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Reconnaissance seismology near Albuquerque, NM

#339

U.S. GEOLOGICAL SURVEY
Reston, VA 22092

Memorandum

Date 3/28/78

JAKSHA

78-339

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(Albq. Seis. Lab.)

AUTHOR(S): Lawrence H. Jaksha, Jerry Locke, John B. Thompson, and Alvin Garcia

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UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

RECONNAISSANCE SEISMOLOGY NEAR ALBUQUERQUE, NEW MEXICO

by

Lawrence H. Jaksha
Jerry Locke
John B. Thompson
Alvin Garcia

Open-File Report 78-339
1978

This report is preliminary and has not been edited or reviewed for conformity with U.S. Geological Survey standards.

ABSTRACT

An eight-element seismic network was operated near Albuquerque, New Mexico during 1976. Analysis of 224 earthquakes located by the network indicates three primary zones of earthquake activity. Of these three zones, the highest seismicity is associated with the Socorro area and the Albuquerque Basin. In the Albuquerque Basin the seismicity shows some correlation with mapped, intra-basin faults and is confined almost entirely to the southern half of the basin. The Albuquerque Basin boundary faults showed very little seismic activity during the time frame of this study.

INTRODUCTION

The U.S. Geological Survey is presently evaluating the seismotectonics of the Rio Grande rift. As a part of this evaluation, a seismic network was established around the Albuquerque Basin in the fall of 1975. This report considers the data accumulated by the network from January 1 to December 31, 1976.

The intent of the study is, at this point, rather broad. We seek to establish relative seismicity levels within and near the Albuquerque Basin. The reconnaissance nature of the report is indicated by the brevity of time that it covers and by our imperfect knowledge of the crustal and mantle structure beneath the study area.

GEOLOGY

Chapin (1971) and Chapin and Seager (1975) describe the Rio Grande rift as a large extensional structure beginning in central Colorado, roughly bisecting New Mexico, and possibly continuing south into Old Mexico (Figure 1). The rift is expressed throughout its length as a series of linked basins offset in a right-stepping echelon fashion.

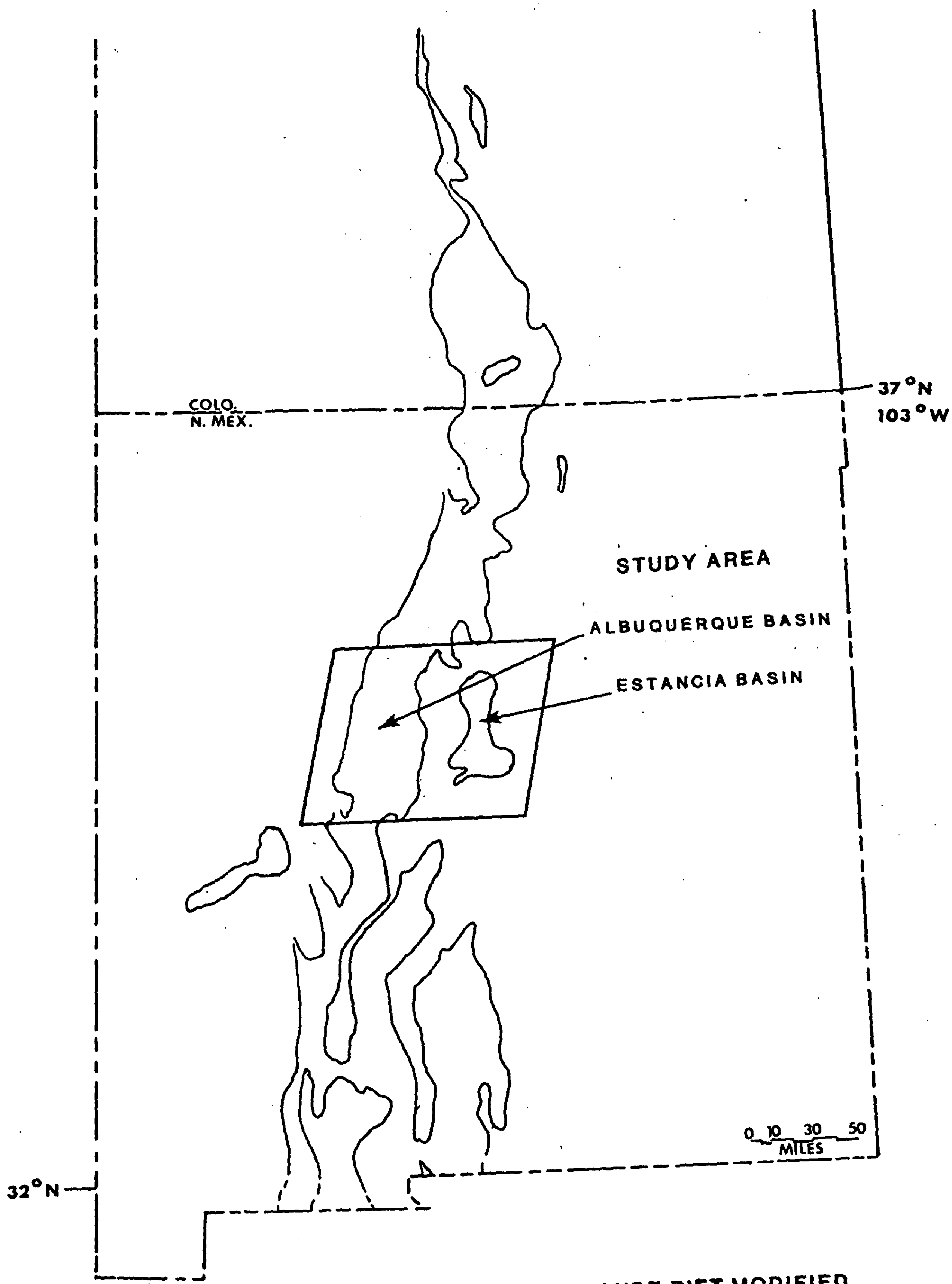


FIG. 1. GENERALIZED MAP OF THE RIO GRANDE RIFT MODIFIED FROM CHAPIN (1971).

The Albuquerque Basin, situated roughly in the middle of the north-south rift, is characterized by raised margins, young intrabasin volcanics, and a thick filling of sediments. The basin has a geologically long history of development, but many of the structural features associated with the present basin indicate a significant amount of deformation in Pliocene and Pleistocene time (E. H. Baltz, written communication, 1977).

SEISMIC NETWORK AND ANALYSIS

The Albuquerque Basin seismic net consists of 13 stations located within and around the study area. Technical information on the instrument parameters is given in a USGS Open-File Report entitled "Albuquerque Basin Seismic Network" by Jaksha and others (1977), and will not be discussed here. The data set considered in this report was compiled from the first 8 stations to become operational. These stations are listed in Table 1.

Table 1. Albuquerque Basin Seismic Network (1976)

STATION NAME	LATITUDE	LONGITUDE	ELEVATION	ROCK TYPE
ABQ/Albuquerque	34°56.55'N	106°27.45'W	1849 m	Granite
CDN/Cerro del Durazno	35°27.28'N	107°20.91'W	2591 m	Basalt
COH/Cochiti	35°34.81'N	106°18.29'W	1646 m	Basalt
EST/Estancia	34°51.87'N	105°43.36'W	2055 m	Limestone
GNM/Golden	35°14.98'N	106°11.56'W	2417 m	Limestone
LAD/Ladron	34°27.50'N	107°02.25'W	1768 m	Gneiss
LPM/Los Pinos	34°18.46'N	106°38.02'W	1737 m	Granite
MLM/Mesa Lucero	34°48.86'N	107°08.70'W	2088 m	Basalt

Data are recorded on 16-mm film and read on a viewer at X20 magnification. Timing is provided by a quartz-crystal oscillator system corrected daily to WWV. Timing errors average less than 50 milliseconds per day, and arrival times are correct to less than 50 milliseconds. All of the stations in the network are equipped with short-period vertical seismometers. The station at Albuquerque (ABQ) has, in addition, two orthogonal short-period horizontal seismometers.

Earthquake hypocenters are solved with the computer program HYPO 71 (Lee and Lahr, 1972) using two different crustal models. For events occurring within the rift, the crustal model derived by Toppozada and Sanford (1976) is utilized. Events occurring outside of the rift are solved with the crustal model adopted by Sanford (1965). These two models are shown in Table 2.

Table 2. Crustal Models

Toppozada & Sanford (1976)		Sanford (1965)	
Thickness (km)	Velocity (P) km/sec	Thickness (km)	Velocity (P) km/sec
18.6	5.8	39.0	6.0
21.3	6.5		8.0
	7.9		

The accuracy of the earthquake hypocenters inferred from an analysis of local mining explosions indicates the locations to be within 2.0 km horizontally and 5 km vertically for events within the network. Events outside of the network (but less than 100 km from ABQ) are thought to be accurate to 10 km horizontally. Table 3 lists the results obtained from four explosions. The Tijeras quarry is located within the network, the Oxymin and Jackpile mines are on the edge of the network, and the White Sands explosion is outside of the network. The Tijeras solution utilizes P and S arrivals; the other three solutions use P arrivals only. The White Sands shot is about 135 km from station ABQ and more than 60 km from the nearest station used in the solution. The earthquakes considered in this report all contain S data in the solutions, and none are as far outside the network as the White Sands shot.

Table 3. Explosion Analysis

Explosion	Known Coordinates	Solution Coordinates	Error
Tijeras	Lat = 35.063°N	Lat = 35.071°N	Lat = 0.9 km
limestone	Long = 106.396°W	Long = 106.412°W	Long = 1.5 km
quarry	Depth = 0.0 km	Depth = 3.5 km	Depth = 3.5 km
Oxymin	Lat = 35.4611°N	Lat = 35.460°N	Lat = 0.12 km
copper	Long = 106.1150°W	Long = 106.106°W	Long = 0.82 km
mine	Depth = 0.3 km	Depth = 5.7 km	Depth = 5.4 km
Jackpile	Lat = 35.125°N	Lat = 35.119°N	Lat = 0.67 km
uranium	Long = 107.382°W	Long = 107.366°W	Long = 1.4 km
mine	Depth = 0.0 km	Depth = 0.95 km	Depth = 0.95 km
White Sands	Lat = 33.679°N	Lat = 33.761°N	Lat = 9.1 km
"Dice Throw"	Long = 106.521°W	Long = 106.452°W	Long = 6.3 km
explosion	Depth = 0.0 km	Depth = 0.41 km	Depth = 0.4 km

Depth of focus is not assigned to earthquakes that are not within the network in this report. Where reported, the depth of focus is assigned to a 5-km-thick section of the crust beneath the basin. Depth A represents a focal depth of 0 to 5 km, depth B is 5 to 10 km, and depth C is 10 to 15 km beneath the surface of the basin.

Magnitude determinations are made from the maximum amplitude on the record at station ABQ. These amplitudes are converted to the equivalent Wood-Anderson response and magnitudes assigned using the procedure outlined by Richter (1958). The possibility of error here is quite large, so the reported magnitudes represent a range of values rather than a specific number. Events with magnitudes less than 0.5 are assigned to group X, those with magnitudes 0.5 to 1.5 are assigned to group Y, and events larger than 1.5 are assigned to group Z. The largest earthquake in the data set had a magnitude of 2.4.

This study rather arbitrarily assumes that earthquakes within about 100 km of station ABQ contain information applicable to the Albuquerque Basin. Table 4 lists all of the events less than about 100 km from ABQ that were located by the network in 1976. The data set contains 224 earthquakes.

Table 4. Earthquakes in the Vicinity of the Albuquerque Basin

DATE	ORIGIN TIME	LAT	LONG	DEPTH	MAGNITUDE
760102	19:03:35	34.45	106.69	C	X
760111	23:03:56	34.60	106.85	A	X
760114	07:01:31	34.15	106.82		Z
760115	10:19:44	34.18	106.80		Y
760120	18:12:12	34.28	106.28		X
760122	12:16:08	34.43	107.02		X
760122	15:58:48	34.06	107.02		Y
760122	16:00:53	34.07	106.98		Y
760125	07:26:13	35.43	107.31	C	X
760203	02:04:43	34.44	106.68	C	X
760214	19:05:17	34.38	106.87		Y
760227	12:26:37	33.95	106.57		X
760228	22:07:36	34.74	106.08		X
760229	07:44:12	34.62	106.23		X
760305	14:03:22	34:44	107.00	A	Y
760306	03:22:39	35.38	107.36		X
760307	07:48:57	35.16	106.13		X
760307	11:14:16	34.37	106.62	A	X
760312	14:22:29	34.91	106.92		X
760312	18:30:04	35.09	106.11		X
760319	05:39:40	35.13	107.36	B	X
760320	15:53:40	34.46	107.05		X
760323	12:53:20	34.32	106.84		Y
760325	06:46:34	35.12	107.44		X

DATE	ORIGIN TIME	LAT	LONG	DEPTH	MAGNITUDE
760326	01:53:39	34.12	106.53		X
760327	06:54:28	35.13	106.43	B	X
760401	09:26:16	35.03	106.69		X
760401	14:40:24	33.89	105.84		Z
760401	14:46:59	34.01	106.02		Z
760401	14:51:12	33.78	105.75		Z
760401	15:24:03	34.01	106.03		X
760401	16:20:19	34.02	106.01		Y
760401	17:15:42	34.05	106.03		X
760401	19:12:59	34.07	106.00		X
760401	22:12:14	34.22	106.88		Y
760401	23:39:37	34.02	105.98		Y
760401	23:52:21	34.01	106.01		X
760402	00:42:25	34.00	106.92		X
760402	06:15:18	34.02	105.97		Y
760402	18:21:24	34.03	105.97		Y
760403	05:56:57	35.21	106.15		Y
760403	12:15:26	34.03	106.00		X
760403	13:13:24	34.06	105.99		Y
760403	19:52:42	34.05	107.00		Y
760404	15:55:12	34.21	106.86		Y
760406	06:44:51	34.72	106.87	A	X
760406	18:09:01	34.02	105.99		Z
760407	15:36:42	34.40	106.78	A	X

DATE	ORIGIN TIME	LAT	LONG	DEPTH	MAGNITUDE
760410	10:25:16	34.73	106.87	A	X
760416	12:36:06	34.02	105.98		Y
760416	14:07:34	34.15	107.00		Y
760418	03:48:19	34.01	105.98		Y
760418	05:09:49	34.35	106.72	B	X
760418	06:20:13	34.04	106.00		Y
760418	12:39:46	35.38	107.41		X
760418	15:54:48	34.04	106.01		Y
760418	16:28:17	34.07	105.98		X
760419	05:03:41	34.17	106.87	A	Z
760419	12:35:12	34.16	106.85	B	Z
760419	02:04:21	34.14	106.84		X
760420	09:12:26	34.76	105.89		X
760420	11:36:05	34.74	105.90		X
760421	11:16:20	34.34	106.81	A	Y
760422	04:13:08	34.03	106.73		X
760424	08:14:20	35.68	105.74		X
760424	08:24:42	35.68	105.70		Y
760425	12:23:50	34.24	106.88		X
760426	08:04:24	34.46	106.67	B	X
760426	08:21:23	34.43	106.69	C	X
760504	23:19:45	34.02	105.99		X
760505	14:12:27	34.59	106.91	A	X
760505	15:02:53	34.59	106.92	A	X
760505	15:21:30	34.59	106.93	A	X

DATE	ORIGIN TIME	LAT	LONG	DEPTH	MAGNITUDE
760509	03:54:09	34.25	106.86		Z
760510	07:55:38	35.46	107.21		X
760511	01:55:25	34.83	105.65		X
760514	03:51:57	34.31	106.87		X
760515	11:23:27	35.61	106.93	C	Y
760517	21:43:55	34.09	106.71		X
760518	23:39:28	34.15	106.85		Y
760524	08:49:21	35.27	107.57	B	X
760524	13:36:02	35.46	107.09		X
760524	14:10:39	34.01	105.92		X
760526	01:32:34	35.43	107.09		X
760529	10:30:49	34.49	106.97		X
760530	09:42:43	34.15	106.61		X
760530	11:21:02	34.13	106.68		X
760530	12:01:25	34.12	106.67		X
760530	12:27:13	34.13	106.66		X
760601	10:05:46	34.46	106.69	C	X
760601	11:18:30	34.45	106.68	C	X
760608	06:24:41	34.13	106.97		
760609	17:37:45	34.46	106.99	B	Z
760609	17:42:20	34.47	106.97		X
760615	06:53:02	34.49	106.97		X
760616	05:52:16	34.23	106.56		X
760623	09:02:23	34.14	106.94		Y
760626	22:16:08	34.38	106.79	C	Y

DATE	ORIGIN TIME	LAT	LONG	DEPTH	MAGNITUDE
760626	04:17:34	34.07	106.02		Y
760628	14:59:41	34.44	106.69	C	X
760702	00:28:08	34.20	106.90		X
760705	03:00:57	34.32	106.77		X
760706	07:11:44	34.31	106.89	A	Y
760708	07:16:02	34.48	106.98		X
760715	03:44:02	34.93	106.45		Y
760719	01:55:34	34.15	106.96		X
760719	14:24:49	34.34	106.79		Y
760720	19:22:37	34.58	106.90	A	X
760726	04:00:20	35.59	106.89	B	X
760726	14:02:41	34.44	106.97	A	Y
760728	12:14:48	34.48	107.00	A	Y
760729	14:08:06	34.16	106.53		X
760730	09:35:01	34.83	106.77	C	X
760730	11:11:40	34.44	107.64		
760801	15:23:40	34.64	105.80		X
760801	22:53:20	34.60	106.85	A	X
760801	23:24:09	34.60	106.85	A	Y
760802	01:15:54	35.36	107.42		X
760802	04:28:22	34.60	106.85	A	X
760802	09:04:57	34.60	105.81		X
760802	09:14:44	34.60	106.84	B	Y
760802	09:16:59	34.60	106.85	A	X
760802	14:37:27	34.59	106.84	A	X

DATE	ORIGIN TIME	LAT	LONG	DEPTH	MAGNITUDE
760802	14:38:10	34.60	106.85	A	X
760802	18:52:52	34.60	106.85	A	X
760802	21:07:10	34.60	106.86	A	X
760802	22:30:25	34.60	106.86	A	X
760803	00:04:07	34.60	106.86	A	X
760803	00:23:41	34.60	106.85	A	Y
760803	01:17:11	34.59	106.85	A	X
760803	01:47:50	34.60	106.85	A	X
760803	03:13:12	34.59	106.85	A	X
760803	03:59:57	34.59	106.85	A	X
760803	07:10:16	34.48	106.99	A	X
760803	09:30:27	34.60	106.85	A	X
760805	00:31:34	34.60	106.85	A	X
760806	11:18:06	34.48	106.98	A	X
760809	03:28:14	34.76	105.81		X
760809	23:08:14	34.48	106.99	A	X
760811	03:15:20	34.20	106.86		Y
760812	00:56:37	34.10	106.98		Y
760812	01:24:37	34.12	106.98		Y
760812	01:45:42	34.14	106.98		Y
760812	07:52:08	34.15	106.97		X
760812	11:33:12	34.81	106.64	A	X
760812	19:14:48	34.48	106.98	A	Y
760813	00:22:48	34.15	106.95		Y

DATE	ORIGIN TIME	LAT	LONG	DEPTH	MAGNITUDE
760814	21:20:12	33.94	106.83		Y
760814	22:10:28	34.68	105.78		Y
760822	18:54:18	35.37	107.37		X
760823	13:30:22	33.97	105.95		Y
760823	19:37:20	34.59	106.84	A	X
760823	12:33:48	35.12	106.43	B	X
760823	20:02:46	34.32	106.89		X
760823	20:45:35	34.59	106.86	A	Y
760824	01:15:41	34.60	106.85	A	X
760825	06:37:07	34.60	106.85	A	X
760826	11:53:26	35.46	107.31		X
760827	10:54:01	34.44	106.72	C	X
760831	09:54:28	34.25	106.85		X
760901	11:26:23	35.29	107.25	A	X
760902	13:15:06	34.21	106.86		X
760904	06:41:41	35.02	105.88	B	X
760905	08:32:12	34.31	106.88		Y
760909	08:37:33	35:38	107.33	B	X
760912	18:59:01	35.39	107.33	B	Y
760913	06:44:08	35.37	107.34	B	X
760915	04:33:47	35.40	107.33	C	X
760917	18:09:41	34.09	106.98		Z
760917	18:13:09	34.41	106.77	A	X
760919	19:24:45	34.63	105.82		Z

DATE	ORIGIN TIME	LAT	LONG	DEPTH	MAGNITUDE
760920	21:20:31	34.60	105.82		Z
760923	10:27:30	34.73	105.89		X
760924	05:45:46	34.96	105.99	B	X
760927	03:48:40	34.73	105.82		X
760927	23:35:52	34.24	106.84		Y
760928	01:37:45	35.12	107.15	C	X
760929	07:51:08	34.33	106.79		Y
760929	17:53:03	34.60	106.91	A	X
760930	11:36:30	35.27	107.35	A	X
761001	18:22:55	34.54	107.07	A	X
761004	09:30:57	35.40	107.35	C	Y
761009	00:59:29	34.08	107.01		Y
761014	05:14:53	34.71	106.87	A	X
761014	07:27:11	35.01	105.85	C	Y
761016	04:10:01	34.36	106.86	A	Y
761017	21:26:09	34.43	106.99	A	X
761019	01:16:36	34.10	106.98		Y
761024	21:42:39	34.14	106.65		Y
761024	22:29:19	34.15	106.64		Y
761024	22:58:36	34.15	106.68		X
761024	23:03:36	34.15	106.67		X
761026	00:26:03	34.16	106.62		X
761027	19:19:05	35.28	107.28	B	X
761028	00:58:19	34.19	106.61		X
761103	07:58:48	34.48	107.04	A	X

DATE	ORIGIN TIME	LAT	LONG	DEPTH	MAGNITUDE
761103	14:43:00	35.32	107.20	A	X
761103	21:05:00	35.33	107.12	A	Y
761106	07:44:58	35.44	106.35	C	Y
761109	13:24:49	35.21	107.07	B	Y
761113	08:40:49	34.77	105.77		Y
761114	13:50:56	34.57	107.06	A	X
761116	03:42:35	34.56	107.06	A	X
761118	05:10:57	34.16	106.66		Y
761118	07:27:30	34.14	106.63		Y
761124	02:13:58	35.44	107.09		X
761127	23:29:28	34.29	106.86		Y
761130	07:31:02	34.40	106.80	A	Y
761201	15:51:55	34.98	105.87	A	X
761203	13:27:55	34.46	106.72	A	X
761203	21:10:03	34.48	106.99	A	X
761205	11:33:02	34.55	107.06	A	X
761208	07:33:50	34.55	107.06	A	X
761209	21:17:39	34.38	106.83	A	X
761210	00:03:32	34.32	106.89	A	X
761212	00:09:22	34.02	107.03		X
761212	20:29:24	34.69	105.79		X
761214	17:35:04	34.00	105.99		Y
761216	14:21:13	34.32	106.89		X
761218	18:22:30	34.68	105.79		X
761223	08:36:58	34.68	105.77		Z

DATE	ORIGIN TIME	LAT	LONG	DEPTH	MAGNITUDE
761223	09:48:10	34.68	106.82	A	X
761226	00:00:05	34.27	106.91	B	Y
761226	00:06:11	34.31	106.90		Y
761227	15:33:00	34.01	105.99		Y
761228	11:10:28	34.30	106.91		X
761228	12:08:32	34.30	106.91		X
761230	13:37:42	34.86	105.78	B	Y
761231	15:20:47	34.45	107.00		X

SEISMICITY

The events listed in Table 4 are plotted in Figure 2. Three zones of activity are noted:

(1) The zone encompassing the Socorro area and the southern Albuquerque Basin.

(2) The area northeast of Grants, New Mexico.

(3) The Estancia Basin with a tentative extension south to about lat 34° N.

Sanford and others (1976b) note a generally similar distribution of earthquakes for this region.

The bias introduced into the data set by station distribution has not been rigorously assessed. The relative seismicity of the three zones, however, does not change appreciably when magnitude thresholds are applied. A casual study of the network's detection level indicates that a magnitude 0.2 event anywhere in the study area will be located and that some earthquakes down to about magnitude -0.2 can be solved.

The events listed in Table 4 that are within or very near the Albuquerque and Estancia Basins are plotted in Figure 3.

Four features are apparent from an inspection of Figure 3:

(1) The seismic activity in the Albuquerque Basin shows some correlation with the mapped faults, fault zones, or extensions of faults.

(2) The lack of seismicity on the Albuquerque Basin boundary faults.

(3) The aseismicity of the Albuquerque Basin north of about lat 35°N.

(4) The tendency for Estancia Basin earthquakes to occur in the eastern half of the basin.

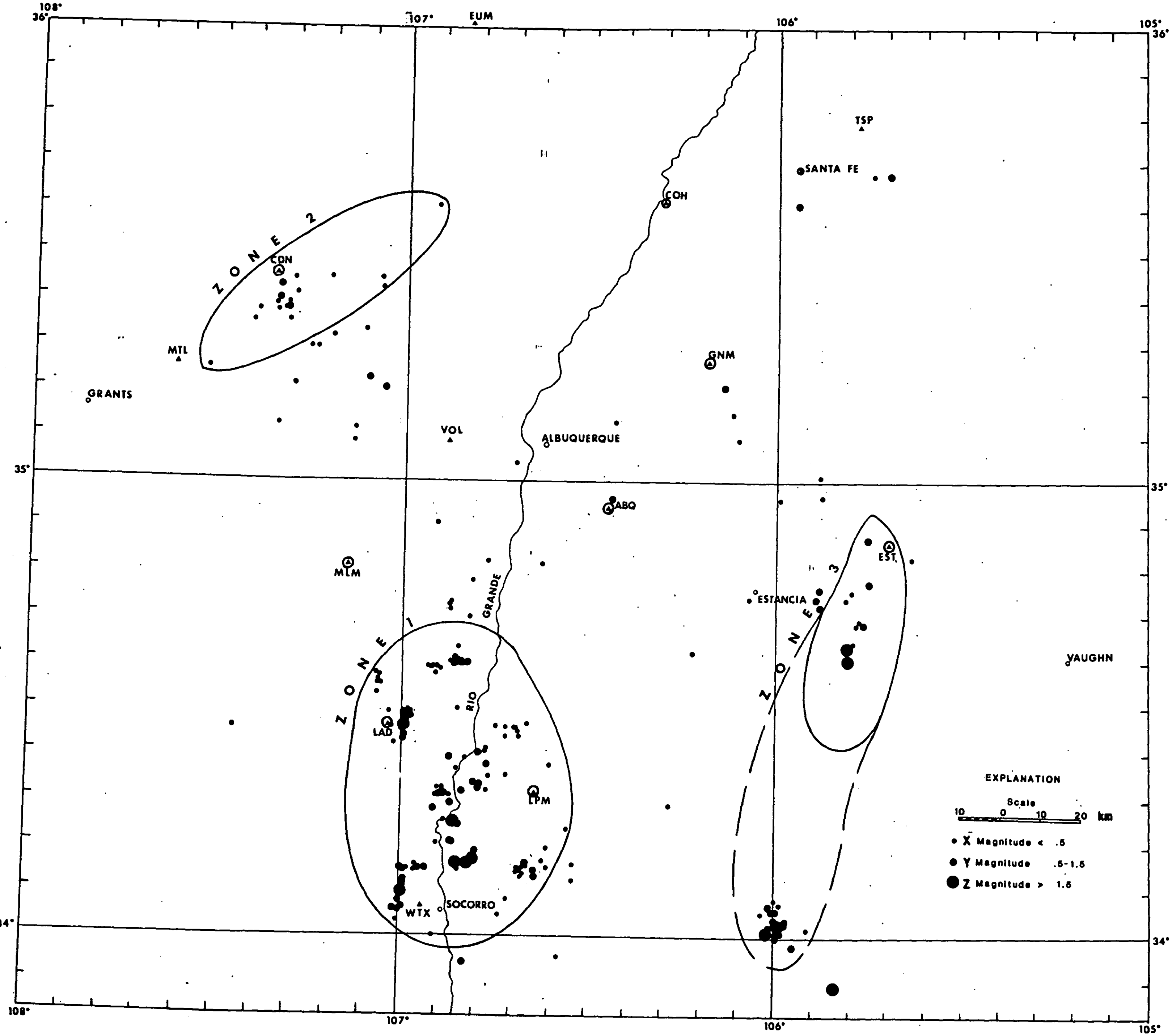


FIG. 2. Earthquakes in the vicinity of Albuquerque New Mexico (1976).

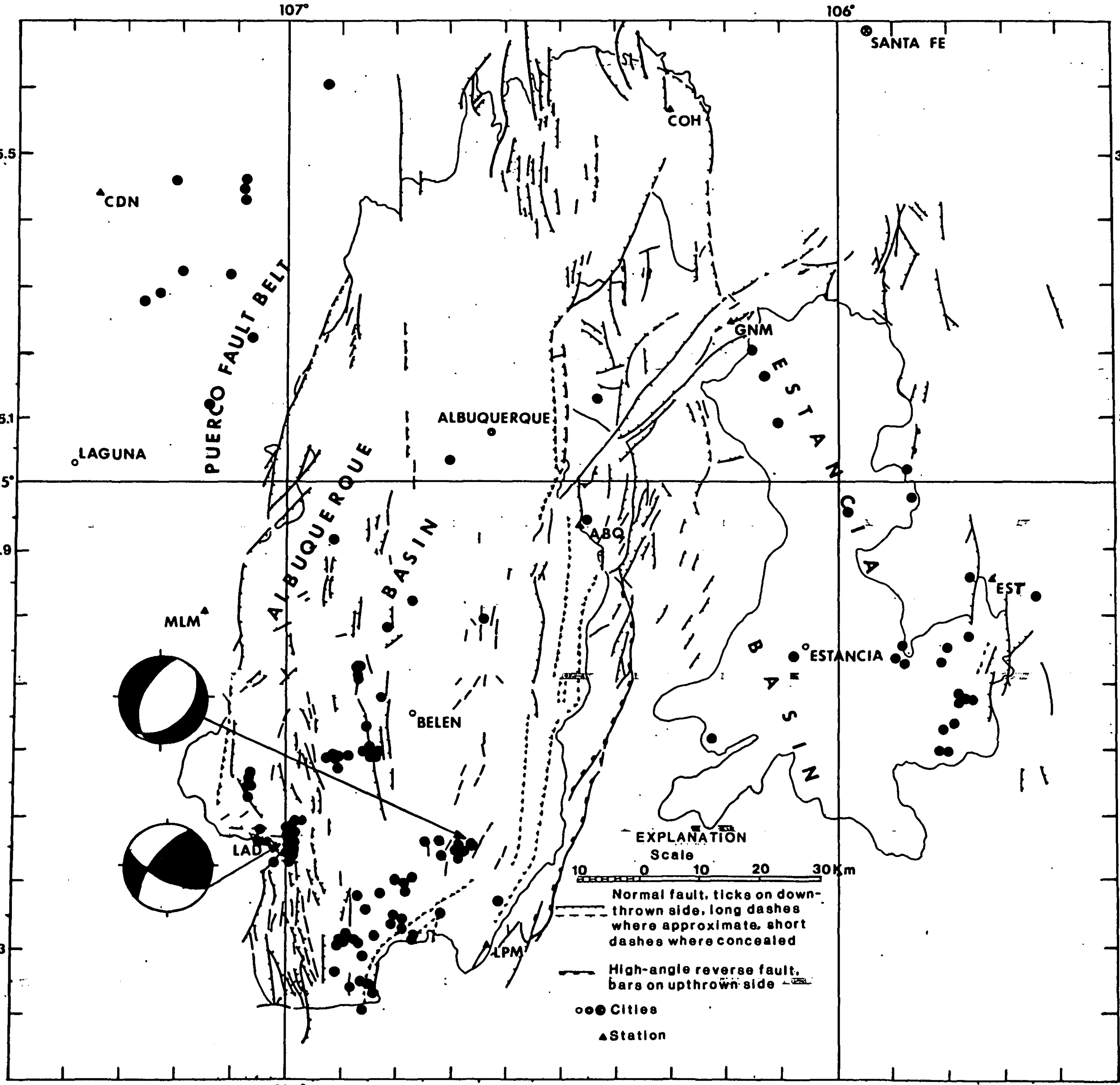


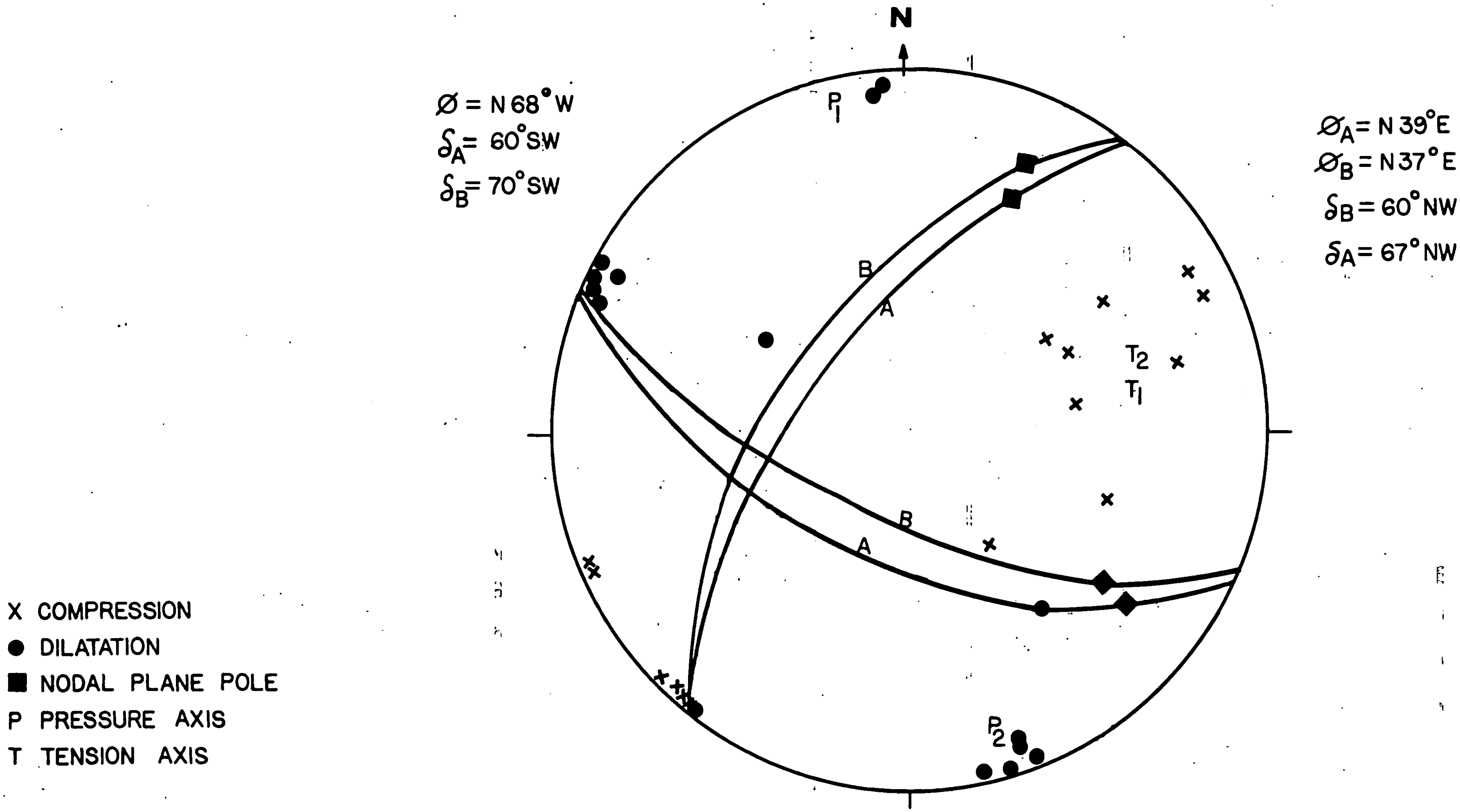
FIG. 3. 1976 earthquakes within the Albuquerque and Estancia Basins. Map is modified from Woodward, Callendar, and Zilinski (1975).

In the course of compiling this data set, it became apparent that due to their small magnitude, a significant number of observed events were impossible to locate. These earthquakes, mostly with negative magnitudes and S-P intervals of less than two seconds, were grouped logarithmically into the categories shown in Table 5.

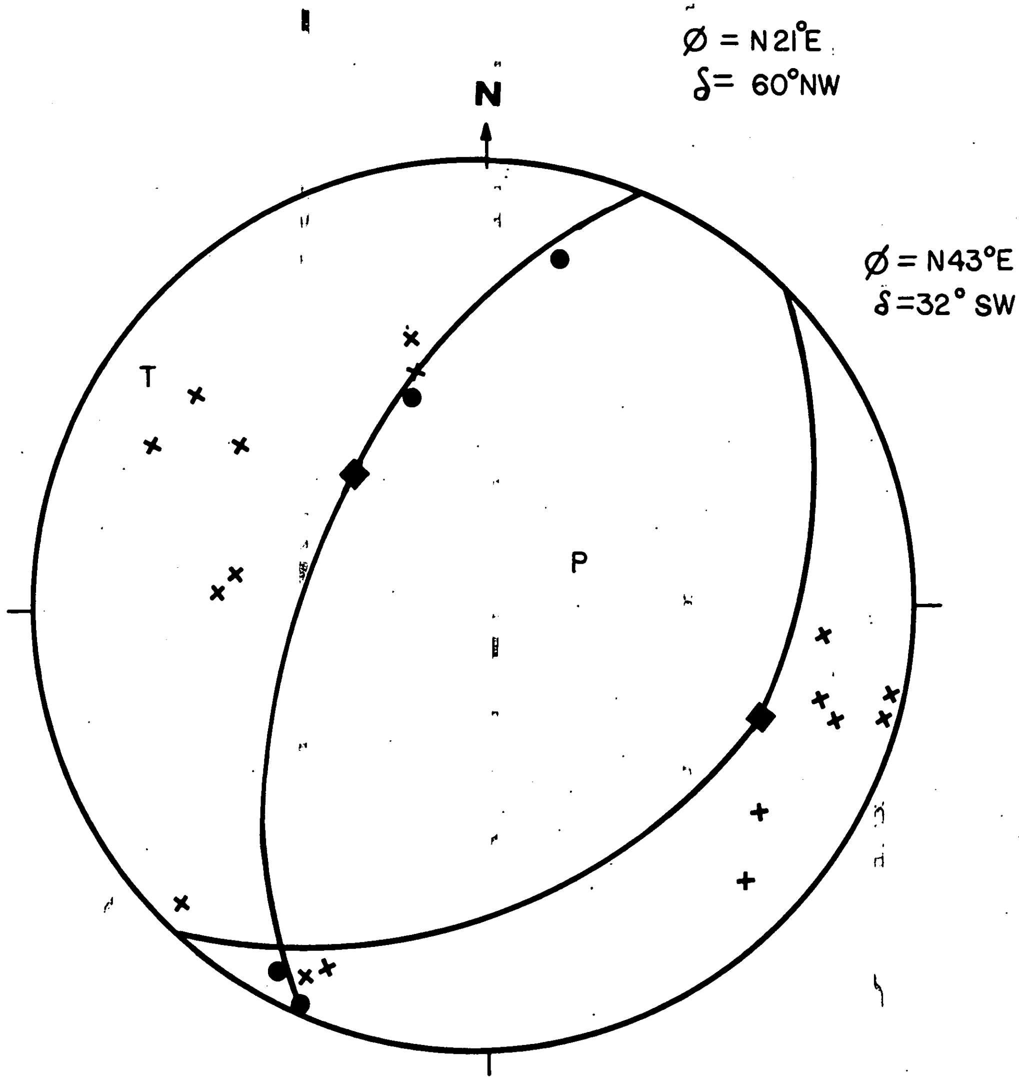
Table 5. Microearthquakes during 1976

Station	Number of Events
LAD	100 - 1000
LPM	10 - 100
ABQ	10 - 100
CDN	10 - 100
EST	10 - 100
MLM	0 - 10
GNM	0 - 10
COH	0 - 10

Two composite focal mechanisms were obtained from the 1976 data set. Figure 4 is a composite of 11 earthquakes near station LAD. These earthquakes all have focal depths of less than 5 km. The solution suggests a combination of strike-slip and reverse faulting on a NE- or WNW-striking fault. Figure 5 is a composite of 7 earthquakes near station LPM. These earthquakes all have focal depths greater than 5 km. The solution suggests normal faulting along a NNE-striking fault. The nodal plane having the steepest dip (60°NW) and striking N21°E is the preferred fault plane in this solution.



EQUAL AREA PROJECTION
LOWER HEMISPHERE
FIG. 4.



X COMPRESSION
● DILATATION
■ NODAL PLANE POLE
P PRESSURE AXIS
T TENSION AXIS

EQUAL AREA PROJECTION
LOWER HEMISPHERE
FIG. 5.

Shuleski (1976) derived composite focal mechanisms in the Socorro area immediately to the south of those presented in this study. Predominantly normal faulting along generally north-south striking faults is suggested by that study. It is too early in this present investigation to imply such a trend in the southern Albuquerque Basin.

DISCUSSION

The reconnaissance nature of this report precludes any statement in the nature of a conclusion, but several observations are suggested by the study:

(1) Chapin (1971) described the Estancia Basin as one of a number of inflection basins downwarped simultaneously with development of the Rio Grande rift. He further suggested that, considering its youthfulness and the presence of young (1500 to 2000-year-old) basalts just south of it, the Estancia Basin may be currently developing into a major depression. This study documents significant seismicity in the basin, the majority of it apparently in its eastern half.

(2) The Albuquerque Basin north of about lat 35°N was almost aseismic during the period of time covered by this report. This has not been entirely the case historically. Northrop (1961) documents occasional felt events that certainly originated in or near the northern basin during the time period 1893-1956. Sanford (1976) listed 12 events associated with the northern basin having magnitudes (M_L) from 3.0 to 4.5 that occurred between 1930 and September 1, 1973.

The historical and recent seismicity of the entire Albuquerque Basin is summarized by Northrop (1976) and Sanford and others (1972). Quite frequent activity and earthquake swarms characterize the southern basin while single, occasional earthquakes appear to be the normal pattern in the north. The data being considered in this study do not deviate significantly from these earlier reports.

The seismotectonics of the southern Albuquerque Basin appear to be closely related to those of the Socorro region adjacent to it. The work done in the Socorro area by Dr. Allan Sanford and his colleagues (1965, 1973, 1976a) presents evidence for intracrustal magma beneath the Lemitar Mountains. The high seismicity of the region as well as the nature of the activity and the documented high heat flow (Reiter and others, 1975) do suggest a local anomaly overprinting the regional stress field.

The exact relationship between such a magma body and the seismicity in the southern Albuquerque Basin that is noted in this report is well beyond the scope of this paper.

(3) This study documents seismicity northeast of Grants, New Mexico. Sanford and others (1976b) noted this activity in a larger context and correlated it with a zone of Miocene and younger volcanism that extends from northeastern New Mexico to about Silver City, New Mexico.

(4) The absence of earthquake activity along the boundary faults of the Albuquerque Basin during 1976 is noted in this report. Some of the unlocated microearthquakes listed in Table 5 might be associated with the boundary faults, but the activity is clearly higher inside of the basin.

SUMMARY

This report documents relative seismicity levels in the central Rio Grande rift, New Mexico. The tectonic regime currently operating in the study area is manifested as three zones of seismic activity:

(1) A complex, intrarift zone in the Socorro area and the southern Albuquerque Basin that is interpreted by Sanford and others (1976) to include injection of magma into the crust.

(2) Activity northeast of Grants, New Mexico, that can be correlated with a zone of young volcanism.

(3) A zone of earthquakes in the eastern part of the Estancia Basin.

Taken qualitatively, these manifestations are not inconsistent with contemporary rift tectonics presented by Chapin (1971) or Chapin and Seager (1975).

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