United StatesDepartment of the Interior
Geological Survey

PRELIMINARY CATALOG OF SEISMICITY

FROM SOUTH-CENTRAL GUATEMALA

JULY 1 - DECEMBER 31, 1976

By
R. A. White and David H. Harlow

Open-File Report 80-83

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Menlo Park, California

PRELIMINARY CATALOG OF SEISMICITY FROM SOUTH-CENTRAL GUATEMALA JULY 1 - DECEMBER 31, 1976

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INTRODUCTION

A six-station seismic network, about 40 km in diameter, has been operated just west of Guatemala City since March 1975. The network is part of a cooperative project between the U. S. Geological Survey and the Instituto Nacional de Sismologia, Vulcanologia, Meterologia e Hidrologia (INSIVUMEH) of Guatemala.

The primary purpose of the network is to monitor the seismicity associated with the active volcanoes Pacaya and Fuego and the inactive volcanoes Agua and Acatenango that have not erupted for at least two hundred years. A secondary purpose is to investigate seismicity along the Mixco Fault Zone, a set of normal faults that passes within 5 km of Guatemala City. The major value of the network, however, may lie in its proximity to the Motagua fault, the site of the disasterous Guatemalan earthquake (Ms = 7.5) of February 4, 1976 that killed more than 76,000 people. The area of coverage, although some 150 km distant from the point of initial rupture on the Motagua Fault (Dewey and Julian, 1976) is important for reasons as follows:

1) It contains the western terminus of the 230 km of surface faulting (Plafker and others, 1976a) that occurred on the Motagua fault.

2) It contains most of the observed secondary surface faulting (Bonilla and others, 1976).

3) It is roughly coincident with the region of greatest damage and highest casualties (Espinosa and others, 1976).

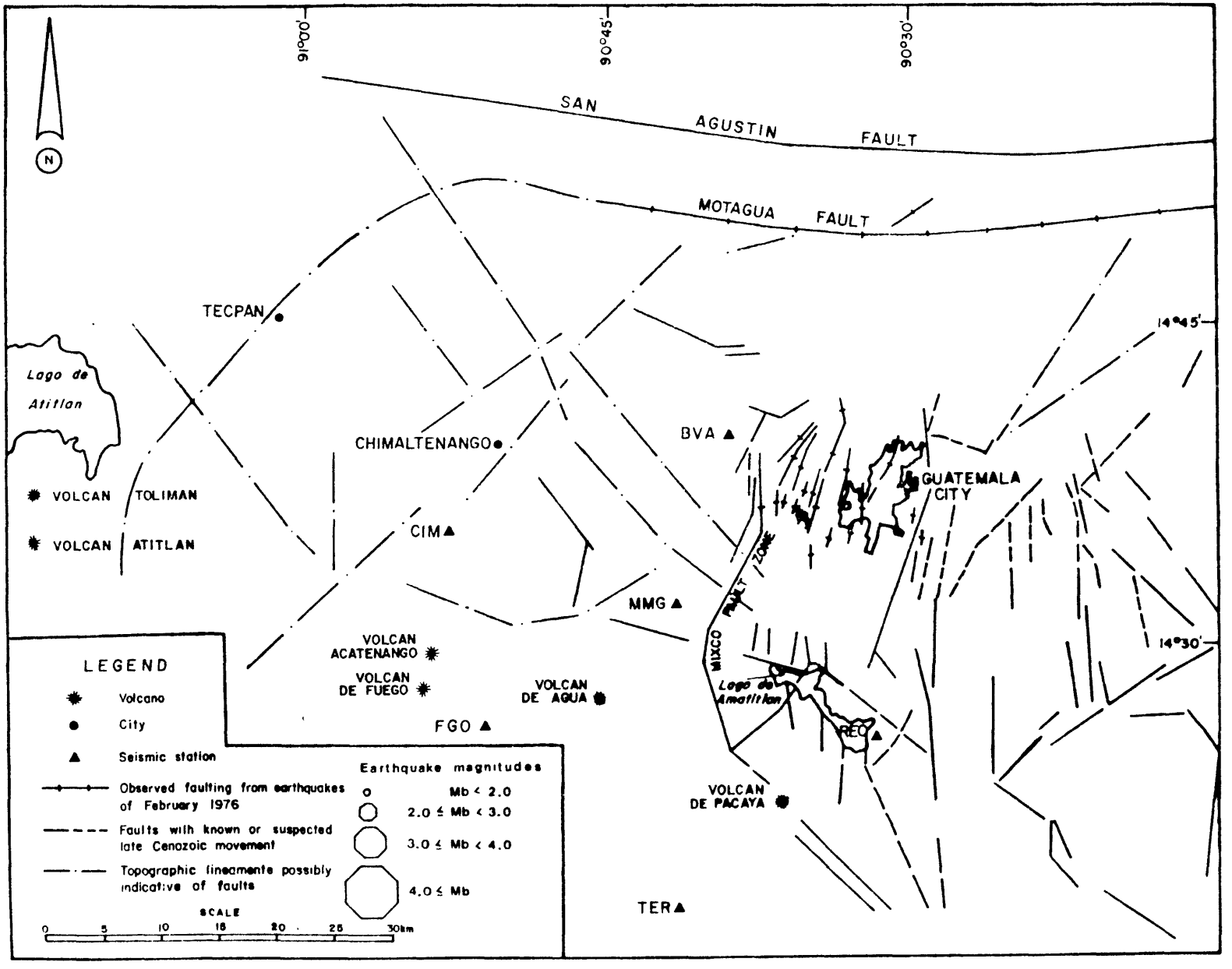

FIGURE 1. Map of the study area. The data shown on this map were gathered from various geologic maps published by the Instituto Geographico Nacional, Guatemala.

4) 9 of the 13 largest aftershocks (Mb 4.5) (Person and others, 1976) as well as several thousand aftershocks of lesser magnitude (White and Harlow, 1979) occurred within the area of coverage.

This catalog is the third in a chronological sequence. The first reports hypocentral data on the seismicity prior to the Guatemalan earthquake of February 4, 1976 and the second reports aftershocks through June 30, 1976. This catalog contains the hypocentral data on 999 events from July 1, 1976 through December 31, 1976. These data show that even after ten months the level of seismicity in this area is still four to six times above that prior to the Guatemalan earthquake. Because the level of seismicity is still decreasing, however, it is not yet possible to determine whether the relatively low seismicity in the months prior to the earthquake represents the mean background level, or is some precursory quiescent phenomenon.

INSTRUMENTATION

The remote seismic stations each use a one second vertical L-4C Mark Products* seismometer with a resistor circuit added to give 80% critical damping. The signal is converted to a frequency-modulated tone by an amplifier and voltage-controlled oscillator package, Model JE202 developed at the U. G. Geological Survey by J. Van Schaack. The amplifier has a maximum gain of 100 db and has a 12 db/octave filters with 3 db points

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offices in Guatemala City. The tone is demodulated by a discriminator, Van Schaack Model JE101, and a time signal from a crystal-controlled oscillator is added. The resulting signal is then recorded at a rate of 60 mm per minute on a drum recorder using heat-sensitive paper.

The six stations are plotted on a base map in Figure 1 and the station coordinates, elevations, magnifications, and delays are listed in Table 1. A block diagram of the total system is shown in Figure 2.

The overall frequency response of the seismic system is shown in Figure 3. The magnification is adjusted according to the background noise level at each station ranging from 6×10^4 to 2.4×10^5 at 25 Hz.

TABLE 1

Station Coordinates, Elevations, Magnifications, and Delays

Station	Latitude (Degrees)	Longitude (Degrees)	Elevation (Meters)	Magnification at 25 Hz	Delay (Sec)
FGO	14.446N	90.840W	1410	120,000	0.10
CIM	14.595N	90.860W	2450	60,000	0.41
MMG	14.538N	90.681W	2190	60,000	0.48
BVA	14.667N	90.637W	2262	120,000	0.22
REC	14.437N	90.519W	1500	120,000	0.40
TER	14.304N	90.684W	0570	240,000	0.05

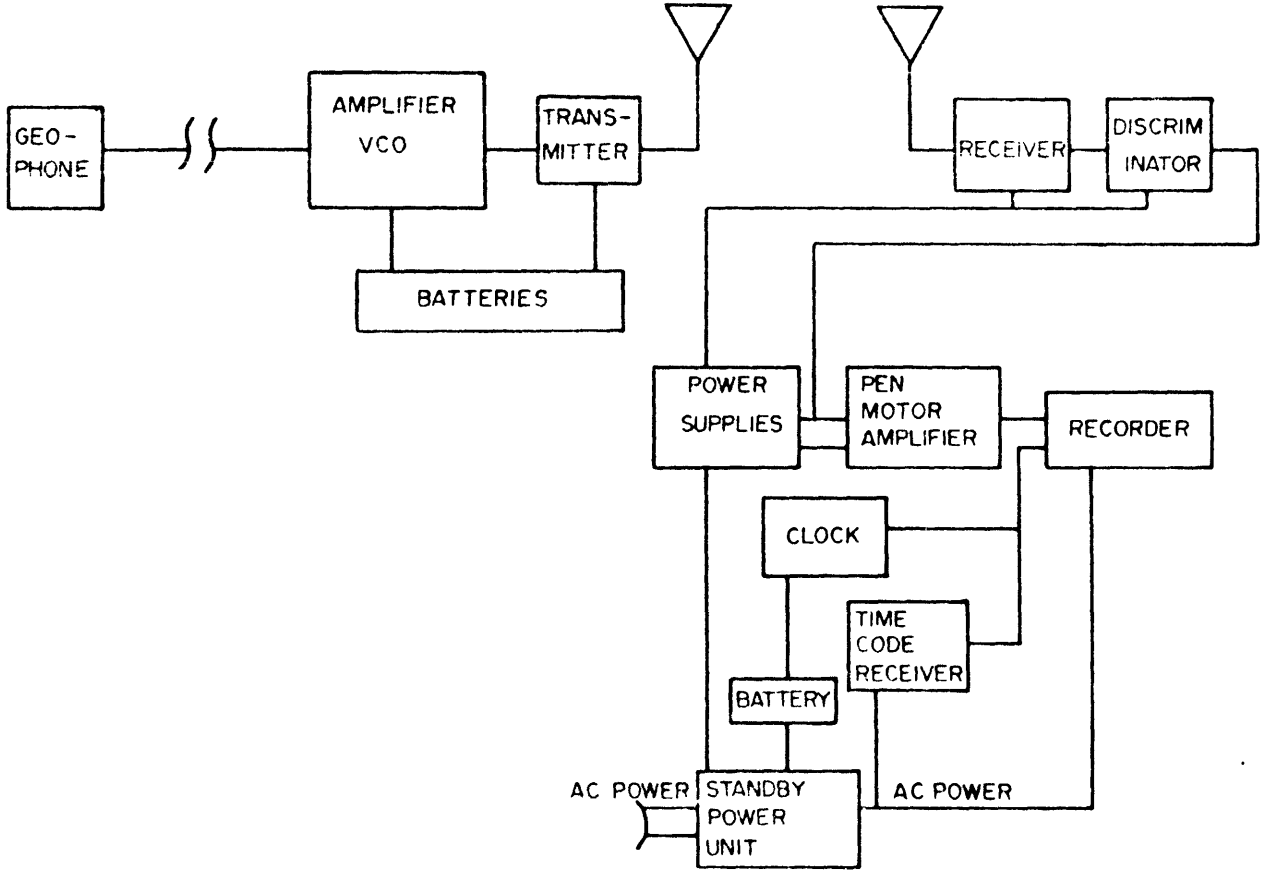

FIGURE 2. Block diagram of the seismic system

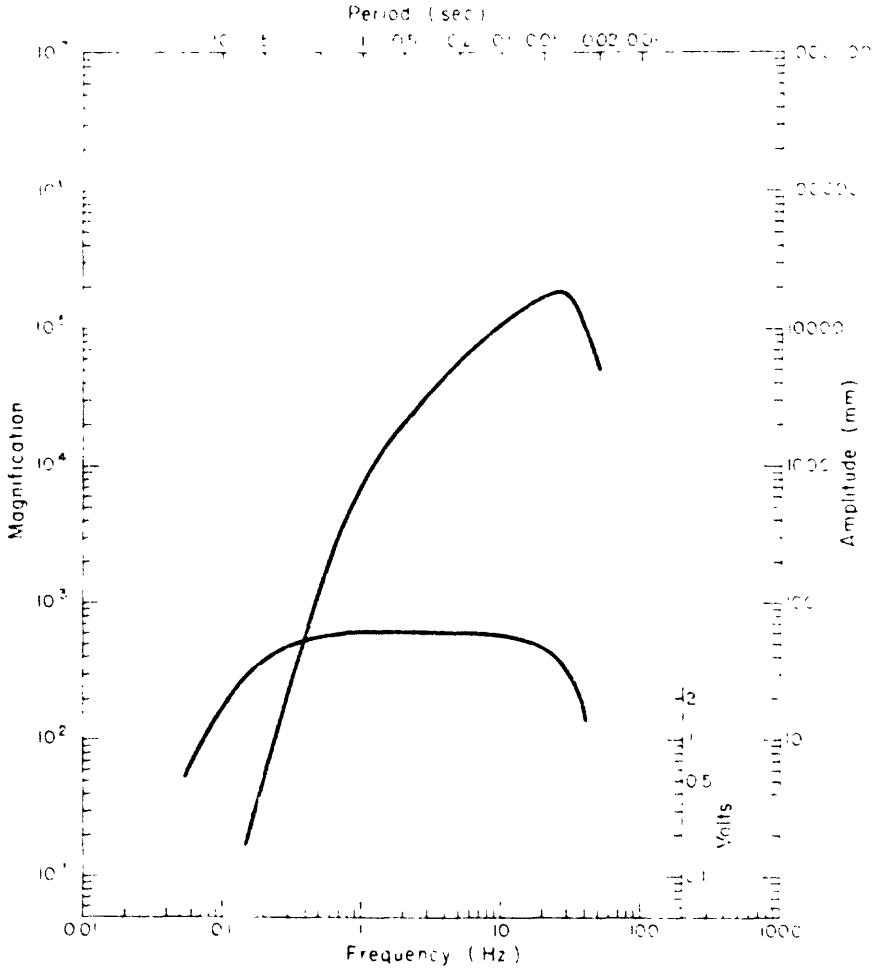

FIGURE 3. Frequency response curves for the high-gain, short-period seismographs. The lower curve shows the response of the electronics and the upper curve shows the system response, including the displacement response of the geophone.

DATA ANALYSIS

The paragraphs below describe how the events are processed.

1. All events with 4 or more discernable P-arrivals are examined for P-wave arrival time and first motion, S-wave arrival time if possible, and the signal duration. P-arrival time can be read to within ±0.1 sec, but S-arrivals are often unclear and may have reading errors of ±0.3 sec. The signal duration is measured from the first break to the point where the signal drops below a peak-to-peak amplitude of 1 mm.
2. Punched cards are prepared from the examined data and processed by the computer program HYPOELLIPSE (Lahr in preparation) to determine origin time, hypocenter, magnitude, statistical data on the quality of the solution, and data on the error ellipsoid enclosing the one standard deviation region of the hypocenter.
3. First solutions are analyzed, any errors corrected, the events reprocessed, and poor solutions eliminated.

MAGNITUDES

The useful dynamic range of earthquake magnitudes determined from record amplitudes is limited because the high gain amplifiers are saturated by relatively small seismic signals. Richter magnitudes are approximated, therefore, by a method based on signal duration (Lee and others, 1972) given in Equation 1.

$$M = -0.87 + 2.00 \log(t) + 0.0035 \qquad (1)$$

M is the body wave magnitude, t, the signal duration in seconds, and is the epicentral distance in kilometers. The magnitude listed in the catalogue is the average of the magnitudes determined for each station. We believe that this method is accurate to $\pm$0.3 magnitude and that the method provides good information on relative magnitudes. Figure 5 shows the magnitude distribution of the earthquakes listed in this catalog.

VELOCITY MODEL

Accurate calculation of hypocentral solutions depends upon the compatibility between the seismic velocities in the real earth and the velocity model specified to the program HYPOELLIPSE. Since neither velocity studies, or reliable explosion data exist for Guatemala, a crustal model was approximated using a velocity that increases linearly with depth. A set of eleven such models, covering the range of possibilities thought to

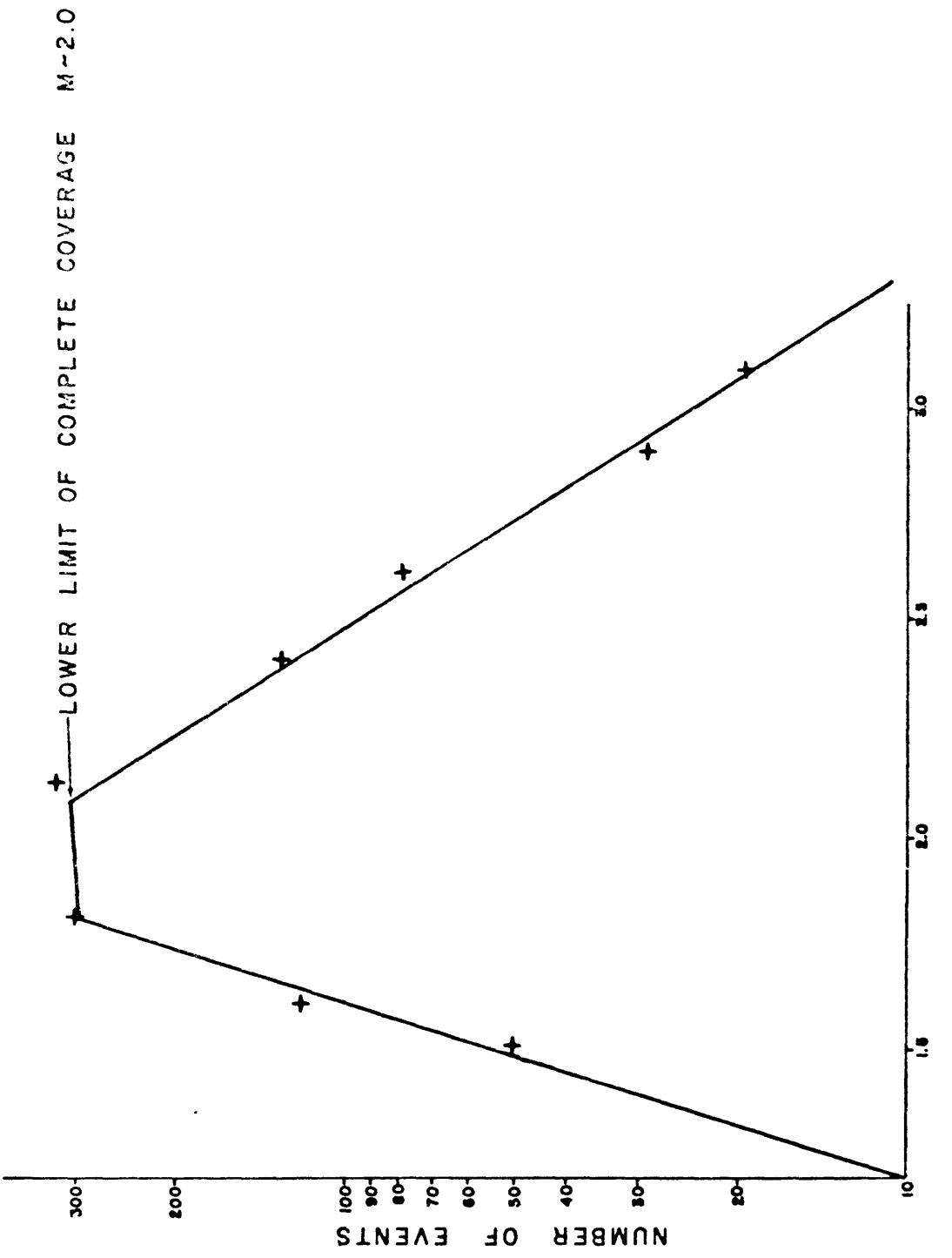

FIGURE 5. Magnitude distribution for the events listed in this catalog.

exist in similar tectonic environments, was tested on a set of 100 local events. The results listed in Table 2 show that among the six best models, virtually no difference (0.015 sec.) exists in the average RMS of the travetime residuals. Model 7 was chosen because it is the closest to the average of these six best models and produced the smallest average RMS: a surface velocity of 5.5 km/sec increasing linearly by 0.1 km/sec with each kilometer of depth.

Tests of selected events show that for different crustal models, epicenters inside the net vary by less than one km, and depths vary up to 5 km. For events at 1 diameter outside the net, epicenters vary up to 8 km between most extreme models but vary only about 3 km between the six best models mentioned above.

STATION CORRECTIONS

Station delays were developed to correct for factors such as elevation and local geology that are unique to each recording site. A set of 100 well recorded events were processed by HYPOELLIPSE and the resultant average traveltime residuals were fed back into the station corrections until the standard deviation of the residuals was minimized. See Table 1 for a listing of the station corrections.

Table 2

Velocity Model Data

Model	Surface Velocity (Km/sec)	Rate of Linear Increase with Depth (Km/sec/km)	Average RMS of Traveltime Residuals (Sec)
1	4.5	.15	.232
2	5.0	.15	.221
3	5.5	.15	.232
4	4.0	.10	.309
5	4.5	.10	.266
6	5.0	.10	.231
7*	5.5	.10	.219
8	6.0	.10	.241
9	5.5	.07	.232
10	6.0	.07	.228
11	6.5	.07	.275

*Model selected for use in this catalog.

DISCUSSION

The earthquake locations are based on the time of the first arrival of P-waves and equally, whenever available, S-waves. The HYPOELLIPSE program uses Geiger's method (Geiger, 1912) to minimize the RMS of the traveltime residuals. The traveltimes and the partial derivatives are calculated for a horizontally homogeneous model by a technique developed by Eaton (1969). For each event, the program also calculates the ellipsoid enclosing the one standard deviation region of the RMS of the traveltime residuals. Our studies indicate that epicentral locations are accurate to $\pm$2.0 km inside the perimeter of the network and range to $\pm$4.0 km out at 30 km beyond the perimeter. Depths are accurate to $\pm$3.0 km inside the perimeter and range to $\pm$6.0 km at 30 km beyond the perimeter.

Figure 5 compares the epicenters of 30 events that were well recorded by both this network and by a temporary network operated by Langer and others (1976) in this area from February 9 through February 17, 1976. It shows that epicentral differences can range up to 5 km but average about 2 km.

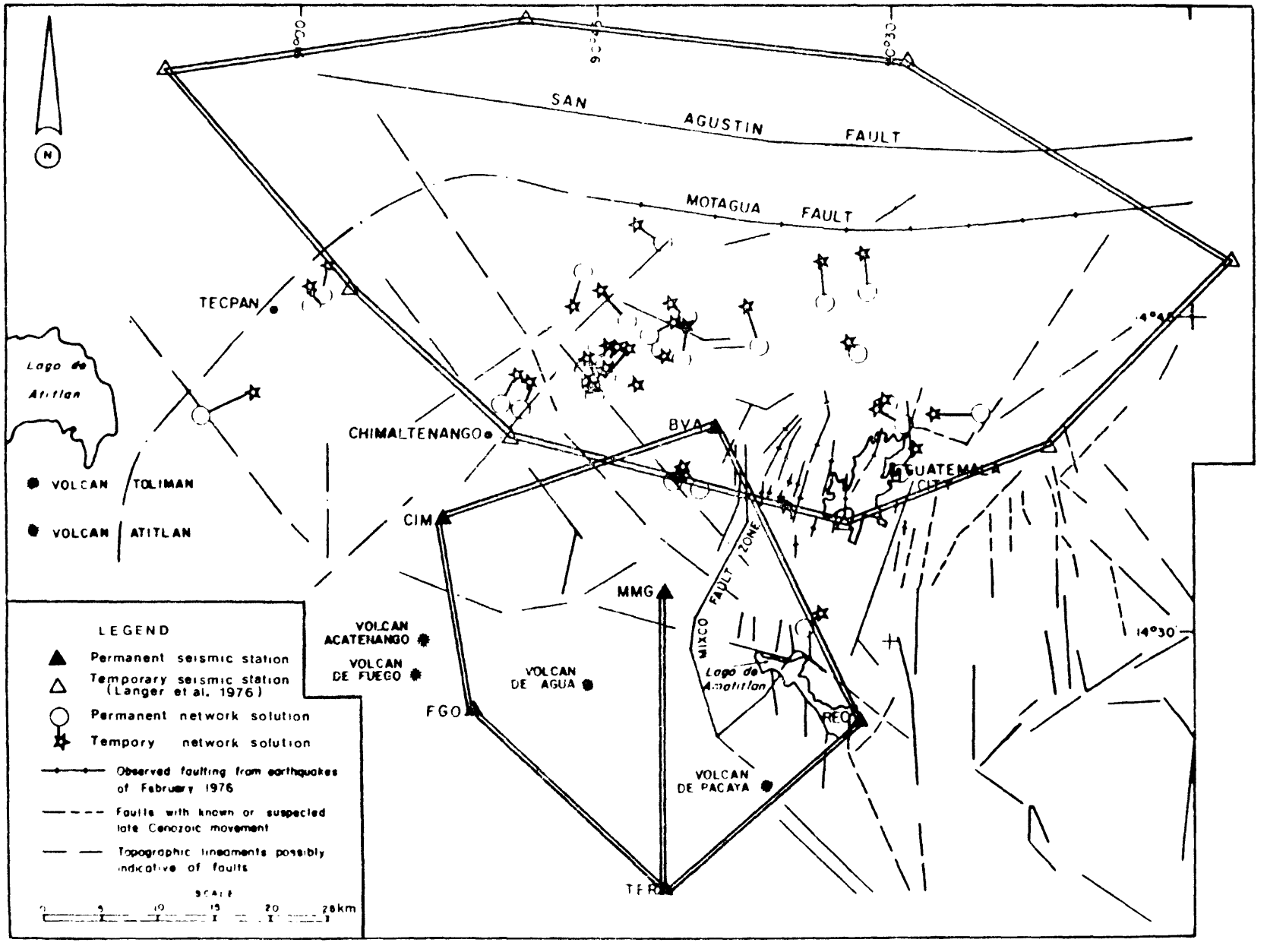

FIGURE 6. Comparison of epicentral locations. Solid double line connecting open triangles is the permanent network described in this report. Solid double line connecting solid triangles is a temporary network operated by Langer and others (1976). Circles are epicenters located from permanent network seismograms. Stars are epicenters located from the temporary network seismograms and are connected by solid line to the corresponding permanent network solution.

ACKNOWLEDGMENTS

We would like to express our gratitude to Ing. Claudio Urrutia E., Director of the Instituto Nacional de Sismologica, Vulcanologia, Meterologia e Hirdologia (INSIVUMEH), Guatemala. Ing. Urrutia has continually offered helpful advice and encouragement and has provided technical personnel the use of office space, and logistical support that has made this project successful. The late Mr. Jose Vasseaux's interest and help have been important to the project. Special appreciation is extended to Mr. Eddy Sanchez for his excellence in maintenance of the instruments. We are indebted to Charlie Langer for providing arrival-time data from the aftershock study he performed.

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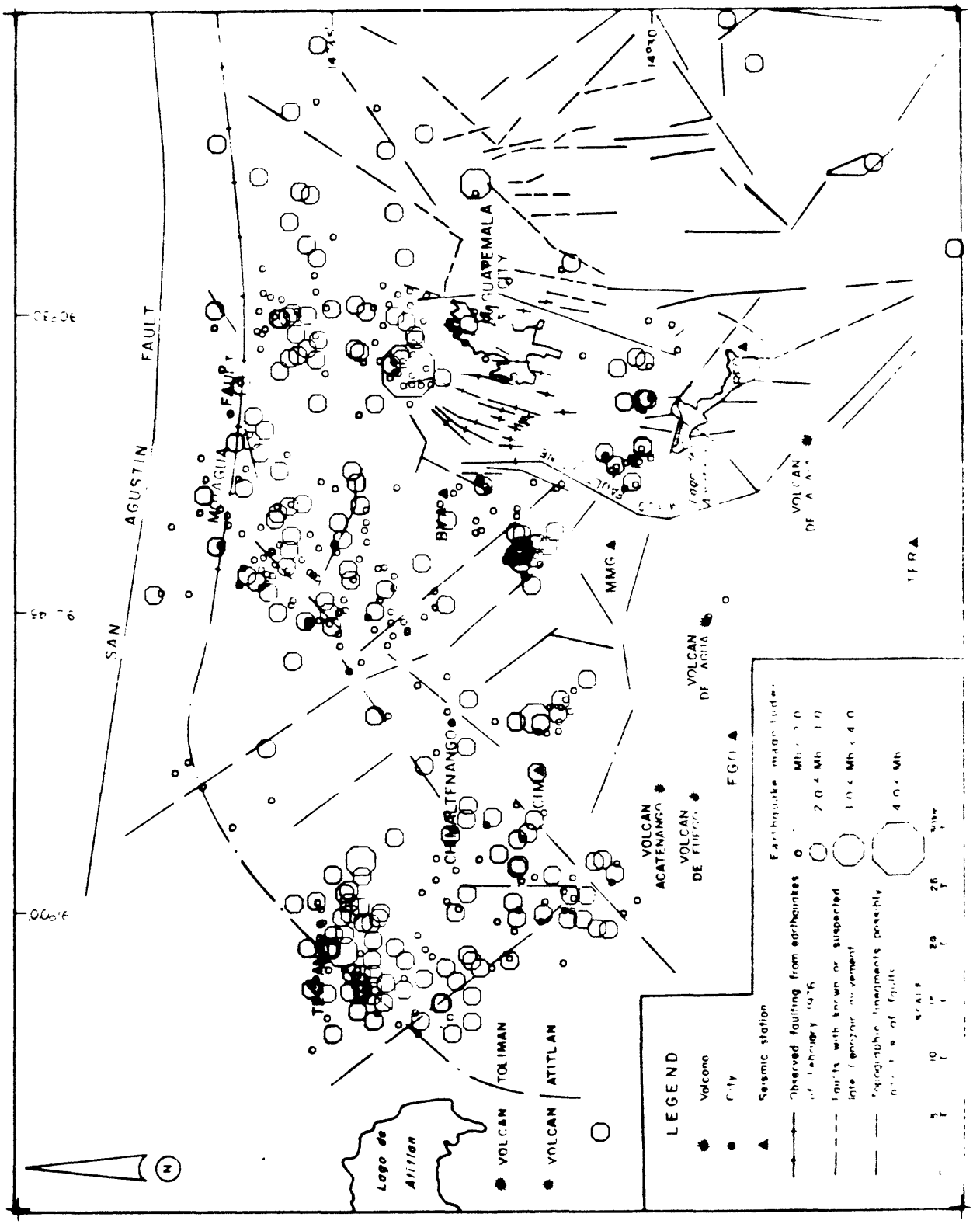

FIGURE 6. July 1 to December 31, 1976.

Appendix

The hypocentral parameters listed in this appendix are the following:

Abbreviation	Definition
HR	Hour of occurrence.
MN	Minute of occurrence. Coordinated Universal
SEC	Second of occurrence. Time
LAT N	North latitude of epicenter in degrees and minutes.
LONG W	West longitude of epicenter in degrees and minutes.
DEEP	Depth of hypocenter in kilometers.
MAG	Magnitude.
P	Number of P-arrivals used in locating the earthquake.
S	Number of S-arrivals used in locating the earthquake.
GAP	Maximum gap between stations contributing P-arrivals.
D3	Distance to the third closest station used in locating the earthquake.
RMS	Root mean square of the traveltime residuals, R_i in seconds.
ERH	The greatest horizontal deviation of the error ellipsoid from the hypocenter.
ERZ	The greatest vertical deviation of the error ellipsoid from the hypocenter.
Q	Quality of the solution based on the larger of the distances ERH and ERZ:

Quality	Largest Distance
A	2.5 km
B	5.0 km
C	10.0 km
D	10.0 km

1970		ORIGIN HR	MN	TIME SEC	LAT N DEG	MIN	LONG W DEG	MIN	DEEP KM	MAG	P	S	GAP DEG	D3 KM	RMS SEC	ERH KM	ERZ KM	Q
JUL	1	3	46	38.3	14	42.6	91	4.3	0.2	2.1	6	3	316	46	0.17	1.9	4.2	B
	1	4	22	6.4	14	43.0	91	5.2	9.3	2.3	6	4	318	48	0.14	1.7	2.4	A
	1	4	23	46.6	14	35.6	91	8.8	2.1	1.9	2	3	354	56	0.09	3.8	5.7	C
	1	4	48	44.7	14	31.6	90	38.2	6.1	1.3	3	4	205	24	0.06	1.1	1.3	A
	1	13	9	40.9	14	40.9	90	31.7	7.5	2.2	6	2	277	27	0.08	2.1	1.9	A
	1	16	13	51.8	14	36.5	91	2.0	4.6	2.3	6	2	310	40	0.12	2.4	3.1	B
	1	18	31	22.0	14	48.7	90	42.5	12.7	1.8	4	6	300	30	0.25	1.1	1.1	A
	2	3	11	31.0	14	39.4	91	5.0	2.0	1.8	6	3	317	45	0.10	1.8	4.4	B
	2	4	47	45.3	14	39.1	91	3.3	9.9	2.1	6	4	313	42	0.18	1.5	1.8	A
	2	6	54	28.3	14	47.4	90	33.2	9.0	2.3	6	5	298	39	0.17	1.1	1.3	A
	2	7	5	23.2	14	29.3	90	34.7	0.9	1.9	6	4	156	20	0.10	0.6	4.2	B
	3	7	24	58.8	14	29.2	90	32.8	27.3	1.9	2	3	223	25	0.07	1.5	2.2	A
	3	8	35	13.8	14	42.4	91	3.4	7.7	2.7	6	2	314	45	0.05	2.0	3.5	B
	4	1	17	25.9	13	46.7	90	59.8	1.3	4.1	6	0	334	89	0.21	19.5	94.1	D
	4	4	6	17.2	14	36.2	90	50.5	7.0	2.3	6	5	188	19	0.13	0.8	1.2	A
	4	4	7	7.5	14	36.2	90	54.7	13.0	1.9	6	5	286	26	0.30	0.9	1.0	A
	4	9	33	36.3	14	42.7	90	44.5	10.3	1.6	5	5	249	20	0.14	0.9	1.3	A
	4	13	15	14.7	14	42.9	90	34.9	5.1	2.4	6	5	282	31	0.11	1.4	1.3	A
	4	14	7	27.2	14	39.9	91	4.4	13.1	2.1	6	3	316	44	0.18	1.8	2.4	A
	5	0	30	48.4	14	45.7	90	28.5	5.4	1.7	6	5	302	36	0.29	1.2	2.8	B
	5	0	46	46.6	14	38.8	91	4.5	0.7	1.6	6	1	315	44	0.07	2.5	7.1	C
	5	1	37	30.5	14	13.9	90	27.5	6.3	2.1	4	4	305	42	0.21	1.3	2.1	A
	6	0	16	8.2	14	43.6	90	57.3	9.4	3.0	5	3	313	36	0.06	1.9	2.0	A
	6	3	5	36.9	14	44.6	90	45.1	7.0	1.8	6	4	209	24	0.12	1.0	1.8	A
	6	4	12	47.4	14	47.1	90	42.9	8.4	2.0	6	2	291	28	0.11	1.9	1.6	A
	6	5	12	9.0	14	41.6	91	3.7	9.8	2.8	6	3	315	44	0.08	2.2	2.2	A
	6	8	50	54.3	14	35.6	90	41.9	8.0	0.9	4	4	175	17	0.42	0.6	0.9	A
	6	9	57	8.0	14	33.1	91	0.2	7.6	2.0	4	2	304	41	0.15	2.3	3.5	B
	6	11	52	14.1	14	44.1	90	59.9	9.2	2.4	6	4	309	40	0.21	1.5	1.6	A
	7	3	35	31.1	14	46.5	90	47.7	24.2	2.0	3	3	298	29	0.07	1.5	1.4	A
	7	3	40	31.8	14	47.6	90	49.3	20.4	1.9	4	4	295	32	0.23	1.3	1.9	A
	7	7	23	34.8	14	38.4	91	2.3	13.5	2.5	5	3	329	40	0.14	2.3	2.1	A
	7	20	32	19.6	14	10.7	90	49.8	8.8	2.9	6	0	307	43	0.21	11.8	6.3	D
	7	20	33	32.4	13	28.2	91	8.0	10.7	3.3	4	1	342	128	0.14	31.1	31.2	D
	7	21	47	36.8	13	51.5	90	58.2	1.3	3.1	6	0	331	50	0.23	9.4	78.5	D
	8	2	50	28.1	14	30.3	90	35.1	6.0	1.3	3	3	209	28	0.13	1.8	1.9	A
	8	4	10	11.3	14	42.0	90	43.3	3.7	1.7	6	3	240	19	0.11	1.0	2.0	A
	8	21	18	48.2	14	34.5	90	20.0	41.0		4	2	304	38	0.09	3.3	1.8	B
	9	6	32	10.3	14	44.5	91	0.1	10.6	2.3	5	4	310	40	0.16	1.5	1.8	A
	9	9	6	47.7	14	50.5	90	30.2	6.1	2.8	6	1	308	45	0.12	3.2	3.9	B
	9	10	11	44.8	14	38.7	90	32.6	0.3	1.7	5	3	251	23	0.21	2.5	5.7	C
	9	17	9	28.8	14	46.1	90	32.2	7.1	2.7	6	1	297	37	0.12	3.1	2.5	B
	9	21	19	23.9	13	48.6	90	58.3	5.7	3.8	5	0	333	85	0.07	7.4	98.9	D
	10	2	20	21.8	14	36.7	90	33.7	0.9	1.6	4	3	294	20	0.14	2.4	5.0	B
	10	9	45	57.1	14	38.5	90	49.4	3.3	2.6	6	1	224	20	0.08	2.2	3.4	B

1 1976	ORIGIN HR	MN.	TIME SEC	LAT N DEG	MIN	LONG W DEG	MIN	DEEP KM	MAG	P	S	GAP DEG	D3 KM	RMS SEC	ERH KM	ERZ KM	Q
JUL	10	10	23.7	14	40.0	90	52.0	6.2	1.6	5	3	275	25	0.15	1.1	1.2	A
	10	19	45.3	14	46.5	91	5.9	2.7	1.8	6	2	321	51	0.16	2.1	5.6	C
	10	13	27	15.1	14	48.4	90	23.7	7.6	2.2	5	3	314	43	0.14	1.6	4.1	B
	10	14	21	33.1	14	42.5	90	29.0	5.7	1.7	5	4	293	30	0.16	1.1	2.7	B
	10	20	13	25.2	14	40.7	91	3.2	7.7	2.3	6	3	313	43	0.11	2.1	3.5	B
	10	21	18	12.4	14	34.0	91	2.4	10.8	1.8	4	2	314	39	0.25	2.4	3.4	B
	11	0	29	52.5	14	46.5	91	0.5	9.8		5	5	313	42	0.11	1.1	2.2	A
	11	4	9	56.7	14	50.1	90	18.0	3.7	2.5	6	3	322	53	0.25	2.2	5.2	C
	11	8	55	21.8	14	48.7	90	35.5	11.5	2.1	6	3	299	38	0.15	1.9	1.4	A
	11	8	55	21.9	14	49.5	90	36.7	12.4	2.2	6	3	301	37	0.17	1.7	1.3	A
	11	15	45	1.0	14	41.6	91	3.1	5.9	1.8	5	2	314	43	0.04	2.7	3.2	B
	11	17	13	44.2	14	39.6	90	44.8	2.8	2.0	6	3	206	15	0.19	1.5	3.6	B
	12	1	8	47.6	14	47.4	90	38.1	12.5	2.2	6	3	295	32	0.25	1.3	1.7	A
	12	6	5	55.8	14	30.4	90	34.8	5.7	1.5	3	4	214	25	0.21	1.5	1.9	A
	12	12	38	2.5	14	41.5	90	46.1	7.0	1.4	4	2	238	28	0.23	3.1	5.0	C
	13	15	31	16.6	14	34.2	90	50.1	5.7	2.4	6	1	132	17	0.09	1.9	3.0	B
	13	16	40	36.4	13	42.5	91	6.7	16.3	2.4	3	5	349	102	0.18	5.6	9.7	C
	13	18	1	33.3	14	40.6	90	45.3	4.7	1.7	6	3	223	17	0.08	1.0	1.9	A
	13	22	34	27.2	14	46.4	90	24.4	5.3	2.1	5	4	311	39	0.21	1.6	3.1	B
	13	22	34	27.7	14	46.1	90	27.0	1.6	2.0	6	5	305	37	0.22	1.2	3.2	B
	13	23	51	9.1	14	37.2	90	50.5	9.9	1.8	5	5	221	19	0.20	0.9	1.1	A
	14	2	47	36.0	14	41.1	90	33.5	4.9	1.9	6	4	276	28	0.13	1.0	1.7	A
	14	7	0	26.6	14	35.1	91	3.5	4.2	3.1	6	0	311	41	0.22	11.7	13.9	D
	14	7	5	36.7	14	28.4	90	32.3	8.8	1.8	6	3	184	24	0.15	1.3	1.4	A
	14	8	41	59.7	14	42.8	90	43.0	10.7	1.3	5	5	277	20	0.23	1.0	0.9	A
	14	8	45	14.1	14	32.9	90	59.0	13.6	2.1	5	3	299	33	0.13	1.8	1.2	A
	14	11	12	9.1	14	41.4	90	46.0	9.0	1.2	6	3	236	19	0.13	1.6	1.8	A
	14	17	58	7.3	14	42.9	90	45.9	10.4	1.5	6	3	254	22	0.10	1.7	1.6	A
	14	18	12	18.7	14	42.0	90	43.9	11.3	1.8	6	3	240	19	0.18	1.5	1.7	A
	14	18	12	19.2	14	40.1	90	44.9	5.1	1.7	6	4	214	16	0.25	0.8	1.7	A
	15	5	20	55.5	14	35.1	90	51.0	8.3	1.8	5	3	137	19	0.14	1.6	1.6	A
	15	5	30	23.8	14	33.6	90	59.8	6.7	1.9	5	4	303	34	0.15	1.1	1.7	A
	16	2	23	6.8	14	24.7	90	18.2	6.9	2.1	4	2	306	43	0.17	3.2	3.3	B
	16	7	56	36.6	14	39.7	90	33.6	4.8	2.7	6	1	257	25	0.09	2.1	2.5	A
	16	8	18	37.9	14	55.3	90	55.0	1.6	1.5	5	1	322	49	0.09	2.8	12.1	D
	16	9	18	15.8	14	33.6	90	50.0	12.3	1.6	4	4	139	17	0.20	1.4	1.7	A
	16	9	26	10.0	14	32.8	90	48.4	5.1	2.3	5	2	216	23	0.07	1.5	2.7	B
	16	9	26	24.7	14	34.1	90	49.8	9.0	1.5	5	3	128	16	0.21	1.2	1.8	A
	17	5	18	21.4	14	35.0	90	59.9	11.1	2.4	6	4	304	35	0.19	1.3	1.2	A
	17	13	28	17.8	14	41.4	90	27.7	3.7	2.2	6	2	291	29	0.22	1.4	3.6	B
	17	16	22	20.2	14	41.7	90	32.4	0.5	2.1	6	4	283	29	0.09	1.3	3.3	B
	17	16	22	20.5	14	41.3	90	33.3	0.2	5.4	6	5	278	28	0.15	1.1	3.2	B
	18	2	44	36.1	14	40.5	90	21.6	14.2	2.7	5	2	305	38	0.23	2.0	3.8	B
	18	2	49	44.9	14	47.5	90	15.4	3.9	2.6	4	2	325	54	0.16	3.9	9.2	C
	18	2	49	45.9	14	45.8	90	17.6	10.8	4.0	5	3	321	49	0.19	1.3	5.5	C

1 1976	ORIGIN HR	MN.	TIME SEC	LAT N DEG	MIN	LONG W DEG	MIN	DEEP KM	MAG	P	S	GAP DEG	D3 KM	RMS SEC	ERH KM	ERZ KM	Q
JUL 16	2	57	30.9	14	40.4	90	29.6	0.8	1.7	4	3	280	26	0.12	1.6	4.3	B
18	3	58	18.2	14	47.8	90	42.1	4.4	1.5	5	1	313	42	0.09	2.7	3.0	B
18	12	22	53.4	14	46.0	90	41.3	10.7	1.8	4	3	309	41	0.15	1.7	1.3	A
18	12	36	48.2	14	42.9	90	50.2	10.4	2.0	5	3	273	26	0.13	1.1	1.4	A
18	19	2	2.0	14	50.3	90	40.0	9.9	1.6	5	3	317	47	0.13	1.7	2.2	A
18	21	49	53.8	14	16.7	90	29.5	0.2	2.3	5	1	269	35	0.14	3.1	6.0	C
19	1	42	12.6	14	48.4	90	30.3	5.6	1.7	5	3	304	41	0.24	1.4	3.0	B
19	4	12	31.7	14	46.6	90	31.4	6.4	2.4	6	6	299	38	0.21	1.0	1.5	A
19	4	12	32.1	14	45.7	90	32.7	11.1	2.4	6	6	295	36	0.60	1.0	1.0	A
19	9	7	54.0	14	48.0	90	44.1	7.9	2.5	6	4	294	30	0.12	1.5	2.0	A
19	17	30	54.7	14	47.0	90	42.0	8.4	2.1	6	2	293	27	0.08	2.3	2.1	A
19	18	29	23.3	14	17.7	90	31.4	0.7	2.3	5	2	273	32	0.11	2.3	5.4	C
19	19	33	15.6	14	46.0	91	3.7	9.8	2.7	6	4	317	47	0.20	1.4	2.5	B
19	23	27	7.1	14	41.9	90	25.5	6.6	2.1	5	3	299	33	0.08	1.3	2.5	B
20	12	36	9.2	14	46.3	90	18.1	7.9	2.4	4	3	321	48	0.12	1.5	8.1	C
20	15	34	1.7	14	41.8	90	33.4	10.5	1.9	4	2	282	29	0.19	1.3	2.8	B
20	20	27	56.9	14	43.4	90	45.5	10.1	2.4	4	1	258	22	0.05	2.0	2.7	B
21	4	27	58.0	14	45.1	90	45.1	10.5	2.0	5	4	273	25	0.12	1.1	1.6	A
21	14	22	34.4	14	45.2	90	33.4	5.6	1.3	4	4	312	35	0.13	1.4	1.5	A
21	16	41	34.4	14	44.9	90	30.2	5.1	2.2	6	6	297	34	0.17	1.2	2.0	A
21	16	41	34.8	14	43.3	90	30.3	8.8	2.2	6	5	293	31	0.18	1.0	1.3	A
21	22	32	58.9	14	45.2	91	5.1	3.8	1.6	6	4	319	49	0.15	1.4	3.8	B
22	10	20	33.5	14	43.3	90	40.7	12.4	1.8	6	4	270	24	0.20	1.0	1.1	A
22	10	20	33.6	14	43.3	90	41.7	12.8	1.8	5	4	263	23	0.19	1.3	1.6	A
22	22	21	42.6	14	44.0	90	38.2	11.2	2.2	6	4	282	29	0.27	1.3	1.4	A
23	0	24	15.4	14	30.3	91	16.8	16.7	2.2	4	3	327	66	0.18	2.2	3.6	B
23	1	54	24.3	14	49.3	90	41.2	13.9	1.7	5	4	301	31	0.24	1.1	1.7	A
23	9	45	33.3	14	39.2	90	39.3	0.2	1.7	5	2	156	23	0.12	1.2	4.8	B
23	11	55	46.8	14	42.1	90	46.3	11.3	1.2	5	3	270	20	0.10	1.7	1.1	A
23	19	47	17.0	14	38.9	90	38.9	12.0	1.4	5	4	169	27	0.33	1.2	1.4	A
23	20	46	37.4	14	37.6	90	38.9	6.8	1.7	6	5	131	23	0.07	0.6	0.9	A
24	3	45	17.3	14	38.0	90	24.5	0.6	1.4	5	3	291	31	0.14	1.6	4.4	B
24	7	49	21.9	14	35.8	90	41.6	9.3	1.4	5	6	177	18	0.11	0.7	0.9	A
24	12	43	33.2	14	39.3	91	5.9	3.7	2.4	5	3	317	50	0.11	2.5	3.9	B
24	17	57	28.4	14	36.2	90	41.2	5.6	2.1	6	4	131	19	0.14	0.7	1.9	A
24	17	57	28.5	14	35.9	90	41.3	4.4	2.1	6	4	126	19	0.16	0.6	1.9	A
24	18	0	56.3	14	36.2	90	40.4	7.4	1.3	4	4	163	24	0.14	0.8	0.9	A
24	21	40	21.6	14	31.0	90	34.8	4.8	2.0	6	4	165	18	0.08	0.9	2.9	B
24	23	34	56.6	14	35.6	90	42.3	8.3	1.6	5	4	131	22	0.11	1.1	2.7	B
24	23	54	0.6	14	49.2	90	33.9	9.4	2.1	6	3	302	40	0.16	1.8	1.7	A
25	4	17	34.8	14	51.1	90	53.7	13.9	1.9	6	3	314	42	0.20	2.3	2.0	A
25	5	23	24.8	14	30.1	90	35.2	0.7	1.7	6	4	152	19	0.19	0.9	4.2	B
25	12	21	21.4	14	44.6	90	46.7	10.7	1.5	5	4	271	25	0.24	1.1	1.4	A
25	23	5	46.4	14	35.6	90	42.4	9.5	1.0	3	3	182	22	0.08	1.5	3.5	B
26	2	38	12.4	14	43.8	90	30.0	7.0	2.3	6	3	295	32	0.11	1.3	2.1	A

2 1976	ORIGIN TIME HR	MN	SEC	LAT N DEG	MIN	LONG W DEG	MIN	DEEP KM	MAG	P	S	GAP DEG	D3 KM	RMS SEC	ERH KM	ERZ KM	Q
JUL 26	5	6	46.9	14	45.9	90	24.6	4.8	2.3	5	3	310	52	0.11	1.6	4.9	B
26	8	6	47.2	14	45.6	90	27.7	0.9	2.3	6	5	304	36	0.15	1.2	3.2	B
26	19	14	36.2	14	43.3	90	45.3	13.7	1.4	6	4	256	22	0.15	0.9	1.3	A
26	19	14	57.5	14	31.7	90	58.4	2.8	1.9	5	4	290	31	0.13	1.2	2.2	A
26	22	52	38.0	14	36.1	90	41.8	7.7	1.3	5	6	134	18	0.21	0.6	1.5	A
27	1	22	0.6	14	45.6	90	20.6	4.0	1.8	5	4	317	45	0.18	1.3	3.6	B
27	4	56	4.8	14	43.8	90	38.8	6.6	2.9	6	0	280	27	0.13	4.7	1.6	B
27	18	7	54.7	14	47.0	90	39.9	12.7	2.7	6	3	293	30	0.14	1.7	1.6	A
28	12	49	45.4	14	41.1	90	32.5	3.0	1.9	4	2	277	27	0.07	1.2	4.2	B
29	3	55	40.5	14	36.2	90	56.3	3.4	2.2	5	3	289	29	0.11	1.3	1.9	A
29	4	36	32.1	14	45.1	91	1.6	5.1	2.1	6	5	313	43	0.11	1.3	2.2	A
29	4	36	32.2	14	44.5	91	1.8	4.2	3.4	6	5	313	43	0.14	1.5	2.3	A
29	5	10	49.1	14	45.0	90	45.8	8.2	2.3	6	2	273	25	0.09	1.8	2.3	A
29	23	15	34.2	14	42.9	90	23.7	4.7	1.7	4	3	306	37	0.07	1.1	5.2	C
29	23	15	54.0	14	48.4	90	37.3	0.2	2.2	4	4	298	35	0.15	1.8	3.8	B
30	5	0	23.7	14	36.7	90	42.5	9.5	1.6	4	2	194	23	0.04	1.3	1.2	A
30	6	46	47.5	14	42.9	90	45.1	18.6	2.4	3	5	280	21	0.13	1.2	1.0	A
31	5	2	33.9	14	37.1	91	0.3	8.2	1.7	5	2	305	36	0.08	1.5	2.5	B
31	5	49	6.0	14	45.6	91	1.1	3.2	1.9	5	4	313	42	0.08	1.6	4.3	B
31	8	47	34.5	14	45.7	90	43.4	13.0	1.8	5	4	280	25	0.25	1.1	1.2	A
31	12	5	12.9	14	36.6	91	2.1	4.5	1.9	5	2	311	39	0.07	1.6	3.5	B
31	16	31	7.1	14	42.2	91	4.1	2.0	2.2	5	1	316	45	0.02	3.4	6.3	C
31	19	7	43.0	14	47.7	91	5.6	3.0	2.2	5	2	321	51	0.09	3.0	6.7	C
AUG 1	5	48	1.5	14	48.1	91	4.9	2.2	2.2	5	1	321	50	0.01	4.0	7.0	C
1	8	31	45.1	14	49.3	90	46.8	4.8	2.6	5	6	299	33	0.20	9.6	8.0	C
1	8	52	54.6	14	48.5	90	31.3	7.1	1.7	5	4	303	41	0.13	1.2	2.0	A
1	9	52	56.0	14	31.4	90	38.0	6.2	1.9	5	2	130	16	0.08	0.9	1.0	A
1	12	34	15.7	14	46.4	90	39.6	6.6	2.4	5	2	291	29	0.12	2.6	2.3	B
2	9	42	47.3	14	37.9	90	25.5	0.0	1.4	4	3	286	29	0.19	2.5	10.4	D
2	18	3	20.0	14	39.8	90	39.8	7.8	1.4	4	3	224	29	0.53	1.3	1.0	A
2	20	38	13.2	14	41.9	90	30.5	7.2	2.1	4	3	287	29	0.13	1.5	1.7	A
3	3	48	29.7	14	41.1	91	4.6	5.5	1.7	5	3	317	46	0.10	1.8	2.9	B
3	9	56	49.6	14	42.1	90	21.6	0.0	1.7	4	3	313	39	0.18	2.6	10.5	D
3	10	36	14.0	14	6.5	91	10.8	24.1	3.8	5	0	330	72	0.18	34.4	38.4	D
3	12	30	45.8	14	28.7	90	31.0	10.6	1.7	4	4	257	24	0.26	1.0	1.0	A
3	13	29	58.3	14	29.8	90	30.8	14.6	1.9	4	3	262	23	0.26	1.0	1.3	A
3	20	42	40.7	14	51.1	90	39.3	16.6	2.1	5	4	305	36	0.25	1.2	2.1	A
3	21	48	51.6	14	41.0	90	31.5	6.6	2.0	5	2	278	27	0.03	1.8	2.3	A
4	9	47	47.2	14	39.6	91	8.0	1.6	1.8	5	2	322	51	0.11	2.2	7.8	C
4	11	6	9.1	14	46.9	90	25.9	7.7	2.0	5	3	309	39	0.09	1.5	3.2	B
4	12	10	40.4	14	18.0	90	32.0	0.1	2.1	4	3	292	37	0.10	2.7	5.6	C
4	14	19	27.9	14	34.8	90	50.8	9.4	2.2	2	3	249	24	0.14	1.1	2.0	A
4	18	32	9.5	14	48.2	90	28.2	6.5	1.8	5	4	307	41	0.09	1.2	2.2	A
4	19	13	33.8	14	42.1	90	33.0	3.9	2.3	5	1	284	29	0.07	2.3	2.6	B
4	19	22	33.9	14	35.9	90	54.5	13.7	2.5	5	0	279	25	0.17	5.5	3.0	C

1970		ORIGIN HR	MN	TIME SEC	LAT N DEG	MIN	LONG W DEG	MIN	DEEP KM	MAG	P	S	GAP DEG	DS KM	RMS SEC	ERH KM	ERZ KM	Q
AUG	4	21	05	29.8	14	39.5	90	28.4	0.0	1.9	5	3	279	26	0.21	1.6	4.1	B
	5	0	57	51.2	14	51.2	90	40.2	18.9	1.9	3	3	315	35	0.12	1.8	1.5	A
	5	5	38	45.4	14	35.9	90	56.3	8.5	1.8	5	3	289	28	0.17	1.3	1.5	A
	6	3	58	28.9	14	42.0	90	56.2	14.4	2.2	3	3	297	32	0.17	1.4	1.4	A
	6	5	43	54.8	14	13.3	90	26.3	0.8	2.3	4	3	321	50	0.11	2.4	4.4	B
	6	13	52	41.7	14	39.1	90	57.8	0.3	1.7	4	4	297	33	0.11	1.1	3.4	B
	6	15	30	26.9	14	43.6	90	32.3	2.6	2.0	5	3	290	32	0.15	1.3	2.3	A
	6	18	35	27.8	14	38.7	91	2.9	0.2	2.9	5	1	312	41	0.04	3.0	7.0	C
	6	19	7	38.1	14	39.1	91	6.0	0.7	1.9	5	3	319	47	0.12	2.4	5.4	C
	7	0	52	57.3	14	35.2	90	53.0	4.6	2.6	5	2	267	22	0.26	1.2	1.4	A
	7	2	56	29.9	14	39.6	91	2.6	5.6	2.4	5	3	312	41	0.11	1.1	2.8	B
	7	3	30	19.0	14	39.8	91	1.0	0.0	2.4	5	2	306	39	0.18	1.6	6.5	C
	7	4	22	26.5	14	45.5	90	17.2	6.0	2.2	5	3	321	49	0.12	1.4	4.3	B
	7	5	40	51.8	14	23.3	90	43.0	9.3	2.5	3	2	220	28	0.10	3.1	2.4	B
	7	6	9	23.5	14	40.1	91	3.0	2.2	2.6	4	2	313	44	0.07	4.0	5.7	C
	7	21	21	4.0	14	40.1	91	6.3	2.6	2.2	5	2	319	48	0.22	2.5	5.2	C
	7	21	33	50.8	14	40.3	91	2.9	5.3		5	2	313	42	0.03	2.4	2.9	B
	8	2	52	53.9	14	41.0	90	21.8	0.0	2.2	5	0	306	38	0.19	11.6	34.7	D
	8	16	7	45.3	14	45.7	90	31.5	1.0	1.5	5	3	297	36	0.20	1.3	4.8	B
	9	11	25	23.8	14	41.5	91	2.3	7.5	2.0	5	2	312	42	0.06	1.5	3.6	B
	9	11	56	44.9	14	43.1	90	48.8	24.6	1.5	4	2	266	24	0.14	1.6	1.7	A
	9	17	2	29.8	14	25.0	90	32.6	16.0	3.7	3	2	232	30	0.12	1.7	1.5	A
	10	2	5	29.1	14	42.8	90	46.7	1.1	2.6	4	1	255	22	0.08	5.0	8.1	C
	10	6	16	56.5	14	31.3	90	33.2	10.8	2.1	4	3	237	32	0.15	1.4	1.1	A
	10	6	17	59.8	14	50.5	90	31.1	8.0	1.4	4	4	322	45	0.21	1.4	2.2	A
	10	7	47	21.1	14	21.4	90	58.7	13.9	2.4	5	0	306	38	0.19	10.7	3.1	D
	11	4	40	11.0	14	42.0	90	34.5	4.7	2.8	5	0	280	30	0.02	4.7	2.2	B
	11	5	12	18.2	14	41.5	90	34.0	7.8	1.5	5	4	279	29	0.11	1.0	1.0	A
	11	5	20	37.9	14	43.4	90	32.8	11.1	1.5	4	3	288	32	0.28	1.1	1.6	A
	11	6	31	34.1	14	38.0	90	57.3	7.9	1.5	4	3	294	31	0.08	1.5	1.4	A
	11	19	59	31.3	14	45.7	90	23.1	0.2	2.0	4	2	314	40	0.15	3.1	11.2	D
	11	21	26	31.9	14	39.3	90	57.1	6.1	2.6	5	0	295	32	0.08	9.2	4.3	C
	11	21	41	43.0	14	45.0	91	4.5	4.8	1.8	5	3	318	48	0.20	2.4	5.6	C
	11	21	42	42.5	14	43.5	91	4.1	7.3	1.8	5	3	316	47	0.16	1.6	4.2	B
	12	4	17	27.7	14	40.9	91	1.0	3.0	1.6	5	3	308	40	0.11	1.6	2.7	B
	12	7	2	50.7	14	36.6	91	2.3	3.7	2.2	5	3	311	39	0.16	1.6	2.7	B
	12	8	3	44.7	14	41.1	90	33.9	4.9	1.3	4	3	276	26	0.09	1.5	1.4	A
	12	9	42	42.6	14	38.6	90	31.9	9.8	1.6	4	4	255	23	0.14	1.0	1.3	A
	12	18	7	5.1	14	48.8	90	36.4	7.0	1.6	4	3	323	37	0.09	1.6	1.7	A
	12	18	31	56.9	14	46.8	90	20.5	4.0	2.1	5	3	317	45	0.06	2.3	4.2	B
	13	17	36	17.6	14	13.6	91	10.7	15.8	2.6	5	0	328	64	0.15	26.3	33.9	D
	14	8	34	11.6	14	50.3	90	41.8	9.8	1.9	5	4	304	33	0.20	1.5	1.5	A
	14	8	37	55.5	14	41.8	90	18.2	2.8	2.7	5	2	315	44	0.14	1.7	9.2	C
	14	10	22	43.3	14	31.2	90	59.9	0.8	1.7	5	2	296	34	0.17	2.8	3.9	B
	14	20	23	11.4	14	45.6	90	42.0	6.4	1.8	6	4	283	25	0.17	1.3	1.3	A

1 1976	ORIGIN HR	MN	TIME SEC	LAT N DEG	MIN	LONG W DEG	MIN	DEEP KM	MAG	P	S	GAP DEG	D3 KM	RMS SEC	ERH KM	ERZ KM	Q
AUG14	20	55	14.8	14	45.1	90	17.7	0.9	2.6	6	2	320	48	0.21	2.6	10.1	D
15	0	9	45.9	14	27.0	90	46.4	0.4	1.6	6	1	117	18	0.27	0.9	8.0	C
15	7	8	44.2	14	40.8	91	5.2	14.3	2.8	6	2	317	46	0.22	2.4	2.2	A
15	8	41	26.5	14	49.7	90	55.7	12.4	1.8	6	6	312	42	0.19	1.0	1.7	A
15	13	1	31.2	14	49.9	90	40.3	9.5	1.7	5	5	317	46	0.21	1.3	1.5	A
15	15	7	26.7	14	27.0	90	45.4	3.0	1.6	6	3	113	18	0.22	0.5	2.9	B
15	15	20	46.8	14	42.0	91	1.6	6.1	2.5	6	3	311	41	0.18	1.6	2.2	A
16	22	11	10.4	14	4.1	90	48.9	4.4		5	0	317	52	0.14	20.6	35.1	D
16	23	47	51.5	13	50.9	90	53.3	6.0	3.0	5	0	331	76	0.09	14.5	98.1	D
17	0	45	4.9	13	56.9	91	4.4	18.5	3.0	5	0	330	75	0.14	37.7	74.3	D
17	2	32	2.6	14	42.1	90	15.8	1.3	3.4	6	0	319	48	0.15	13.3	64.8	D
17	9	9	55.7	14	32.6	90	42.1	0.2	1.3	3	3	247	27	0.19	3.0	14.0	D
17	12	2	15.9	14	41.2	90	34.9	7.2	1.5	6	4	270	28	0.25	1.0	1.3	A
17	22	52	50.5	14	41.4	90	26.2	0.0	2.0	4	2	315	31	0.20	2.2	14.8	D
18	5	18	7.6	14	41.9	90	39.0	9.4	1.4	6	6	271	25	1.45	0.9	0.7	A
18	6	18	15.9	14	40.1	90	44.1	0.7	1.1	4	4	240	27	0.07	1.0	4.0	B
18	8	56	17.5	14	31.4	90	37.9	2.1	2.4	6	0	131	16	0.10	0.8	2.9	B
18	9	2	24.1	14	30.5	90	38.9	2.7	1.5	5	3	167	22	0.16	0.8	2.9	B
18	9	51	3.3	14	11.9	90	26.5	1.5	2.8	6	2	312	46	0.12	2.1	4.7	B
18	10	33	54.8	14	30.1	90	56.0	0.1	1.8	2	3	298	35	0.14	2.0	4.5	B
18	17	28	32.5	13	40.1	90	57.2	4.0	3.0	5	0	337	97	0.21	21.1	96.9	D
18	18	39	51.1	14	42.9	90	30.1	5.6	1.8	6	4	293	31	0.19	1.1	2.2	A
18	19	40	17.9	14	41.6	90	32.7	5.3	2.4	6	3	282	28	0.19	1.1	1.9	A
19	14	19	20.0	14	44.5	90	41.5	6.9	2.1	6	2	276	24	0.05	1.7	1.9	A
19	15	8	26.5	14	37.5	90	39.1	6.5	1.9	6	2	127	23	0.13	1.3	2.1	A
19	21	53	2.1	14	35.3	90	50.3	5.7	3.0	6	0	141	18	0.07	2.5	3.0	B
20	5	49	49.1	14	43.1	91	3.5	11.2	2.1	5	3	315	45	0.17	2.2	2.5	B
20	7	36	43.7	14	32.5	90	57.4	3.8	2.3	6	4	269	30	0.24	1.3	2.2	A
20	11	7	59.1	14	48.3	90	40.9	13.9	1.5	5	4	314	43	0.20	1.7	1.4	A
20	11	53	31.8	14	34.8	90	51.1	11.1	1.4	6	3	154	19	0.11	1.7	1.3	A
20	12	33	17.4	14	34.1	90	49.4	8.8	2.3	5	2	234	23	0.17	1.4	2.8	B
20	20	2	55.2	14	48.1	90	31.2	6.9	1.7	6	5	302	40	0.21	1.1	2.2	A
21	0	32	32.7	14	38.3	91	4.0	17.5	2.9	6	3	314	43	0.13	1.8	2.0	A
21	0	43	22.0	14	45.1	91	1.7	13.9	2.0	6	6	314	43	0.21	1.0	1.5	A
21	11	49	51.4	14	36.6	90	53.9	1.6	2.8	6	0	270	25	0.12	5.7	3.3	C
21	13	13	55.9	14	42.7	90	59.9	6.8	2.1	6	5	307	39	0.18	1.3	1.7	A
21	17	53	42.9	14	47.5	90	30.6	5.4	2.2	6	4	302	39	0.16	1.3	2.6	B
21	18	42	1.5	14	35.0	90	50.6	7.4	2.1	6	4	125	18	0.19	1.3	1.3	A
22	3	38	27.2	14	30.4	90	32.6	4.8	2.1	4	3	193	20	0.04	1.0	2.3	A
23	7	7	41.2	14	34.2	90	50.5	8.9	1.4	6	4	146	18	0.20	1.2	1.3	A
23	13	59	13.9	14	41.6	90	32.8	7.5	1.4	4	4	281	28	0.12	1.4	1.2	A
24	1	16	41.5	14	35.3	90	41.8	6.6	2.2	5	2	220	22	0.26	1.1	1.7	A
24	4	14	43.3	14	42.7	90	20.3	4.3	1.8	5	3	312	42	0.18	1.3	4.4	B
24	5	59	36.5	14	40.1	90	58.3	0.3	1.4	5	3	300	34	0.12	1.4	4.2	B
24	12	22	14.6	14	39.5	90	48.3	5.5	1.5	5	4	226	19	0.23	0.9	1.9	A

2 1976	ORIGIN HR	MN	TIME SEC	LAT N DEG	MIN	LONG W DEG	MIN	DEEP KM	MAG	P	S	GAP DEG	D3 KM	RMS SEC	ERH KM	ERZ KM	Q
AUG24	17	25	9.0	14	49.8	90	35.3	11.0	1.6	4	5	302	44	0.24	1.2	1.3	A
25	2	15	39.6	14	49.4	90	38.6	6.3	1.9	3	4	300	34	0.24	1.2	2.0	A
25	6	43	13.4	14	35.4	90	55.4	6.9	2.9	4	2	323	32	0.18	2.1	1.7	A
25	6	44	55.7	14	37.1	90	57.0	11.4	2.0	4	3	327	34	0.15	2.8	0.9	B
25	8	14	49.0	14	35.4	90	58.1	5.9	1.8	4	2	327	37	0.09	3.3	1.7	B
25	10	35	13.5	14	35.7	90	56.0	4.8	2.0	4	2	324	33	0.05	1.7	1.9	A
26	7	59	46.7	14	49.0	90	38.0	2.8	1.7	3	4	335	35	0.25	1.2	2.5	B
26	19	15	10.8	14	46.3	90	45.5	16.7	2.1	4	3	282	27	0.19	1.3	2.0	A
27	6	6	40.8	14	38.1	90	40.6	12.7	1.6	4	3	154	20	0.26	0.8	0.9	A
27	13	59	45.2	14	41.9	90	33.3	9.2	1.3	4	4	285	29	0.16	1.4	1.1	A
27	16	31	26.0	14	26.2	90	44.5	5.2	1.8	6	3	119	16	0.23	0.8	2.7	B
27	17	42	0.6	14	45.6	91	0.4	5.3	1.8	5	4	312	41	0.08	1.4	2.7	B
28	0	2	4.6	14	36.2	90	57.7	1.2	2.1	5	2	295	31	0.07	1.7	3.6	B
28	0	29	52.3	14	36.4	90	59.4	0.3	2.1	5	2	302	34	0.12	1.9	4.5	B
28	1	53	58.6	14	39.3	90	30.8	4.8	1.6	5	3	266	24	0.15	1.1	2.5	B
28	8	47	46.4	14	34.9	90	59.3	6.9	1.7	4	3	303	33	0.16	1.4	1.7	A
28	8	58	20.3	14	35.2	90	41.8	6.6	2.2	6	4	122	18	0.22	0.6	0.9	A
28	14	22	3.4	14	46.9	90	32.6	4.1	2.7	6	4	298	38	0.15	1.1	1.9	A
28	14	24	46.5	14	46.6	90	21.9	4.4	2.1	4	1	315	57	0.08	5.3	12.5	D
28	15	5	42.1	14	41.2	90	30.0	7.9	1.4	5	5	283	28	0.14	1.6	1.5	A
28	16	26	5.5	14	48.2	90	42.4	17.8	1.9	5	4	298	30	0.29	1.2	1.5	A
28	17	11	29.8	14	47.6	90	45.1	12.9	2.2	6	4	290	29	0.19	1.1	1.7	A
28	17	13	3.7	14	47.8	90	42.1	9.8	1.8	4	3	313	42	0.14	1.9	2.3	A
28	17	17	54.4	14	44.1	90	43.5	4.4	2.2	6	1	265	22	0.11	2.5	2.9	B
28	17	18	4.8	14	46.0	90	43.1	6.8	1.5	6	4	283	26	0.16	1.3	1.4	A
28	17	28	30.9	14	46.4	90	42.5	10.1	1.7	4	3	306	39	0.08	1.9	2.2	A
28	17	29	33.1	14	47.1	90	43.1	12.6	1.6	4	4	307	40	0.12	1.2	1.7	A
28	17	56	31.8	14	48.6	90	43.6	13.1	2.1	6	4	297	30	0.23	1.1	1.7	A
28	17	59	19.0	14	48.1	90	43.7	10.9	1.5	5	4	310	41	0.26	1.2	1.8	A
28	19	38	4.0	14	48.3	90	43.0	9.6	1.4	3	5	312	30	0.27	1.2	1.5	A
29	0	6	40.5	14	49.4	90	43.7	10.4	1.7	5	4	301	32	0.12	1.2	2.0	A
29	0	50	33.8	14	48.3	90	43.9	13.0	1.8	6	4	296	30	0.19	1.1	1.7	A
29	2	54	10.2	14	46.8	90	44.5	9.6	1.8	5	4	286	28	0.10	1.4	1.4	A
29	4	53	25.7	14	47.8	90	43.3	7.9	1.6	5	4	294	29	0.07	1.4	1.5	A
29	4	53	25.8	14	46.9	90	39.8	15.0	1.7	5	3	293	30	0.44	1.8	1.2	A
29	10	57	5.1	14	48.1	90	43.2	12.5	1.8	6	5	296	29	0.27	1.1	1.2	A
29	11	27	0.5	14	43.4	90	41.1	7.7	1.3	5	5	268	24	1.16	1.0	1.3	A
29	16	43	39.6	14	44.2	90	43.0	3.0	2.4	6	5	268	22	0.23	1.0	2.1	A
29	18	32	18.6	14	50.4	90	41.8	15.8	2.1	5	4	304	34	0.30	1.2	2.0	A
29	18	56	14.9	14	49.0	90	43.3	12.6	2.1	5	4	300	31	0.13	1.2	1.5	A
29	19	33	4.9	14	40.7	90	58.9	4.2	1.6	5	4	303	36	0.12	1.0	2.3	A
29	22	12	25.9	14	50.2	90	33.1	7.3	1.5	4	2	320	44	0.08	2.6	4.1	B
30	2	20	52.6	14	44.4	90	44.5	12.2	1.8	6	4	267	23	0.27	1.0	1.4	A
30	5	37	17.5	14	40.0	90	57.2	3.8	1.7	6	5	297	33	0.09	1.0	1.5	A
30	13	4	31.6	14	48.1	90	31.2	2.5	1.9	4	3	319	40	0.07	1.4	2.9	B

3 1976	ORIGIN TIME HR	MN	SEC	LAT N DEG	MIN	LONG W DEG	MIN	DEEP KM	MAG	P	S	GAP DEG	D3 KM	RMS SEC	ERH KM	ERZ KM	Q
AUG 30	18	55	35.2	14	51.2	90	37.5	3.8	1.7	5	4	305	38	0.15	1.1	2.4	A
31	9	47	12.9	14	50.9	90	38.6	7.2	1.4	4	5	314	47	0.11	1.4	1.7	A
SEP 1	1	18	48.0	14	43.2	91	0.4	0.8	2.6	6	3	309	40	0.10	1.8	3.7	B
1	1	23	18.4	14	45.9	91	6.6	11.9	1.7	5	5	322	52	0.15	1.5	2.7	B
1	1	23	44.2	14	45.0	91	5.9	5.2	2.2	6	3	320	50	0.21	2.0	3.6	B
1	10	58	31.0	14	46.8	90	47.5	6.2	2.0	5	4	287	29	0.10	1.2	2.1	A
1	20	5	36.7	14	39.1	90	55.8	9.4	1.9	6	3	290	30	0.16	1.2	1.4	A
2	1	56	47.7	14	39.5	90	55.1	6.7	1.3	5	3	288	29	0.10	2.0	1.1	A
2	4	15	35.4	14	38.0	90	24.1	12.4	3.9	5	1	293	32	0.12	3.7	3.3	B
2	5	57	48.9	14	34.2	90	51.0	16.3	1.2	4	3	161	18	0.19	1.8	1.5	A
3	0	18	4.4	14	42.3	90	22.4	1.2	2.4	5	4	307	38	0.23	1.4	4.4	B
3	1	21	16.4	14	30.6	90	16.9	0.3	1.9	6	2	308	43	0.25	2.4	5.4	C
3	4	15	5.3	14	41.6	90	45.6	10.0	1.5	6	4	237	19	0.23	1.2	1.4	A
3	23	24	12.5	14	42.2	90	22.5	0.5	2.2	5	3	307	38	0.18	2.0	8.0	C
4	8	49	47.8	14	39.5	90	40.6	5.5	2.6	6	2	186	21	0.26	1.5	2.2	A
5	9	52	12.8	14	42.4	90	44.0	7.6	2.9	6	1	246	20	0.12	2.1	2.5	B
5	15	6	50.6	14	37.0	90	48.3	9.3	2.0	4	1	274	19	0.02	3.9	2.3	B
5	21	15	8.7	14	15.2	90	27.4	0.3	2.2	6	3	302	40	0.20	1.2	4.5	D
5	21	55	56.1	14	46.1	90	36.1	10.8	2.3	5	4	296	36	0.24	1.3	1.7	A
6	3	20	4.6	14	38.5	90	54.7	4.1	2.1	6	4	284	27	0.08	1.1	1.6	A
7	5	15	4.6	14	43.8	91	2.7	0.6	1.9	5	3	314	44	0.15	2.2	5.5	C
7	6	21	52.0	14	44.2	90	58.8	7.5	2.4	6	4	307	38	0.14	1.4	2.2	A
7	6	25	25.8	14	44.6	90	40.7	11.5	2.1	6	5	283	26	0.24	1.0	1.2	A
7	8	55	6.8	14	45.5	90	38.7	7.5	1.6	5	3	308	29	0.22	1.6	1.7	A
7	11	5	34.5	14	38.6	90	55.3	9.1	2.2	6	4	287	28	0.11	1.2	1.4	A
7	15	54	24.6	14	35.3	90	44.8	13.3	1.8	3	2	272	29	0.13	3.1	1.4	B
7	16	1	39.8	14	42.2	90	46.8	0.6	2.2	5	3	249	21	0.22	2.7	5.3	C
7	16	18	15.8	14	42.3	90	46.7	5.7	1.9	3	3	250	21	0.24	1.3	2.5	A
7	20	27	0.4	14	45.2	91	3.9	7.4	2.1	5	3	317	47	0.07	2.1	3.9	B
8	6	39	5.2	14	45.0	91	1.7	10.6	2.0	5	6	313	43	0.16	1.1	1.7	A
9	3	28	29.7	14	36.3	91	0.8	0.7	1.9	4	3	307	37	0.21	1.2	3.7	B
9	4	36	59.3	14	38.0	91	2.6	0.2	2.3	5	3	312	40	0.09	1.3	4.6	B
9	6	10	29.4	14	47.0	90	30.6	7.8	2.4	5	4	301	38	0.15	1.2	2.4	A
9	7	49	30.7	14	40.2	90	55.2	6.9	2.3	4	1	289	30	0.08	2.5	2.1	A
9	21	5	21.9	14	37.5	90	39.2	5.7	1.5	6	4	127	23	0.33	0.6	1.1	A
10	21	15	13.8	14	51.1	90	36.3	0.8	1.9	3	2	305	40	0.08	2.0	5.1	C
10	23	12	36.0	14	49.2	90	42.9	13.3	1.6	5	3	301	31	0.24	1.5	2.0	A
11	6	44	32.9	14	45.5	90	59.7	8.1	1.9	6	6	310	40	0.19	1.0	1.8	A
11	19	52	34.1	14	35.0	90	50.5	6.3	2.0	6	2	126	18	0.11	1.8	1.8	A
11	20	48	56.1	14	33.4	90	48.9	9.5	1.2	6	3	119	23	0.57	1.1	1.7	A
12	2	46	45.8	14	43.1	91	2.2	5.4	2.5	6	6	313	43	0.26	1.0	2.0	A
12	3	26	4.8	14	44.7	91	1.6	0.8	2.1	5	3	313	43	0.14	2.3	5.7	C
12	7	38	52.9	14	51.2	90	26.0	0.0	2.5	6	6	314	47	0.21	1.5	3.3	B
12	14	49	1.1	14	44.7	90	42.2	14.9	1.4	5	5	275	24	0.22	1.0	0.9	A
13	7	11	13.3	14	46.1	90	45.5	14.1	1.8	4	4	281	37	0.11	1.3	1.3	A

1976	ORIGIN HR	MN	TIME SEC	LAT N DEG	MIN	LONG W DEG	MIN	DEEP KM	MAG	P	S	GAP DEG	D3 KM	RMS SEC	ERH KM	ERZ KM	Q
SEP 14	2	57	11.0	14	39.0	90	59.7	10.1	1.8	4	2	304	36	0.03	2.4	2.5	B
14	3	33	54.8	14	43.6	91	3.3	0.4	2.6	4	5	334	45	0.18	1.9	3.5	B
14	3	40	19.8	14	43.7	91	1.9	8.3	1.7	5	5	312	43	0.20	1.3	1.8	A
14	6	12	58.6	14	34.5	90	58.1	5.3	2.2	6	4	298	31	0.10	1.3	1.9	A
14	13	37	36.4	14	39.4	90	56.1	8.2	2.0	5	4	291	30	0.15	1.1	1.7	A
15	4	33	12.8	14	48.1	90	51.8	7.0	2.3	6	5	302	35	0.14	1.0	1.9	A
15	4	46	11.9	14	44.1	91	5.6	0.5	1.7	5	2	319	50	0.12	2.5	7.3	C
15	22	57	42.7	14	45.4	90	45.3	12.8		5	3	276	26	0.25	1.2	1.8	A
16	2	10	58.4	14	33.5	90	59.2	12.3	1.7	5	3	304	33	0.16	1.2	1.7	A
16	15	38	48.6	14	40.4	90	33.2	1.4	1.8	6	4	268	26	0.20	1.1	2.8	B
17	2	25	54.5	14	42.8	91	0.2	10.3	2.1	5	4	308	40	0.18	1.5	1.8	A
17	3	57	13.8	14	43.6	91	2.9	5.1	2.5	6	5	314	45	0.15	1.3	2.7	B
17	7	13	32.5	14	46.0	91	3.5	6.2	1.8	5	4	317	47	0.16	1.8	2.8	B
18	11	5	38.7	14	40.6	91	1.7	6.6	1.9	4	3	310	40	0.03	2.0	2.7	B
18	15	23	39.3	14	45.6	90	31.7	2.5	2.3	6	3	296	36	0.13	1.5	2.7	B
18	19	14	27.0	14	35.8	90	42.4	4.0	1.2	6	2	135	17	0.28	0.8	2.1	A
20	2	9	45.3	14	32.4	91	0.7	9.2	2.0	6	3	303	36	0.17	1.3	1.6	A
20	13	26	45.0	14	36.3	90	42.3	9.1	2.2	6	4	141	17	0.34	0.6	0.9	A
20	17	32	12.9	14	45.6	90	45.5	11.2	1.7	4	5	277	26	0.27	1.1	1.3	A
21	19	21	20.8	14	43.6	90	58.1	10.0	2.7	6	2	304	36	0.05	2.2	2.0	A
23	4	55	59.2	14	33.8	91	0.2	3.0	2.2	5	4	304	35	0.09	1.2	2.5	A
23	18	56	38.3	14	42.7	90	32.8	7.1	1.8	5	4	286	30	0.14	1.1	1.7	A
24	0	14	25.9	14	33.5	90	58.2	0.2	1.5	5	3	299	38	0.20	1.5	3.2	B
24	18	10	43.1	14	42.8	91	4.9	3.5	1.7	6	2	317	47	0.17	2.4	4.0	B
26	21	45	48.7	14	19.0	90	23.1	5.7	2.6	4	2	321	47	0.14	2.4	3.6	B
28	9	4	20.7	14	49.9	90	40.8	13.6	1.8	4	5	302	33	0.20	1.2	1.2	A
28	20	44	39.1	14	44.8	90	39.0	9.3	1.6	6	3	285	28	0.05	1.3	0.9	A
29	9	41	38.0	14	47.9	90	54.4	4.4	1.9	6	4	307	36	0.11	1.8	2.3	A
29	11	55	1.6	14	47.5	90	40.2	5.2	2.1	6	5	295	30	0.18	1.1	2.0	A
29	16	6	5.6	14	45.2	91	2.7	0.2	1.9	6	3	315	45	0.17	1.9	4.2	B
30	12	56	19.2	14	35.0	90	42.8	7.7	1.2	4	4	127	16	0.18	0.7	1.1	A
30	16	54	44.4	14	51.8	90	44.2	13.4	1.9	6	5	310	36	0.17	1.2	1.5	A
30	23	45	41.2	14	37.8	90	38.9	9.3	2.1	6	4	131	23	0.17	1.0	1.8	A
OCT 1	3	50	41.0	14	33.9	90	59.8	5.4	1.7	6	4	303	34	0.21	1.1	1.9	A
2	5	25	31.3	14	43.0	91	1.3	6.4	2.7	6	4	311	42	0.28	1.5	2.4	A
2	7	37	50.3	14	44.4	90	58.9	6.4	2.4	6	2	307	38	0.16	2.3	2.4	A
2	10	1	1.7	14	29.7	90	44.0	1.3	1.2	3	2	144	18	0.22	0.8	6.7	C
2	11	56	3.2	14	44.4	91	2.7	0.6	1.6	6	3	315	45	0.16	1.9	4.1	B
3	4	45	53.7	14	45.1	90	45.7	6.1	1.8	6	4	273	25	0.12	1.0	1.8	A
3	8	27	23.4	14	46.7	90	41.2	25.8	1.4	3	2	312	40	0.03	3.5	2.0	B
3	20	11	30.1	14	39.1	90	59.9	2.7	2.5	6	2	304	36	0.08	2.0	2.8	B
4	18	27	40.6	14	40.7	90	34.0	16.6	1.9	6	5	269	27	0.62	0.9	0.8	A
5	0	46	3.8	14	43.7	90	35.4	3.3	1.6	5	3	284	33	0.18	1.2	2.1	A
5	2	16	7.6	14	36.1	90	40.0	5.8	1.8	6	4	117	21	0.17	0.6	0.9	A
5	8	29	0.4	14	30.2	90	33.6	0.9	1.8	6	2	175	20	0.21	1.4	5.9	C

1976		ORIGIN HR	MN	TIME SEC	LAT N DEG	MIN	LONG W DEG	MIN	DEEP KM	MAG	P	S	GAP DEG	D3 KM	RMS SEC	ERH KM	ERZ KM	Q
OCT	5	8	30	33.4	14	30.5	90	33.3	0.5	1.9	6	2	182	20	0.11	1.5	6.3	C
	5	9	28	18.0	14	29.8	90	33.1	3.5	1.6	3	4	227	26	0.19	1.2	2.4	A
	5	16	27	8.5	14	51.3	90	52.5	7.4	1.8	5	5	313	42	0.13	1.0	2.8	B
	5	23	0	12.3	14	34.0	90	58.9	8.8	1.8	6	4	301	32	0.19	1.2	1.3	A
	6	7	7	59.3	14	33.0	90	32.5	6.6	1.8	5	5	209	16	0.19	0.7	1.6	A
	6	9	39	3.9	14	30.7	90	37.6	5.4	1.2	4	4	190	24	0.17	1.0	1.7	A
	8	13	45	31.0	14	49.2	90	39.0	7.6	2.1	5	3	300	34	0.18	1.3	2.3	A
	8	13	59	34.7	14	38.6	90	58.9	6.9	2.0	5	4	301	34	0.26	1.2	1.4	A
	8	18	31	0.3	14	47.5	90	41.8	9.1	1.6	4	3	295	41	0.05	1.4	1.4	A
	9	3	56	58.2	14	36.3	90	42.5	11.5	1.7	4	3	142	16	0.21	1.5	2.0	A
	9	11	0	26.9	14	45.7	90	29.3	3.2	1.5	5	3	301	36	0.11	1.4	3.3	B
	9	15	29	39.9	14	41.2	90	29.3	2.5	1.9	5	3	285	28	0.19	1.3	3.3	B
	9	16	22	34.8	14	43.7	90	42.5	9.0	1.8	4	5	263	22	0.15	1.1	1.1	A
	10	1	21	15.2	14	35.7	90	43.4	2.5	1.7	4	3	139	15	0.10	1.1	4.8	B
	11	22	4	42.3	14	42.2	90	45.6	5.6	1.5	3	4	270	20	0.10	1.1	2.0	A
	12	0	33	49.6	14	43.8	90	32.2	5.0	2.2	5	4	291	32	0.14	1.2	2.2	A
	12	7	57	20.6	14	40.2	90	34.0	0.5	1.7	5	2	263	26	0.05	2.4	4.7	B
	12	17	47	45.5	14	31.0	90	39.1	4.7	1.7	6	2	117	17	0.17	0.6	1.7	A
	13	1	57	54.3	14	36.5	90	28.8	6.4	1.5	5	3	262	23	0.26	1.1	2.2	A
	13	1	59	24.2	14	37.5	90	30.7	0.3	1.7	6	5	255	21	0.22	1.3	3.3	B
	13	19	11	15.6	14	34.9	90	55.0	6.0	1.5	5	2	281	26	0.22	1.7	1.6	A
	13	19	12	10.6	14	34.1	90	51.8	0.5	1.6	3	2	268	20	0.08	4.0	10.5	D
	13	23	41	39.4	14	35.3	90	42.4	8.1	2.0	6	1	129	16	0.19	0.8	1.8	A
	14	22	8	59.5	14	48.2	90	29.4	9.2	1.9	4	4	318	41	0.17	1.3	2.0	A
	14	22	25	28.7	14	46.2	91	1.6	13.6	2.3	5	5	314	43	0.19	1.2	2.2	A
	15	1	29	49.9	14	48.8	90	36.7	15.1	2.0	4	5	322	36	0.13	1.3	1.7	A
	16	9	39	1.3	14	37.6	90	32.7	11.7	1.5	5	4	239	21	0.15	0.9	1.0	A
	17	9	55	49.9	14	40.6	90	52.7	7.6	2.0	4	2	281	26	0.19	2.4	1.3	A
	18	5	52	39.7	14	40.9	90	48.7	10.3	1.7	5	4	246	21	0.14	1.0	1.3	A
	19	6	37	5.7	14	39.8	91	4.3	6.8	2.2	5	3	316	44	0.13	1.6	2.8	B
	21	2	55	11.1	14	44.6	90	45.1	9.1	1.8	5	4	269	24	0.18	1.0	1.8	A
	21	23	26	39.3	14	37.8	90	41.1	14.0	1.4	4	3	154	26	0.03	1.0	1.5	A
	21	23	57	18.4	14	40.9	91	5.9	1.9	1.7	5	3	319	48	0.09	2.1	3.9	B
	22	23	27	14.0	14	39.6	90	59.3	4.1	1.8	4	2	303	36	0.21	1.9	3.9	B
	23	5	55	6.7	14	36.0	90	58.3	6.8	1.6	4	3	298	32	0.28	1.3	2.4	A
	23	15	47	13.5	14	42.9	90	31.9	16.1	1.5	4	2	289	31	0.11	1.4	1.5	A
	24	17	5	29.4	14	39.2	90	50.6	1.2	1.2	4	3	250	22	0.11	1.5	5.3	C
	24	17	6	0.3	14	38.1	90	48.6	15.5		4	3	210	19	0.26	0.9	1.5	A
	25	2	40	22.2	14	42.2	90	30.0	9.1	1.7	4	3	290	29	0.14	1.2	2.1	A
	25	4	58	5.2	14	35.3	90	42.3	4.8	1.3	5	4	127	17	0.13	0.5	1.9	A
	25	5	13	3.4	14	39.3	90	37.6	17.3		4	2	250	26	0.56	2.7	1.9	B
	25	8	21	39.2	14	34.2	90	39.1	8.7	1.9	4	3	214	23	0.18	2.0	1.1	A
	25	12	18	27.6	14	45.3	91	2.2	9.3	1.7	4	6	314	44	0.16	1.2	1.9	A
	25	13	54	27.3	14	29.8	90	37.6	5.9	1.4	5	2	136	19	0.14	0.8	2.2	A
	26	1	4	41.4	14	35.5	90	41.8	2.9	1.3	5	4	126	18	0.27	0.5	1.4	A

2 1976	ORIGIN HR	MN	TIME SEC	LAT N DEG	MIN	LONG W DEG	MIN	DEEP KM	MAG	P	S	GAP DEG	D3 KM	RMS SEC	ERH KM	ERZ KM	Q
OCT 26	3	26	3.4	14	35.9	90	41.9	8.1	2.4	5	2	132	17	0.18	0.9	2.0	A
26	3	30	27.6	14	31.8	91	0.7	11.5	2.5	5	3	310	36	0.18	1.4	1.9	A
26	6	19	3.8	14	52.5	90	53.0	8.3	1.9	4	3	316	43	0.11	1.7	3.9	B
26	12	28	50.7	14	34.0	90	38.9	10.9	1.6	4	3	223	23	0.14	2.0	1.0	A
27	1	32	32.1	14	35.9	90	42.4	7.0	2.3	6	2	135	17	0.10	0.8	1.9	A
27	9	45	28.5	14	44.7	90	46.2	2.6	1.7	6	2	271	25	0.23	2.2	3.5	B
28	2	12	3.2	14	35.8	90	42.0	8.6	1.1	6	5	131	17	0.14	0.5	0.8	A
28	2	14	50.0	14	34.4	90	41.2	11.7	2.4	6	1	109	19	0.30	0.8	1.8	A
28	4	30	24.4	14	31.9	90	37.4	5.9	1.5	6	3	139	15	0.09	0.6	1.0	A
28	6	52	7.2	14	36.2	90	42.4	9.2	1.5	4	5	140	17	0.17	0.5	1.0	A
28	7	56	57.1	14	36.1	90	57.5	6.4	2.1	6	3	295	31	0.18	1.7	1.7	A
28	9	23	20.2	14	35.3	90	38.8	13.7	1.3	3	3	208	26	0.15	1.2	2.1	A
29	9	27	46.4	14	40.6	90	30.8	0.5	1.5	5	4	276	26	0.20	1.6	3.5	B
29	13	45	48.1	14	43.6	90	39.9	8.6	2.1	6	4	279	26	0.07	1.3	1.5	A
29	22	47	11.0	14	36.5	90	42.6	9.6	1.4	6	5	145	16	0.21	0.5	0.9	A
30	14	42	48.3	14	35.5	90	42.3	6.6	1.6	6	5	129	17	0.17	0.5	0.9	A
1	21	41	23.6	14	47.1	90	37.3	8.5	1.3	6	5	294	33	0.13	1.1	1.1	A
1	21	41	41.3	14	37.9	90	38.7	6.6	1.8	5	1	248	24	0.17	1.6	1.8	A
NOV 1	4	15	7.8	14	41.4	90	46.1	10.1	1.2	6	5	237	19	0.16	0.9	1.2	A
1	7	20	30.5	14	37.9	90	38.5	3.6	1.2	6	3	142	24	0.38	1.1	2.5	A
1	16	19	10.0	14	47.6	90	39.9	10.5	1.5	4	4	312	42	0.13	1.2	1.6	A
1	19	22	58.5	14	37.6	90	28.0	8.1	1.6	4	4	272	25	0.09	1.2	1.9	A
2	23	35	58.1	14	42.7	90	41.1	11.9	1.8	5	0	275	34	0.06	5.4	3.1	C
3	6	36	31.9	14	44.2	90	48.0	8.9	1.3	6	4	271	25	0.27	1.0	1.7	A
3	6	48	9.0	13	56.4	90	55.1	18.9	2.7	5	0	327	70	0.16	38.8	43.5	D
5	3	42	2.3	14	36.0	90	42.2	3.8	2.1	6	2	136	17	0.10	0.7	2.2	A
5	18	34	22.6	14	42.0	90	32.8	7.4	1.9	5	4	284	29	0.15	1.1	1.6	A
6	13	0	59.0	14	42.4	90	42.9	11.1	1.9	6	5	247	20	0.28	0.9	0.9	A
7	2	12	14.5	14	37.4	91	2.6	7.5	1.8	6	4	311	40	0.16	1.1	1.9	A
10	4	37	56.9	13	49.8	90	54.1	31.9	2.5	5	0	332	79	0.08	51.4	46.3	D
12	5	3	57.4	14	35.8	90	43.3	10.7	1.4	5	5	140	15	0.20	0.5	0.9	A
12	5	10	22.1	14	35.9	90	42.7	10.6	2.6	6	0	139	16	0.10	1.1	2.0	A
13	1	51	7.8	14	38.4	91	5.3	6.5	2.1	6	3	316	45	0.10	1.4	2.8	B
13	6	2	38.6	14	47.7	90	42.7	15.3	1.5	5	3	294	29	0.23	1.2	1.6	A
13	8	53	34.5	14	39.5	90	50.0	13.2	1.6	4	5	245	21	0.18	0.9	1.2	A
13	13	58	54.3	14	39.7	90	29.9	0.0	1.9	4	3	274	25	0.17	2.3	5.5	C
13	22	40	0.1	14	46.8	90	30.4	7.2	2.0	4	4	314	38	0.23	1.2	2.3	A
14	2	20	19.6	14	43.8	91	4.8	8.9	2.4	6	3	318	48	0.19	1.7	3.0	B
14	6	23	35.0	14	52.6	90	40.9	13.3	1.6	5	3	309	37	0.20	1.6	2.2	A
14	11	6	23.3	14	44.3	90	45.0	6.6	1.4	5	3	266	23	0.09	1.0	2.1	A
15	11	52	32.0	14	43.9	90	43.5	10.0	1.6	6	4	264	22	0.21	0.9	1.4	A
15	12	20	0.3	14	37.6	90	55.6	7.7	1.7	5	4	287	28	0.10	1.2	0.9	A
15	19	40	57.1	14	45.8	90	43.3	5.9	1.6	6	2	281	25	0.14	2.4	2.5	A
16	3	43	9.8	14	36.2	90	42.4	13.5	1.4	6	5	140	17	0.18	0.6	0.8	A
16	5	6	48.0	14	50.3	90	22.0	10.1	2.1	5	3	318	47	0.15	2.6	3.2	B

1 1976	ORIGIN HR	MN	TIME SEC	LAT N DEG	MIN	LONG W DEG	MIN	DEEP KM	MAG	P	S	GAP DEG	D3 KM	RMS SEC	ERH KM	ERZ KM	Q
NOV 16	18	16	0.8	14	37.4	90	55.2	7.0	2.3	6	3	285	27	0.18	1.7	1.5	A
16	23	11	53.2	14	48.3	90	32.1	9.1	1.6	4	5	318	41	0.20	1.2	2.0	A
17	2	28	39.0	14	44.8	90	26.7	0.2	1.8	6	4	304	35	0.18	1.5	3.7	B
17	2	32	18.8	14	44.9	91	1.0	7.6	2.1	5	6	312	42	0.17	1.0	1.9	A
17	6	12	10.0	14	36.1	90	59.8	3.8	1.8	5	3	304	35	0.17	1.5	2.4	A
17	10	47	19.1	14	38.1	90	30.4	9.4	1.3	5	5	261	22	0.19	1.0	1.3	A
18	1	34	19.4	14	43.8	90	51.3	10.4	2.9	6	0	285	28	0.05	6.5	2.2	C
18	9	12	2.1	14	44.9	90	58.0	1.9	2.3	5	3	306	37	0.20	2.2	3.1	B
18	14	8	10.2	14	45.7	90	59.4	8.7	1.9	6	3	310	39	0.14	1.9	2.3	A
18	21	9	4.9	14	45.6	90	34.9	0.6	2.7	6	1	291	35	0.14	1.5	4.8	B
19	17	10	15.0	14	46.8	90	59.4	11.8	2.1	5	4	312	40	0.20	1.8	2.3	A
20	13	59	42.5	14	32.1	90	57.3	6.6	2.0	6	2	286	29	0.18	1.3	1.9	A
20	20	50	11.7	14	45.2	90	30.1	6.2	1.9	5	4	298	35	0.17	1.2	1.8	A
21	7	21	14.8	15	11.0	90	51.3	7.1	2.1	6	0	336	74	0.23	5.6	75.5	D
21	14	1	18.1	14	45.4	90	41.7	20.2	1.6	4	3	283	25	0.30	1.4	1.7	A
21	14	15	35.7	14	42.2	90	45.1	8.4	1.9	6	5	243	20	0.24	0.9	1.3	A
22	5	48	21.3	14	38.1	90	41.2	9.5	1.4	6	3	160	19	0.22	0.7	1.0	A
23	2	47	41.8	14	35.5	90	43.8	6.2	2.7	6	0	138	14	0.09	0.9	2.1	A
23	2	49	16.1	14	34.7	90	41.9	8.0	2.1	6	1	117	18	0.11	0.7	1.7	A
23	7	30	29.8	14	35.4	90	42.1	11.4	1.5	6	1	128	17	0.08	0.8	1.9	A
24	1	30	24.0	14	42.3	90	50.2	7.3	1.8	6	3	269	25	0.17	1.7	2.2	A
25	11	23	19.2	14	47.7	90	40.5	14.8	2.0	4	3	313	42	0.15	1.5	2.4	A
25	11	23	20.1	14	36.4	90	31.0	9.0	2.0	6	2	259	22	0.23	1.6	2.4	A
25	11	45	21.8	14	45.4	90	33.6	6.1	1.3	3	2	292	37	0.08	2.6	2.3	B
25	15	58	34.8	14	33.3	90	29.7	4.6	2.5	5	0	244	20	0.07	3.3	4.1	B
25	23	0	32.2	14	42.0	91	13.3	1.3	2.1	4	1	342	61	0.05	7.5	13.1	D
25	23	18	0.2	14	32.9	90	25.8	1.4	1.8	4	1	315	46	0.07	2.7	11.1	D
25	23	20	46.4	14	33.5	90	28.0	10.1	2.1	5	2	261	23	0.27	1.1	1.8	A
26	0	36	4.3	14	34.0	90	28.3	10.3	1.9	5	2	259	23	0.22	1.1	1.8	A
26	8	33	5.9	14	43.1	91	3.9	12.5	2.0	5	5	316	46	0.16	1.6	1.7	A
26	8	44	19.1	14	43.5	91	0.4	7.1	2.3	5	4	309	40	0.28	1.5	2.0	A
26	15	37	12.7	14	45.3	90	44.5	7.1	2.3	6	4	275	25	0.09	1.3	1.4	A
26	18	29	47.3	14	48.4	90	44.3	20.5	1.6	3	4	296	30	0.08	1.4	2.0	A
28	10	34	2.0	14	41.8	90	29.5	5.0	1.2	4	4	288	29	0.11	1.2	2.2	A
28	15	52	9.4	14	47.3	90	30.7	7.7	2.1	5	6	302	39	0.23	1.0	1.5	A
29	7	23	24.5	14	46.1	90	45.7	9.1	1.3	5	4	281	27	0.14	1.1	1.9	A
29	9	27	6.4	14	37.3	90	40.1	3.1	1.9	5	3	132	21	0.19	0.9	2.7	B
30	22	41	12.7	14	31.5	90	58.0	3.3	2.4	6	3	287	31	0.22	1.4	2.6	B
30	22	43	36.1	14	32.3	91	10.7	4.6	2.0	6	4	320	54	0.15	1.6	3.4	B
30	23	53	54.9	14	44.4	91	1.0	11.2	2.4	5	5	311	42	0.22	1.1	2.9	B
DEC 3	12	52	17.6	14	44.2	91	3.8	11.1	2.1	6	5	316	46	0.21	1.2	1.8	A
4	14	54	10.9	14	48.2	90	31.4	7.6	1.8	4	6	362	41	0.21	1.1	1.6	A
4	17	55	16.3	14	47.3	90	29.7	10.5	1.3	3	5	316	39	0.18	1.2	1.6	A
4	19	12	12.9	14	47.6	90	30.5	4.2	1.9	6	4	302	39	0.20	1.3	2.7	B
4	21	9	49.4	14	33.7	90	59.0	6.3	2.3	5	4	303	33	0.16	1.5	1.6	A

1976	ORIGIN HR	MN	TIME SEC	LAT N DEG	MIN	LONG W DEG	MIN	DEEP KM	MAG	P	S	GAP DEG	DS KM	RMS SEC	ERH KM	ERZ KM	Q
DEC 5	17	29	10.6	14	35.8	90	41.7	9.6	1.4	6	5	130	18	0.14	0.5	0.8	A
7	13	24	37.0	14	30.1	90	37.1	9.2	2.0	6	3	132	18	0.30	0.7	1.9	A
8	7	31	46.5	14	44.1	91	2.9	4.1	2.6	6	3	315	45	0.14	1.8	3.3	B
8	7	36	26.6	14	30.1	90	37.0	6.6	2.3	6	2	132	18	0.13	0.8	2.2	A
8	7	50	56.9	14	30.7	90	37.7	7.2	1.4	5	4	126	17	0.11	0.6	1.1	A
8	7	52	57.7	14	30.3	90	37.8	6.3	1.5	5	4	126	18	0.11	0.6	1.2	A
9	4	24	37.9	13	20.0	90	1.9	71.7	4.1	6	0	348	151	0.21	47.3	67.5	D
9	20	10	12.7	14	46.6	90	30.3	18.6	1.9	3	4	301	43	0.21	1.4	2.5	B
9	21	54	45.4	14	31.0	90	37.6	4.7	1.8	6	0	129	17	0.14	0.9	2.1	A
10	4	12	21.7	14	29.9	90	34.7	3.7	2.3	6	3	157	20	0.19	1.1	3.4	B
10	4	39	4.7	14	30.5	90	37.7	5.5	1.2	5	4	126	17	0.11	0.6	1.2	A
10	5	32	3.5	14	42.2	90	33.6	6.9	1.8	5	4	282	30	0.21	1.1	1.5	A
10	11	56	36.8	14	45.4	91	0.4	11.4	1.9	5	5	311	41	0.19	1.2	2.1	A
10	21	1	42.7	14	46.9	90	44.8	15.8	1.4	4	4	287	28	0.21	1.1	1.6	A
10	22	32	23.7	14	44.2	90	59.4	8.7	2.2	6	6	308	39	0.15	1.0	1.6	A
12	13	49	53.9	14	43.7	90	59.6	11.1	2.0	6	4	308	39	0.18	1.6	1.4	A
12	17	56	42.3	14	46.1	90	30.5	9.9	2.1	6	5	299	37	0.17	1.1	1.8	A
12	21	13	2.1	14	40.7	90	42.7	5.2	2.6	6	1	219	18	0.05	1.9	2.8	B
13	8	8	25.4	14	43.6	90	47.6	2.9	1.8	6	4	265	24	0.15	1.6	2.6	B
13	15	15	22.2	14	41.8	91	5.4	4.8	1.8	6	4	318	47	0.25	1.5	2.6	B
13	16	34	21.5	14	48.1	91	13.8	18.1	1.9	3	2	330	66	0.14	44.3	39.2	D
13	18	20	1.8	14	29.0	90	37.8	2.1	1.4	4	4	157	21	0.12	1.2	5.4	C
14	4	54	7.9	14	30.7	90	38.6	5.9	2.5	6	2	118	17	0.19	0.7	1.8	A
14	6	59	10.4	14	30.2	90	37.1	14.0	1.1	4	3	131	18	0.24	0.7	2.1	A
14	15	58	36.0	14	31.9	90	37.5	9.5	1.2	4	5	138	15	0.16	0.5	1.0	A
14	20	44	36.3	14	45.8	90	59.3	14.3	2.1	6	3	310	39	0.17	1.4	2.2	A
15	2	49	32.0	14	35.0	91	0.3	6.6	1.6	6	3	305	35	0.12	1.3	1.9	A
15	18	55	9.4	14	43.5	91	3.7	3.4	2.1	5	3	310	46	0.12	1.9	4.9	B
15	20	6	38.8	14	30.0	90	32.8	2.8	2.3	6	3	187	21	0.08	0.9	2.3	A
15	21	25	4.9	14	39.2	90	48.8	1.2	2.5	5	1	228	19	0.04	2.8	6.2	C
16	5	41	50.6	14	38.6	90	51.7	13.6	2.0	4	4	266	23	0.41	1.0	1.0	A
16	10	35	20.7	14	46.1	90	45.6	13.4	1.6	5	3	281	27	0.12	1.4	1.4	A
18	11	56	32.2	14	41.4	90	30.8	3.0	2.1	5	4	283	28	0.19	1.0	2.4	A
18	15	19	58.1	14	47.8	90	29.6	10.4	1.8	4	5	304	40	0.25	1.1	1.6	A
19	14	50	10.5	14	40.3	91	2.1	9.8	1.8	4	4	311	41	0.25	1.4	1.6	A
19	15	39	9.8	14	33.3	90	50.1	2.7	2.1	5	0	145	17	0.05	1.9	5.3	C
20	2	12	37.4	14	46.6	90	32.5	11.4	2.0	5	5	297	38	0.23	1.1	1.2	A
20	7	54	1.8	14	46.9	90	41.3	12.0	2.0	5	3	293	28	0.08	1.1	1.8	A
20	12	51	3.1	14	36.2	91	0.2	9.9	2.5	5	2	305	35	0.23	1.7	1.9	A
23	18	12	43.6	14	43.1	91	2.9	3.3	2.1	5	3	314	44	0.09	1.8	4.8	B
24	6	0	10.3	14	34.6	90	49.8	6.4	1.7	5	5	123	17	0.18	0.8	1.2	A
24	6	4	45.7	14	33.8	90	49.4	0.7	1.8	5	3	123	16	0.07	0.7	4.0	B
26	1	37	49.1	14	49.3	90	33.8	11.3	1.8	4	3	318	43	0.19	1.4	1.5	A
26	5	58	16.5	14	44.8	90	41.7	10.0	1.6	5	3	278	24	0.19	1.1	1.7	A
26	16	58	23.8	14	30.1	90	34.7	4.3	2.4	4	4	159	19	0.17	0.6	1.8	A

2 1976	ORIGIN HR	MN	TIME SEC	LAT N DEG	MIN	LONG W DEG	MIN	DEEP KM	MAG	F	S	GAP DEG	D3 KM	RMS SEC	ERH KM	ERZ KM	Q
DEC 26	22	25	32.2	14	26.0	90	16.0	6.4	2.1	5	3	328	48	0.16	1.9	3.4	B
27	5	11	3.7	14	43.3	90	40.1	8.8	1.9	5	4	276	25	0.17	1.0	1.4	A
28	6	56	16.2	14	53.4	90	44.2	10.1	2.3	5	4	313	39	0.16	1.4	2.3	A
28	8	26	20.9	14	53.1	90	44.2	10.1	1.7	5	4	312	39	0.11	1.4	2.2	A
28	11	4	30.5	14	44.3	90	41.8	4.7	1.7	4	4	278	24	0.32	1.2	2.3	A
29	0	4	0.4	14	41.0	90	31.9	5.8	1.7	4	4	277	27	0.08	1.1	1.9	A
29	0	13	25.0	14	42.5	90	31.0	8.3	1.4	3	4	291	30	0.22	1.2	1.8	A
29	20	7	54.1	14	31.4	90	57.5	0.4	1.9	6	3	284	30	0.19	1.7	3.7	B
30	0	52	31.7	14	43.8	91	2.7	8.5	1.9	5	2	314	44	0.17	3.4	2.9	B
30	23	35	5.1	14	32.0	90	37.3	7.5	2.0	6	4	141	15	0.13	0.6	0.9	A
31	16	3	41.3	14	46.1	90	45.5	17.7	1.4	6	4	281	27	0.27	1.0	1.4	A
31	22	25	16.9	14	30.5	90	59.3	4.4	1.7	4	4	291	40	0.22	1.2	1.9	A