

U.S. DEPARTMENT OF THE INTERIOR  
GEOLOGICAL SURVEY

SEISMICITY NEAR ALBUQUERQUE, NEW MEXICO, 1976-1978

BY

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OFR-81-117  
1981

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

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ABSTRACT

During 1976, 1977, and 1978, more than 600 earthquakes were located in the Albuquerque, New Mexico, area. The activity is not uniformly distributed throughout the study area but falls mainly into three zones. Of these three zones, two are fairly well defined. The third zone is much less well delineated. Five composite focal mechanisms constructed during the study are in good agreement with the east-west tensional stress field proposed for the Rio Grande rift.

INTRODUCTION

The U. S. Geological Survey is studying the seismotectonics of the Rio Grande rift in New Mexico. As a part of this study, a seismic network was installed around the rift in the central part of the state (Figure 1). The technical parameters and station locations for this network are described by Jaksha and others (1977). Jaksha and Locke (1978) reported on the results obtained from operating this network during 1976 and 1977. This present study adds the earthquakes located during 1978 to those reported on previously to compose a three-year data base.

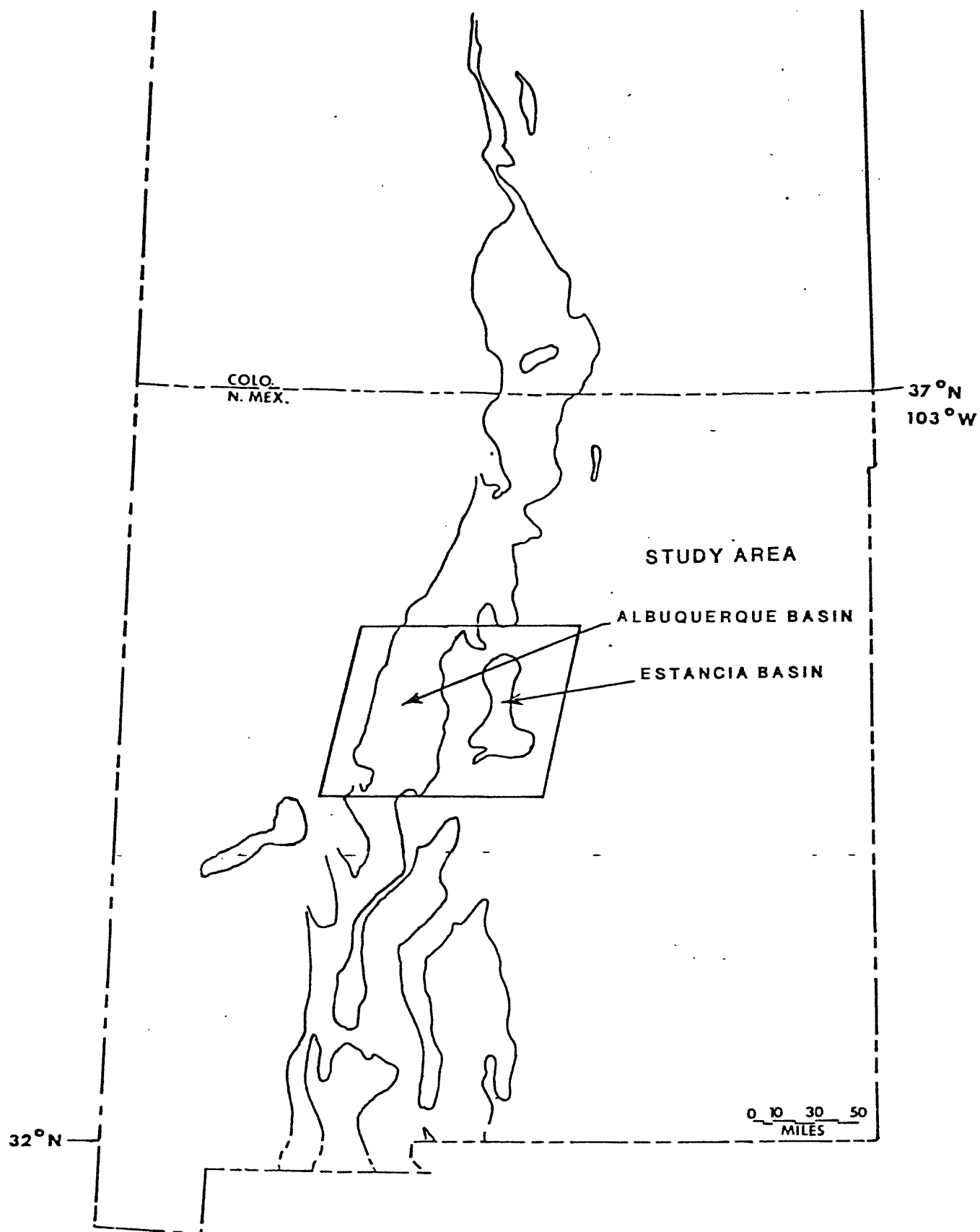


FIG. 1. GENERALIZED MAP OF THE RIO GRANDE RIFT MODIFIED ,  
FROM CHAPIN (1971).

## ANALYSIS

The earthquake hypocenters determined during 1978 were solved with the computer program HYPO 71 (Lee and Lahr, 1975). The crustal model determined for the Rio Grande rift by Topozada and Sanford (1976) was used for the computations (Table 1).

TABLE 1

Crustal Model  
(Topozada and Sanford, 1976)

| <u>Thickness (km)</u> | <u>Velocity (P) km/sec</u> |
|-----------------------|----------------------------|
| 18.6                  | 5.8                        |
| 21.3                  | 6.5                        |
|                       | 7.9                        |

The magnitude ( $M_L$ ) of the earthquakes were estimated using the duration equation:  $M_L = 2.8 \log_{10} T - 3.6$  (Newton and others, 1976). The 1978 data are listed in Table 2. The list contains 228 earthquakes that range in magnitude ( $M_L$ ) from -0.5 to +2.5 and, in focal depth, from 5 to 15 km.

Focal depths are given in Table 2 only if the hypocenter is inside of the recording network and a seismograph station is close to the hypocenter. "Close" is roughly defined as being no further distant from the hypocenter than the hypocenter is below the surface.

Station corrections for earthquakes occurring near the Albuquerque volcanoes were estimated by Jaksha and others (1980) and were used in the solution of events originating in that area. Station corrections for other source areas have not yet been determined.

TABLE 2

## Hypocenter Data for 1978

| <u>Date</u> | <u>Origin<br/>Time</u><br>(Hr/Min/Sec) | <u>Latitude</u><br>(Deg. N) | <u>Longitude</u><br>(Deg. W) | <u>Depth</u><br>(km) | <u>Magnitude</u><br>(ML) |
|-------------|--|-----------------------------|------------------------------|----------------------|--------------------------|
| 780114      | 04:01:54                               | 34.84                       | 105.93                       |                      | -0.5                     |
| 780114      | 04:57:55                               | 34.84                       | 105.94                       |                      | 0.3                      |
| 780115      | 03:35:54                               | 34.83                       | 105.93                       |                      | -0.1                     |
| 780116      | 18:22:03                               | 34.04                       | 106.49                       |                      | 0.5                      |
| 780117      | 05:05:01                               | 34.33                       | 106.73                       |                      | -0.1                     |
| 780118      | 17:11:02                               | 34.35                       | 107.01                       | 10                   | 0.8                      |
| 780118      | 17:32:53                               | 35.38                       | 106.36                       |                      | 0.0                      |
| 780120      | 01:24:18                               | 34.85                       | 105.92                       |                      | -0.2                     |
| 780120      | 23:01:57                               | 34.57                       | 106.83                       |                      | 0.0                      |
| 780121      | 05:05:33                               | 35.38                       | 106.33                       |                      | 0.0                      |
| 780121      | 08:18:13                               | 34.57                       | 106.82                       |                      | 0.0                      |
| 780121      | 10:38:31                               | 34.57                       | 106.83                       |                      | -0.3                     |
| 780124      | 06:02:06                               | 34.11                       | 106.77                       |                      | 0.3                      |
| 780124      | 22:57:40                               | 34.04                       | 107.04                       |                      | 0.2                      |
| 780127      | 01:41:33                               | 34.29                       | 105.85                       |                      | 0.2                      |
| 780129      | 01:57:50                               | 34.39                       | 107.03                       |                      | 0.2                      |
| 780130      | 02:53:01                               | 35.83                       | 106.85                       |                      | 0.6                      |
| 780205      | 14:27:00                               | 35.29                       | 107.35                       |                      | -0.1                     |
| 780207      | 04:05:03                               | 35.23                       | 107.12                       |                      | 0.3                      |
| 780210      | 14:15:50                               | 34.61                       | 107.09                       |                      | 0.3                      |
| 780213      | 18:57:39                               | 35.70                       | 107.11                       |                      | 0.7                      |
| 780214      | 06:01:12                               | 35.30                       | 107.38                       | 15                   | 1.5                      |
| 780219      | 16:45:31                               | 35.65                       | 106.83                       |                      | -0.2                     |
| 780228      | 01:40:33                               | 34.21                       | 106.84                       |                      | 0.3                      |
| 780228      | 04:20:20                               | 35.31                       | 107.34                       |                      | -0.3                     |
| 780228      | 07:35:41                               | 34.36                       | 106.74                       | 10                   | 0.3                      |
| 780302      | 20:50:28                               | 34.07                       | 106.96                       |                      | 0.3                      |
| 780306      | 07:05:20                               | 34.10                       | 106.77                       |                      | 0.7                      |
| 780306      | 07:08:18                               | 34.08                       | 106.74                       |                      | 1.1                      |
| 780306      | 07:35:18                               | 34.09                       | 106.76                       |                      | 0.4                      |
| 780306      | 08:00:00                               | 34.10                       | 106.76                       |                      | 0.3                      |
| 780306      | 09:11:30                               | 34.08                       | 106.75                       |                      | 0.0                      |
| 780306      | 12:28:22                               | 34.07                       | 106.72                       |                      | 1.1                      |
| 780306      | 18:26:04                               | 34.11                       | 106.76                       |                      | 0.3                      |
| 780307      | 00:42:39                               | 33.77                       | 106.56                       |                      | 2.1                      |
| 780307      | 02:44:01                               | 33.79                       | 106.61                       |                      | 0.3                      |
| 780307      | 06:49:50                               | 34.07                       | 106.75                       |                      | 0.3                      |
| 780307      | 06:59:40                               | 34.10                       | 106.75                       |                      | 0.5                      |
| 780307      | 09:44:55                               | 33.76                       | 106.63                       |                      | 0.5                      |
| 780307      | 15:08:39                               | 34.09                       | 106.76                       |                      | 0.7                      |
| 780308      | 00:28:29                               | 34.06                       | 106.77                       |                      | 0.2                      |
| 780314      | 01:48:02                               | 34.03                       | 106.81                       |                      | 0.7                      |
| 780314      | 05:34:03                               | 34.10                       | 106.97                       |                      | 0.4                      |
| 780314      | 10:43:22                               | 36.04                       | 106.23                       |                      | 1.1                      |
| 780317      | 03:14:38                               | 33.81                       | 106.60                       |                      | 1.4                      |
| 780318      | 04:03:27                               | 34.18                       | 106.83                       |                      | 0.7                      |
| 780319      | 03:29:35                               | 34.20                       | 105.84                       |                      | 1.3                      |

TABLE 2  
(Cont'd)

## Hypocenter Data for 1978

| <u>DATE</u> | <u>ORIGIN<br/>TIME</u><br>(Hr/Min/Sec) | <u>LATITUDE</u><br>(Deg. N) | <u>LONGITUDE</u><br>(Deg. W) | <u>DEPTH</u><br>(km.) | <u>MAGNITUDE</u><br>(ML) |
|-------------|--|-----------------------------|------------------------------|-----------------------|--------------------------|
| 780322      | 01:46:41                               | 34.26                       | 106.73                       |                       | 0.5                      |
| 780327      | 16:49:51                               | 35.41                       | 107.33                       | 13                    | 0.3                      |
| 780328      | 00:39:36                               | 34.24                       | 106.88                       |                       | 0.4                      |
| 780329      | 16:36:13                               | 34.92                       | 106.44                       | 15                    | 0.5                      |
| 780329      | 22:11:02                               | 34.09                       | 106.92                       | 5                     | 0.9                      |
| 780330      | 00:11:10                               | 34.12                       | 106.80                       |                       | 0.0                      |
| 780330      | 01:52:12                               | 34.12                       | 106.92                       |                       | 0.2                      |
| 780330      | 13:41:41                               | 35.28                       | 107.37                       |                       | 0.7                      |
| 780330      | 15:19:42                               | 34.12                       | 106.92                       |                       | 0.5                      |
| 780331      | 13:29:10                               | 34.02                       | 106.71                       |                       | 0.2                      |
| 780401      | 08:57:08                               | 34.65                       | 107.23                       |                       | 0.3                      |
| 780401      | 16:23:25                               | 34.09                       | 106.93                       | 5                     | 0.2                      |
| 780409      | 22:34:42                               | 35.34                       | 107.36                       |                       | 0.7                      |
| 780414      | 18:01:23                               | 35.32                       | 107.35                       |                       | 0.0                      |
| 780418      | 08:51:22                               | 34.12                       | 107.04                       |                       | 0.2                      |
| 780419      | 07:48:54                               | 35.09                       | 106.37                       |                       | -0.1                     |
| 780421      | 01:11:46                               | 34.14                       | 106.87                       | 9                     | 0.3                      |
| 780421      | 23:54:39                               | 34.19                       | 106.83                       |                       | 0.2                      |
| 780423      | 13:11:00                               | 35.65                       | 106.95                       |                       | 0.1                      |
| 780423      | 23:25:35                               | 35.64                       | 106.95                       |                       | 0.7                      |
| 780423      | 23:59:49                               | 35.65                       | 106.95                       |                       | 0.9                      |
| 780424      | 00:03:30                               | 35.65                       | 106.94                       |                       | 0.7                      |
| 780424      | 02:09:22                               | 35.65                       | 106.94                       |                       | 0.6                      |
| 780424      | 03:01:25                               | 35.65                       | 106.94                       |                       | 0.5                      |
| 780501      | 07:28:42                               | 33.76                       | 106.62                       |                       | 0.3                      |
| 780508      | 11:34:10                               | 34.05                       | 106.65                       |                       | 0.5                      |
| 780510      | 06:17:16                               | 34.31                       | 106.92                       |                       | -0.1                     |
| 780511      | 00:02:43                               | 34.15                       | 106.00                       |                       | 0.7                      |
| 780515      | 23:20:35                               | 34.10                       | 107.03                       |                       | 0.6                      |
| 780516      | 17:02:37                               | 34.09                       | 106.64                       |                       | 0.5                      |
| 780518      | 10:19:45                               | 35.09                       | 107.99                       |                       | 0.2                      |
| 780524      | 06:03:51                               | 34.80                       | 106.08                       |                       | 0.0                      |
| 780526      | 08:21:38                               | 34.82                       | 106.06                       |                       | 0.7                      |
| 780526      | 11:19:09                               | 34.81                       | 106.06                       |                       | -0.2                     |
| 780526      | 11:35:05                               | 34.77                       | 106.07                       |                       | -0.1                     |
| 780527      | 08:57:29                               | 34.02                       | 106.62                       |                       | 1.0                      |
| 780527      | 08:59:21                               | 34.01                       | 106.62                       |                       | 0.2                      |
| 780527      | 09:14:25                               | 34.03                       | 106.59                       |                       | 0.3                      |
| 780527      | 14:37:17                               | 34.07                       | 106.66                       |                       | 0.4                      |
| 780527      | 21:16:40                               | 33.79                       | 106.57                       |                       | 0.6                      |
| 780527      | 22:21:08                               | 34.43                       | 107.00                       |                       | 0.7                      |
| 780527      | 23:07:20                               | 34.41                       | 106.99                       |                       | 0.5                      |
| 780528      | 07:49:49                               | 34.95                       | 105.89                       |                       | -0.1                     |
| 780528      | 09:02:05                               | 34.81                       | 106.06                       |                       | 0.3                      |
| 780528      | 18:25:29                               | 34.02                       | 106.63                       |                       | 0.7                      |
| 780528      | 20:42:07                               | 34.81                       | 106.06                       |                       | -0.2                     |

TABLE 2  
(Cont'd)

Hypocenter Data for 1978

| <u>DATE</u> | <u>ORIGIN<br/>TIME</u><br>(Hr/Min/Sec) | <u>LATITUDE</u><br>(Deg. N) | <u>LONGITUDE</u><br>(Deg. W) | <u>DEPTH</u><br>(km.) | <u>MAGNITUDE</u><br>(ML) |
|-------------|--|-----------------------------|------------------------------|-----------------------|--------------------------|
| 780530      | 02:10:44                               | 34.81                       | 106.06                       |                       | -0.1                     |
| 780530      | 02:16:45                               | 34.76                       | 106.08                       |                       | 0.0                      |
| 780530      | 02:42:44                               | 34.81                       | 106.06                       |                       | -0.5                     |
| 780530      | 23:29:20                               | 34.82                       | 106.06                       |                       | -0.8                     |
| 780531      | 06:31:57                               | 34.84                       | 106.06                       |                       | -0.8                     |
| 780531      | 18:15:13                               | 34.81                       | 106.07                       |                       | 0.6                      |
| 780531      | 18:54:56                               | 34.81                       | 106.07                       |                       | 0.0                      |
| 780601      | 05:03:22                               | 34.07                       | 107.04                       |                       | 1.1                      |
| 780607      | 11:10:17                               | 34.49                       | 106.97                       |                       | 0.0                      |
| 780614      | 08:56:28                               | 34.41                       | 105.64                       |                       | 0.2                      |
| 780616      | 14:24:44                               | 34.13                       | 106.87                       |                       | 0.2                      |
| 780617      | 15:41:40                               | 34.10                       | 106.84                       |                       | 0.3                      |
| 780617      | 21:12:01                               | 34.14                       | 106.87                       |                       | 0.0                      |
| 780619      | 12:53:59                               | 34.43                       | 106.70                       |                       | -0.3                     |
| 780621      | 06:07:01                               | 34.41                       | 106.88                       |                       | 0.4                      |
| 780621      | 18:42:08                               | 34.13                       | 106.88                       | 5                     | 0.0                      |
| 780623      | 13:32:40                               | 35.28                       | 106.14                       |                       | 0.1                      |
| 780627      | 15:10:11                               | 34.34                       | 107.01                       | 9                     | 0.6                      |
| 780627      | 15:10:47                               | 34.34                       | 107.00                       |                       | 0.0                      |
| 780627      | 15:35:35                               | 34.33                       | 107.00                       |                       | 0.2                      |
| 780629      | 18:48:43                               | 34.43                       | 106.17                       |                       | 0.3                      |
| 780629      | 22:13:41                               | 34.43                       | 106.19                       |                       | 0.9                      |
| 780707      | 04:35:07                               | 34.44                       | 106.18                       |                       | -0.1                     |
| 780707      | 08:45:39                               | 34.55                       | 107.06                       |                       | 0.7                      |
| 780707      | 18:14:51                               | 34.08                       | 106.57                       |                       | 0.4                      |
| 780708      | 10:50:44                               | 34.63                       | 105.85                       |                       | 0.0                      |
| 780712      | 10:05:07                               | 34.37                       | 106.98                       |                       | 0.0                      |
| 780713      | 20:40:59                               | 34.38                       | 106.96                       |                       | 1.0                      |
| 780714      | 07:55:51                               | 34.55                       | 107.07                       |                       | 0.1                      |
| 780716      | 05:49:26                               | 34.35                       | 106.99                       |                       | 0.0                      |
| 780719      | 04:05:27                               | 34.39                       | 106.97                       |                       | 0.0                      |
| 780721      | 05:02:37                               | 34.72                       | 105.17                       |                       | 2.5                      |
| 780801      | 16:40:06                               | 34.29                       | 106.82                       |                       | 1.1                      |
| 780805      | 06:39:45                               | 34.14                       | 106.89                       | 6                     | 0.0                      |
| 780905      | 10:33:21                               | 34.38                       | 106.13                       |                       | 1.6                      |
| 780910      | 11:09:00                               | 34.31                       | 106.81                       |                       | 0.4                      |
| 780923      | 08:59:52                               | 34.14                       | 106.98                       |                       | 1.0                      |
| 780924      | 20:47:32                               | 35.73                       | 106.75                       |                       | 0.0                      |
| 780925      | 00:31:49                               | 35.71                       | 106.77                       |                       | 0.3                      |
| 780925      | 01:44:31                               | 35.72                       | 106.75                       |                       | 1.5                      |
| 780925      | 01:47:04                               | 35.71                       | 106.79                       |                       | 0.3                      |
| 780925      | 02:07:44                               | 35.72                       | 106.77                       |                       | 0.2                      |
| 780925      | 02:12:07                               | 35.73                       | 106.75                       |                       | 0.0                      |
| 780925      | 02:12:30                               | 35.73                       | 106.75                       |                       | 0.0                      |
| 780925      | 02:17:49                               | 35.72                       | 106.76                       |                       | 0.5                      |
| 780925      | 02:28:13                               | 35.72                       | 106.75                       |                       | 0.3                      |
| 780925      | 02:32:47                               | 35.72                       | 106.76                       |                       | 0.0                      |
| 780925      | 03:57:32                               | 35.72                       | 106.76                       |                       | 0.6                      |

TABLE 2  
(Cont'd)

Hypocenter Data for 1978

| <u>DATE</u> | <u>ORIGIN<br/>TIME</u><br>(Hr/Min/Sec) | <u>LATITUDE</u><br>(Deg. N) | <u>LONGITUDE</u><br>(Deg. W) | <u>DEPTH</u><br>(km.) | <u>MAGNITUDE</u><br>(ML) |
|-------------|--|-----------------------------|------------------------------|-----------------------|--------------------------|
| 780925      | 04:01:17                               | 35.72                       | 106.76                       |                       | 0.3                      |
| 780925      | 04:39:06                               | 35.72                       | 106.76                       |                       | 0.2                      |
| 780925      | 04:51:28                               | 35.72                       | 106.76                       |                       | 0.3                      |
| 780925      | 06:55:35                               | 35.72                       | 106.77                       |                       | -0.1                     |
| 780925      | 06:58:05                               | 35.73                       | 106.77                       |                       | 0.0                      |
| 780925      | 07:18:43                               | 35.72                       | 106.77                       |                       | 0.0                      |
| 780925      | 08:29:14                               | 35.73                       | 106.76                       |                       | 0.3                      |
| 780925      | 10:45:33                               | 35.72                       | 106.76                       |                       | 0.2                      |
| 780925      | 12:30:47                               | 35.73                       | 106.75                       |                       | 0.2                      |
| 780927      | 20:21:12                               | 35.12                       | 106.80                       | 10                    | 0.3                      |
| 780928      | 09:00:45                               | 35.13                       | 106.80                       | 10                    | 1.2                      |
| 780928      | 09:06:13                               | 35.12                       | 106.80                       | 9                     | -0.4                     |
| 780928      | 12:12:23                               | 35.13                       | 106.80                       | 9                     | 0.7                      |
| 780928      | 12:33:57                               | 35.12                       | 106.80                       | 9                     | 0.2                      |
| 780928      | 12:50:39                               | 35.13                       | 106.79                       | 9                     | 0.8                      |
| 780928      | 22:01:48                               | 35.12                       | 106.80                       | 9                     | 1.1                      |
| 780928      | 22:10:19                               | 35.13                       | 106.80                       | 9                     | 0.5                      |
| 780929      | 00:37:03                               | 35.11                       | 106.80                       | 8                     | 0.4                      |
| 780929      | 02:44:12                               | 35.12                       | 106.80                       | 10                    | 1.0                      |
| 780929      | 09:38:39                               | 35.12                       | 106.80                       | 9                     | 1.5                      |
| 780929      | 09:47:16                               | 35.13                       | 106.79                       | 9                     | 0.5                      |
| 780929      | 09:50:39                               | 35.12                       | 106.80                       | 9                     | 0.5                      |
| 780929      | 11:54:09                               | 34.45                       | 107.00                       |                       | 0.2                      |
| 780929      | 21:26:34                               | 35.12                       | 106.80                       | 9                     | 0.5                      |
| 780929      | 22:26:18                               | 35.12                       | 106.80                       | 9                     | 0.5                      |
| 780930      | 00:36:14                               | 35.13                       | 106.80                       | 9                     | 1.2                      |
| 780930      | 00:38:59                               | 35.11                       | 106.80                       | 9                     | 0.4                      |
| 780930      | 00:52:40                               | 35.12                       | 106.80                       | 8                     | 0.4                      |
| 780930      | 02:43:00                               | 35.12                       | 106.80                       | 9                     | 0.2                      |
| 780930      | 07:48:17                               | 35.12                       | 106.80                       | 8                     | 0.5                      |
| 780930      | 08:18:52                               | 35.12                       | 106.80                       | 9                     | 1.1                      |
| 780930      | 10:58:27                               | 35.11                       | 106.80                       | 9                     | 0.5                      |
| 780930      | 11:52:46                               | 35.12                       | 106.81                       | 7                     | 0.9                      |
| 780930      | 13:14:48                               | 35.12                       | 106.80                       | 8                     | 0.5                      |
| 780930      | 14:56:52                               | 35.13                       | 106.80                       | 9                     | 1.0                      |
| 780930      | 15:39:08                               | 35.13                       | 106.80                       | 8                     | 0.5                      |
| 781001      | 00:16:39                               | 35.13                       | 106.80                       | 9                     | 1.4                      |
| 781001      | 11:46:57                               | 35.12                       | 106.79                       | 9                     | 1.1                      |
| 781001      | 11:55:11                               | 35.13                       | 106.80                       | 9                     | 0.3                      |
| 781001      | 11:57:15                               | 35.13                       | 106.80                       | 10                    | 0.4                      |
| 781001      | 14:35:04                               | 35.14                       | 106.80                       | 10                    | 0.5                      |
| 781001      | 20:09:40                               | 35.11                       | 106.80                       | 8                     | 0.5                      |
| 781001      | 22:22:18                               | 35.12                       | 106.79                       | 9                     | 0.9                      |
| 781001      | 22:34:44                               | 35.13                       | 106.80                       | 9                     | 0.8                      |
| 781002      | 02:03:44                               | 35.13                       | 106.80                       | 8                     | 0.8                      |
| 781002      | 03:11:37                               | 35.12                       | 106.79                       | 9                     | 1.2                      |
| 781002      | 03:31:56                               | 35.12                       | 106.80                       | 7                     | 0.3                      |



TABLE 2  
(Cont'd)

Hypocenter Data for 1978

| <u>DATE</u> | <u>ORIGIN<br/>TIME</u><br>(Hr/Min/Sec) | <u>LATITUDE</u><br>(Deg. N) | <u>LONGITUDE</u><br>(Deg. W) | <u>DEPTH</u><br>(km.) | <u>MAGNITUDE</u><br>(ML) |
|-------------|--|-----------------------------|------------------------------|-----------------------|--------------------------|
| 781002      | 11:05:01                               | 35.13                       | 106.80                       | 10                    | 0.1                      |
| 781002      | 11:06:38                               | 35.13                       | 106.80                       | 10                    | 0.2                      |
| 781002      | 17:41:15                               | 35.14                       | 106.79                       | 10                    | 0.7                      |
| 781002      | 17:49:38                               | 35.13                       | 106.80                       | 10                    | 0.3                      |
| 781003      | 12:28:22                               | 35.13                       | 106.80                       | 10                    | 0.3                      |
| 781003      | 17:01:24                               | 35.13                       | 106.79                       | 10                    | 0.8                      |
| 781004      | 03:15:56                               | 35.13                       | 106.81                       | 10                    | 0.3                      |
| 781005      | 03:14:02                               | 35.46                       | 107.31                       | 15                    | 1.1                      |
| 781005      | 11:39:39                               | 35.14                       | 106.80                       | 9                     | 0.4                      |
| 781008      | 17:03:57                               | 34.43                       | 106.20                       |                       | 0.9                      |
| 781008      | 17:07:05                               | 34.43                       | 106.18                       |                       | 1.0                      |
| 781016      | 02:26:52                               | 35.30                       | 107.50                       | 8                     | 0.5                      |
| 781017      | 18:50:28                               | 34.54                       | 106.86                       |                       | 0.2                      |
| 781019      | 08:26:51                               | 33.81                       | 106.68                       |                       | 0.7                      |
| 781101      | 06:41:44                               | 34.36                       | 107.02                       |                       | 0.5                      |
| 781105      | 01:14:42                               | 34.36                       | 107.04                       |                       | 0.7                      |
| 781108      | 08:18:29                               | 34.36                       | 107.01                       |                       | 0.6                      |
| 781115      | 08:05:28                               | 34.36                       | 107.02                       |                       | 0.3                      |
| 781115      | 10:24:38                               | 34.37                       | 107.01                       |                       | 0.8                      |
| 781124      | 00:17:37                               | 34.43                       | 107.07                       |                       | 0.0                      |
| 781128      | 05:25:40                               | 35.27                       | 106.67                       | 9                     | 1.7                      |
| 781129      | 11:47:13                               | 34.38                       | 106.86                       |                       | 0.5                      |
| 781207      | 20:27:22                               | 35.12                       | 106.80                       | 9                     | 0.9                      |
| 781207      | 23:25:50                               | 35.12                       | 106.81                       | 9                     | 0.8                      |
| 781209      | 08:23:16                               | 34.09                       | 106.84                       |                       | 0.5                      |
| 781215      | 18:59:30                               | 35.13                       | 106.80                       | 10                    | 0.5                      |
| 781217      | 02:59:38                               | 34.96                       | 106.25                       |                       | 0.7                      |
| 781217      | 03:03:46                               | 34.97                       | 106.25                       |                       | 0.5                      |
| 781217      | 04:07:30                               | 34.97                       | 106.25                       |                       | 0.4                      |
| 781217      | 05:59:04                               | 34.96                       | 106.26                       |                       | 1.1                      |
| 781217      | 06:12:33                               | 34.96                       | 106.26                       |                       | 1.0                      |
| 781217      | 16:13:01                               | 34.97                       | 106.27                       | 13                    | 1.7                      |
| 781221      | 12:47:50                               | 34.07                       | 107.01                       |                       | 0.0                      |
| 781221      | 12:52:14                               | 34.09                       | 106.99                       |                       | 0.5                      |
| 781226      | 01:54:46                               | 34.04                       | 107.05                       |                       | 0.0                      |
| 781227      | 09:29:22                               | 34.05                       | 107.02                       |                       | 0.2                      |
| 781228      | 19:15:45                               | 34.05                       | 107.02                       |                       | 0.0                      |
| 781230      | 12:11:22                               | 34.11                       | 106.99                       |                       | 2.0                      |
| 781231      | 04:50:17                               | 34.04                       | 107.04                       |                       | -0.3                     |

## Seismicity

The events listed in Table 2 are plotted, along with 1976 and 1977 earthquakes, in Figures 2 and 3. While a high percentage of the 1978 events fall into the zones described by the earlier data, there are important exceptions.

A cluster of poorly located events occurred at the northern end of the White Sands Missile Range. These events include one of the largest earthquakes ( $M_L = 2.1$ ) to be located by the network during 1978. This series is plotted at about  $33.8^\circ$  N,  $106.6^\circ$  W on Figure 2.

A series of very small earthquakes was located along a northerly striking linear zone just north of the city of Estancia. This series contained a number of events that could not be located but appeared from S-P intervals at station ABQ to have originated in this area. This earthquake sequence occurred approximately along the north-south axis of the Estancia Basin (Figure 3). The largest event in this group had a magnitude ( $M_L$ ) of 0.7.

On September 24, 1978, an earthquake swarm that lasted about 16 hours occurred at about  $35.72^\circ$  N,  $106.75^\circ$  W. The largest event in this swarm was a  $M_L$  1.5. This series of earthquakes was unusual in that it is associated with the Jemez Mountains volcanic complex. This feature appeared largely quiescent during a  $4\frac{1}{2}$  year study reported on by Sanford and others (1979).

About 56 hours after the Jemez swarm terminated, a much longer swarm commenced at the Albuquerque volcanoes. The volcanoes are located at  $35.15^\circ$  N,  $106.80^\circ$  N and are about 75 km south of the Jemez Mountains. This

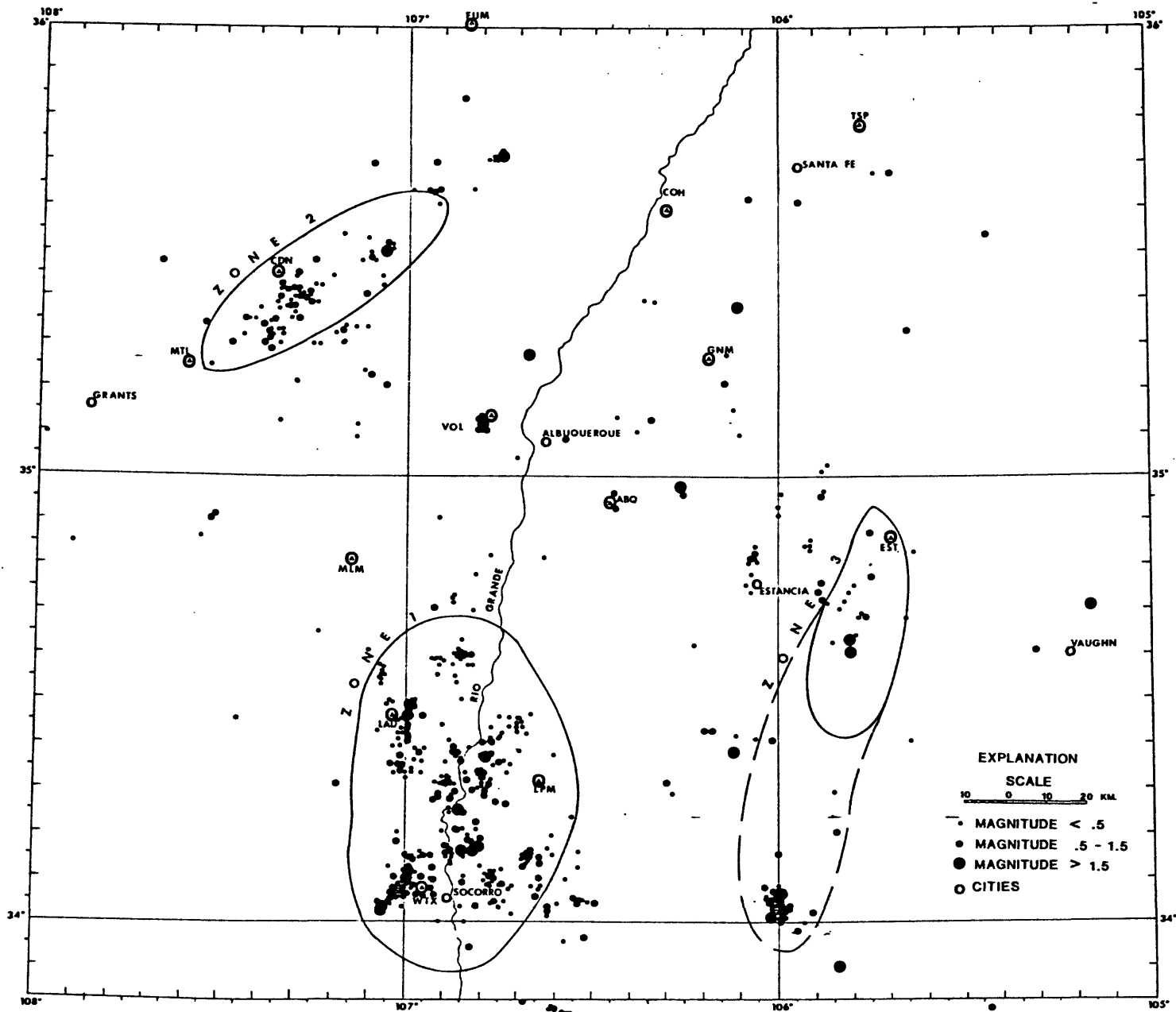


FIG. 2. Earthquakes in the vicinity of Albuquerque New Mexico (1976 - 1978).

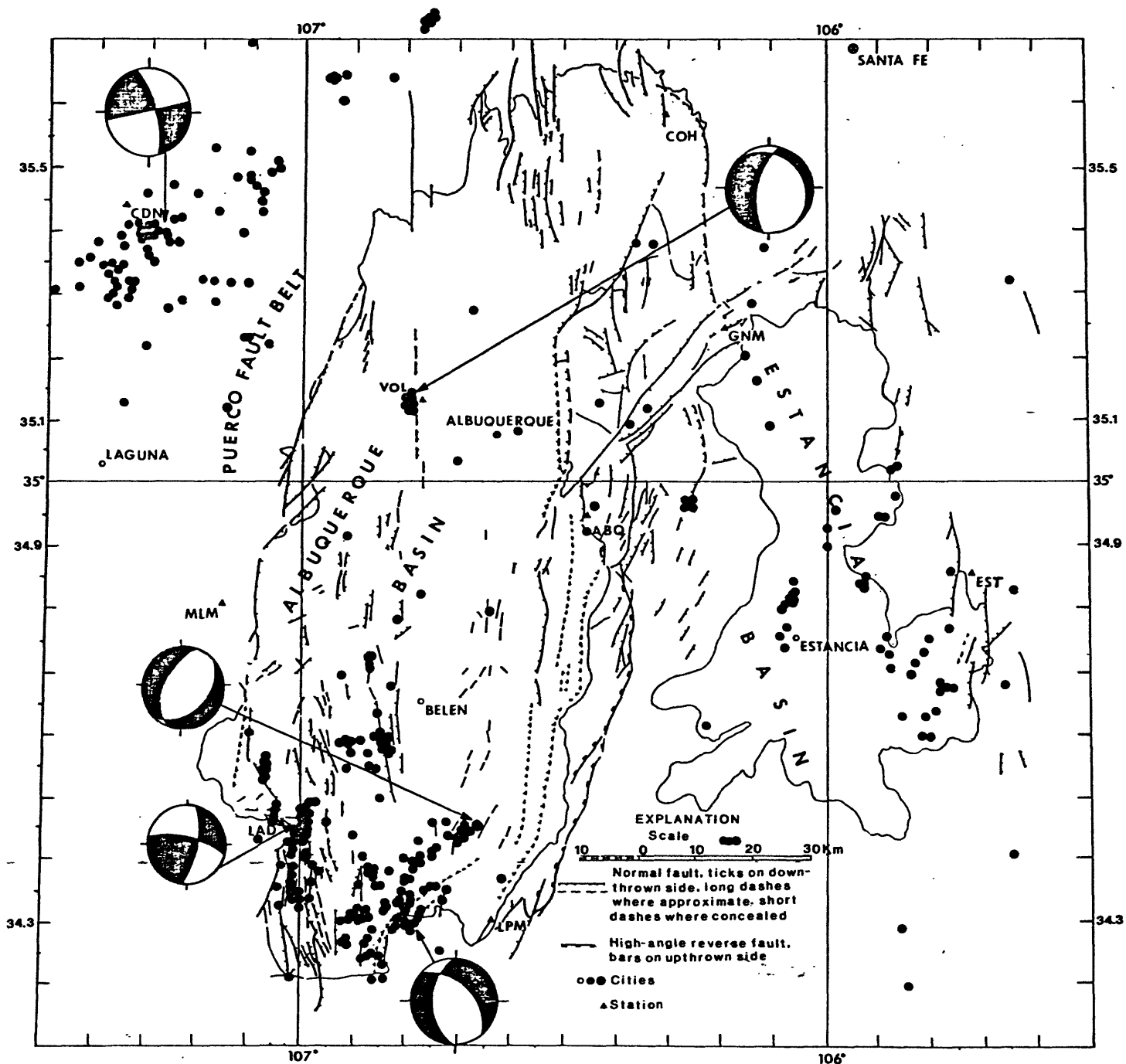


FIG. 3. 1976-1978 earthquakes within and near the Albuquerque and Estancia Basins and locations of focal mechanisms.  
 Map is modified from Woodward, Callender, and Zilinski (1975).

series of earthquakes was the subject of a detailed investigation by Jaksha and others (1980). (The largest earthquake in this series was a magnitude 2.5 ( $M_L$ ) that occurred in March of 1979).

In December 1978, a brief earthquake swarm occurred about 18 km ENE of Station ABQ. This swarm was located at about  $34.96^\circ$  N,  $106.26^\circ$  W, in the Manzano Mountains. The largest earthquake in this series was a magnitude 1.7 ( $M_L$ ).

#### Composite Fault-Plane Solutions

A field program was conducted near Ladron Peak during the spring of 1978. A network of four temporary stations along with the permanent station LAD was operated for a period of about 2 weeks. Two small earthquakes were recorded on the temporary network. A composite fault-plane solution (Figure 4) was constructed from first arrivals recorded on the small network and from clear arrivals recorded on the permanent network for earthquakes that occurred during 1976-1978. The azimuths and angles of incidence are thought to be best determined from data recorded at the stations of the temporary network. These data are shown as large O's or X's on Figure 4. Readings from the permanent network are shown with smaller O's or X's. The large symbols were given more weight than the small symbols in estimating the nodal planes.

The nodal plane striking almost due north is interpreted to represent the fault plane in this construction. This interpretation is supported by the north-south trend of the epicenters near Ladron Peak on Figure 3. The inconsistent data points on Figure 4 suggest that several different

faults are presently active near Ladron Peak. The dip of the fault plane in Figure 4 is poorly constrained. A plane, steeply dipping to the east, fits the data only slightly better than a plane steeply dipping to the west. The dominant motion along the fault plane is left-hand strike-slip.

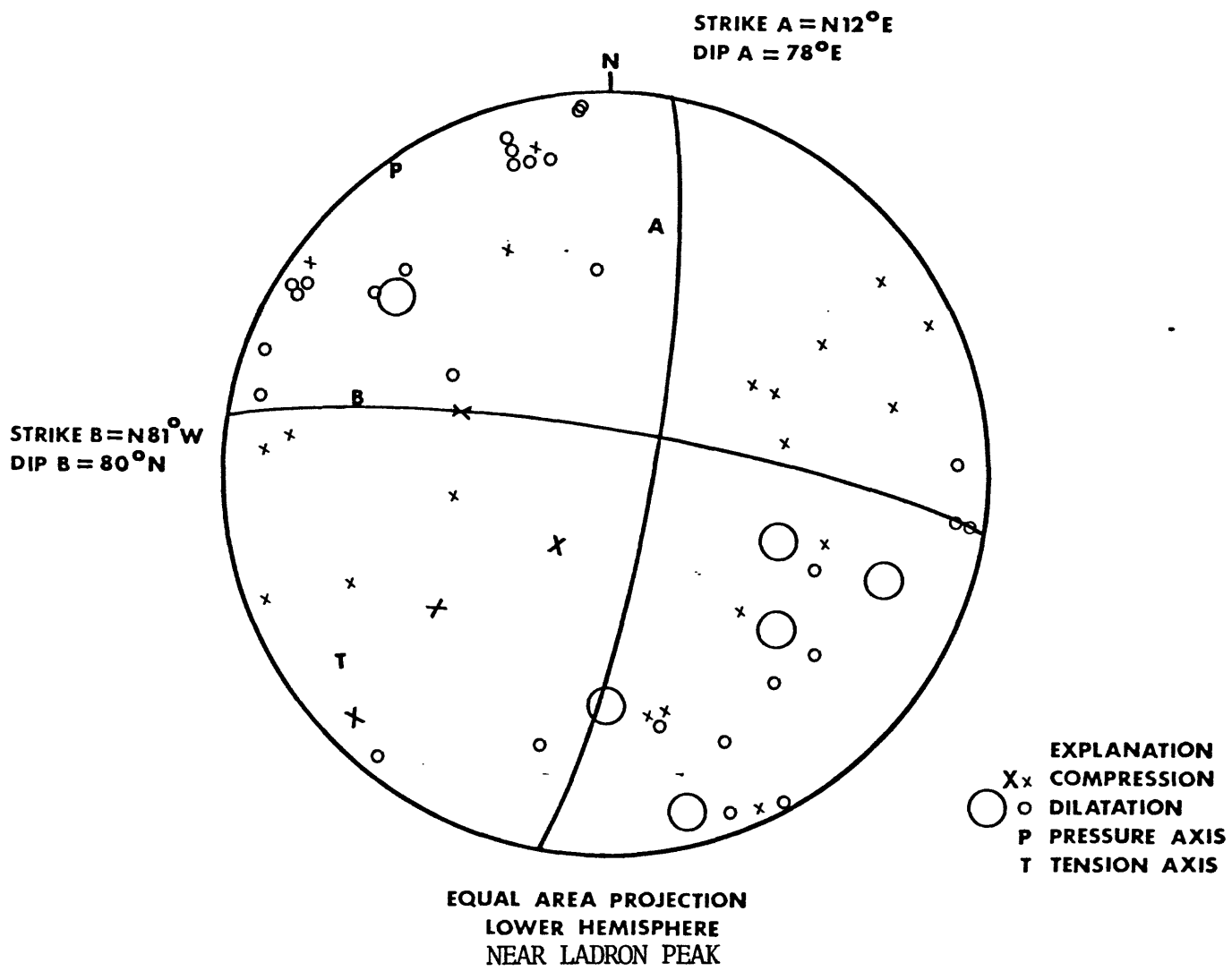
Jaksha and others (1980) constructed the composite fault-plane solution near the Albuquerque volcanoes shown on Figure 3 from data recorded on close-in temporary stations and from clear arrivals on the permanent network. This solution is shown in Figure 5. The nodal plane striking north and dipping steeply to the west was interpreted to represent the active fault plane at the Albuquerque volcanoes. The other fault plane solutions shown on Figure 3 were discussed by Jaksha and Locke (1978).

### Discussion

This report contains data on 3 years of seismic activity in the vicinity of Albuquerque, N. Mex. The study notes three zones where small earthquakes are occurring. These zones are:

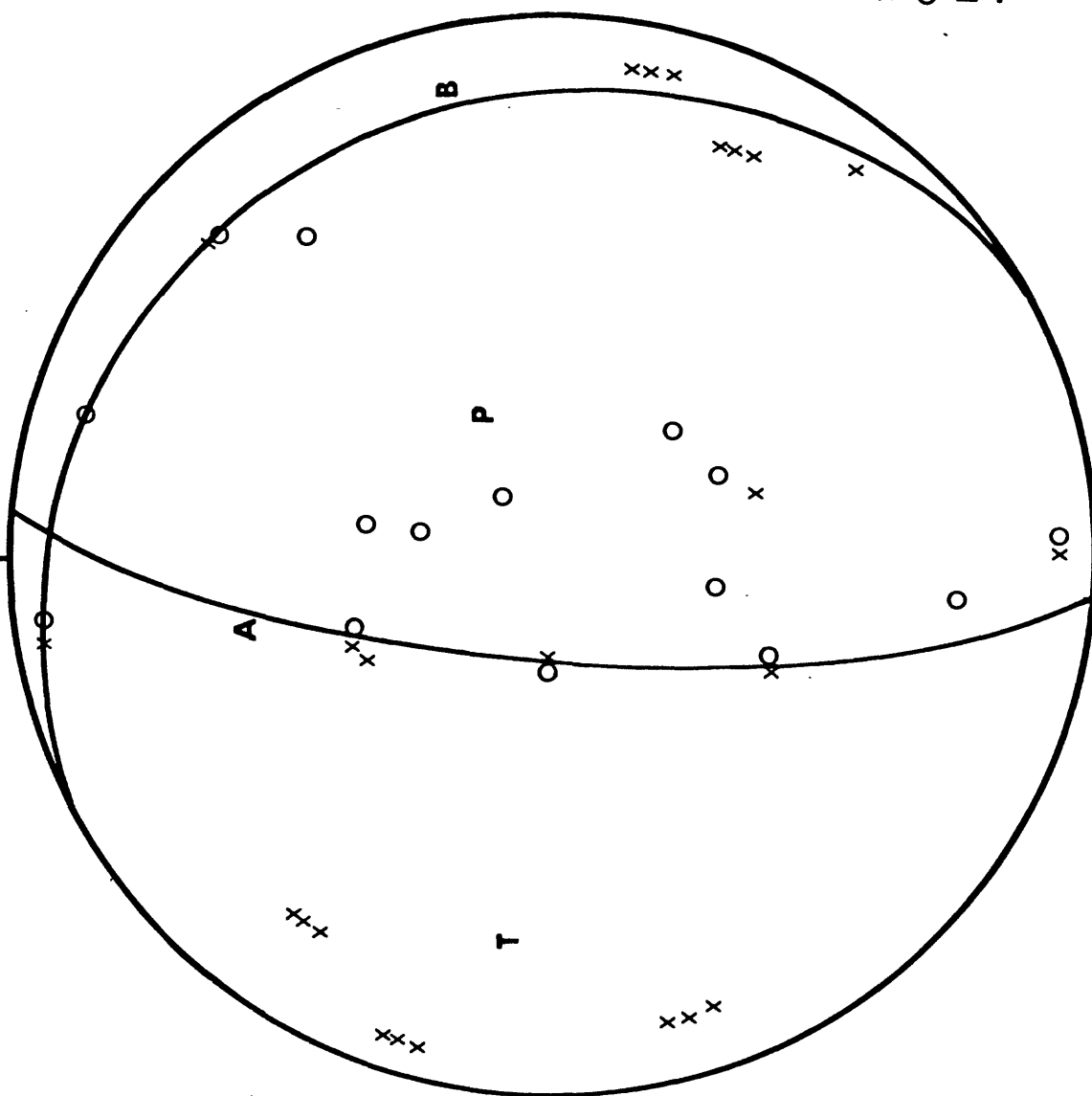
1. The area between Belen and Socorro in the Rio Grande rift.
2. The area northeast of Grants near the boundary between the rift and the Colorado Plateaus.
3. A poorly defined zone to the east of the Rio Grande graben and between the rift and the High Plains.

The earthquakes that were located during 1978 correlate well with the three zones described by the 1976 and 1977 data. Several important exceptions occurred, however, during 1978 which suggests that a simple three-zone model might be inadequate to describe the longer-term activity.



STRIKE B = N25°W  
DIP B = 16°NE

STRIKE A = N5°E  
DIP A = 74°W



x COMPRESSION  
o DILATATION  
P PRESSURE AXIS  
T TENSION AXIS

EQUAL AREA PROJECTION  
LOWER HEMISPHERE  
NEAR ALBUQUERQUE VOLCANOES



The composite T axis for the five fault-plane solutions determined during this study is in good agreement with a east-west tensional tectonic regime governing the Rio Grande rift as proposed by Chapin (1971).

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