	46.5	C
35	77	8	11	17	31	40.87	32-58.33	115-51.97	10.91	0.94	6	159	4.4	0.08	1.2	1.1	C
36	77	8	13	15	57	47.84	32-51.33	115-43.62	8.48	2.28	30	66	0.7	0.19	0.5	0.6	B
37	77	8	14	22	9	44.58	32-46.28	115-25.98	5.00	1.30	10	150	26.7	0.08	0.4	1.1	B
38	77	8	14	22	16	45.88	32-46.53	115-25.51	6.03	1.84	13	176	17.3	0.20	1.0	2.0	C
39	77	8	15	6	22	53.08	33- 3.39	115-33.79	4.67	1.13	28	81	6.8	0.17	0.4	0.3	B
40	77	8	17	17	57	54.77	32-55.04	115-29.90	9.11	1.11	13	83	8.4	0.32	1.1	3.3	B
41	77	8	18	1	55	25.98	32-50.49	115-24.54	4.49	2.75	34	93	3.4	0.26	0.7	0.7	B
42	77	8	21	4	48	30.67	32-46.85	115-26.75	10.00	1.29	31	121	9.0	0.41	1.0	1.2	C
43	77	8	21	6	58	49.12	32-47.27	115-26.22	5.00	1.13	13	193	40.7	0.30	1.4	2.2	C
44	77	8	21	14	34	24.46	32-47.42	115-26.58	6.84	1.12	8	144	30.8	0.18	0.9	31.8	C
45	77	8	22	4	26	34.71	33- 7.76	115-36.48	5.60	1.31	19	60	5.0	0.20	0.8	0.7	B
46	77	8	23	18	53	52.97	33- 0.15	115-31.61	8.60	2.11	27	93	9.1	0.24	0.6	0.9	B
47	77	8	23	19	15	10.15	32-59.83	115-31.14	3.34	0.66	16	95	6.6	0.09	0.4	0.5	B
48	77	8	23	19	15	16.10	33- 0.33	115-32.27	7.15	1.35	13	92	6.7	0.33	1.5	3.9	C
49	77	8	23	19	15	30.03	32-59.93	115-31.27	4.00	1.94	14	94	6.5	0.12	0.5	0.5	B
50	77	8	24	0	14	8.00	33- 0.0	115-31.33	8.56	1.29	20	94	6.4	0.24	0.8	0.9	B

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    D  H M   SEC    LAT       LONG      DEP  MAG   N GAP   DM  RMS   ERH  ERZ Q

77 828 15  4 36.17 32-55.63 115-46.55 4.95-0.81  7 133   5.5 0.06   0.9  0.9 B 1
77 9 1 20 11 15.66 33- 4.14 115-34.88 6.03 0.97 11 138   7.1 0.15   0.8  2.7 C 1
77 9 2 20  7  9.81 33- 5.69 115-35.18 5.70 1.79 25  77   7.5 0.21   0.5  0.6 B 1
77 9 3  3 29 30.33 32-57.22 115-33.10 1.55 1.30  6 125  12.2 0.23   2.7  2.5 C 1
77 9 6  7 55 54.59 32-57.41 115-30.79 4.53 0.71  9 104  10.7 0.10   0.6  0.5 B 1
77 9 6 14 36 36.73 32-54.22 115-47.92 7.32 0.92  6 189   6.2 0.03   0.4  0.8 C 1
77 9 6 14 37 20.53 32-54.95 115-46.42 9.95 1.61 16 124   6.4 0.24   0.9  0.8 B 1
77 9 7 11 40  5.01 32-58.20 115-53.41 9.83 0.81  8 100   6.4 0.16   1.1  2.0 B 1
77 910  7 39 14.31 32-59.27 115-33.38 1.34 1.04  7  94   6.9 0.08   0.4  0.6 B 1
 7 910 13 17 38.95 33-15.22 115-59.24 2.21 1.22  7 115  32.5 0.05   0.5  0.7 B 1
 7 910 16 13 48.33 32-51.05 115-35.41 6.03 0.31  6 272  24.7 0.27   3.7 48.0 D 1
   910 16 14  1.28 32-50.79 115-34.90 6.39 0.62  6 274  25.7 0.13   2.1 30.9 D 1
   912  0 27 37.72 32-55.01 115-29.92 2.77 1.08 16  77  14.9 0.30   1.0  1.1 C 1
   912  7  3 27.71 32-54.75 115-35.12 7.38 1.08 16  92  11.9 0.36   0.9  4.0 C 1
   912  7 27  5.64 32-54.66 115-34.30 5.68 1.89 22  93  12.5 0.39   0.8  1.7 C 1
   912 22 44  5.17 32-59.66 115-33.14 1.16 1.53 10  93   6.9 0.20   0.4  0.5 B 1
   913  1 43  5.93 33- 3.36 115-34.13 5.10-0.84  6  93   7.4 0.08   0.6  0.7 B 1
   913  1 43  8.59 33- 3.59 115-33.35 7.40 0.57  5 100   6.2 0.19   2.4  7.3 D 1
    13  6 47  2.08 33- 2.57 115-33.54 3.06 1.98 21 100   6.5 0.32   0.8  1.1 C 1
    13 11 51  4.65 33-21.14 115-41.9012.08 1.26 15 120   6.6 0.24   1.0  1.2 B 1
    13 11 52 43.35 33-21.08 115-42.0010.36 1.54 14 120   6.8 0.19   0.9  1.9 B 1
    13 19  8 13.22 33- 0.14 115-47.89 4.40 2.24 15  87   5.3 0.08   0.3  0.2 B 1
    14  5  3 59.74 33-14.41 115-36.44 6.38 1.46 16 129   4.2 0.22   0.9  2.1 B 1
    15  0 37 38.47 32-59.90 115-23.75 7.75 0.93 11  92   5.9 0.35   1.6  5.0 C 1
     7 10 24 27.93 32-47.69 115-26.30 9.55 1.25 13 114   7.4 0.14   0.5  1.6 B 1
     7 11 59 58.[illegible] 32-47.27 115-26.69 7.23 1.34 14 118   8.2 0.16   0.6  1.1 B 1
       12 26 23.64 32-46.69 115-26.62 9.73 1.91 19 122   9.3 0.30   1.0  1.5 C 1
       15 22 40.29 33-16.49 115-41.02 9.12 1.54 12 100   8.4 0.36   1.7  4.3 C 1
        0 55 41.73 32-46.49 115-26.30 9.89 1.88 32 123   9.7 0.41   0.9  1.1 C 1
        7 43 26.98 32-55.80 115-34.21 4.63 1.30  9  94   6.2 0.34   1.9  1.6 C 1
       14 13 31.81 32-51.81 115-28.48 8.76 0.97 19 123   3.5 0.21   0.6  1.3 B 1
       13 41  0.57 32-54.97 115-31.43 8.15 0.84 14  86  10.1 0.22   0.7  1.4 B 1
       15  9  3.93 32-54.35 115-48.35 8.94 0.79  7 170   5.7 0.04   0.3  0.5 B 1
        7 50 47.55 32-49.77 115-35.48 3.10 1.03  9  96  12.9 0.20   1.2  2.6 C 1
        8 52 26.39 32-49.46 115-34.79 7.30 1.33 22  99  14.0 0.41   0.9  2.7 C 1
        4  9 30.34 33-15.65 115-58.72 1.36 1.18  5 227  33.0 0.01   0.5  0.3 C 1
          41 22.19 32-53.40 115-30.64 5.00 0.0  14 103   7.6 0.31   1.4  1.7 C 1
          19  4.41 33- 6.20 115-36.20 8.89 0.53  7 185   7.5 0.34  33.3 30.6 D 1
          23  0.51 33- 9.32 115-38.30 5.00 1.15 18  99   1.3 0.43   1.7  0.8 C 1
          31 19.54 33- 8.90 115-37.76 2.90 1.16 13  83   2.2 0.15   0.5  0.4 B 1
          32 40.09 33- 6.99 115-38.30 5.00 1.81 29  74   1.9 0.39   0.9  0.6 B 1
          26 39.31 33- 7.78 115-37.83 4.12 0.88 19  76   4.2 0.48   1.2  1.1 B 1
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