USGS-OFR-91-367 USGS-OFR-91-367

UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

Denver, Colorado

SEISMICITY AND FOCAL MECHANISMS FOR THE SOUTHERN GREAT BASIN OF NEVADA AND CALIFORNIA IN 1990

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91-367

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Seismicity and Focal Mechanisms for the Southern Great Basin of Nevada and California in 1990

Abstract

For the calendar year 1990, the Southern Great Basin seismic network (SGBSN) recorded about 1050 earthquakes in the SGB, as compared to 1190 in 1989. Local magnitudes, M_L, ranged from 0.0 for various earthquakes to 3.2 for an earthquake on April 3,1990 5:47:58 UTC, 37.368° North, 117.358° West, Mud Lake, Nevada quadrangle. 95% of those earthquakes have the property, $M_L \leq 2.4$. Within a 10 km radius of the center of Yucca Mountain, the site of a potential national, high-level nuclear waste repository, one earthquake with $M_L = 0.6$ was recorded at 40-Mile Wash. The estimated depth of focus of this earthquake is 3.8 km below sea level. Other, smaller events may have also occurred in the immediate vicinity of Yucca Mountain, but would have been below the detection threshold ($M_L \approx 0.0$ at Yucca Mountain). Focal mechanisms are computed for seventeen earthquakes in the Nevada Test Site (NTS) and in the SGB west of the NTS for the year 1990. Solutions are mostly strike-slip, although normal slip is observed for a hypocenter at Stonewall Flat, Nevada, and reverse slip is observed for a hypocenter at Tucki Mountain, California. The average direction of the focal mechanism **P**-axes is North 47° East, with nearly horizontal inclination, and the average direction of the **T**-axes is North 42° West, with nearly horizontal inclination, consistent with a regional tectonic model of active northwest extension during the Holocene epoch.

Introduction

The SGBSN has operated continuously since August, 1978, with the current complement of 54 stations in place by mid-1981. Horizontal-component seismographs were added in 1984, and a vertical-component seismograph south of Boulder City, Nevada, was added in August, 1988. Figure 1 shows the current station locations, along with some of the major physiologic features. Stations CPX and EPN were moved to less noisy sites in August and September, 1990, and renamed CPY and EPM, respectively.

The primary purpose of the network is to investigate the seismotectonic environment in the vicinity of Yucca Mountain, Nevada, the potential site of a high-level, national nuclear waste repository. Also, the network provides information on seismically active regions within about 160 km radial distance of Yucca Mountain. Seismic signals from the network are continuously telemetered to the USGS data processing center in Golden, Colorado, where preliminary hypocenter determination is performed, along with research on focal mechanisms and faulting, on fluid-induced seismicity, on attenuation of seismic waves, on velocity structure, and on other topics of importance to the Yucca Mountain Project.

Operation of the seismic network is funded under an interagency agreement with the Department of Energy, which provides Quality Assurance guidelines for the collection, analysis, interpretation, and reporting of data. The seismic network data are collected as permanent records to support site characterization. Because seismicity data in the SGB come from sources and crustal paths that are, at best, approximately known, the hypocenters and analyses that are presented in open-file format are necessarily preliminary. Any "final" report of seismicity in the SGB should integrate information from all relevant sources, whereas the open-file reports of SGB seismicity periodically published by the U.S.G.S., such as this one, are less comprehensive. **All hypocenters and focal mechanisms discussed in this report are preliminary.**

Acknowledgments

Maintenance and periodic calibration of seimic stations and related field equipment is performed by D. E. Overturf of the U. S. Geological Survey, and by contract technicians. Preliminary

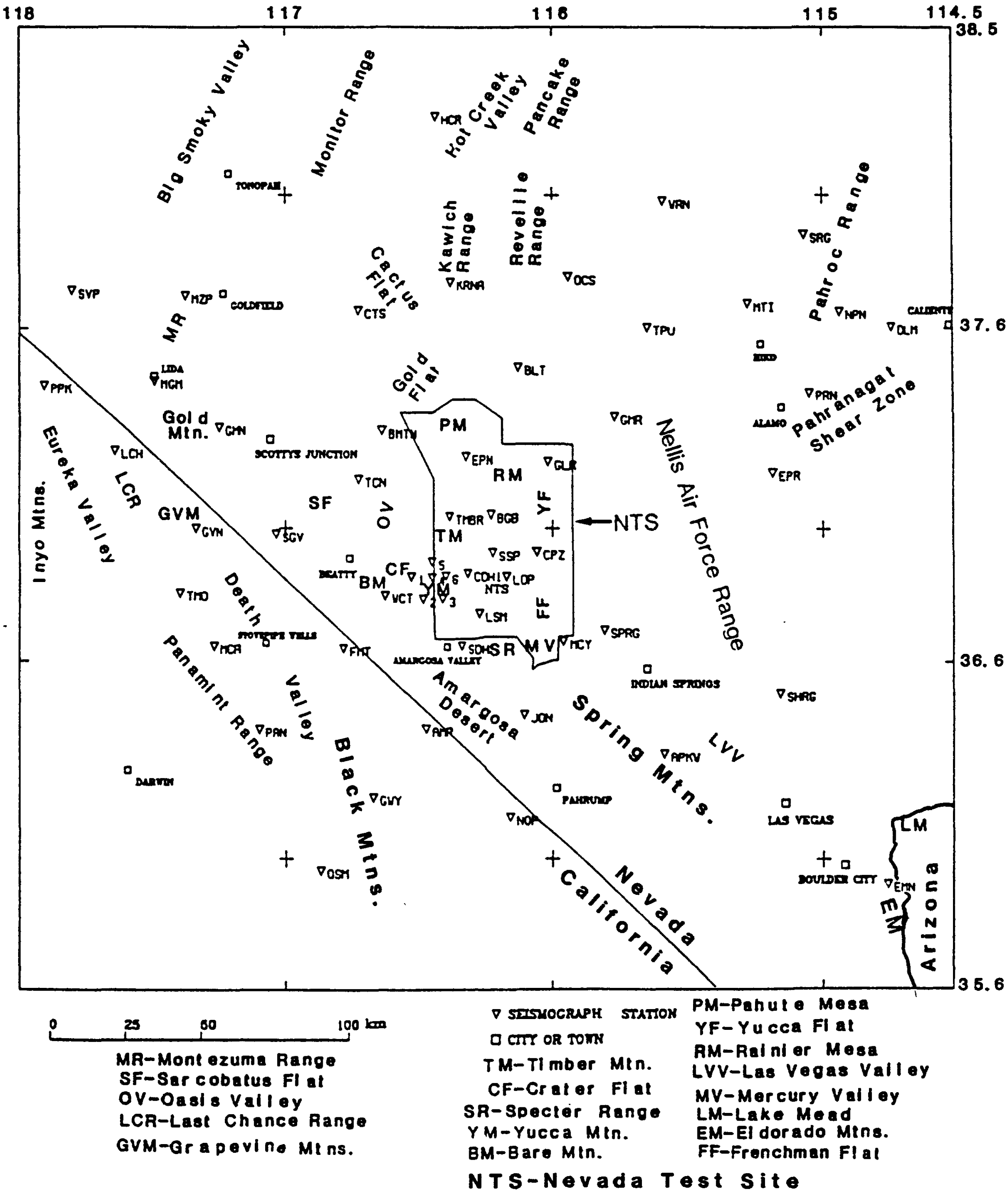


Figure 1.- Map of SGBSN seismograph station locations, cities and towns, and major physiographic features of the southern Great Basin.

seismic event catagorizations, phase arrival time determinations, and hypocenter determinations were performed by Miles Weida and Joel Duggar, also of the U. S. Geological Survey.

Helpful reviews of this report were provided by Joan Gomberg and Margaret Hopper of the U.S. Geological Survey, Branch of Geologic Risk Assessment.

Calibrations of Instruments

All seismographic systems in the SGBSN are periodically calibrated as specified in the Quality Assurance document, YMP-USGS Seismic Procedure 11. Seismometers are visited and calibrated every six months, or as needed. Calibration results are deemed acceptable when the amplitude response of a seismographic system lies within a ±30% range of a nominal response, in the frequency band $2 \leq f \leq 10$ Hz. In actual field calibrations, systems are tested in the frequency band $0.1 \leq f \leq 20$ Hz. In these calibrations, the S13 systems generally display an amplitude response within 10% of the nominal level at all measured frequencies, while the L4C systems display responses within 25% of their nominal levels for frequencies $1 \leq f \leq 10$ Hz. For $f < 2$ Hz, the true system magnifications are rarely required, because wavelet periods corresponding to peak-amplitude S-waves observed on seismograms of local SGB earthquakes, which are scaled to obtain M_L estimates, are almost always < 0.5 seconds.

Overview of Seismicity in the SGB for 1990

Epicenters for all earthquakes occurring during the calendar year 1990 in the SGB for which preliminary hypocenters could be determined are listed in Appendix A and shown in Figure 2. The southwestern part of the region is better covered by the Caltech seismic network at Pasadena, California, and any study of strain and seismicity rates in the southwestern SGB would benefit by merging data from their catalog with the SGBSN catalog. Many other portions of the SGB shown in Figure 1 are extremely sparcely covered by SGBSN stations, or not covered at all, except for short-duration special studies conducted by other networks or laboratories. The SGBSN also archives regional and teleseismic data and regularly provides it to interested investigators. Epicenters for chemical explosions and probable explosions that were located by the SGBSN are listed in Appendix B, and are shown in Appendix B, Figure B1. Epicenters for nuclear device tests at Nevada Test Site (NTS) are listed in Appendix C, and are shown in Figure C1. Some probable nuclear device detonation aftershock epicenters and cavity-collapse related activity, located in the Silent Canyon Caldera, are denoted by "L" (low-frequency event) in Figures 2, 7, and C1. They are also listed in Appendix C. Focal mechanism solutions derived from data collected by the SGBSN for 17 earthquakes of 1990 are shown in the figures of Appendix D. Appendix E contains station information, and Appendix F contains information about input parameters to the hypocenter location program HYPO71.

The earthquake data base whose hypocenters are listed in Appendix A is derived from SGBSN seismic signals that were captured by a computer dedicated to seismic monitoring, and from data read from 16 millimeter develocorder films, which serve as a backup to the computer detection system. Events read from the develocorder are labeled with a D in the "quality" field of each hypocenter record of Appendix A. Measurements made from seismograms recorded on the computer are generally more reliable, with impulsive P and S arrivals being determined to an accuracy better than 0.02 sec (digitizing rate=104.167 sps/channel), versus 0.10 sec for arrivals read from develocorder film. Hypocenters derived from computer-recorded events are labeled "I" in the quality field. Seismograms from all SGBSN stations that display a usable signal for a given local earthquake are written to computer magnetic tapes for permanent archiving. Copies of these tapes are periodically distributed to the U.S.G.S. Local Records Center, and are available to interested investigators after annual seismicity reports are published.

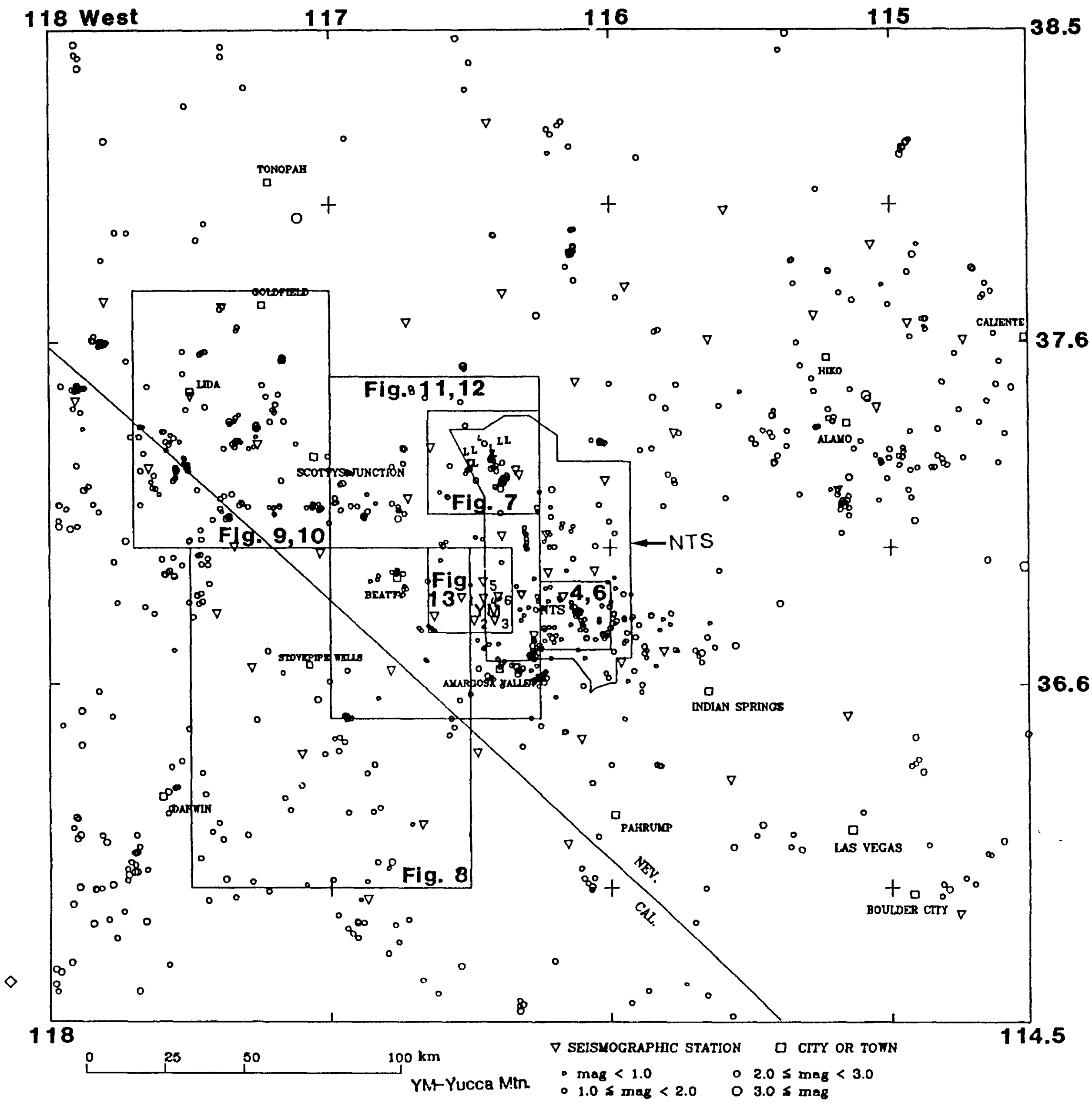


Figure 2.– Earthquake epicenters in the SGB for the year 1990. Boxes indicate regions discussed in subsequent text and figures.

As many as five magnitude estimates are determined per event, (1) coda-average magnitude, M_{ca}, (2) duration magnitude, M_D, (3) local magnitude from horizontal component instruments M_L^{hor}, (4) local magnitude from vertical component instruments, M_L^{ver}, and (5) local magnitude from clipped records, M_L^{clip}. These are discussed in previous SGBSN data reports (for example, Rogers and others, 1987). Standard error estimates in the hypocentral parameters are routinely calculated in the program HYPO71 (Lee and Lahr, 1975), and some of these are listed in Appendix A. Table 1 summarizes some of the hypocentral parameters computed by HYPO71 for the digitally recorded earthquake data of 1990. In Table 1, *RMS* is the average traveltime residual, *# P+S Phases* is the number of phases used by the algorithm, *Gap* is the maximum azimuthal angle without a station, *Depth* is the depth of focus estimate, *Err(z)* is the estimate of standard error in depth, and Δ_{min} is the minimum source-to-station epicentral distance.

Table 1. Selected statistical characteristics of a subset of the 1990 SGBSN seismicity catalog.[1]

Statistic	RMS (sec)	# P+S Phases	M_{ca}	M_L^{clip}	M_D	M_L^{hor}	M_L^{ver}	Gap (deg.)	Depth[2] (km)	Err(z) (km)	Δ_{min} (km)
Mean	0.154	15.1	1.54	1.67	1.30	1.49	1.31	157.8	3.96	2.48	16.47
Median	0.13	13	1.48	1.60	1.27	1.44	1.25	147	3.31	1.30	12.3
Maximum	2.16	56	3.80	4.00	2.50	3.74[3]	3.23	332	20.22	28.7	141.0
Minimum	0.00	4	0.66	0.80	0.40	0.10	0.02	42.	-2.0	0.0	0.2
N# obs.	946	946	736	358	33	528	909	879	879	879	879

[1] Only events captured by digital monitoring system are included. Also, only events with Err(z)< 30 km are included in the tabulations for Gap, Depth, Err(z), and Δ_{min}.
[2] Depth of focus is relative to sea level (0.0 km), positive below.
[3] One-station estimate, NEIC $M_L = 3.1$ for this earthquake.

The average magnitude for SGB hypocenters of 1990 is about 1.5. Furthermore, 95% of those hypocenters have $M_L < 2.4$. To further illustrate statistical properties of the hypocenter catalog, plots of err(z) versus Δ_{min} and err(z) versus source-to-station gap are shown in Figure 3. Although err(z) correlates positively with these two parameters, the scattergrams show that the correlation is weak, and many events having no nearby stations and/or poor coverage nevertheless are reported with relatively low err(z) estimates (< 2 km). This tendency of HYPO71 to underestimate uncertainty in depth estimates is shared by many currently available hypocenter determining algorithms. This point is discussed by Gomberg and others (1990).

Earthquake hypocenter determination requires that the investigator make a number of simplifying assumptions about the nature of rock being sampled by seismic rays. In this report and all prior SGBSN data reports, the earth models are assumed to be a sequence of horizontal layers with constant P-wave and S-wave velocities are constant. The ratio of P to S velocity is assumed constant in the medium, implying that the raypaths for those two body waves are identical. Appendix F shows the two standard models, one for the immediate vicinity of Yucca Mountain and the other for the rest of the southern Great Basin. Even for a fixed earth model, variations in hypocenters may result from varying initial conditions (e.g., starting hypocenter) and data weighting schemes. Some of these factors are discussed in the 1987 through 1989 seismicity report (in preparation). To reduce the chance of HYPO71 iterations converging to a local rather than the global RMS minimum, starting depths of both zero and seven km are used; the reported hypocenter in Appendix A is the one having the minimum RMS. In the case of equal RMS values, the hypocenter resulting from the seven km starting depth is (arbitrarily) reported. No algorithm is known that "finds" the true earth model;

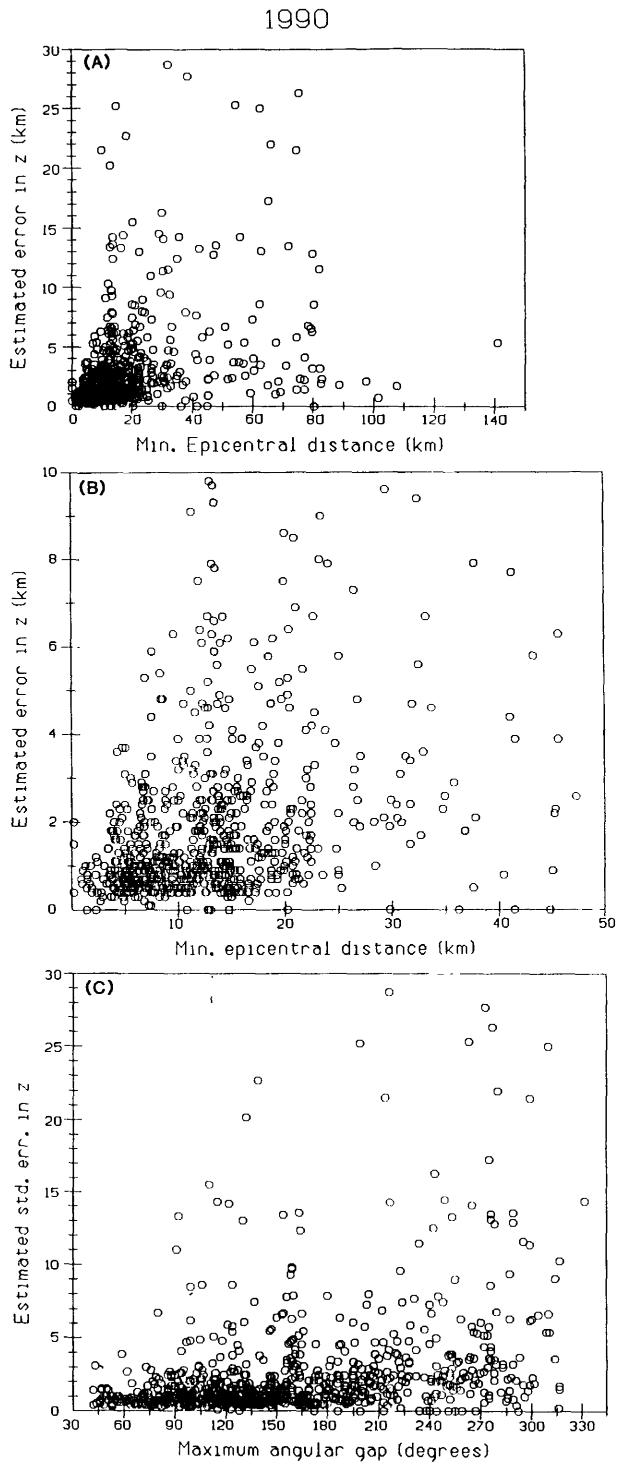


Figure 3.- (a) HYPO71's estimated standard error in depth of focus (km) of SGB earthquakes for 1990 versus distance in km to nearest station with a usable P or S phase arrival time reading. (b) Close-up of inner 50 km of the data plotted in (a). (c) Estimated standard error in depth of focus of SGB earthquakes for 1990 versus source to station gap in degrees.

all available computer codes tend to smooth the earth's roughness, and thereby probably bias hypocenters in ways that defy simple error-statistic estimation. One may infer a strong apparent horizontal velocity anisotropy from SGB P-wave traveltimes from Rainier Mesa and western Yucca Flat nuclear device sources. Although these observed variations correspond to very shallow crustal depths (probably not exceeding five to ten km below the earth's surface), and may not be representative of local earthquake source-to-station raypaths, they are strong enough to result in epicenter errors of three km for Rainier Mesa tests recorded at SGBSN stations when using standard, horizontally isotropic, earth models and HYPO71 to determine the hypocenter. Most NTS tests are located to within about one km of the true epicenter, however.

The multiple sources of hypocenter estimate uncertainty need to be considered when making generalizations about the spatial distribution of SGB seismicity. Redetermination of hypocenters using a variety of plausible earth models should be performed to discover the range of hypocenters that could be associated with a given earthquake's phase arrival time data before one concludes that the data unequivocally demonstrate the validity of some favorite hypothesis. Revisiting the data in this way should result in the development of a more viable data base of hypocenters, which is less dependent on vagaries of computer programs and model biases than the current catalog.

Notable Southern NTS Seismicity, 1990

Microearthquakes occur sporadically in the SGB, with detection rates varying from zero per day to a few dozen per day. The first relatively concentrated seismicity for 1990 began on January 26, at the northernmost end of Skull Mountain, Nevada Test Site. A focal mechanism was prepared for the mainshock of January 26, 1990, 10:34:15 UTC, having $M_L = 2.5, \Delta_{min} = 6.4$ km, depth about 5 km below sea level. The solutions indicate predominantly right-lateral strike slip motion on an east-dipping, nearly north-south oriented fault, or predominantly left-lateral strike slip motion on a north-dipping, east-west oriented fault (Figure D1). The mainshock is one of about two dozen late January microearthquakes loosely distributed under the northern end of Skull Mountain. The most prominant fault in the vicinity is the Cane Spring fault, a left-lateral strike-slip fault trending $\approx$ North 50° east, which may define the south-eastern boundary of Skull Mountain (Poole and others, 1965, Ekren and Sargent, 1965). The focal mechanism solutions for this Skull Mountain earthquake are not consistent with motion on the Cane Spring or *en echelon* Skull Mountain faults in its vicinity. Depth sections of the Skull Mountain series hypocenters, shown in Figure 4, show that events extend from near-surface to a depth of about six km below sea level. Examination of the behavior of the root-mean-square travel-time residual (RMS) as a function of assumed focal depth indicates that for some of these events the shallowest hypocenters are poorly resolved. Figure 5 shows that RMS does not increase significantly with focal depth until about six km below sea level. (This ambiguity could be reduced by increasing near-source station density which may be possible by deploying a temporary portable seismic net.) Figure 6 is a map of all preliminary epicenters in the same region as those of Figure 4 for the time period August, 1978, through December, 1990. The average number of microearthquakes detected and located by the SGBSN in this map region per year prior to 1990 is 42. For 1990, the number is 72.

Seismicity in the vicinity of the Cane Spring fault is examined here because the suggestion has been advanced (Ken Fox, written communication) that a semi-continuous belt of seismicity monitored by the SGBSN may illuminate a fault zone that extends northeast from the Amargosa Desert of California and Nevada to the Pahranagat Shear Zone, southeast of Alamo, Nevada (see Figure 1 for locations). If such a fault zone exists, it is difficult to find major surface-breaking faults in the NTS that align with the zone *and* with seismicity concentrations. Gomberg (1991) explores plane

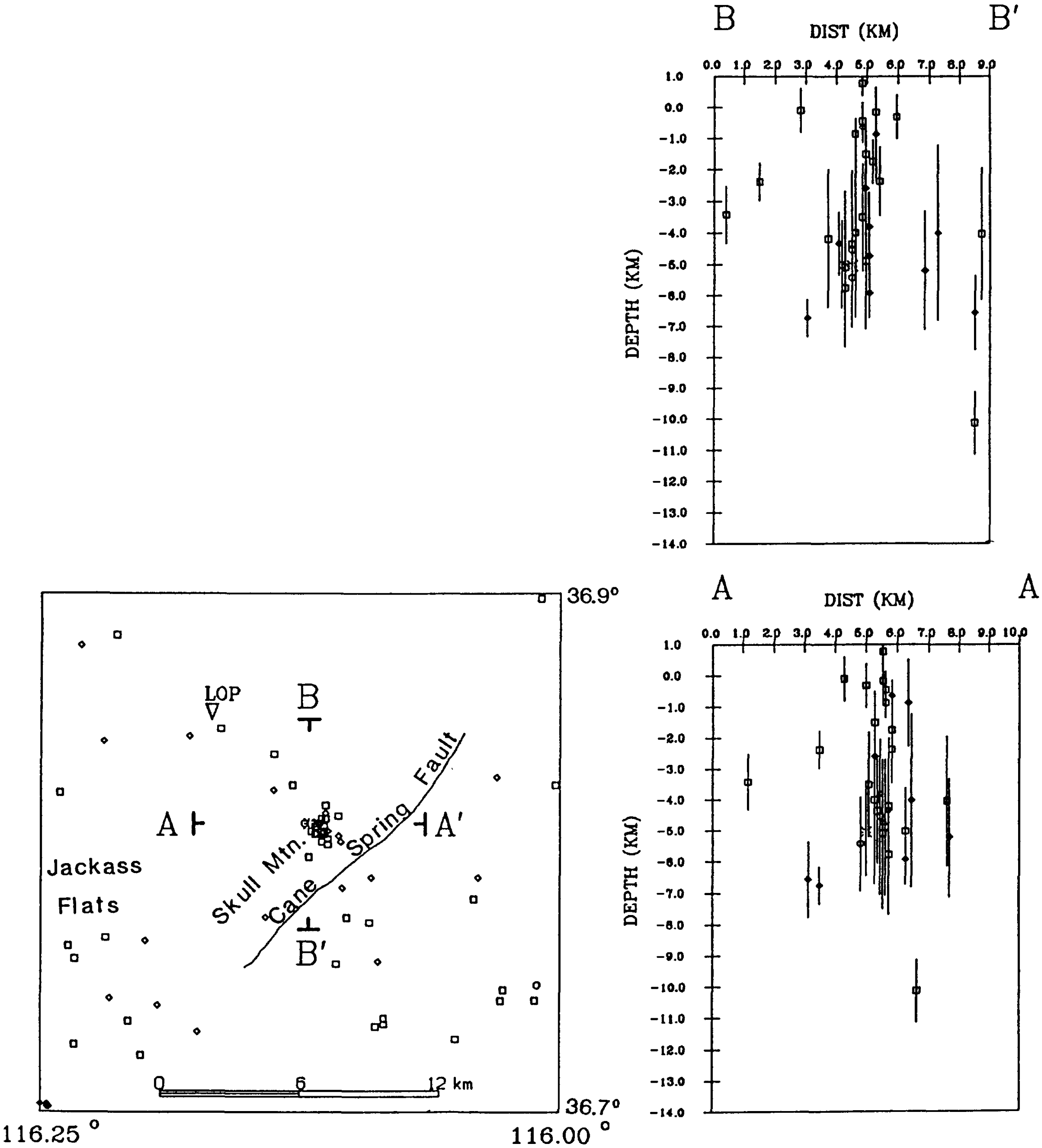


Figure 4.– Preliminary epicenters and depth sections of hypocenters in the vicinity of Skull Mountain and Cane Spring fault, Nevada Test Site, for the year 1990. The concentration of epicenters north of the fault, in the northernmost part of Skull Mountain, occurred in late January, 1990.

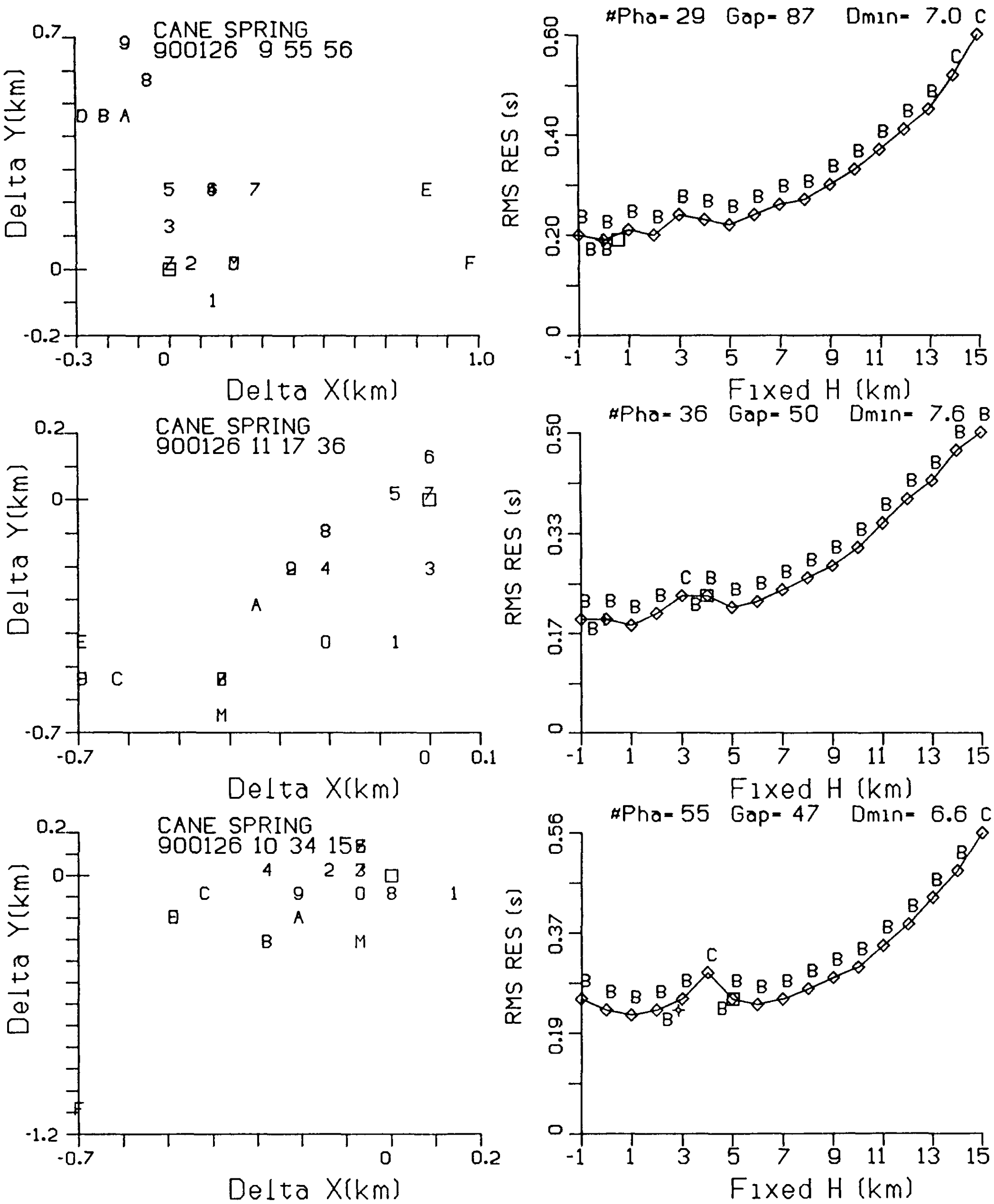


Figure 5.– *Left Side:* Plots of variations in epicenter with assumed depth of focus for the mainshock and two very shallow hypocenters in the Skull Mountain series of late January, 1990. The letters correspond to depth: 0, 1, 2, ..., A, B, C, ... are zero, one, two, ..., 10, 11, 12, ... below sea level (hexadecimal notation). "M" refers to the epicenter for the solution with depth fixed at one km above sea level. "S" and "Z" refer to free depth epicenters, with $z_0 = 7$ and 0 km, respectively. *Right Side:* Plots of RMS travel time residual as a function of assumed depth of focus corresponding to the same earthquake data. The letters above the (x, y) points are HYPO71's "grades," which are always assigned to hypocenters, and are frequently used to assess their relative accuracy. The velocity model used in hypocenter determinations for these plots has $V_P = 4.9$ km/sec in the shallowest layer, and $V_P = 6.0$ km/sec in the second layer.

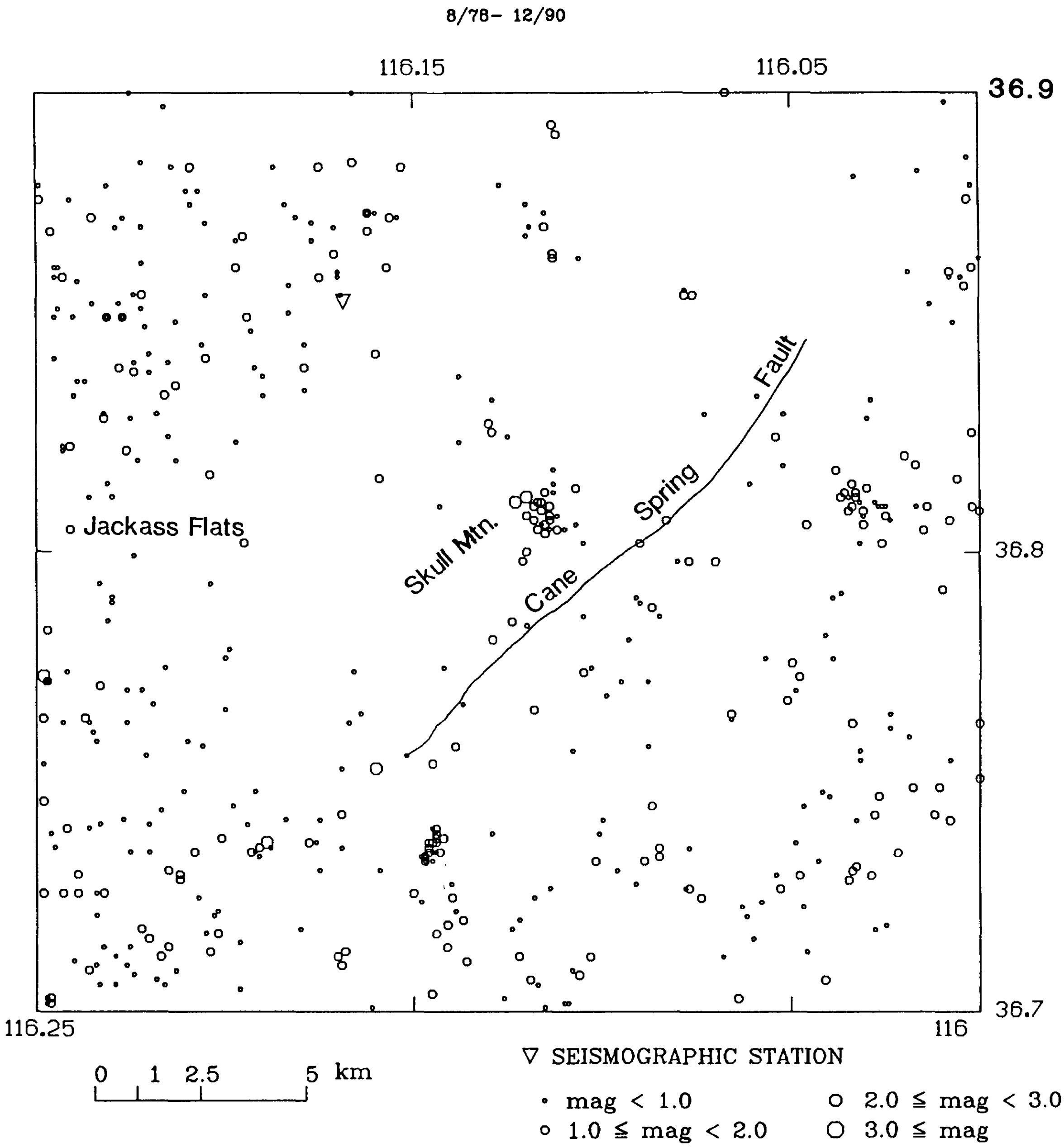


Figure 6.– Earthquake epicenters in the same part of southern NTS as shown in Figure 4 for the period August, 1978, through December, 1990. The extended catalog shows concentrations of activity at several places away from the Cane Spring fault, but none on the fault, which is mapped as vertical by Poole and others (1965).

strain boundary element models to show that major faults in the SGB may modify a regionally uniform shear strain field to distribute concentrations of shear strain away from the major fault traces. Concentrations of shear strain are found where faults bend and terminate. Therefore, the relative absence of seismicity between Frenchman Flat and the Pahranagat shear zone may not indicate the lack of northeast-trending faults connecting these two zones of relatively high seismicity. Instead, such faults, if they exist, may be unusually long and straight. Alternate interpretations of the low levels of seismicity between southern NTS and the Pahranagat Shear Zone cannot be ruled out. Because SGBSN station coverage is at its sparsest at Nellis Air Force Range, east of NTS, with a resulting higher-than-average detection threshold magnitude, the SGBSN catalog provides little information to corroborate various hypotheses about crustal deformation there.

Silent Canyon, Northwest NTS, Seismicity, in 1990

A series of earthquakes in the southern Silent Canyon Caldera (SCC), northern Nevada Test Site, occurred in mid-February through late February, 1990, with sporadic tremors in later months. A map of epicenters for Silent Canyon Caldera activity for 1990 is presented in Figure 7. The hypocenters are concentrated at a depth of about seven km below sea level, with few less than six km. Depth sections (not shown) indicate the possibility of a northeast-dipping seismically active plane, although patterns such as this may be due to depth-epicenter tradeoffs associated with hypocentral uncertainty rather than to structure. Graphs of the S-wave traveltime versus the P-wave traveltime for several SCC events ("Wadati diagrams") suggest that locally, $V_P/V_S = 1.81 \pm 0.03$, somewhat higher than the regional average (1.71). Inputting the 1.81 ratio into HYPO71 results in SCC event hypocenters being about one km shallower than those reported here.

Typically, source spectra S-wave corner frequencies, f_c, for SCC events, especially those associated in time and space with nuclear device tests, are low, with $f_c < 5$ Hz. The February seismicity is unusual for SCC in that its frequency content is more typical of most SGB subregions, with observed source corner frequencies, $f_c > 10$ Hz, that one expects for microearthquakes. SCC is geologically complex, and variation in frequency content of seismic coda for events in different parts of the caldera may indicate strong local variations in Q as well as variations in seismic source properties.

Focal mechanism solutions for two of the February, 1990 SCC series earthquakes are shown in Appendix D, Figures D2 and D3. Both focal mechanisms indicate oblique strike-slip, normal-slip motion, although details of nodal plane orientations differ. Earthquakes having these sorts of focal mechanisms might be expected in a region having $\sigma_H \approx \sigma_v$, with σ_H oriented in a WSW-ENE direction, if a Coulomb yield criterion with a coefficient of friction, $\mu \approx 0.75$, is required, and principal horizontal compressive stresses having magnitudes, $\sigma_H \approx 4\sigma_h$, are locally present (Morrow and Byerlee, 1984; Harmsen and Rogers, 1986). The February, 1990 SCC series is well modeled by the standard double-couple focal mechanism, and the distribution of P-wave first motions neither suggests nor requires the presence of a substantial component of an isotropic (volumetric) component to the source moment, unlike the almost exclusively dilatational distribution of P-wave polarities for a few SCC earthquakes following BENHAM and other Silent Canyon Caldera nuclear device tests.

Death Valley and Vicinity Seismicity in 1990

Death Valley is considered to be one of the most tectonically active regions of the southern Great Basin. Hamilton (1988) states that "Death Valley is now being widened obliquely as the ranges to the west move relatively northwestward away from those to the east. ... The northwest-trending [Furnace Creek and Death Valley] strike-slip faults are thus transform faults to the

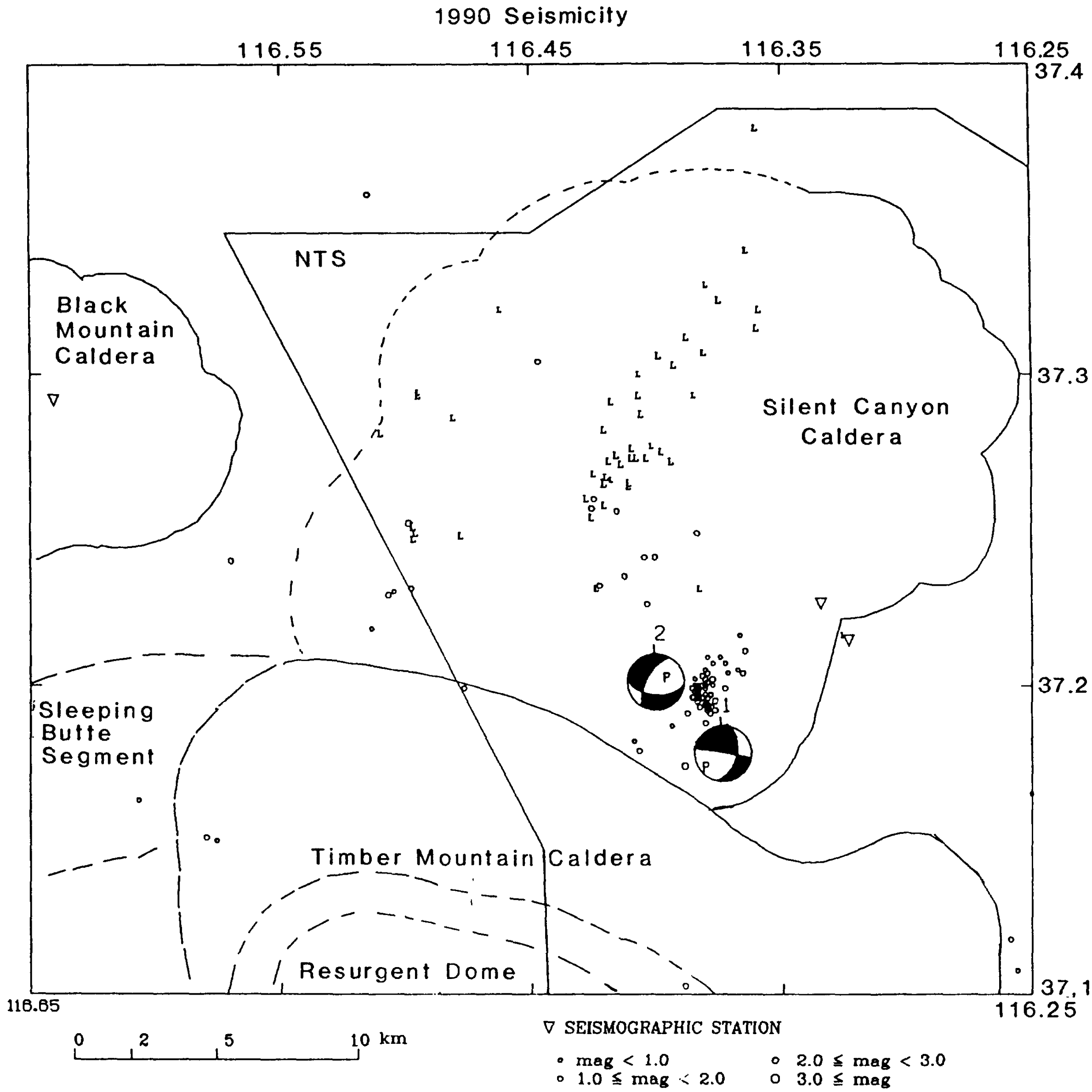


Figure 7.– Preliminary epicenters in the vicinity of Silent Canyon Caldera for high-coda-frequency earthquakes (shown as hexagons) and low-coda-frequency probable nuclear-testing induced events (shown as "L"s) recorded in 1990. Focal mechanism solutions for two earthquakes that occurred in February, 1990, are plotted near their epicenters. Caldera complex boundaries are shown (W. J. Carr, written communication).

extension recorded by the oblique slip on the north-trending Black Mountains frontal faults" (p72-73). The SGBSN geographic coverage was designed to permit monitoring of seismicity having $M_L > 1.5$ in the vicinity of central and northern Death Valley. During the period 1979 through 1990, the central part of Death Valley has been relatively quiet, although activity localized at Tucki Mountain and in the eastern Panamint Mountains, bounding Death Valley to the west, are notably elevated relative to the regional levels. Figure 8a shows all earthquake epicenters for 1990 in the vicinity of the central part of Death Valley, and Figure 8b shows all epicenters for previous years of SGBSN monitoring, 1978 through 1989 (stations shown in Figure 8 define the western perimeter of the network; west of the stations seismic monitoring is far less complete). The central valley has a nearly complete absence of earthquake epicenters. Other faults known to have had surface movement in the last two to three million years are also shown in Figure 8; correlation of epicenters with some of these faults is evidently much better than with the main Death Valley fault or the Furnace Creek fault. Hamilton goes on, "the continuing Quaternary extension of this [central] section of Death Valley may be accomodated by slip on a fault that dips westward from the west base of the Black Mountains, ..., the continuation of that fault beneath the west side of the valley and the Panamint Mountains is at a very gentle angle ..." (Hamilton, 1988, p. 76-77). The SGBSN may be monitoring seismicity on a detachment fault, perhaps at its intersection with other faults, or on other complicated structures in Death Valley, rather than seismicity on the main strike-slip faults. Slip on the Furnace Creek and Death Valley faults must be episodic, with the seismic network monitoring a quiescent moment in its evolution, or slip is aseismic, occurring primarily by creep. The former alternative may be plausible if rock of the central valley is experiencing significantly lower fluid pore pressures than that of the region to the west. A study of the spatial correlation of microseismicity levels (number of events; cumulative moment) with hydrologic parameters in the vicinity of Death Valley should be informative.

The focal mechanism shown in Figure 8(a) (also in Appendix D, Figure D9) for an earthquake at Tucki Mountain, California, that occurred on July 25, 1990, 00:52:50 UTC, is the only example of a reverse-slip solution for data analysed in this report. (A focal mechanism for an earthquake on March 16, 1982, at northern Tucki Mountain, California, one of whose nodal planes also displays a large component of reverse slip, is discussed in Harmsen and Bufe (1991).) The epicenter of that lone 1990 earthquake is at the southeast end of a northwest-trending lineation of earthquakes that occurred sporadically over several years of monitoring. The northeast dipping nodal plane of the focal mechanism, if the fault plane, indicates that the rock of Death Valley is pushing over a possible mountain-bounding fault in eastern Tucki Mountain. If the alternate nodal plane is the fault plane, then the rock of Death Valley is pushing under Tucki Mountain. From the principal of minimum energy, the work required against gravity favors slip on the former nodal plane. That the SGBSN observes reverse slip in what some geologists claim is the most actively extending region within the SGB may appear ironic; however, if Tucki Mountain is an obstacle to that extension, then reverse slip may be a required component of the total crustal deformation response in its vicinity. Furthermore, thrust at Tucki Mtn. is predicted by models of strike-slip along a curved fault, in this case, from the Furnace Creek fault to the Death Valley fault. There is excellent agreement between the deformation implied by the Tucki Mtn. focal mechanism and "secondary structure" predicted by a laboratory-scale photoelastic model of stress along a curved fault (Freund, 1974, his Figure 27).

Because of the extremely low rate of occurrence of small-magnitude earthquakes in central Death Valley, a more complete picture of current crustal deformation there is difficult to obtain. It is plausible that the rock of the central valley has greater hydraulic conductivity, and consequently lower pore pressure, than the rock of the surrounding mountain ranges, resulting in greater effective normal stress across the major faults than exists across the secondary faults in the

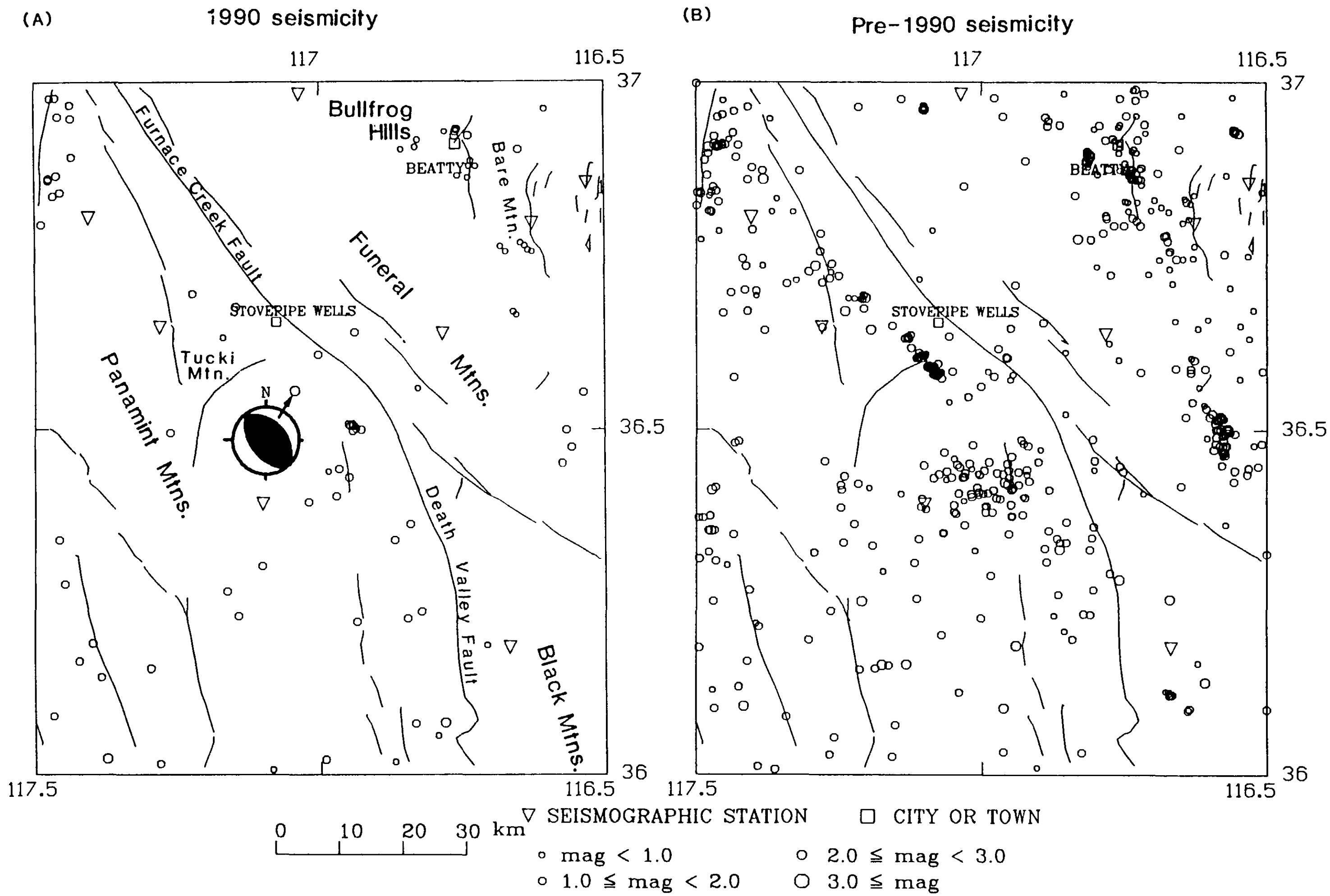


Figure 8.– (a) Preliminary epicenters in the vicinity of Death Valley, California, for earthquakes during the calendar year 1990, and faults that may have had surface movement in the last two to three million years. Focal mechanism, with compressional quadrant darkened, is for an earthquake of July 25, 1990, 0:52 UTC. (b) Preliminary epicenters in the same region as Figure 8(a) for the period August, 1978 through December, 1989.

mountain ranges surrounding Death Valley. It is also possible that the Death Valley-Furnace Creek fault system is experiencing a quiescient moment in its evolution, or that deviatoric stress levels are low (Rogers and others, 1991), or that the northwest trend of the Furnace Creek fault is not suitable to permit slip in the current stress field.

Northwestern SGB seismicity, 1990

In the northwestern section of the southern Great Basin, several small series of earthquakes occurred in 1990, and four earthquakes in the region were analysed for focal mechanisms (Figure 9). On April 21, 17:55:52 UTC a strike-slip earthquake having $M_L = 2.0$ occurred at the western edge of Sarcobatus Flat, about 16 km south of Scottys Junction, Nevada (mechanism labeled "1" in Figure 9; Appendix D, Figure D4). The estimated depth of the earthquake is 7.2 ± 1.4 km below sea level. On May 13, 00:48:11 UTC, an oblique normal-slip, strike-slip earthquake having $M_L = 1.9$ occurred about 2.7 km east of the April 21 earthquake (mechanism labeled "2" in Figure 9; Appendix D, Figure D5). The estimated depth of the May 13 earthquake is 6.3 ± 1.5 km below sea level. On November 1, 07:51:46 UTC, a normal-slip earthquake having $M_L = 2.4$ occurred in Stonewall Flat about 18 km ESE of Goldfield, Nevada (mechanism labeled "3" in Figure 9; Appendix D, Figure D16). The estimated depth of the earthquake is 6.0 ± 1.4 km below sea level. On December 13, 01:01:00 UTC, a strike-slip earthquake having $M_L = 2.8$ occurred about 1 km east of the town of Gold Point, 14 km SE of Lida, Nevada, in an unnamed alluvial valley west of Mt. Dunfee (mechanism labeled "4" in Figure 9; Appendix D, Figure D17). The estimated depth of the December 13 earthquake is 2.8 ± 1.0 km below sea level.

The northwestern SGB has been perennially seismically active, and listings and discussions of preliminary hypocenters from the SGBSN may be found in Rogers and others (1987), Harmsen and Rogers (1987), and Harmsen and Bufe (1991). Figure 10 shows all epicenters determined by the SGBSN prior to 1990. Besides the areas seismically active in 1990, notable concentrations of seismicity may be discerned in previous years' monitoring in the Montezuma Range, in the Palmetto Mountains west of Lida, Nevada, in the Last Chance Range, at Gold Mountain and the Grapevine Mountains, in northern Death Valley, and in various other mountains and valleys. The strike-slip focal mechanism for the earthquake of December 13 contrasts with predominantly normal-slip mechanisms for earthquakes about 5 to 10 km east of the December 13, 1990, epicenter, reported in the three just-cited open-file reports. This close proximity of strike-slip and dip-slip styles of deformation argues for the local presence of an axially symmetric stress field in the vicinity of Slate Ridge, Nevada.

Sarcobatus Flat, Oasis Valley, and caldera seismicity, 1990

Central and eastern Sarcobatus Flat also have been seismically active during the period of operation of the SGBSN. Seismicity at Sarcobatus Flat for the period 1978 through 1983 is reviewed in Rogers and others (1987), and listings of subsequent seismicity are given in Harmsen and Rogers (1987) and Harmsen and Bufe (1991). Many clusters of seismicity continued to be observed in eastern Sarcobatus Flat during 1990. Predominantly strike-slip focal mechanisms for five earthquakes in eastern Sarcobatus Flat are shown in Figure 11 (mechanisms 2, 5, 7, 8, and 9, respectively; Appendix D, Figures D6, D10, D13, D14, and D15, respectively). Magnitudes for these Sarcobatus Flat events range from $M_L = 1.1$ for an earthquake of August 2, 1990, 05:15:02 UTC to $M_L = 2.6$ for an earthquake of October 29, 1990, 02:37:27 UTC. Depth estimates range from 0.5 ± 0.5 km below sea level for an earthquake of September 6, 1990, 10:32:18 UTC, to about 5.0 ± 1.4 km for earthquakes in September and October. Figure 11 also shows two focal mechanisms (numbers 3 and 6) near the western edge of the volcanic calderas that form the western part of NTS, one (number 3) an oblique strike-slip, normal slip mechanism for an

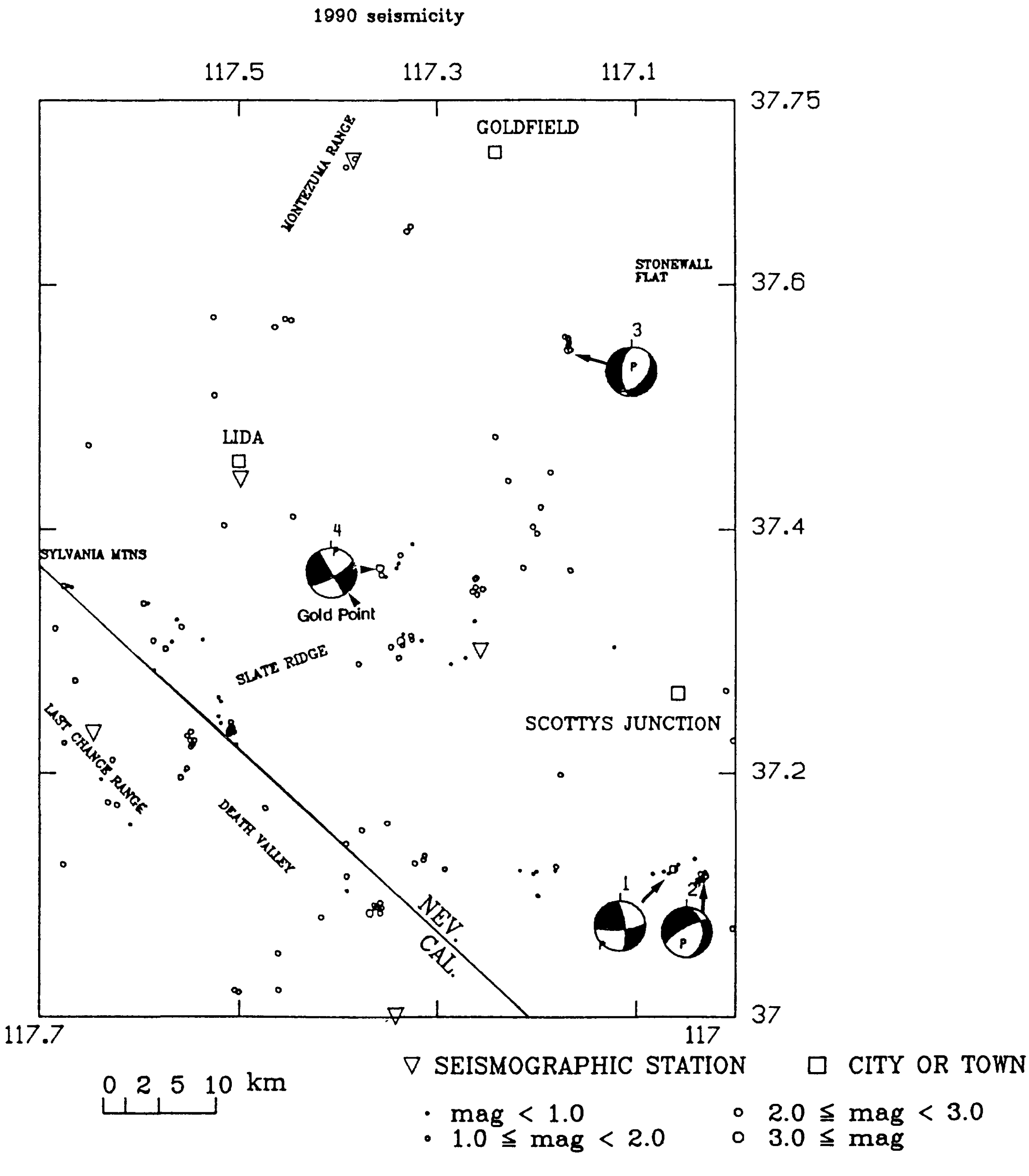


Figure 9.– Seismicity recorded in the northwestern part of the SGB during 1990, with four focal mechanisms plotted near their corresponding epicenters.

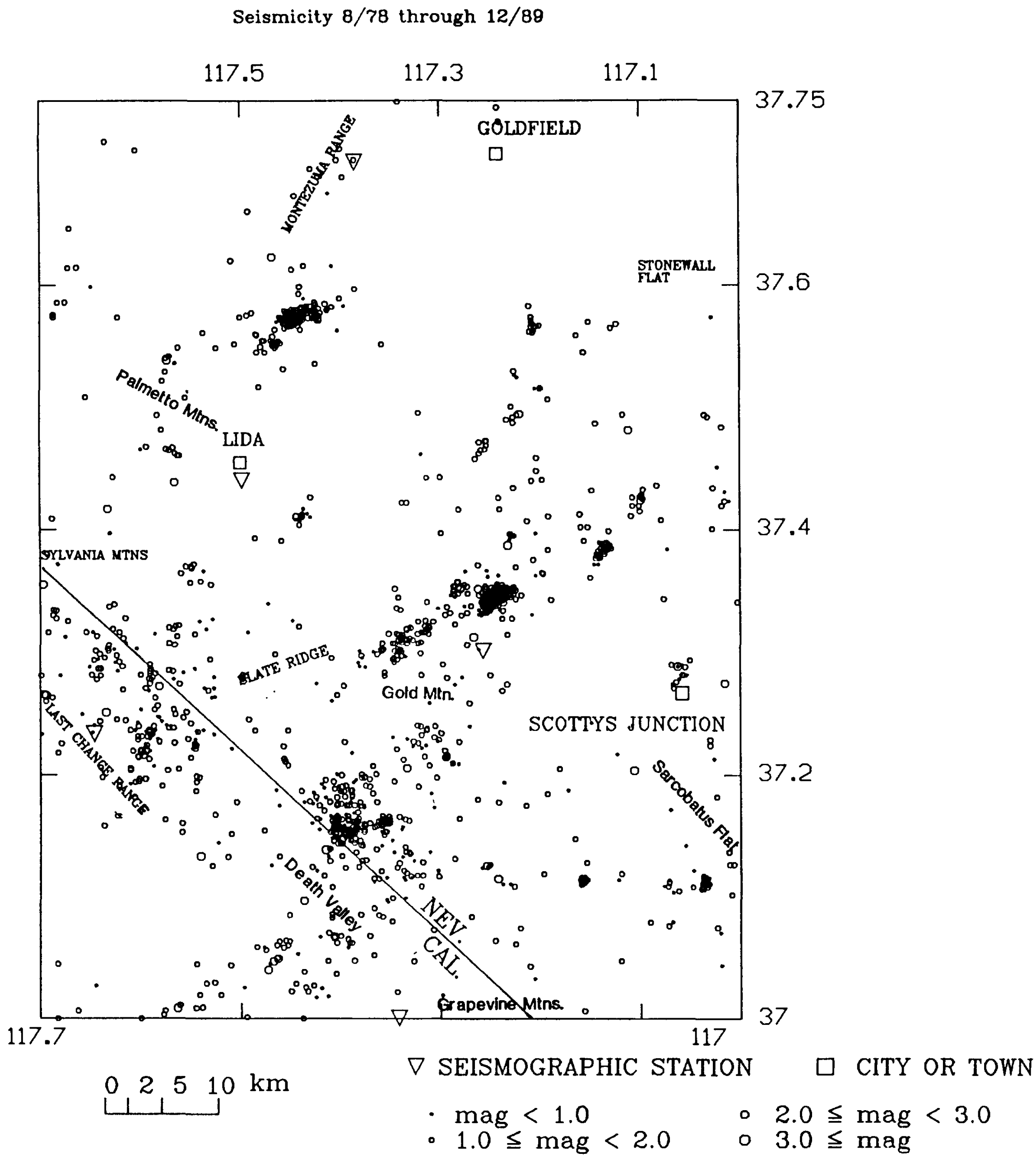


Figure 10.– Seismicity recorded in the northwestern part of the SGB during the period August, 1978, through December, 1989, i.e., during the recording period of the SGBSN prior to 1990.

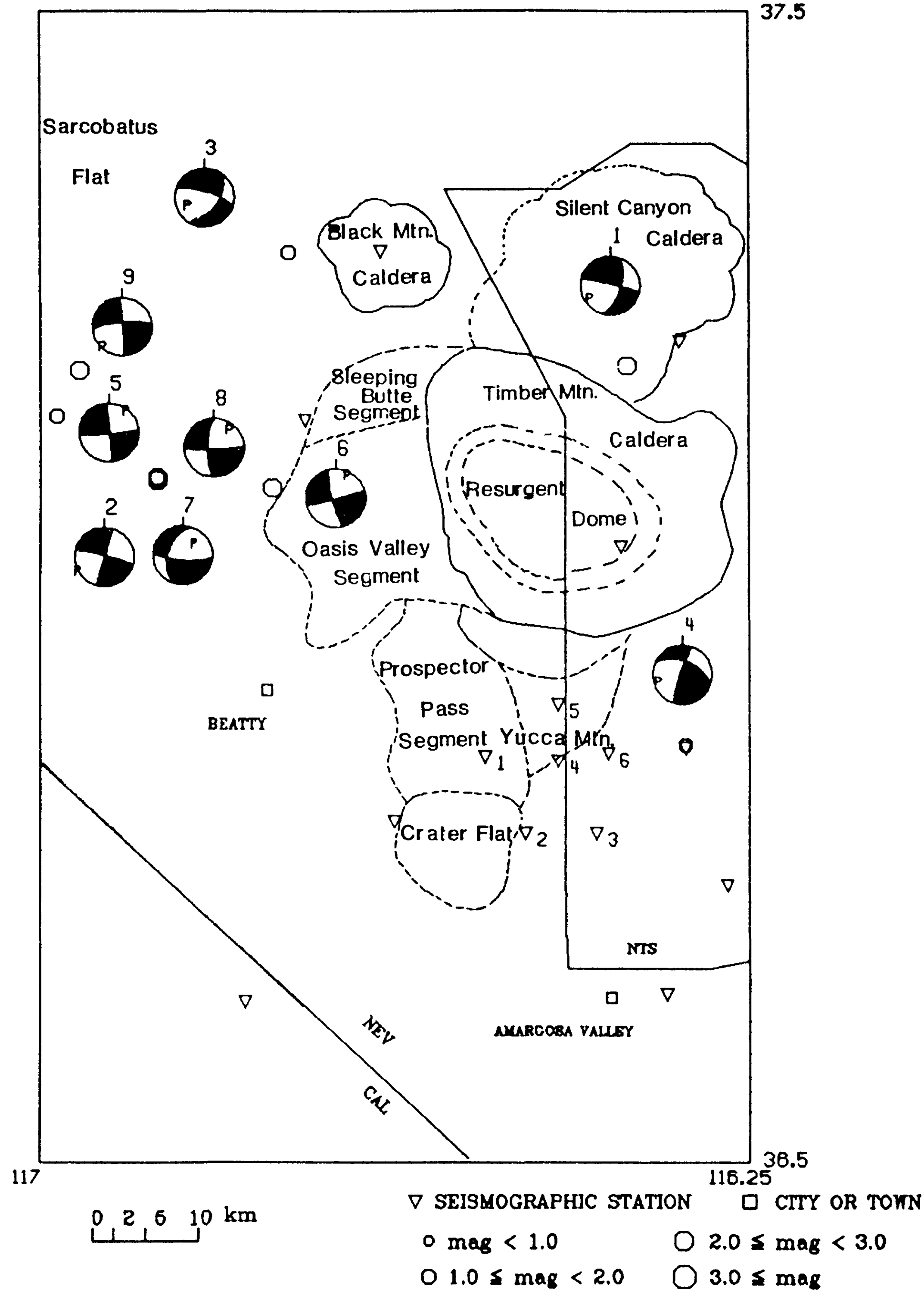


Figure 11.– Map of eastern Sarcobatus Flat and western NTS, showing caldera boundaries (W. Carr, written communication, 1990) and focal mechanisms for earthquakes of 1990, labeled "1" through "9." The inner and outer dashed rings surrounding the resurgent dome of the Timber Mountain Caldera represent minimum and maximum estimates of its extent, respectively.

earthquake on June 24, 1990, 23:55:38 UTC, west of the Black Mountain Caldera, having M_L = 1.9 (Appendix D, Figure D7), and one (number 6) a strike-slip mechanism for an earthquake on August 3, 1990, 20:23:55 UTC having $M_L = 2.3$ with epicenter at the western edge of the Oasis Valley segment of the Timber Mountain-Oasis Valley caldera complex (W. Carr, written communication, 1990) (Appendix D, Figure D9). Figure 11 displays another predominantly strike-slip focal mechanism solution for a $M_L = 1.1$ earthquake at Little Skull Mountain on July 22, 1990, 08:17:14 UTC (mechanism 4; Appendix D, Figure D8). Seismicity recorded by the SGBSN for the period August 1, 1978 through December 31, 1990 in the same map region as Figure 11 is plotted in Figure 12. This plot shows that Yucca Mountain, a seismically quiet place, is surrounded by zones of variable - but generally higher - seismicity levels. The western edges of the volcanic caldera complexes appear to help define a diffuse, but distinctly visible, north-south trending seismicity zone having length in excess of 50 km, which we designate as the "Oasis Valley lineament" (A. M. Rogers and others, 1989, written communication).

Much of the diffuse seismicity in the interior of the Silent Canyon Caldera is low-frequency activity associated with the Department of Energy's nuclear device testing program (e.g., cavity collapses), but most other seismicity shown in Figure 12 is natural (epicenters from a few mining blasts may have been misidentified as earthquake epicenters). The concentrations of seismicity at some caldera and resurgent dome boundaries (e.g., Sleeping Butte segment boundary with Timber Mountain caldera segment, labeled A in Figure 12; northeastern edge of Timber Mountain caldera segment, labeled B; southern edge of Timber Mountain resurgent dome, labeled C) are spatially similar to concentrations of seismicity along the southern edge of the Long Valley caldera (Savage and Cockerham, 1984) which were widely held to be associated with dike intrusion. However, I do not wish to imply that these Timber Mountain seismicity patterns suggest the possibility of an active volcanic process, only the possibility that caldera boundaries may continue to act as stress concentrators some 9.5 million years after active volcanism occurred. Alternatively, one may argue that zones or pockets of concentrated seismicity are observed throughout the SGB, and the coincidence of some of them with caldera boundaries is not sufficient evidence to conclude a causal relationship between the two. The spatial relationship between seismicity and caldera structure is not new to the SGBSN data set. McKeown (1975) also noted that aftershocks of the megaton-yield series of Pahute Mesa nuclear explosions of the late 1960s were mostly confined to caldera faults and caldera-bounding faults ("ring fractures"). Aftershock distributions rarely extended away from the calderas along basin-and-range faults.

Yucca Mountain Seismicity, 1990

No earthquakes were detected by the SGBSN at Yucca Mountain in 1990; the nearest earthquake occurred in 40-Mile Wash four km east of Yucca Mountain Jan 14, 1990, 14:57:54 UTC, $M_L = 0.6$ (Figure 13a). The depth of focus was well constrained at about 3.8 km below sea level using the velocity model of Appendix F, Figure F2 (the Yucca Mountain model) (Figure 13b). Polarities of P-wave first motions were too ambiguous to usefully constrain focal mechanism nodal planes. A temporary portable microearthquake network installed by the University of Nevada, Reno, Nevada, in the vicinity of Yucca Mountain during the last quarter of 1990, capable of recording earthquakes having magnitudes as low as $M_L = -1.0$, also showed that Yucca Mountain is seismically quiet (Brune and others, 1991). Microseismicity at Yucca Mountain recorded by the SGBSN in previous years is discussed in Rogers and others (1987), Harmsen and Rogers (1987), and in an upcoming report on SGB seismicity for 1987 through 1989.

b-values

This report does not intend to provide a comprehensive analysis of b-values for SGBSN data.

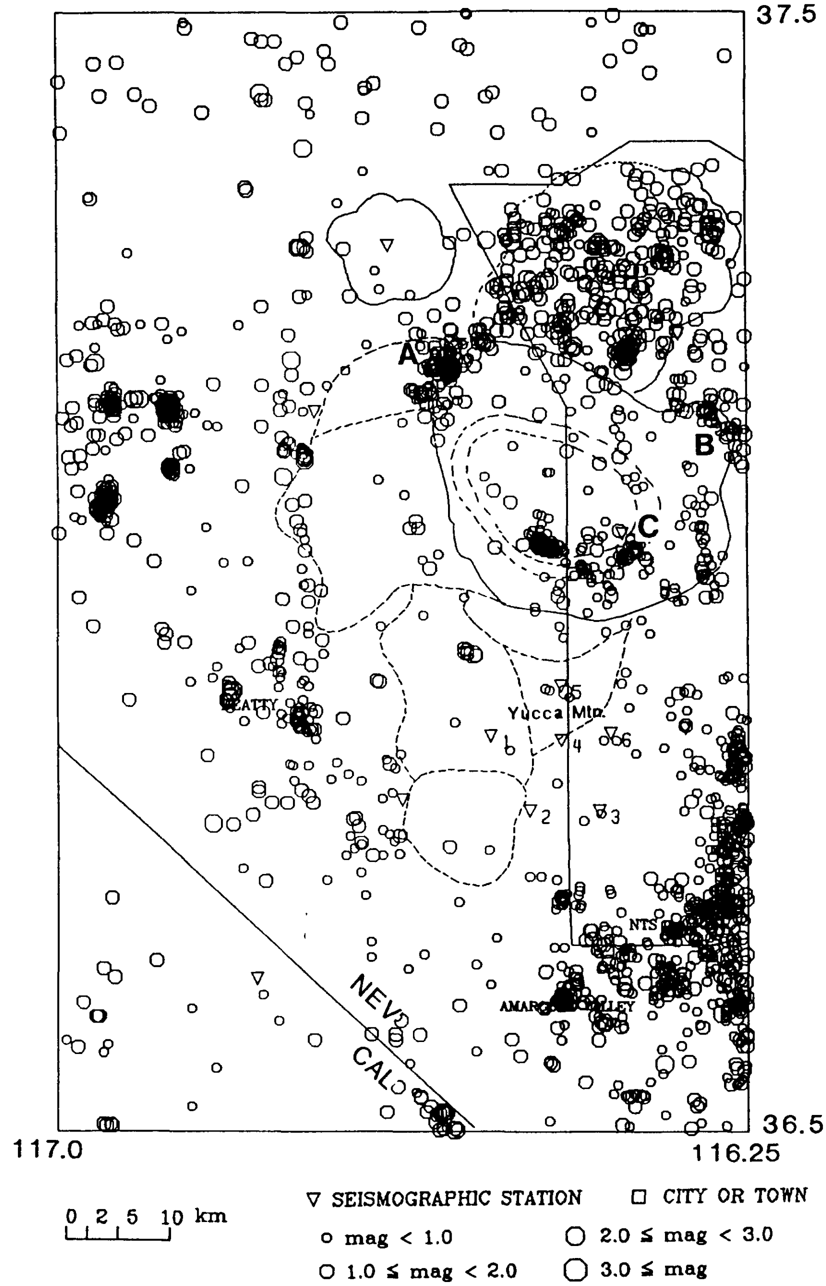


Figure 12.– Seismicity in eastern Sarcobatus Flat and western NTS during the period August, 1978, through December, 1990, showing caldera boundaries (W. Carr, written communication, 1990). A concentration of seismicity at the Timber Mountain Caldera-Sleeping Butte segment boundary is labeled "A." Another concentration, at the northeastern boundary of the Timber Mountain Caldera, is labeled "B," and a third, at the southeastern edge of the resurgent dome of the Timber Mountain Caldera, is labeled "C." A few other seismicity concentrations at caldera boundaries are evident, but unlabeled. No attempt was made prior to about 1982 to exclude seismicity, either aftershocks or cavity collapses, that resulted from the Department of Energy's nuclear device testing program. After 1982, reporting of such phenomena was gradually phased out of the SGBSN catalog. Such activity may comprise the majority of epicenters shown in the Silent Canyon Caldera.

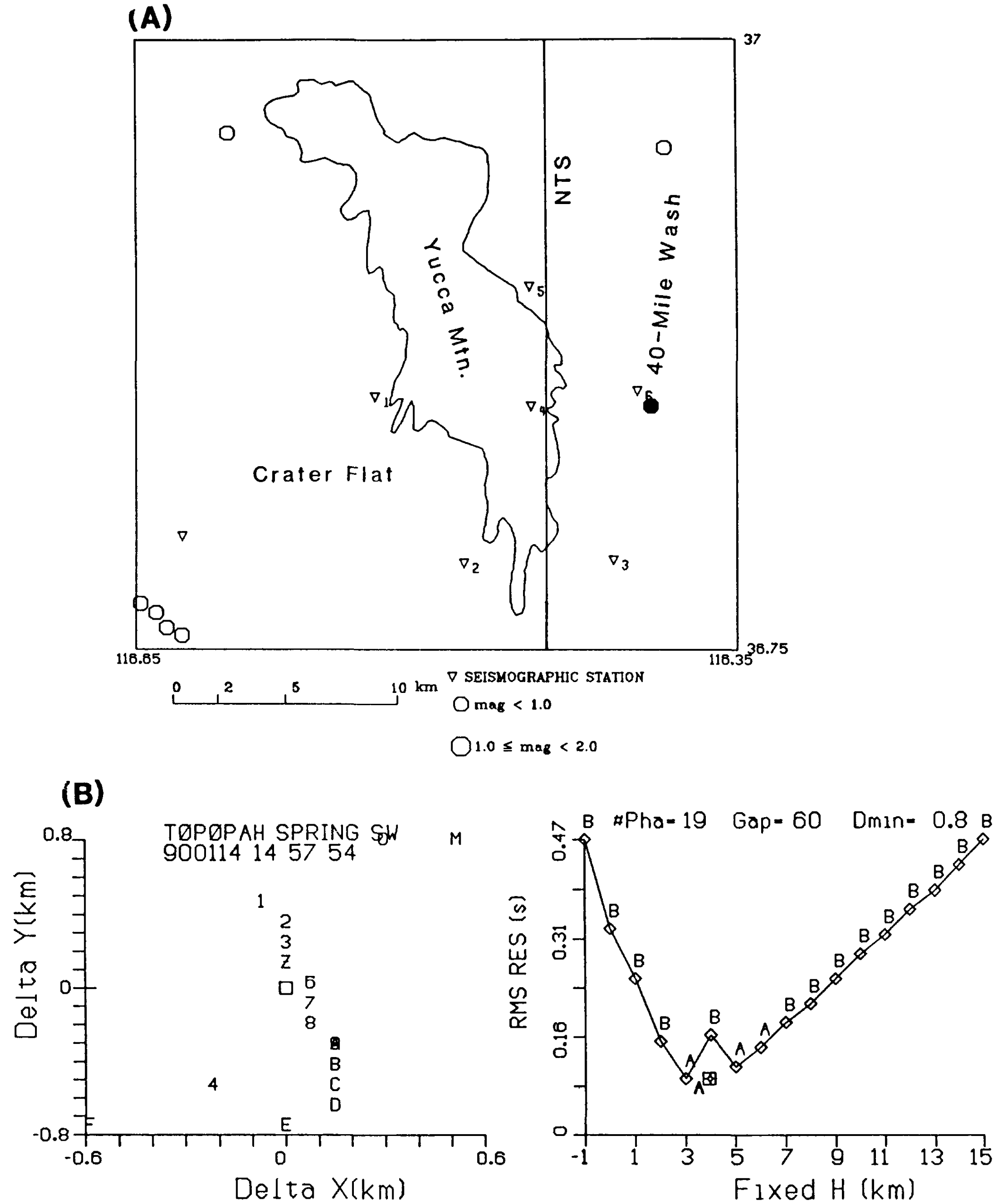


Figure 13.– (a) Seismicity detected by the SGBSN in the immediate vicinity of Yucca Mountain, Nevada, during the calendar year 1990 is confined to one earthquake at Forty-Mile Wash, shown with filled-in epicenter. A few earthquakes at Bare Mountain are also shown. (b) *Left.* Epicentral variation with assumed focal depth for the 40-Mile Wash earthquake shown in Figure 13(a), with letters having the same meanings as in Figure 5. ***Right.*** Variation in RMS residual as a function of assumed depth of focus. Note the much improved definition of the depth estimate (relative to the RMS criterion) when nearby station data are present when compared to the RMS graphs of Figure 5. Letters above and below the (x, y) points again correspond to HYPO71 "grades" assigned to the hypocenters.

However, because b-values are frequently considered when seismologists attempt to characterize the seismotectonic framework of a region, a few estimates are provided here. Only SGBSN data for the calendar year 1990 are used in the following determinations, also, only local magnitudes are considered.

The goal is to estimate the coefficient b in the relationship,

$$\log N_i = a + bM_{Li},$$

where N_i is the number of earthquakes in each "magnitude bin," within which the hypocenter magnitudes have the property $|M_{Lj} - M_{Li}| \leq dM$, where M_{Lj} is the jth magnitude reading, and i the ith bin, with midpoint M_{Li}, and dM is the half-interval width. Various estimation methods (least-square, maximum likelihood, and others) are used to estimate b. For vertical-component instrument derived magnitudes, data partitioning in the magnitude range $1.375 < M_L^{ver} < 3.375$, in magnitude intervals of 0.25, was observed to provide a sufficiently linear relation between $\log N$ and M_L. The resulting preliminary b-value estimates are $\hat{b} = -1.03$ (Aki method), $\hat{b} = -1.01$ (Page method), $\hat{b} = -1.01$ (Karnik maximum likelihood method), $\hat{b} = -0.92$ (Perkins minimum χ^2 fit), and $\hat{b} = -1.01$ (Bender correction to Aki value). For horizontal-component magnitudes, the magnitude range $1.375 < M_L^{hor} < 3.875$, in magnitude intervals of 0.25, provides an approximately linear $\log N$ versus M_L. The resulting b-value estimates are $\hat{b} = -0.93$ (Aki method), $\hat{b} = -0.93$ (Page method), $\hat{b} = -0.92$ (Karnik maximum likelihood method), $\hat{b} = -0.88$ (Perkins minimum χ^2 method), and $\hat{b} = -0.92$ (Bender correction to Aki value). These various estimates are discussed in Bender (1983). The consistently lower estimates for b when using horizontal instrument M_L data when compared to vertical instrument M_L data may result from the lower gain settings of the horizontal instruments, which allow them to record larger magnitude events on scale; also, the horizontal component magnitudes for $M_L > 2.5$ are, on average, higher than corresponding vertical component magnitudes, further discussed in the 1987 to 1989 SGB seismicity report. An area for future research might be the assessment of local variations in b-value, and the comparison of b-values for SGBSN data with those of adjacent parts of Nevada, California and Utah. Variations are, according to frequently espoused dogma, significant because many seismologists believe that b-value varies inversely with regional stress,

$$b \propto \frac{1}{S}.$$

In particular, we may wish to compare b-values within the SGB with that of the Central Nevada Seismic Belt, which has experienced several $M_L > 6$ earthquakes in the twentieth century.

Some Comments on Regional Stresses and SGBSN Focal Mechanisms

The nature of the regional crustal stress tensor, how it varies laterally, vertically, temporally, and how smooth or rough it is are all topics of great interest and great uncertainty both in the SGB and in most continental crust. Earthquake focal mechanisms could theoretically provide constraints on the range of plausible stress tensors, especially if more were known about local material and fault properties, e.g., whether new faults are being formed or old faults are being reactivated, if the latter, whether a Coulomb-Mohr criterion of failure is appropriate (Mogi, 1974), and if so, the range of coefficients of friction, μ, that are present (Morrow and Byerlee, 1984), the local pore pressure, and the thermal regime. A commonly invoked assumption in stress field determinations is that sliding occurs in the direction of maximum shear stress on a given plane. This assumption is plausible for smooth planes of weakness; it is less plausible for corrugated or undulating surfaces, on which motion is probably parallel to the direction of corrugation. In the same vein, if μ has directional variation (i.e., if μ is a second order tensor rather than a scalar), the underlying physics may require a revision of the standard assumptions.

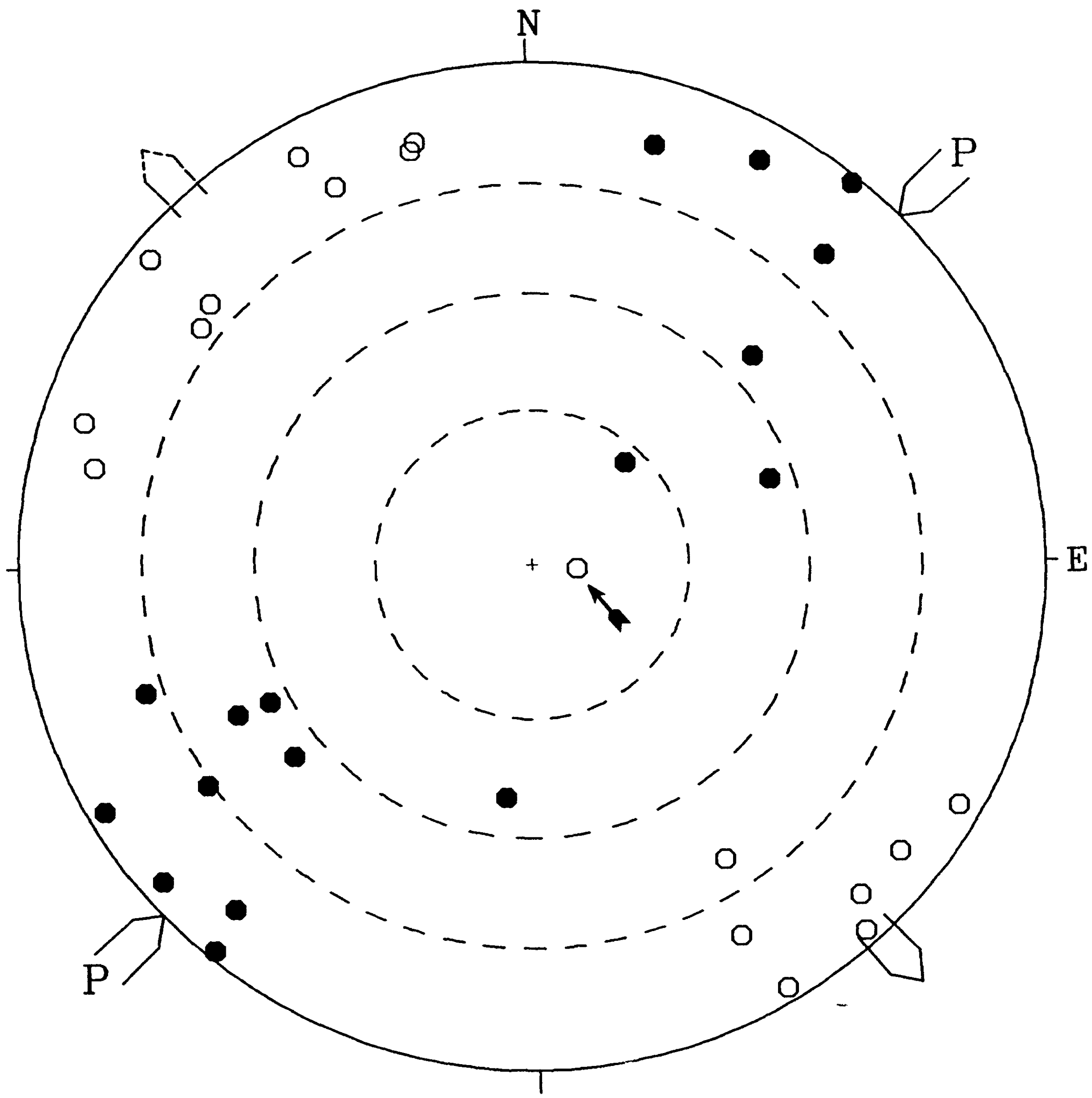
The focal mechanism solutions for SGBSN data are themselves somewhat ambiguous, both as a result of the regional character of the station distribution and the uncertainty in the source-to-station raypaths. Some of these uncertainties are discussed in the 1987 to 1989 SGB seismicity report. P-wave first motions are modeled as direct or refracted by HYPO71, depending on assumed focal depth (some cases well constrained, other cases poorly constrained) and source-to-station distance (on average, a much better-constrained parameter). If wrongly modeled, raypath take-off angles may affect the range of permissible double-couple mechanisms. Amplitudes of first motions vary strongly with source radiation pattern as well as with path effects, and thus provide ambiguous guidelines to the analyst trying to determine whether a particular arrival is direct or refracted. With this uncertainty, focal mechanisms are nevertheless reported in Appendix D as a preferred solution and, optionally, one or two alternate solutions. The alternate mechanisms of Appendix D attempt to display the range of the most-poorly constrained parameter, which could be the strike, dip, or rake angle of one of the nodal planes. When fitting a potential stress tensor to a population of earthquake focal mechanisms, the analyst must consider both nodal planes of a given "preferred" solution, and should also consider the nodal planes from alternate solutions. Thus, an exponential growth in computer time is indicated by the permutations and combinations: each earthquake may have a preferred solution and two (or more) solutions exhibiting the maximum plausible variation in strike, dip, and rake angles. For a population of n earthquakes, one may wish to consider $\geq 6^n$ permutations of nodal planes when analysing the appropriateness of a given stress tensor, and must consider a wide range of initially plausible stress tensors. Michael (1987) reviews various algorithms for stress tensor determination, in which the algorithm either preselects the preferred plane or uses both nodal planes; pre-selection is biased by the relative importance the algorithm places on various slip criteria, and no pre-selection generally widens the confidence regions for principal compressive stress directions and relative amplitudes. Whether stress field inversions should be performed for the set or some subset of focal mechanisms computed from 1979 through 1990 by analysis of SGBSN data is debatable, but what the focal mechanisms can do is to provide a data base that may generally support or contradict the hypothesis that some specific uniform stress tensor, determined by other means in the vicinity of Yucca Mountain, extends regionally through some portion of the southern Great Basin.

Two less computer-intensive and assumption-dependent ways of describing the focal mechanism data are to compute the average P-axis and T-axis directions, and to intersect compression dihedra and tension dihedra, respectively. These analyses have been performed for mechanisms reported in prior SGBSN data reports (e.g., Rogers and others, 1987). Table 2 presents 17 focal mechanism solutions for SGB earthquakes of 1990, without consideration of plausible alternate solutions. For 16 of these solutions (solution 10 excluded), the average P-axis, as determined by Watson statistics (Schuenemeyer and others, 1972), trends North 46.6° East, with inclination −6.8°, and the average T-axis trends North 41.9° West, with inclination −3.0°. Figure 14 is a plot of those 17 P and T axes, with arrows in the directions of the just-noted average values. The intersection of 16 P-dihedra of those focal mechanisms (the reverse-slip solution shown in Figure D10 is again excluded) yields a pair of small area patches on the lower hemisphere, one in the northeast quadrant, and a small sub-horizontal one in the southwest quadrant; the T-dihedra intersect in larger patches centered in the northwest and southeast directions, in cones having radius about 15° (Figure 15). These regions of intersection are plausible areas to search for the directions of maximum and minimum principal compressive stresses when seeking a uniform

Table 2. Preliminary Southern Great Basin Focal Mechanisms for 1990

St, ***strike of nodal plane***; Dp, ***dip of nodal plane***; Rk, ***rake of slip vector***; Tr, ***trend of axis***; Pl, ***plunge of axis***. Convention for rake angle sign: $-180° < Rk < 0°$ for mechanisms having a component of normal slip, and $0° < Rk < 180°$ for mechanisms having a component of reverse slip. ML, ***local (SGB) magnitude***; Tsm, ***type of source mechanism***: 1, ***single event focal mechanism***; 2, ***composite focal mechanism***. Nodal planes: No inferred fault planes for these focal mechanisms are presented here, although for many of the mechanisms, inferences about the preferred nodal plane based on lineations of epicenters and/or on the state of tectonic crustal stress are possible. For example, if the maximum horizontal compressional stress is oriented at about North 20° to 30° East, then right-lateral strike slip may be expected on steeply dipping, north-trending fault planes with greater likelihood than left-lateral strike slip on east-trending fault planes, other mechanical conditions being equal. Rmk: Remarks, designated by *, means that $(SV/P)_z$ amplitude ratios were used to constrain or help determine the focal mechanism. Alternate focal mechanisms: dashed-line solutions in the figures of Appendix D represent equally plausible focal mechanism solutions for the same data. Alternate solutions are not shown in this table.

Figure Index	Origin time (UTC) Date	Time	Focal depth (km)	Magnitude (ML)	Geologic Quadrangle	Tsm	Nodal planes 1st St	1st Dp	1st Rk	2nd St	2nd Dp	2nd Rk	Principal axes P Tr	P Pl	T Tr	T Pl	B Tr	B Pl	Rmk
1	900126	10:34	5.06	2.4	Cane Spring, Nev.	1	12.	66.	-147.	267.	61.	-28.	232.	40.	139.	3.	45.	50.	*
2	900215	11:49	7.03	2.3	Scrugham Peak, Nev.	1	284.	85.	-30.	16.	61.	-174.	236.	24.	334.	17.	95.	60.	
3	900227	8:16	6.46	2.0	Scrugham Peak, Nev.	1	211.	64.	-136.	98.	51.	-34.	70.	49.	331.	8.	235.	40.	
4	900421	17:55	6.64	2.0	Bonnie Claire SE, Nev.	1	87.	77.	16.	353.	75.	167.	220.	2.	310.	20.	125.	70.	*
5	900513	0:48	6.20	1.9	Bonnie Claire SE, Nev.	1	240.	73.	-58.	356.	36.	-149.	187.	52.	307.	21.	50.	30.	
6	900604	8:47	0.97	1.5	Springdale, Nev.	1	15.	90.	-175.	285.	85.	0.	240.	4.	150.	3.	20.	85.	
7	900624	23:55	4.79	1.9	Black Mountain, Nev.	1	288.	73.	-42.	33.	50.	-157.	243.	42.	346.	14.	90.	45.	
8	900722	8:17	2.62	1.1	Calico Hills, Nev.	1	198.	84.	141.	293.	51.	8.	252.	22.	148.	31.	10.	50.	*
9	900725	0:52	8.05	2.2	Stovepipe Wells, Cal.	1	314.	40.	82.	144.	50.	97.	230.	5.	95.	83.	320.	5.	
10	900802	5:15	5.00	1.1	Springdale, Nev.	1	355.	88.	175.	85.	85.	2.	40.	2.	310.	5.	150.	85.	
11	900803	20:23	-1.03	2.3	Springdale, Nev.	1	75.	87.	-10.	165.	80.	-177.	30.	9.	120.	5.	240.	80.	
12	900821	22:00	2.38	1.9	Stonewall Pass, Nev.	1	181.	57.	-114.	41.	40.	-58.	42.	68.	288.	9.	195.	20.	
13	900905	4:58	5.00	2.0	Springdale, Nev.	1	94.	76.	-43.	197.	48.	-161.	47.	40.	152.	17.	260.	45.	*
14	900906	10:32	0.77	2.2	Springdale, Nev.	1	89.	85.	-19.	181.	71.	-175.	43.	17.	136.	10.	255.	70.	
15	901029	2:37	4.96	2.6	Springdale, Nev.	1	355.	89.	-165.	265.	75.	-1.	221.	11.	129.	10.	360.	75.	
16	901101	7:51	5.98	2.6	Mellan, Nev.	1	290.	77.	-38.	30.	53.	-164.	243.	36.	345.	15.	94.	50.	
17	901213	1:01	2.72	2.8	Gold Point, Nev.	1	150.	90.	-160.	60.	70.	0.	17.	14.	283.	14.	150.	70.	



SGB Focal Mechanism P and T axes 1990

● P axis

○ T axis

Figure 14.– Inclinations (plunges) and azimuths of 17 focal mechanism preferred solution P axes and T axes for 1990 data reported in Appendix D are plotted on the equal area lower hemisphere projection. The inward-directed tabs represent the orientation of the average P-axis for all but one those data, and the outward-directed tabs represent the orientation of the average T-axis for all but one of those data (the exceptional Tucki Mtn. reverse-slip mechanism, whose T-axis has an arrow pointing towards it, is excluded from the averaging computations). Dashed circles represent inclinations of 25°, 45°, and 65°, respectively.

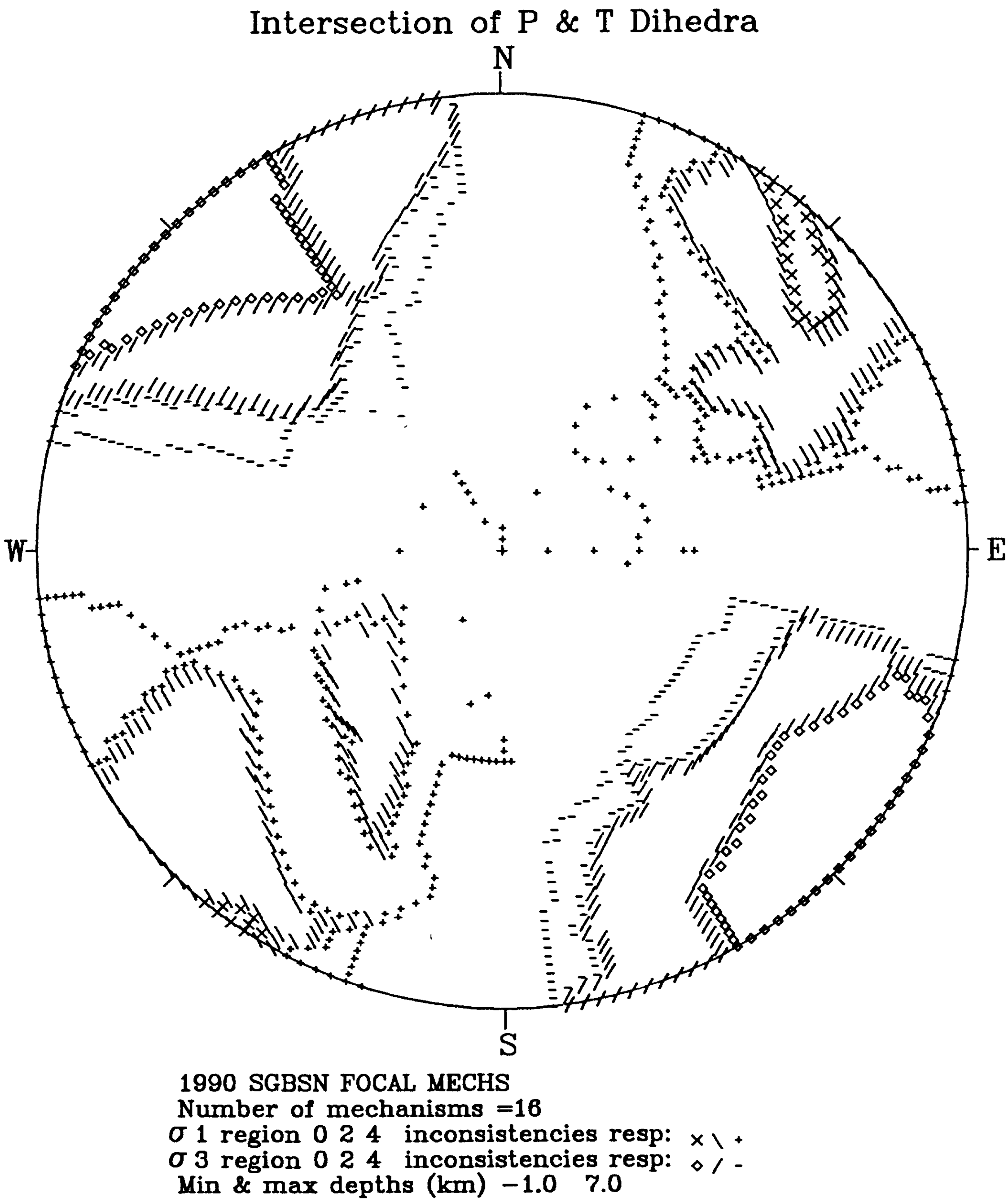


Figure 15.– Intersection of compressional first motion quadrants, containing the T axes of 16 of the 17 focal mechanisms of 1990, may constrain the location of minimum principal compressive stress direction, σ_3, in a region where the stress tensor is uniform. The zones of intersection of the T quadrants of those 16 focal mechanisms are shown surrounded by diamonds. Similarly, the zones of intersection of the 16 focal mechanism P quadrants, which may constrain the location of the maximum principal compressive stress direction, σ_1, are shown surrounded by × symbols. Regions where all but one and all but two quadrants intersect are also shown in this figure.

stress tensor that attempts to fit this set of focal mechanisms. The average P and T directions, and the zones of quadrant intersection, agree fairly well with those of focal mechanism data presented in previous SGBSN reports. For example, the average P-axis for SGB earthquake focal mechanisms for the period 1987 through 1989 trends North 38° East, with inclination $-5°$, and the average T axis for those data trends North 57° West, with inclination $2.8°$. The differences between the two data set averages result from a few anomalous solutions and from the broader geographic region sampled in the 1987-1989 report. Individual and average focal mechanism data for a much broader region, including all of Nevada and adjacent parts of California, are presented in Rogers and others (1991).

Summary and Conclusions

• Yucca Mountain continues to exhibit very low rates of seismicity, but is surrounded by many zones of relatively elevated, but low-magnitude, seismicity, such as Sarcobatus Flat, southern Nevada Test Site (Rock Valley-Cane Spring fault zones), and Timber Mountain.

• Caldera boundaries should be considered as controlling structures for seismicity in the vicinity of Yucca Mountain and Timber Mountain.

• Although no swarms, clusters, or magnitude 3+ earthquakes have been recorded in the Oasis Valley west of the calderas of western NTS, more than a decade of seismic monitoring by the SGBSN reveals an approximately linear north-south trending epicenter pattern with length $\approx$ 50 km in that valley. This epicenter trend is about 25 km west of the center of Yucca Mtn.

• The fact that predominantly strike-slip seismicity is observed in at least equal abundance to predominantly normal-slip seismicity during the monitoring period 1979-1990 suggests that seismically active portions of the southern Great Basin enjoy a stress field having relatively large maximum horizontal compressive stress, σ_H, comparable or even slightly greater than the vertical crustal stress, $\sigma_v \approx \rho g z$.

• The nearly complete absence of seismicity on Death Valley and Furnace Creek faults during the monitoring period 1979 through 1990, coupled with the presence of seismicity on the east side of the Panamint Mountains, suggest that the local seismically active structures may be rangefront faults, perhaps at their intersection with gently dipping faults spanning central Death Valley from the western Black Mountains to the eastern Panamint Mountains.

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NOTE: Parenthesized numbers following each cited reference are for U.S. Department of Energy OCRWM Records Management purposes only and should not be used when ordering the publication.

Appendix A

Earthquake locations for the year 1990
and quadrangle map names to which locations are keyed

The local hypocenter summary column headings are for the most part self-explanatory. UTC is Universal Coordinated Time. Horizontal error equals $\sqrt{sdx^2 + sdy^2}$, where sdx and sdy refer to the HYPO71 standard errors in longitude and latitude, respectively. Vertical error is the HYPO71 standard error in depth (sdz). "AZI GAP" is the azimuthal gap, that is, the largest angle subtended by the epicenter and any two circularly adjacent stations with positive phase weight. "Q1" and "Q2" represent two HYPO71 hypocenter quality estimates as defined by Lee and Lahr (1975). "DS" is a code for data source: A for analog seismograms, (data scaled from develocorder films, starting depth, z_0, at 7 km for iterations), I for data scaled from digital seismograms. Various values are tried for z_0, the initial hypocenter guess. x_0 and y_0 are always taken to be near the earliest-reporting station. When equal final RMS values occur for solutions having different z_0, the solution derived from the $z_0 = 7.0$ km starting value is reported (although the choice is arbitrary).

Mca is the coda-average magnitude, Md is the duration magnitude estimate, MLh is local magnitude from horizontal-component instruments, MLv is local magnitude from vertical-component instruments, MLc is the maximum of station magnitudes from overdriven (clipped) records. Amplitudes recovered from vertical-component data are multiplied by 1.75 to provide an approximate horizontal-equivalent amplitude. The depths may be followed by one or two stars. One star means that the depth-of-focus standard error estimate was very large ($\geq$ half crustal thickness). Two stars imply that the depth was fixed by HYPO71 during the last several iterations for hypocenter, because the data lacked resolving power for that parameter. DELMIN is the minimum source to station distance in km, and RMS RES. is the root-mean-square travel time residual, defined in the text of this report. #N PH. is the number of (P+S) phases having positive weight in the solution. Finally, U.S.G.S. quadrangle is the name of $7\frac{1}{2}$ or 15 minute topographic quadrangle in which the epicenter lies.

Appendix A excludes all "low-frequency" seismicity associated with NTS nuclear device tests. Such phenomena include aftershocks at ultra-shallow hypocentral depths and cavity collapses. Such events, though having a tectonic significance, are strongly associated in time and space with testing, and their inclusion in the Appendix A seismicity catalog would probably bias any effort to determine natural seismicity rates in the northern NTS from this catalog. See Appendix C of this report for further details on these "low-frequency" events.

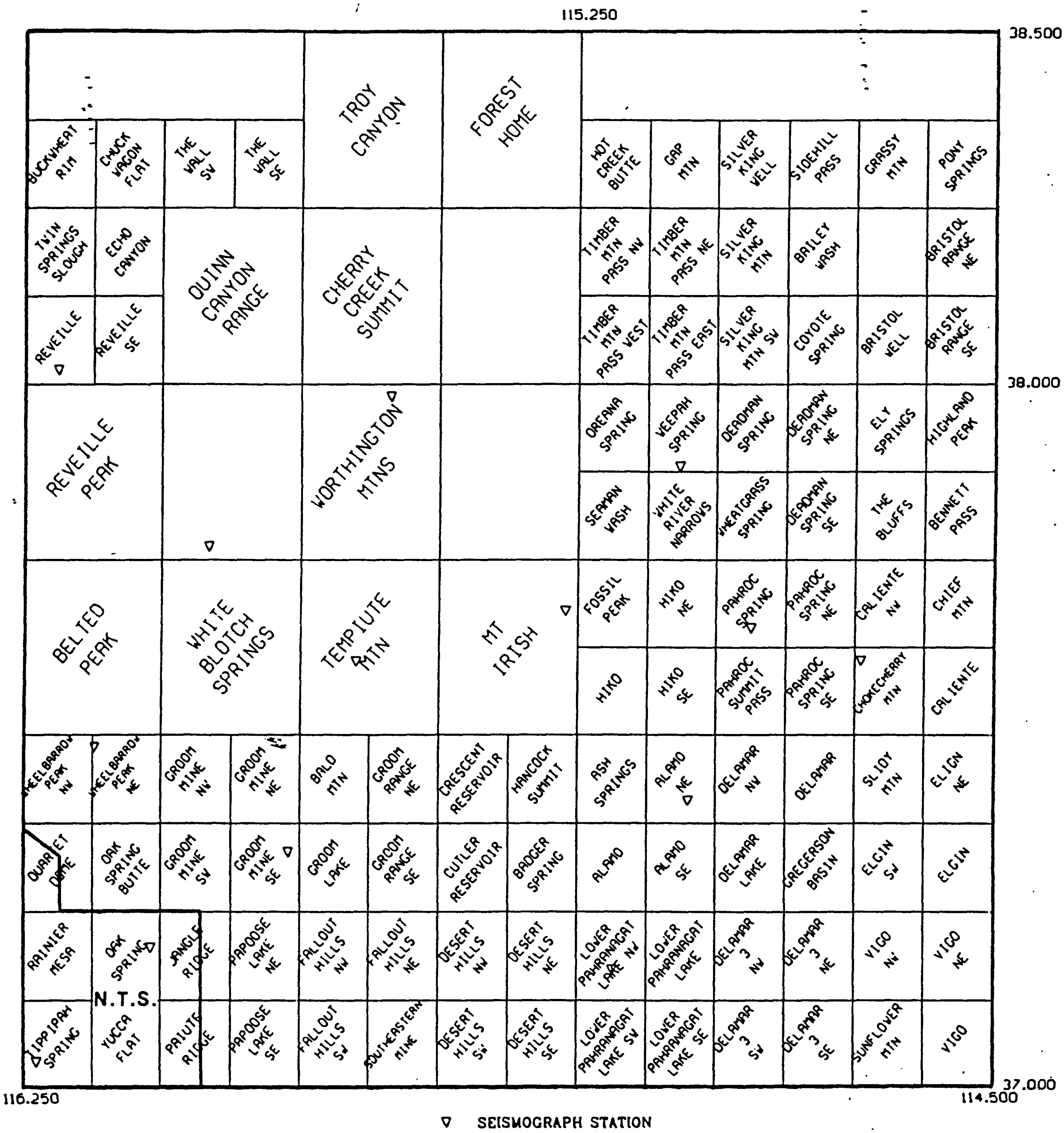

Figure A1.– Quadrangle names in the northeast quarter of the southern Great Basin.

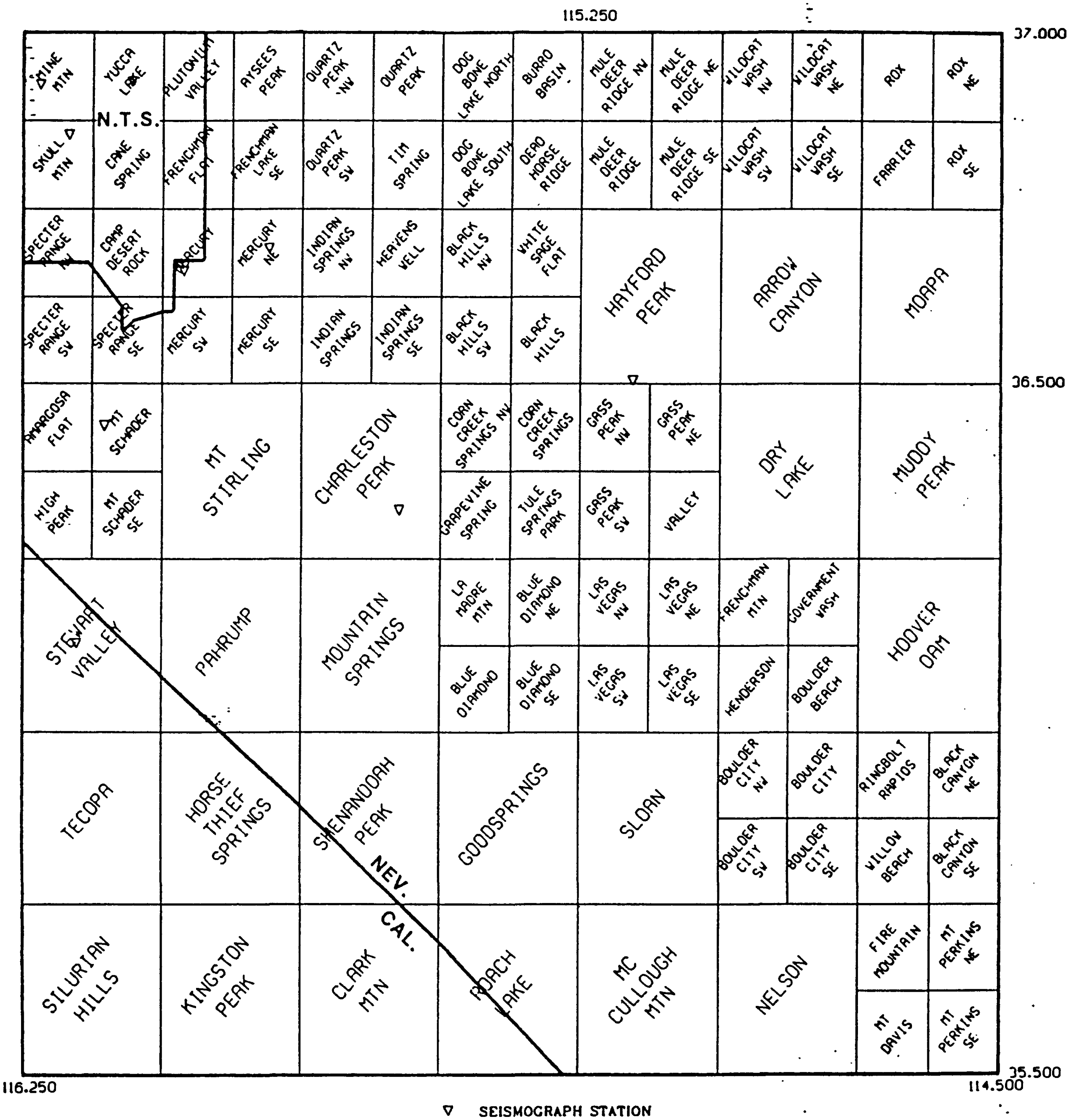

Figure A2.– Quadrangle names in the southeast quarter of the southern Great Basin.

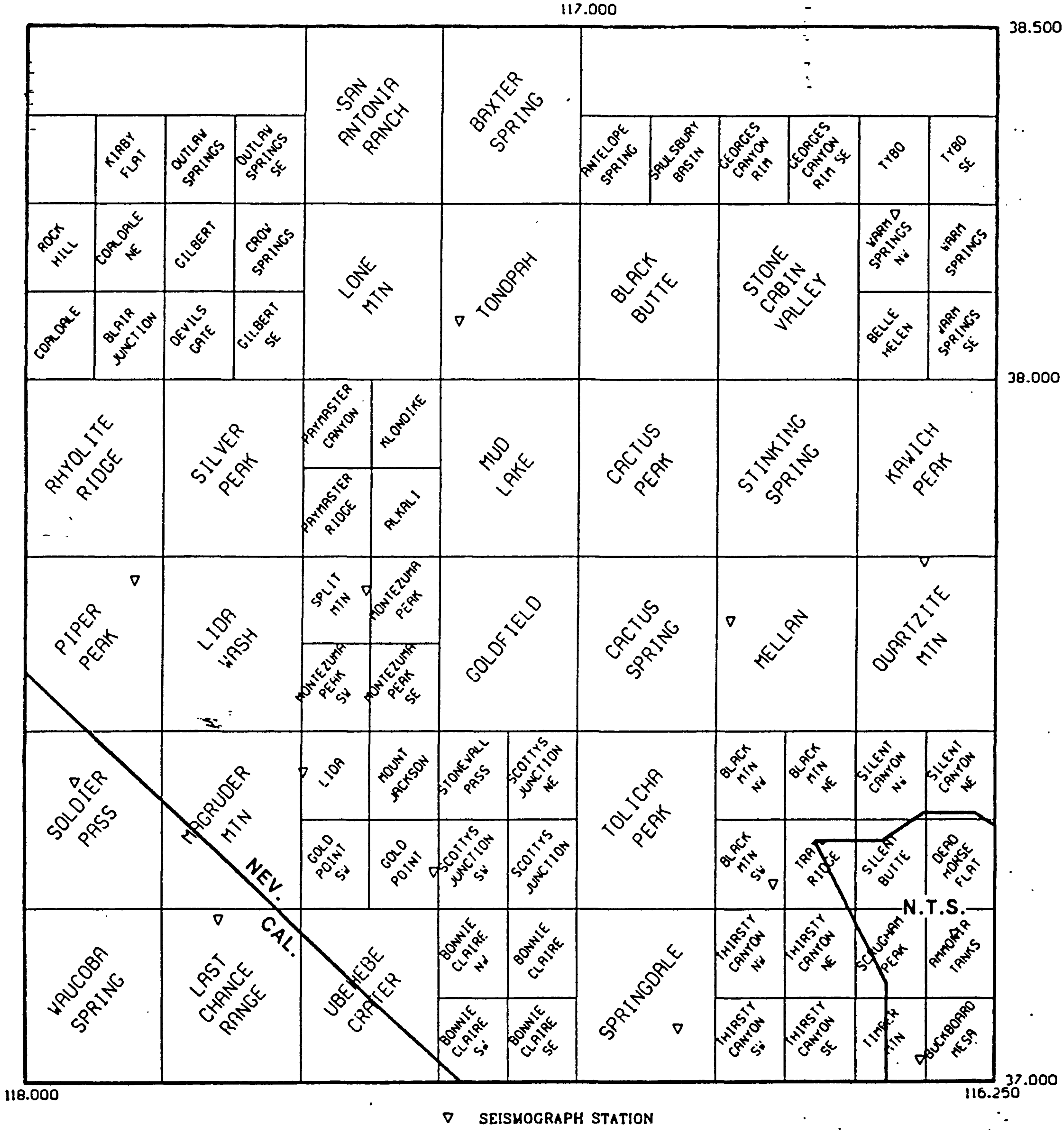

Figure A3.– Quadrangle names in the northwest quarter of the southern Great Basin.

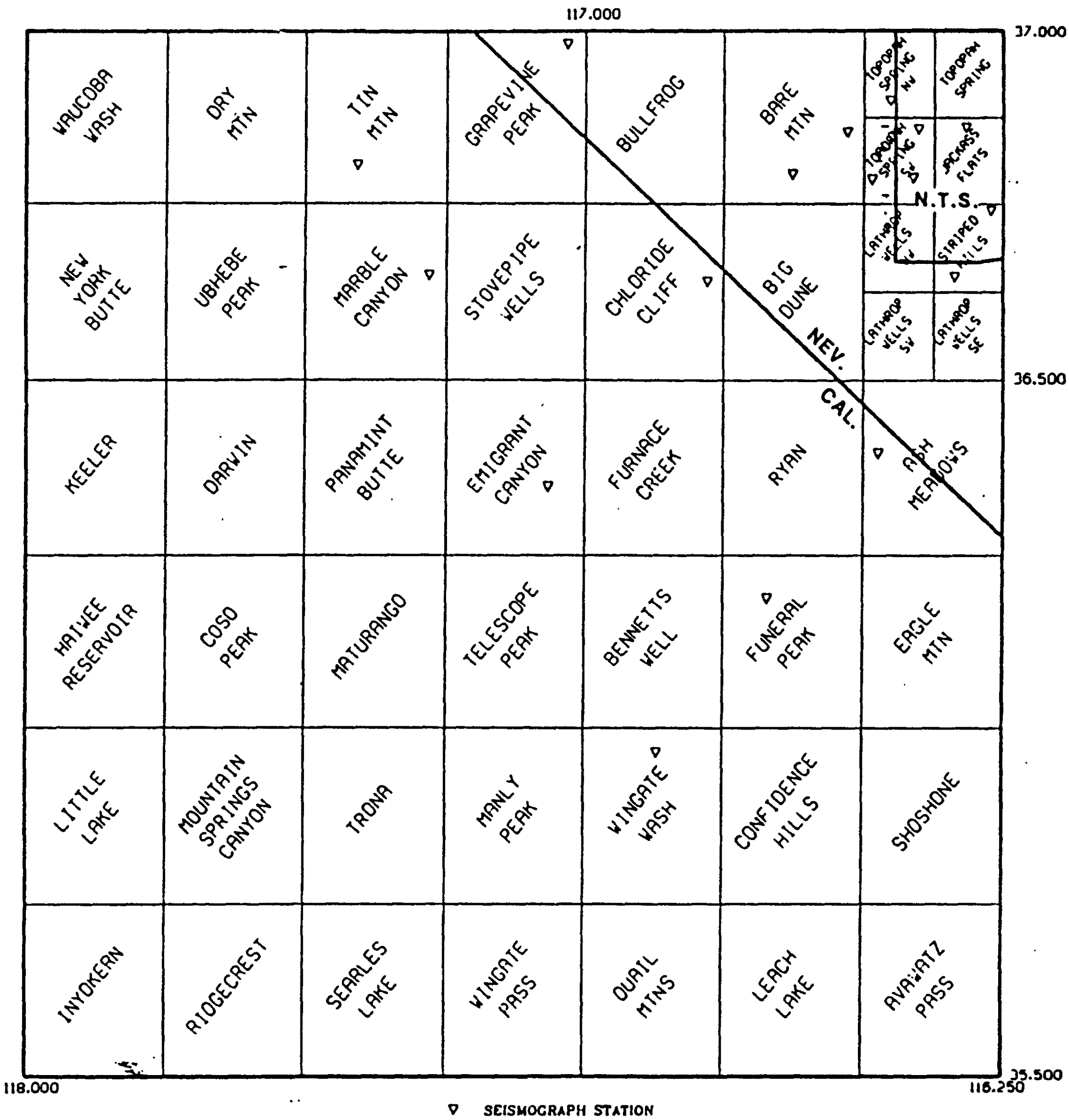

Figure A4.– Quadrangle names in the southwest quarter of the southern Great Basin.

1990 LOCAL HYPOCENTER SUMMARY – SGB EARTHQUAKES

DATE – TIME (UTC)			LATITUDE (DEG. N)	LONGITUDE (DEG. W)	STAND ERROR H(KM)	DEPTH (KM)	STAND ERROR Z(KM)	AZI GAP (DEG)	QQD 12S	MAGNITUDE ESTIMATES Mca	Md	MLh	MLv	MLc	DEL-MIN (KM)	RMS RES. (SEC)	#N PH.	U.S.G.S. QUADRANGLE
JAN	2	12:28:37	36.712	115.555	0.4	1.69	2.7	110	BCA		2.55				22.9	0.13	19	HEAVENS WELL
	2	17:45:21	36.943	114.514	4.4	-1.54	1.8	299	CDI			3.74			64.9	0.17	13	ROX NE
	3	1:40:47	36.778	115.647	0.9	-0.36	1.5	169	BCI	1.67	1.10		0.87		17.4	0.19	21	QUARTZ PEAK SW
	3	20:41:44	37.341	115.369	2.9	5.00*	——	179	CDA		1.76				29.1	0.20	5	BADGER SPRING
	4	21:50:23	36.713	116.253	0.6	5.49	0.9	123	ABI	1.16		1.57	1.26		3.7	0.14	13	STRIPED HILLS
	5	17:40:39	36.722	118.040	3.8	-1.02	2.6	278	CDI	1.84			1.71		57.4	0.20	11	***QUAD. NOT LISTED*
	6	12:11:36	38.441	115.394	4.3	3.80*	——	260	CDU	1.97			1.82		53.9	0.13	9	FOREST HOME
	6	16:43:54	36.756	116.627	2.2	2.97	2.3	147	BCI	1.42			0.99		4.5	0.26	11	BARE MTN
	6	18:12: 1	38.285	117.515	——	26.23	——	274	ADU	2.20			1.97		93.7	0.02	4	OUTLAW SPRINGS SE
	6	18:57:42	36.962	114.649	2.2	-0.88	2.4	228	BDI	2.36		2.27	2.17		53.1	0.30	17	ROX
	6	20:21:24	37.140	115.041	3.6	3.06*	——	265	CDI			0.78			13.3	0.27	8	LOWER PAHRANAGAT LAKE
	7	1:53:15	37.883	114.903	2.6	0.19	2.5	245	CDI				0.89		14.6	0.14	6	DEADMAN SPRING
	7	4:41:23	37.019	117.503	0.7	3.05*	——	162	CCI	1.03	0.97				14.1	0.25	20	LAST CHANCE RANGE
	7	14:30:18	35.771	117.577	1.1	8.09	1.0	296	BDI	1.92	1.68	1.94			67.5	0.20	27	MOUNTAIN SPRINGS CANYON
	7	18:46:30	37.115	117.031	0.3	0.64	0.5	127	BCI				0.61		14.8	0.15	21	BONNIE CLAIRE SE
	7	18:45:27	37.113	117.036	0.3	0.95	0.5	104	ACI	1.59		1.68	0.90		14.6	0.12	24	BONNIE CLAIRE SE
	8	21: 4:52	37.324	118.382	2.2	2.97	4.7	282	BDU						43.6	0.15	16	***QUAD. NOT LISTED*
	9	7: 7:42	36.797	115.920	0.6	6.97	1.4	256	ADA		1.32				15.6	0.08	11	FRENCHMAN FLAT
	10	9:21:36	36.495	117.263	0.7	0.16	0.7	191	ADI	1.62			1.57		16.8	0.14	21	PANAMINT BUTTE
	10	11:20:56	36.737	115.911	0.4	-1.94	0.5	148	ACI	1.38			1.03		9.6	0.13	15	MERCURY
	10	11:38:53	37.444	115.085	0.4	0.46	0.4	84	BBI	2.62		3.51	2.86		5.1	0.16	40	ALAMO NE
	10	17:43:44	36.222	115.103	——	6.85	——	213	DDI	1.08	0.97		1.09		44.8	2.16	4	LAS VEGAS NE
	11	3: 5:21	37.320	117.557	0.6	0.46	0.9	71	BCI	2.37	1.29	1.11	1.39		12.6	0.16	13	MAGRUDER MTN
	12	0: 9:20	37.314	117.335	0.6	7.24	1.1	148	ACI	0.76		0.81	-0.09		7.0	0.10	9	GOLD POINT
	12	0:27:15	37.256	115.035	0.4	-1.65	0.2	223	ADI	1.57		1.27	1.04	1.3	16.6	0.01	6	ALAMO SE
	12	0:38: 8	35.473	115.605	2.6	-1.13	2.2	238	DDU	2.09		2.26	2.06		88.0	1.03	18	***QUAD. NOT LISTED*
	12	1:47:35	37.295	117.339	0.4	6.04	0.9	75	ABI	1.47				1.8	7.3	0.14	20	GOLD POINT
	12	3:43:23	37.305	117.336	0.7	6.54	1.1	135	ACI			1.11	1.08		7.0	0.07	9	GOLD POINT
	12	3:47:17	37.435	115.081	0.6	2.67	0.9	81	AAI	2.09			2.12		4.1	0.13	19	ALAMO NE
	12	11:48:29	37.303	117.347	0.3	1.93	1.2	74	BBI	1.88			1.79		7.9	0.15	26	GOLD POINT
	12	14:19:25	36.340	116.869	0.7	9.89	2.2	106	BCI			1.33	1.07		21.6	0.15	10	FURNACE CREEK
	12	17:29:57	37.309	117.337	0.4	7.00	1.0	71	BBI	2.04	1.76		2.03	1.8	7.1	0.17	37	GOLD POINT
	13	3:44:34	37.403	117.515	0.4	7.92	0.6	97	ABI	1.81			1.20		4.5	0.10	12	MAGRUDER MTN
	13	4:59:32	37.310	117.326	0.4	8.51	0.6	146	ACI	1.26		1.27	1.20	1.1	6.2	0.08	13	GOLD POINT
	13	5:31:15	36.800	116.307	0.4	1.77	2.5	107	BBI	1.16			0.71		7.1	0.11	13	JACKASS FLATS
	13	16:56: 1	37.313	117.327	0.7	7.70	1.0	149	ACI	1.34			1.32	1.7	6.3	0.14	13	GOLD POINT
	14	0:28:41	37.455	114.098	8.4	2.55*	——	313	DDI	2.10		2.25	2.11		59.0	0.08	8	***QUAD. NOT LISTED*
	14	3:40:15	37.854	114.918	2.9	-1.99	2.3	227	CDI	1.97	2.03	2.02	2.13		13.7	0.39	12	WHEATGRASS SPRING
	14	12:28:51	37.113	117.034	0.3	7.54	1.6	104	ABI	1.14			1.20		14.5	0.13	23	BONNIE CLAIRE SE
	14	14:57:55	36.850	116.393	0.3	2.44	0.6	61	AAI	1.20	0.45		0.61		1.0	0.11	18	TOPOPAH SPRING SW
	14	19:49:34	37.116	117.033	0.3	5.34	2.2	105	BCI	1.10		0.80	1.11		14.9	0.11	18	BONNIE CLAIRE SE
	14	23:15:58	36.852	116.183	0.8	1.71	1.0	138	ACI	1.16	0.94		0.85		1.3	0.10	14	SKULL MTN
	15	4:52:54	36.461	116.162	0.3	10.99	0.4	77	AAI	1.28	0.96		1.54	1.5	5.7	0.09	21	AMARGOSA FLAT
	15	11:32:37	36.360	115.822	0.6	5.01	4.8	228	BDI	1.70		1.62	1.35		26.8	0.10	19	MT STIRLING

1990 LOCAL HYPOCENTER SUMMARY - SGB EARTHQUAKES

DATE	TIME (UTC)	LATITUDE (DEG. N)	LONGITUDE (DEG. W)	STAND ERROR H(KM)	DEPTH (KM)	STAND ERROR Z(KM)	AZI GAP (DEG)	QQD 12S	MAGNITUDE ESTIMATES Mca	Md	MLh	MLv	MLc	DEL-MIN (KM)	RMS RES. (SEC)	#N PH.	U.S.G.S. QUADRANGLE
JAN 15	21:50:23	36.631	116.331	0.4	2.84	1.0	52	BAI	1.91		2.15	1.97	2.0	1.8	0.21	42	STRIPED HILLS
15	22:41: 4	36.404	116.971	0.3	11.37	0.7	99	ABI			1.30	1.10		11.7	0.04	9	FURNACE CREEK
16	3:17:50	37.385	115.420	1.0	-1.54	1.5	109	CCI	2.00				2.0	31.7	0.46	19	CRESCENT RESERVOIR
16	4:47:39	37.634	115.827	0.6	1.36	1.9	65	CCI	1.27			1.55	2.0	15.9	0.32	26	WHITE BLOTCH SPRINGS
16	5: 8: 8	36.361	115.826	0.7	5.99	3.2	198	BDU	1.57		1.16	1.36		26.5	0.15	28	MT STIRLING
16	5:26: 0	36.598	115.887	1.1	4.44	2.5	195	BDI	1.41			1.15		9.6	0.29	20	MERCURY SW
16	5:32:46	37.355	115.259	0.6	-0.03	0.8	90	CCI	2.08			1.89		19.3	0.32	28	BADGER SPRING
16	9: 6:15	37.355	115.261	1.3	3.03*	—	105	CCI	1.63		1.14	1.16		19.5	0.29	9	BADGER SPRING
16	13: 3:39	35.962	117.440	1.1	3.13	5.2	274	CDI	1.81			1.89		51.6	0.25	29	TRONA
17	4:31:32	37.545	114.608	2.6	0.82	2.1	278	CDI	1.88		1.34	1.38		13.3	0.07	7	CALIENTE
17	7:39:52	37.003	116.595	9.7	2.33*	—	332	DDI	1.51					17.1	1.07	8	THIRSTY CANYON SE
17	9:48:25	37.343	115.454	5.7	4.00*	—	296	DDI	1.34			1.44		30.6	0.18	5	CUTLER RESERVOIR
17	10:57:16	36.640	116.331	0.4	1.90	0.7	106	ABI	1.32		1.17	0.97		0.9	0.12	19	STRIPED HILLS
17	12:35:26	37.002	116.199	0.5	1.83	1.1	85	ABI	2.33		1.62			8.7	0.14	20	TIPPIPAH SPRING
18	2:27: 7	36.647	116.313	1.1	1.96	1.1	247	BDI				0.62	1.1	2.4	0.12	11	STRIPED HILLS
19	1:19: 7	37.021	117.500	0.7	4.89	4.9	160	BCI				1.28		13.9	0.16	13	LAST CHANCE RANGE
19	4:26:46	37.285	115.892	1.3	4.59	7.5	137	CCI	1.30			1.37		11.9	0.25	10	GROOM MINE SW
19	10:16:42	38.043	115.263	—	4.97	—	240	DDI	2.80			1.16		29.8	0.56	4	
19	10:58:60	36.028	114.732	3.5	7.03	3.9	208	CDI				1.85		12.0	0.25	10	HOOVER DAM
19	19:29:39	37.201	118.406	3.0	3.42	6.4	282	CDU	2.11			2.58		50.7	0.28	15	***QUAD. NOT LISTED*
20	1:11:49	36.562	116.196	0.4	0.98	0.6	144	ACI	1.57			0.93		15.8	0.10	18	SPECTER RANGE SW
20	5:22: 2	36.500	116.283	0.7	8.05	2.9	124	BCI	1.22	1.11	0.69	1.13	1.8	16.9	0.19	14	LATHROP WELLS SE
20	9:42:19	36.824	116.292	0.6	6.14	1.0	96	ABI	1.07			0.79		4.9	0.12	11	JACKASS FLATS
20	12:18: 3	36.635	116.322	0.8	2.97	0.4	166	ACI				0.91		1.9	0.09	10	STRIPED HILLS
20	17:45:13	36.644	116.313	0.4	8.96	0.4	132	ABI	1.21			1.22		2.4	0.07	15	STRIPED HILLS
21	2: 8:17	35.366	115.454	6.1	3.92	8.8	252	DDU				2.19		88.4	0.40	10	***QUAD. NOT LISTED*
21	7:39:34	37.627	118.099	1.1	3.05*	—	287	CDI	1.56		1.80	1.64	1.9	27.8	0.18	19	***QUAD. NOT LISTED*
22	1: 4:16	37.139	115.156	2.3	5.69	1.8	194	BDI	2.02			2.08		4.3	0.24	12	LOWER PAHRANAGAT LAKE
22	1:24:10	37.400	115.416	5.5	-1.02	9.4	287	DDI			0.90			32.4	0.15	5	CRESCENT RESERVOIR
22	1:32:12	37.158	115.324	3.4	3.93	10.3	317	CDI	1.48		1.26	1.20		12.2	0.16	6	DESERT HILLS NE
22	2: 7:25	37.095	115.148	2.3	5.70	2.4	263	BDI			1.91			8.9	0.13	7	LOWER PAHRANAGAT LAKE
22	2:23:49	37.125	115.177	2.9	8.57	1.4	258	CDI	1.42		1.77	1.60		4.9	0.15	8	LOWER PAHRANAGAT LAKE
22	2:26:29	37.171	115.213	—	4.21	—	292	ADI						2.3	0.00	4	LOWER PAHRANAGAT LAKE
22	4:16:22	37.140	115.170	2.1	4.26	1.4	298	BDI			1.13			3.5	0.06	7	LOWER PAHRANAGAT LAKE
22	5: 5:17	37.134	115.166	4.6	6.15	3.6	210	CDI	2.06		1.82			4.3	0.35	8	LOWER PAHRANAGAT LAKE
22	10:15:21	37.132	115.159	3.5	2.54	3.7	293	CDI	1.38			1.07		4.8	0.10	7	LOWER PAHRANAGAT LAKE
22	21:41:45	37.271	115.052	2.9	10.82	2.5	190	CDI	1.54		-0.10	1.19		15.0	0.10	8	ALAMO SE
22	23:25:52	38.338	117.306	4.0	-1.23	3.4	257	CDI				1.44		71.1	0.29	15	SAN ANTONIA RANCH
22	23:56:46	38.693	117.095	6.5	-1.22*	—	271	DDU						76.9	0.32	14	***QUAD. NOT LISTED*
23	3:38:46	37.944	118.206	1.8	-1.13*	—	315	DDU				1.74		43.7	0.34	10	***QUAD. NOT LISTED*
23	13:56:36	37.630	115.839	1.0	2.50	2.7	62	CCI	1.37		1.37	1.38	1.8	16.8	0.37	20	WHITE BLOTCH SPRINGS
23	15:38:52	37.003	116.300	0.1	-1.45	0.1	123	ABI	1.39			1.16		7.4	0.03	15	BUCKBOARD MESA
23	19:12:50	37.014	116.296	0.4	1.42	1.2	135	ACI	1.16			0.87		6.4	0.10	16	BUCKBOARD MESA
23	22: 7:43	36.782	116.041	1.1	10.69	2.4	207	BDI	1.32			0.81		14.0	0.06	5	CANE SPRING

1990 LOCAL HYPOCENTER SUMMARY - SGB EARTHQUAKES

DATE	TIME (UTC)	LATITUDE (DEG. N)	LONGITUDE (DEG. W)	STAND ERROR H(KM)	DEPTH (KM)	STAND ERROR Z(KM)	AZI GAP (DEG)	QQD 12S	MAGNITUDE ESTIMATES Mca	Md	MLh	MLv	MLc	DEL-MIN (KM)	RMS RES. (SEC)	#N PH.	U.S.G.S. QUADRANGLE
JAN 23	22: 7:54	36.479	116.249	0.4	7.08	1.5	90	ABI	1.34		1.14	1.20	1.6	13.6	0.12	15	AMARGOSA FLAT
23	23:26:52	37.495	115.278	1.4	4.36*	——	130	CCI	1.79			1.20		22.3	0.12	7	HANCOCK SUMMIT
24	5:28:38	37.118	115.148	1.3	6.89	1.0	243	BDI	1.74		1.49			6.6	0.13	10	LOWER PAHRANAGAT LAKE
24	16:10:16	37.000	116.215	0.9	-1.33	0.7	241	ADI	1.14			0.54		15.8	0.15	13	TIPPIPAH SPRING
24	19:58:14	37.803	114.938	10.2	3.05*	——	232	DDI	1.41		1.90	1.31		14.5	0.80	5	WHEATGRASS SPRING
25	19:39: 8	37.736	114.664	3.6	-1.40	2.6	270	CDI	1.68			1.43		15.8	0.17	7	CALIENTE NW
25	19:41: 5	37.747	114.637	1.9	1.67	3.5	278	BDI				1.10		18.0	0.08	6	CALIENTE NW
25	20:12:26	37.770	114.658	2.5	1.32	5.2	272	CDI				1.19		19.5	0.07	6	THE BLUFFS
25	23:34: 0	37.172	116.207	0.4	-1.57	0.6	56	BCI	2.51		2.60	2.39	2.3	11.4	0.23	40	RAINIER MESA
26	2:41:47	37.072	116.168	1.0	3.31	1.3	282	ADI	0.82			0.92		6.7	0.12	13	TIPPIPAH SPRING
26	3:13: 7	36.810	116.118	0.4	4.01	2.7	87	BBI	1.74		2.02	1.51		6.7	0.17	28	CANE SPRING
26	3:17:26	36.790	116.091	0.5	5.23	1.9	129	ABI				0.64		9.9	0.11	14	CANE SPRING
26	3:20:41	36.805	116.114	0.4	0.22	0.7	119	ABI	1.28			0.86		7.4	0.11	15	CANE SPRING
26	3:48:34	38.488	115.369	4.7	-1.13	4.1	266	DDU	2.26			2.05		59.5	0.51	21	FOREST HOME
26	9: 9:56	37.555	117.168	0.6	0.20	0.9	124	BCI	1.03		1.48	1.38		25.0	0.23	19	GOLDFIELD
26	9:55:56	36.809	116.116	0.3	0.69	0.5	87	BBI	1.46			1.04	1.0	6.9	0.17	29	CANE SPRING
26	9:56:27	36.815	116.113	0.5	4.36	1.0	154	ACI				0.79	1.3	6.6	0.12	19	CANE SPRING
26	10: 1:26	36.808	116.114	0.4	0.45	0.6	88	BBI	1.51	1.37		1.23	1.8	7.1	0.19	32	CANE SPRING
26	10: 2:36	36.818	116.113	0.5	4.21	2.2	95	BBI	1.56			0.96	1.8	6.4	0.17	20	CANE SPRING
26	10: 3:20	36.813	116.115	0.6	5.10	2.4	88	BBI	1.64		1.28	1.33	1.8	6.6	0.25	28	CANE SPRING
26	10:21:34	36.806	116.115	0.3	4.76	1.0	93	ABI				1.02	1.3	7.2	0.08	14	CANE SPRING
26	10:22:41	37.107	116.863	0.3	0.65	0.5	102	ACI	1.59			1.10		13.0	0.11	20	SPRINGDALE
26	10:34:16	36.812	116.120	0.4	5.17	1.4	47	BBI	2.25		2.46	2.31	2.5	6.4	0.22	55	CANE SPRING
26	10:55:56	36.806	116.107	0.5	5.94	0.8	289	ADI				0.51		7.7	0.04	7	CANE SPRING
26	11:10:10	36.805	116.112	0.2	1.75	0.7	95	ABI	1.38			1.00		7.5	0.12	24	CANE SPRING
26	11:14: 3	36.807	116.118	0.3	1.51	1.0	50	BBI	1.43			1.68		6.9	0.19	38	CANE SPRING
26	11:17:36	36.798	116.121	0.4	0.31	0.7	51	BBI	1.38			1.24		7.5	0.18	36	CANE SPRING
26	11:23:56	36.808	116.120	0.7	3.52	1.7	155	BCI	1.42			1.14		6.8	0.19	22	CANE SPRING
26	11:55:27	36.804	116.115	0.5	0.16	0.8	87	BBI	1.60			1.35		7.4	0.29	36	CANE SPRING
26	12:28:51	36.807	116.114	0.5	2.78	1.4	51	BBI	1.65	1.07		1.36		7.1	0.23	35	CANE SPRING
26	13:47:51	36.811	116.117	0.4	4.37	1.7	88	BBI	1.43			1.29		6.7	0.18	29	CANE SPRING
26	16:25:42	36.805	116.117	0.3	1.46	0.9	155	ACI				1.24		7.2	0.08	17	CANE SPRING
26	17:17:40	36.808	116.112	0.3	0.65	0.5	95	ABI	0.78			0.66		7.2	0.13	24	CANE SPRING
26	17:31:53	36.811	116.123	0.4	5.44	1.5	47	BBI	1.86		2.38	2.06		6.3	0.21	35	CANE SPRING
26	17:52:37	36.811	116.116	0.4	4.55	2.5	88	BBI	1.98		1.93	1.90		6.7	0.18	29	CANE SPRING
26	17:56:10	36.806	116.116	0.5	3.83	1.1	156	ACI				0.74		7.1	0.09	14	CANE SPRING
27	2:11:51	36.810	116.114	0.3	0.86	0.5	88	BBI	1.68		1.26	1.39		7.0	0.16	33	CANE SPRING
27	2:15:11	36.824	116.138	1.1	6.75	0.6	272	BDI				0.30		4.3	0.04	5	SKULL MTN
27	2:35:29	36.786	116.105	0.7	4.02	2.8	174	BCI				0.80		9.5	0.08	6	CANE SPRING
27	2:35:34	36.805	116.110	0.5	1.25	5.9	121	CBI				0.95		7.6	0.13	7	CANE SPRING
27	3:27:38	36.814	116.107	0.4	5.03	1.4	97	ABI	1.29			1.15		7.1	0.11	17	CANE SPRING
27	3:44:34	36.813	116.113	0.7	5.77	1.9	186	ADI	1.25			0.73		6.8	0.10	9	CANE SPRING
27	9: 3:22	38.514	115.349	5.7	1.09*	——	285	DDI	2.25		2.18	1.98		62.8	0.29	7	***QUAD. NOT LISTED*
27	11:29:56	37.297	115.371	0.7	10.67	5.5	146	CCI	1.54		1.16	1.08		21.7	0.07	6	BADGER SPRING

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DATE	TIME (UTC)	LATITUDE (DEG. N)	LONGITUDE (DEG. W)	STAND ERROR H(KM)	DEPTH (KM)	STAND ERROR Z(KM)	AZI GAP (DEG)	QQD 12S	MAGNITUDE ESTIMATES Mca	Md	MLh	MLv	MLc	DEL-MIN (KM)	RMS RES. (SEC)	#N PH.	U.S.G.S. QUADRANGLE
JAN 27	12:12:14	35.695	117.682	8.8	-1.83	6.6	304	DDI	2.38			2.40		79.4	0.38	15	RIDGECREST
27	13:20:23	38.031	118.313	3.7	3.60	5.4	309	CDI	2.19			2.24	2.6	57.0	0.36	12	***QUAD. NOT LISTED*
27	21:49:36	36.652	116.263	6.3	-1.02	5.3	268	DDI				0.77		6.9	0.60	5	STRIPED HILLS
28	2:28:32	37.814	114.705	2.3	3.07*	—	264	CDI	2.54			2.32	2.3	23.2	0.20	10	THE BLUFFS
28	3:53: 4	37.810	114.699	1.9	3.09*	—	265	CDI	1.94			1.45		22.9	0.18	9	THE BLUFFS
28	17:42:12	37.121	115.161	3.0	4.16	2.9	196	CDI			1.70	1.51		5.7	0.24	8	LOWER PAHRANAGAT LAKE
28	19:36:16	37.728	114.672	8.2	-1.02	6.2	299	DDI	1.47		1.33	1.65	1.6	14.7	0.22	9	CALIENTE NW
29	3:42:38	36.826	117.659	1.8	11.83	3.3	228	BDI				1.25		22.8	0.25	14	DRY MTN
29	7:19:58	37.156	115.189	3.0	7.00	1.1	250	CDI	1.59		1.39			1.4	0.35	5	LOWER PAHRANAGAT LAKE
29	14:40:56	36.710	116.278	0.2	7.69	0.3	76	AAI	1.37			1.12	0.8	3.7	0.06	19	STRIPED HILLS
29	16:29:43	37.133	115.174	2.9	5.45	1.6	256	CDI			1.70			4.2	0.16	8	LOWER PAHRANAGAT LAKE
29	19:31: 3	36.137	114.594	4.8	3.06*	—	236	DDI			2.15	2.19		28.0	0.51	10	HOOVER DAM
30	5:54: 0	37.127	117.844	1.5	-1.77	1.4	218	BDI	1.69			1.69		21.1	0.27	15	WAUCOBA SPRING
31	1:57:30	36.645	116.471	0.7	6.03	2.4	179	BCI	1.94		0.88	1.49	1.6	11.7	0.17	20	LATHROP WELLS NW
31	3: 8:16	37.549	117.168	0.6	7.00	3.6	122	BCI			1.28	1.20		25.5	0.15	12	GOLDFIELD
31	6:20:42	36.155	115.481	0.7	10.84	0.8	252	ADI	2.06		1.93	1.93	2.0	20.7	0.11	24	LA MADRE MTN
31	18:49:46	37.377	115.222	1.0	2.54	2.8	95	BCI				1.22	2.3	15.5	0.29	19	ASH SPRINGS
31	23:33:50	37.227	117.002	2.3	10.89	7.9	180	CCI			1.07	1.19	1.9	24.1	0.29	7	BONNIE CLAIRE
31	23:46:51	37.851	116.141	0.9	2.73	4.9	105	BCI				1.23		20.3	0.17	9	REVEILLE PEAK
FEB 1	0:42:28	35.587	115.589	4.1	3.09*	—	256	DDI			1.30	1.67		78.7	0.34	7	CLARK MTN
1	12:59: 2	37.171	117.474	0.4	8.91	1.4	123	ABI			1.26	1.12		16.7	0.11	13	UBEHEBE CRATER
1	14: 6:53	37.263	115.005	3.1	17.77	2.5	205	CDI			1.06	0.95		16.4	0.04	5	ALAMO SE
3	20:29:28	36.677	116.091	0.3	10.49	0.8	105	ABI	1.05			0.92		11.8	0.10	18	CAMP DESERT ROCK
4	15:18:38	36.931	116.759	0.4	9.45	1.6	94	BCI	1.39			1.39		19.1	0.18	29	BULLFROG
4	15:19:57	36.931	116.760	0.3	1.70	1.1	71	ACI	1.47			0.88		19.0	0.13	30	BULLFROG
4	15:21:21	36.930	116.758	0.3	4.25	6.2	99	CCI	1.22			0.62		18.9	0.13	25	BULLFROG
4	18:38: 5	36.928	116.761	0.3	5.17	3.1	43	BCI	1.68			1.31	1.9	18.9	0.20	44	BULLFROG
4	21: 9:17	36.928	116.779	1.4	3.11*	—	142	CCI				0.55		19.9	0.30	15	BULLFROG
6	16:46:42	36.616	116.239	8.0	0.48	6.3	287	DDI				0.95		9.6	0.08	5	SPECTER RANGE SW
6	22:42:19	37.170	115.189	4.2	2.79	2.0	121	CBI				0.97		0.2	0.22	9	LOWER PAHRANAGAT LAKE
7	11:27:23	37.119	117.031	0.2	0.94	0.4	129	ACI				0.86		15.2	0.07	19	BONNIE CLAIRE SE
7	13: 5:52	36.444	114.913	0.8	-1.75	1.4	159	BCI	2.27					23.1	0.19	18	DRY LAKE
7	15: 9:46	37.235	116.413	0.5	2.01	1.4	42	BBI	2.83			1.72		8.2	0.25	35	SCRUGHAM PEAK
7	17: 3:56	36.222	116.936	1.7	3.04*	—	159	CDI				1.07		24.3	0.16	5	BENNETTS WELL
8	7:40: 4	36.677	117.148	0.7	-0.16	1.0	81	BCI		1.35	1.66	1.27		12.2	0.25	16	STOVEPIPE WELLS
8	13:25:58	37.045	116.221	0.9	4.91	0.9	206	BDI	1.43			0.86		1.1	0.18	18	TIPPIPAH SPRING
9	0:44:17	36.861	117.475	0.8	4.93	1.5	181	BDI			1.50	1.57		8.8	0.16	15	TIN MTN
9	1:22:36	37.130	116.777	0.3	-0.43	0.3	93	ABI	1.77		1.09	1.34	1.5	4.9	0.13	27	SPRINGDALE
9	2:21:58	36.865	117.461	0.9	2.99	1.2	189	BDI				1.37	1.4	8.4	0.16	13	TIN MTN
9	10:50:45	36.858	117.476	0.7	4.96	2.3	182	BDI	1.63		1.62	1.56	1.7	8.7	0.18	23	TIN MTN
9	11:22:48	37.224	117.547	0.2	11.57	0.4	120	ABI	1.70		1.75	1.67		8.9	0.09	26	LAST CHANCE RANGE
9	11:47:41	37.222	117.548	0.2	11.07	0.4	134	ABI			1.45	1.42	1.5	8.9	0.06	15	LAST CHANCE RANGE
9	14: 8:26	37.477	115.764	0.5	4.37	3.9	59	BCI	1.77			1.84	2.3	16.0	0.15	16	GROOM MINE NE
9	23:46:36	35.579	115.579	2.2	1.09*	—	227	CDU				2.05		80.0	0.20	12	CLARK MTN

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DATE	TIME (UTC)	LATITUDE (DEG. N)	LONGITUDE (DEG. W)	STAND ERROR H(KM)	DEPTH (KM)	STAND ERROR Z(KM)	AZI GAP (DEG)	QQD 12S	MAGNITUDE ESTIMATES Mca	Md	MLh	MLv	MLc	DEL-MIN (KM)	RMS RES. (SEC)	#N PH.	U.S.G.S. QUADRANGLE
FEB 10	16:17: 9	37.914	114.472	2.4	7.00	4.6	293	CDI	2.39				3.0	41.5	0.30	15	***QUAD. NOT LISTED*
10	17: 1:12	37.643	114.877	0.3	4.98	0.4	141	ACI				0.73		5.4	0.04	7	PAHROC SPRING
10	17:30:59	37.474	117.242	0.4	0.01	0.7	137	ACI				1.35		19.3	0.10	15	STONEWALL PASS
11	2:13:15	37.452	118.331	4.8	-1.54	3.8	284	CDU				2.22		37.7	0.28	17	***QUAD. NOT LISTED*
11	2:26:35	37.163	116.607	0.2	4.71	0.9	89	ACI				0.92		10.7	0.06	16	THIRSTY CANYON NE
11	3:16:30	37.427	114.653	2.2	-1.02	1.8	252	BDI	2.01			1.98	1.9	21.3	0.17	16	SLIDY MTN
11	20:52:44	37.569	117.457	0.7	-0.33	1.0	102	BCI			1.33	1.35		14.7	0.18	13	MONTEZUMA PEAK SW
11	20:55:56	37.565	117.464	0.4	2.08	1.0	86	ACI				1.68	1.9	14.2	0.13	19	MONTEZUMA PEAK SW
11	21: 1:49	37.571	117.447	0.6	7.16	1.7	93	BCI			1.16	1.20		15.2	0.17	14	MONTEZUMA PEAK SW
11	21: 5:57	37.546	117.166	0.7	7.00	4.2	121	BCI			1.26	1.28		25.8	0.23	17	GOLDFIELD
12	16:42:26	37.529	118.466	2.5	2.74	6.7	310	CDI				2.31		50.8	0.24	15	***QUAD. NOT LISTED*
13	1:21:40	37.062	116.131	0.2	0.13	0.5	121	ABI				0.68		9.1	0.08	18	TIPPIPAH SPRING
13	6:36:35	35.994	117.839	1.5	10.35	3.2	289	BDI			2.31	2.04		79.8	0.16	12	LITTLE LAKE
15	11:13: 6	37.198	116.384	0.4	7.41	0.5	68	AAI	1.67		1.48	1.40		5.6	0.12	22	SCRUGHAM PEAK
15	11:39:32	37.211	116.365	0.7	9.80	0.8	155	BCI			1.25	1.14		3.6	0.21	23	AMMONIA TANKS
15	11:39:54	37.196	116.386	0.6	6.76	0.9	135	ACI			0.88	0.97	1.1	5.8	0.10	14	SCRUGHAM PEAK
15	11:45: 2	37.200	116.384	0.5	6.92	0.7	140	ACI			1.02	0.86		5.6	0.07	16	SCRUGHAM PEAK
15	11:49:58	37.193	116.380	0.3	6.58	0.5	44	BAI	2.24		2.38	2.35	2.5	5.5	0.15	56	SCRUGHAM PEAK
15	11:55:16	37.201	116.380	0.5	7.28	0.8	140	ACI				1.06		5.2	0.12	19	SCRUGHAM PEAK
15	12:59:24	37.196	116.382	0.3	6.65	0.5	68	AAI	1.85		1.54	1.37	1.5	5.5	0.10	21	SCRUGHAM PEAK
15	13: 3:19	37.194	116.380	0.4	6.40	0.7	46	BAI	2.05		1.76	1.98	1.8	5.4	0.17	36	SCRUGHAM PEAK
15	13: 9: 4	37.174	116.389	0.7	0.28	0.6	163	BCI			2.09	2.02		7.3	0.16	21	SCRUGHAM PEAK
15	13: 9:44	37.191	116.379	0.6	6.24	0.9	136	ACI			1.96		2.2	5.5	0.12	15	SCRUGHAM PEAK
15	13:11:12	37.199	116.381	0.4	7.30	0.6	173	ACI			0.97	0.94	1.1	5.3	0.07	13	SCRUGHAM PEAK
15	13:13:56	37.195	116.377	0.3	7.47	0.4	165	ACI			1.23			5.2	0.05	15	SCRUGHAM PEAK
15	13:15: 7	37.188	116.381	0.3	6.26	0.5	135	ABI	2.08		1.85	2.06	2.3	5.8	0.12	34	SCRUGHAM PEAK
15	13:28:58	37.192	116.377	0.3	7.45	0.5	162	ACI	1.77		1.71	1.47		5.3	0.08	21	SCRUGHAM PEAK
15	13:35:12	37.193	116.379	0.3	7.12	0.8	63	AAI	2.47		2.73	2.78	2.8	5.4	0.15	45	SCRUGHAM PEAK
15	13:39:54	37.204	116.366	0.5	8.59	0.5	174	ACI	1.28			1.36		3.9	0.07	18	AMMONIA TANKS
15	13:45: 1	37.192	116.380	0.3	6.77	0.4	163	ACI	2.26		1.79	1.58	1.1	5.6	0.10	25	SCRUGHAM PEAK
15	13:48:52	37.199	116.373	0.3	7.47	0.4	170	ACI			1.21	1.02	1.2	4.7	0.05	19	AMMONIA TANKS
15	13:59:48	37.179	116.407	0.4	-1.69	0.6	160	ACI			0.98	1.14	1.0	8.4	0.06	12	SCRUGHAM PEAK
15	14:14:48	37.194	116.381	0.3	6.53	0.5	166	ACI	1.47			1.21		5.6	0.08	19	SCRUGHAM PEAK
15	17:18:21	37.204	116.380	0.7	7.35	0.9	179	ACI			1.16	1.04	1.2	5.1	0.09	14	SCRUGHAM PEAK
15	17:41:57	37.202	116.378	0.4	7.71	0.6	142	ACI			1.54	1.08	1.1	5.0	0.10	22	SCRUGHAM PEAK
18	9:50: 3	37.196	116.384	0.3	6.30	0.5	53	AAI			1.33	1.51		5.7	0.09	24	SCRUGHAM PEAK
18	15: 0:47	36.862	115.953	0.5	0.71	0.7	129	BCI				1.12		11.9	0.16	18	FRENCHMAN FLAT
19	0: 1:58	37.198	116.385	0.2	6.50	0.4	71	AAI	1.61		1.32	1.25		5.7	0.07	20	SCRUGHAM PEAK
19	1:12:41	37.200	116.382	0.7	6.86	1.1	139	ACI			1.05	0.95		5.4	0.06	13	SCRUGHAM PEAK
19	5:31: 1	37.200	116.381	0.4	7.35	0.6	74	AAI			1.01	1.03	1.2	5.3	0.09	13	SCRUGHAM PEAK
19	5:32:42	37.202	116.381	0.3	6.75	0.5	67	AAI	1.09		1.18	1.34		5.3	0.10	26	SCRUGHAM PEAK
19	5:40:37	37.199	116.384	0.2	6.76	0.4	103	ABI				1.04	1.1	5.6	0.06	14	SCRUGHAM PEAK
19	7:33: 1	37.197	116.384	0.3	6.40	0.5	135	ACI			1.30	1.20	1.4	5.7	0.06	16	SCRUGHAM PEAK
19	7:40: 4	36.730	116.274	0.5	4.61	0.5	85	AAI	1.39		2.04	0.88		1.4	0.12	16	STRIPED HILLS

1990 LOCAL HYPOCENTER SUMMARY - SGB EARTHQUAKES

DATE	TIME (UTC)	LATITUDE (DEG. N)	LONGITUDE (DEG. W)	STAND ERROR H(KM)	DEPTH (KM)	STAND ERROR Z(KM)	AZI GAP (DEG)	QQD 12S	MAGNITUDE ESTIMATES Mca	Md	MLh	MLv	MLc	DEL-MIN (KM)	RMS RES. (SEC)	#N PH.	U.S.G.S. QUADRANGLE
FEB 19	7:49:46	37.203	116.382	0.4	6.98	0.7	142	ACI	1.62		1.20	1.14		5.4	0.07	15	SCRUGHAM PEAK
21	10:38:27	37.770	115.344	6.1	7.00*	——	233	DDI	1.41			1.06		32.7	0.13	5	WORTHINGTON MTN
21	23:24:38	37.204	116.372	0.4	8.24	0.4	178	ACI				0.83	1.2	4.4	0.06	12	AMMONIA TANKS
21	23:35:27	36.151	116.044	5.7	15.17	4.3	190	DDU				1.27		10.3	0.55	8	STEWART VALLEY
22	0: 4: 9	37.335	115.753	0.8	2.41	0.6	84	BAI	1.45		1.61	1.67	1.0	1.7	0.22	19	GROOM MINE SE
22	2: 9:22	37.205	116.381	0.6	7.67	0.9	146	ACI			0.82	0.95		5.2	0.09	13	SCRUGHAM PEAK
22	11: 2:10	37.197	116.381	0.3	6.87	0.4	48	AAI			1.53	1.60	1.9	5.4	0.10	32	SCRUGHAM PEAK
22	11: 6:20	37.209	116.380	0.6	7.83	0.8	152	ACI	1.80		0.81	1.06		5.0	0.08	16	SCRUGHAM PEAK
22	16:36:55	37.207	116.378	0.5	7.83	0.7	148	ACI			0.75	0.84		4.9	0.07	13	SCRUGHAM PEAK
22	16:41:31	37.207	116.373	0.6	7.98	0.8	149	ACI				0.84		4.5	0.06	12	AMMONIA TANKS
22	18: 6:43	37.209	116.375	0.5	8.39	0.7	151	ACI				0.93		4.6	0.07	12	SCRUGHAM PEAK
22	21:31:31	37.216	116.367	1.5	9.96	1.8	196	BDI				0.93		3.9	0.14	8	AMMONIA TANKS
23	2: 0: 9	35.721	118.020	2.4	9.04	1.7	317	BDI	2.43			2.53		107.7	0.24	14	***QUAD. NOT LISTED*
23	3:23:37	37.268	114.955	1.3	7.13	3.8	215	BDI	1.88		1.61	1.48		17.6	0.15	10	DELAMAR LAKE
23	4: 5:13	35.692	117.973	3.1	3.04*	——	317	CDI			1.84	1.87		104.4	0.12	7	INYOKERN
24	0:47:48	35.602	115.559	6.7	2.18*	——	239	DDU			1.56			79.3	0.24	7	CLARK MTN
24	9:49:55	37.106	117.824	1.4	5.09	6.9	212	CDI	1.70		1.33		1.7	21.1	0.19	13	WAUCOBA SPRING
24	14:40: 7	37.568	114.769	2.2	11.45	2.4	187	BDI	1.86		1.46	1.35	1.6	5.0	0.17	7	PAHROC SPRING SE
24	15:12:22	37.598	115.335	0.7	1.33	2.6	103	BCI	1.76		1.36	1.86		10.2	0.19	15	MT IRISH
25	2:38: 9	36.837	117.758	1.1	1.44	3.4	228	BDI	2.10		1.70		2.5	31.7	0.18	25	WAUCOBA WASH
25	5:34:31	35.950	117.920	2.0	8.58	1.8	295	BDI	2.18		2.25	2.31		88.5	0.25	16	LITTLE LAKE
26	0:41:39	37.197	116.379	0.5	8.10	0.7	135	ABI				0.84		5.3	0.10	14	SCRUGHAM PEAK
26	1:11: 2	37.182	116.409	1.6	4.64	5.4	124	CBI				0.75		8.3	0.17	12	SCRUGHAM PEAK
26	1:39:41	37.205	116.368	0.5	9.78	0.5	143	ACI			1.01	0.72		4.0	0.13	21	AMMONIA TANKS
26	1:40:18	37.200	116.378	0.6	8.45	0.9	138	ACI		0.75		0.85		5.0	0.10	15	SCRUGHAM PEAK
26	1:41:22	37.193	116.383	0.4	6.86	0.6	166	ACI				1.44	1.1	5.7	0.07	13	SCRUGHAM PEAK
26	1:41:41	37.196	116.386	0.4	6.56	0.7	65	AAI	1.82		1.58	1.42	1.9	5.9	0.15	28	SCRUGHAM PEAK
26	1:46:42	37.199	116.383	0.5	7.49	0.7	138	ACI				0.89		5.5	0.06	13	SCRUGHAM PEAK
26	2:26:25	37.198	116.384	0.4	7.45	0.6	137	ACI			1.12	0.87	1.1	5.7	0.07	17	SCRUGHAM PEAK
26	8: 3:35	37.199	116.386	0.2	6.93	0.4	73	AAI				1.11	1.2	5.7	0.07	20	SCRUGHAM PEAK
26	14: 7:27	37.510	118.341	6.4	-1.68	4.5	300	DDU	2.00			2.14		39.6	0.22	13	***QUAD. NOT LISTED*
26	21:54:36	36.996	116.297	0.3	10.31	0.4	95	ABI				1.07		7.6	0.05	14	TOPOPAH SPRING
26	22:24:13	36.019	116.869	11.2	7.00*	——	155	DCI				0.95		6.1	1.04	7	BENNETTS WELL
27	8:16:59	37.197	116.379	0.3	6.46	0.6	46	AAI	2.20		1.89	1.91	2.3	5.3	0.11	33	SCRUGHAM PEAK(vp/vs= 1.81)
27	8:19:59	37.196	116.386	0.3	6.81	0.5	70	AAI	1.75		1.47	1.17	1.4	5.9	0.09	16	SCRUGHAM PEAK
27	17:49:36	37.200	115.771	0.6	8.22	1.7	90	BBI			1.39	1.72		14.8	0.16	21	PAPOOSE LAKE NE
27	19:56:45	36.806	115.986	0.5	6.37	1.4	152	ACI				1.06		15.3	0.10	13	FRENCHMAN FLAT
28	4:14:23	37.386	115.423	4.9	-1.02	4.7	208	CDI			1.49	1.31		31.9	0.39	6	CRESCENT RESERVOIR
28	7:32:37	37.617	117.839	1.9	10.93	3.1	181	BDI				1.35		11.4	0.21	10	PIPER PEAK
28	7:37:28	37.600	117.817	1.3	5.61	5.2	163	CCI				1.21		12.8	0.11	9	PIPER PEAK
28	7:39:56	37.589	117.822	0.3	3.04*	——	164	CCI	1.57		1.80	1.84	1.6	14.1	0.12	19	PIPER PEAK
28	8: 3:53	37.598	117.811	3.3	1.77	9.8	159	CCI				2.03	1.7	13.0	0.18	24	PIPER PEAK
28	9: 5:41	37.594	117.810	3.2	1.87	9.3	158	CCI				1.31		13.4	0.14	13	PIPER PEAK
28	9:16:44	37.592	117.819	5.2	2.15*	——	163	DCI				1.58		13.7	0.15	13	PIPER PEAK

1990 LOCAL HYPOCENTER SUMMARY - SGB EARTHQUAKES

DATE (UTC)	TIME (UTC)	LATITUDE (DEG. N)	LONGITUDE (DEG. W)	STAND ERROR H(KM)	DEPTH (KM)	STAND ERROR Z(KM)	AZI GAP (DEG)	QQD 12S	MAGNITUDE ESTIMATES Mca	Md	MLh	MLv	MLc	DEL-MIN (KM)	RMS RES. (SEC)	#N PH.	U.S.G.S. QUADRANGLE
FEB 28	9:22:15	37.594	117.807	2.8	1.99	7.8	156	CCI			1.13	1.28		13.5	0.09	7	PIPER PEAK
28	9:24:17	37.591	117.811	1.6	1.66	4.7	158	BCI			1.12	1.25		13.7	0.08	8	PIPER PEAK
28	10: 0:14	37.597	117.819	0.9	2.84	2.5	164	BCI	1.81				2.2	13.2	0.12	17	PIPER PEAK
28	12: 9:29	37.603	117.818	0.9	8.50	2.3	164	BCI				1.35		12.5	0.13	11	PIPER PEAK
28	13:45:12	37.600	117.820	1.5	5.03	6.7	165	CCI				1.05		12.8	0.20	11	PIPER PEAK
28	15:34:18	36.343	114.887	1.9	-1.54	2.4	173	CCI	2.25			2.26	2.0	30.4	0.34	12	DRY LAKE
28	17:13: 6	37.603	117.841	2.6	3.44*	——	179	CCI				1.05		12.8	0.18	7	PIPER PEAK
28	17:36:25	37.597	117.813	1.1	2.76	3.1	160	BCI	1.24		1.41	1.52		13.2	0.13	12	PIPER PEAK
28	18: 2:40	37.600	117.807	1.1	5.40	4.6	157	BCI				1.11		12.8	0.15	10	PIPER PEAK
28	18:18:57	37.601	117.808	0.9	5.76	3.6	158	BCI				1.26		12.7	0.16	12	PIPER PEAK
28	18:56:55	37.596	117.818	0.9	2.67	2.7	163	BCI			1.64	1.80	2.2	13.3	0.14	20	PIPER PEAK
28	20: 9:10	37.596	117.812	2.9	2.09	7.9	160	CCI	1.51		1.85	1.71		13.2	0.12	12	PIPER PEAK
28	20:55:44	37.544	117.727	2.2	2.95*	——	110	CCI				1.16		20.1	0.31	6	LIDA WASH
28	21:27: 8	37.596	117.811	2.1	1.48	6.3	159	CCI			1.50	1.48		13.2	0.10	11	PIPER PEAK
28	21:56:36	37.598	117.815	0.4	2.98	3.1	161	BCI			1.51	1.56	1.6	13.0	0.08	9	PIPER PEAK
28	22: 5:47	37.594	117.802	2.2	1.80	6.6	153	CCU				1.54		13.4	0.09	9	PIPER PEAK
28	22:17:11	37.601	117.814	1.2	5.61	3.9	161	BCI			1.50	1.74	2.3	12.7	0.17	16	PIPER PEAK
28	22:17:48	37.594	117.799	0.6	-0.22	0.9	151	ACI				1.58		13.4	0.15	11	PIPER PEAK
28	22:19:59	37.596	117.811	3.3	1.92	9.7	159	CCI			1.41	1.94		13.3	0.11	12	PIPER PEAK
28	22:26:35	37.599	117.814	0.7	4.63	4.2	161	BCI			1.73	1.55	1.6	12.9	0.10	11	PIPER PEAK
28	23:42:50	37.595	117.807	0.5	0.85	0.8	156	ACI			1.34	1.42		13.3	0.09	8	PIPER PEAK
MAR 1	1:47:51	37.603	117.820	1.3	5.68	4.6	165	BCI			1.54	1.49		12.5	0.23	16	PIPER PEAK
1	2: 5:55	37.593	117.820	4.6	1.91*	——	164	CCI			1.18	1.05		13.6	0.18	12	PIPER PEAK
1	2:42:35	37.597	117.802	0.4	-0.14	0.6	153	BCI			1.82	1.61	1.6	13.0	0.15	16	PIPER PEAK
1	3:53: 3	37.595	117.802	0.9	-0.71	1.9	153	ACA		2.07				13.3	0.14	8	PIPER PEAK
1	3:57:46	37.595	117.805	——	1.99	——	155	ADA		1.60				13.3	0.04	4	PIPER PEAK
1	4: 3:23	37.599	117.797	0.1	3.82	0.8	151	ADA		1.59				12.9	0.06	5	PIPER PEAK
1	4:26:49	37.606	117.846	1.6	3.37*	——	182	CDA		1.87				12.6	0.12	10	PIPER PEAK
1	6:18: 6	37.598	117.808	0.9	2.26	2.8	157	BCA		2.19				13.0	0.06	7	PIPER PEAK
1	11:53:40	37.606	117.847	2.2	3.49*	——	183	CDA		2.07				12.7	0.13	8	PIPER PEAK
1	17:52: 5	36.577	117.824	2.6	-1.93	2.2	259	CDI	1.74			1.99		45.2	0.16	13	NEW YORK BUTTE
2	13:57:15	36.804	115.988	0.4	6.09	1.4	150	ACI	1.20			1.13		15.4	0.08	11	FRENCHMAN FLAT
2	15:42:40	36.236	116.823	0.3	9.31	1.1	118	ABI			1.64	1.47		14.8	0.11	16	BENNETTS WELL
2	17:10:48	37.016	116.586	0.3	7.62	1.2	95	ACI			0.79	1.17	1.7	17.5	0.11	25	THIRSTY CANYON SE
2	21:46:14	37.573	117.526	7.3	7.56*	——	199	DDI				1.04		14.9	1.19	9	LIDA WASH
3	5:33:57	37.478	116.003	0.6	0.95	1.0	57	BCI			1.57		2.1	10.7	0.18	16	WHEELBARROW PEAK NE
3	16:35:17	37.309	117.586	0.5	7.39	1.1	94	ABI			0.68	1.40		10.1	0.11	9	MAGRUDER MTN
4	1:20:43	36.786	116.319	0.3	8.36	0.6	83	AAI	1.32			0.72		6.3	0.08	16	JACKASS FLATS
4	17:42:36	37.202	116.381	0.4	7.90	0.6	142	ACI	1.42		1.19	1.15	1.1	5.2	0.07	13	SCRUGHAM PEAK
4	17:56:55	37.200	116.385	0.6	7.56	0.9	139	ACI			0.83	0.73		5.7	0.08	12	SCRUGHAM PEAK
5	6:51:29	37.666	114.888	2.3	6.26	2.0	226	BDI			0.76			4.5	0.12	6	PAHROC SPRING
5	9:17:44	35.653	116.315	6.8	1.46*	——	263	DDI	2.55					54.5	0.35	11	AVAWATZ PASS
5	10:13:21	35.635	116.325	5.9	-1.13	3.6	266	DDI		1.36		2.11		56.8	0.36	9	AVAWATZ PASS
6	19: 5:32	36.731	116.175	0.9	7.66	2.7	125	BBI				0.75		8.8	0.15	10	SPECTER RANGE NW

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MAR 7	6:10:33	37.019	117.729	2.4	11.03	3.3	200	BDA		2.10				24.8	0.17	8	LAST CHANCE RANGE
7	6:32:27	37.368	117.213	0.3	-2.01	0.4	122	ABA		1.53				8.5	0.04	6	SCOTTYS JUNCTION SW
8	6:25:48	36.076	116.782	5.3	1.98*	——	128	DCU				2.26		14.6	1.10	13	BENNETTS WELL
9	20:47:53	37.150	116.576	0.6	11.06	1.6	110	ABI				0.88		13.3	0.10	10	THIRSTY CANYON NE
9	20:53:52	37.151	116.580	0.4	13.17	0.7	165	ACI				1.25		12.9	0.08	15	THIRSTY CANYON NE
9	21: 9:27	36.379	114.902	3.7	-1.59	3.5	182	CDI			1.48			27.1	0.15	5	DRY LAKE
10	2:38:32	36.681	115.685	4.7	-1.81	9.1	314	DDI		1.25	0.86	1.02	1.4	11.3	0.18	8	INDIAN SPRINGS NW
10	2:43:17	36.475	116.558	0.4	0.36	0.8	58	BCI	1.48		1.12	1.28	2.6	11.3	0.19	26	RYAN
10	6:46:19	36.763	116.000	0.4	0.00	1.1	129	ACI	1.56		1.65	1.42		11.9	0.08	10	CANE SPRING
10	18: 0: 7	37.121	117.293	0.4	10.02	0.8	92	ABI			1.06	1.35	1.4	14.4	0.12	16	UBEHEBE CRATER
10	23:21:25	37.249	116.384	1.5	4.65	2.9	204	BDI	1.84					6.6	0.06	7	SCRUGHAM PEAK
12	12:47:23	36.826	116.002	0.6	0.42	1.1	149	ACI	1.60			1.06		12.7	0.10	13	CANE SPRING
13	21: 8:26	36.395	117.020	1.6	15.89	1.3	105	BBA		1.46				7.2	0.16	10	EMIGRANT CANYON
14	3: 4:42	37.039	116.300	0.7	5.18	0.9	185	ADI				1.16	0.9	6.3	0.08	10	BUCKBOARD MESA
14	9:55: 3	37.045	116.304	1.3	3.52	2.8	195	BDI				0.82		6.7	0.15	10	BUCKBOARD MESA
16	1: 6:21	36.124	114.866	3.4	-0.85*	——	158	CCI				1.51		24.5	0.41	11	BOULDER BEACH
16	7:33:31	37.165	116.250	0.4	-0.44	0.5	117	ABI	1.30		0.95	1.01	1.2	8.5	0.08	11	AMMONIA TANKS
16	15:43:12	37.508	117.525	0.5	5.31	2.0	77	ABI	1.37		1.68	1.48		7.8	0.15	13	LIDA WASH
17	3: 5:33	37.232	116.423	0.5	-1.69	0.6	75	BBI	1.65		1.72	1.63	1.5	9.1	0.18	14	SCRUGHAM PEAK
17	14: 0:47	36.605	116.237	0.4	7.70	0.8	87	ABI	1.35		1.76	1.09		10.2	0.08	15	SPECTER RANGE SW
17	23: 1:35	35.229	116.717	6.9	15.63	1.9	302	DDI	2.73		4.21		4.0	82.7	0.14	17	***QUAD. NOT LISTED*
18	3:26:53	37.191	115.769	0.5	0.29	0.9	91	BCI	1.78		1.53	1.71	1.8	15.8	0.16	20	PAPOOSE LAKE NE
19	1:51:23	37.199	116.477	0.3	0.69	0.5	131	ACI	1.61		1.42	1.49	2.0	13.7	0.12	25	SCRUGHAM PEAK
21	8:38:43	37.322	117.711	0.9	-0.22	1.3	153	BCI	1.59		1.06	1.12		11.5	0.25	14	MAGRUDER MTN
21	14:16:38	36.728	116.475	0.5	4.69	2.1	172	BCI	1.30			0.74		6.5	0.11	13	LATHROP WELLS NW
22	7:43:33	37.039	116.301	0.3	1.45	1.0	164	ACI	1.08			0.83		6.4	0.07	13	BUCKBOARD MESA
22	11:44:29	36.777	115.982	——	1.60	——	234	ADI	0.99			0.54		13.0	0.00	4	FRENCHMAN FLAT
22	12:55:20	37.470	117.652	0.4	2.29	2.3	79	BCI	1.53		1.84	1.56	1.8	13.9	0.16	19	MAGRUDER MTN
22	15: 8:44	36.663	115.676	0.5	1.09	3.0	73	BCI	1.84		1.79	1.86		12.5	0.21	32	INDIAN SPRINGS NW
24	17:11:17	37.248	115.415	0.8	0.82	1.2	96	BCI	2.02		1.93	2.00		22.1	0.25	24	DESERT HILLS NW
24	20:32: 4	37.251	115.413	0.5	2.91	4.1	94	BCI	2.07		2.05	2.09	2.0	22.0	0.21	28	CUTLER RESERVOIR
25	21:34:44	37.358	116.515	0.4	7.75	2.5	224	BDI	1.53		1.17	1.14		29.9	0.06	14	TRAIL RIDGE
26	6:18: 1	36.699	116.116	0.3	0.98	0.5	122	ACI				0.66		14.5	0.09	13	CAMP DESERT ROCK
26	23:30:53	37.001	116.215	1.0	6.43	1.1	200	ADI	1.33			1.02	1.2	4.2	0.14	14	TIPPIPAH SPRING
28	5:48:13	37.115	117.392	0.8	6.08	4.1	190	BDI	1.73			1.34	1.6	23.8	0.10	15	UBEHEBE CRATER
29	11:13:54	37.311	115.105	1.3	2.66	2.8	160	BCI	1.77		1.98	1.66		11.7	0.27	13	ALAMO SE
29	11:19:26	36.506	116.947	0.4	0.91	0.9	70	ACI	1.59		1.33	1.22		18.7	0.14	15	CHLORIDE CLIFF
29	22:10:47	36.506	116.941	0.3	7.89	1.3	68	ACI	1.59		1.44	1.55		19.1	0.10	17	CHLORIDE CLIFF
30	11:53:53	36.767	116.219	0.4	0.62	0.7	92	ABI	1.17			0.68		5.5	0.11	14	SKULL MTN
30	18: 9:44	37.235	114.902	3.3	-0.88*	——	234	CDI	1.94			1.82		23.2	0.22	6	DELAMAR 3 NW
31	1: 7:57	35.600	115.564	3.0	2.22*	——	239	CDI	1.78		1.67	1.74		79.1	0.16	10	CLARK MTN
31	22:53:46	36.864	116.757	0.9	1.59	2.5	175	BCI	1.18			0.74		13.8	0.12	11	BULLFROG
31	23:58: 5	37.187	116.394	1.0	4.54	2.8	127	BBI	1.20		0.74	0.72		6.9	0.07	10	SCRUGHAM PEAK
APR 1	2:30:39	37.191	116.388	0.3	7.35	0.5	66	AAI	1.44		1.16	1.23	1.2	6.3	0.09	19	SCRUGHAM PEAK

1990 LOCAL HYPOCENTER SUMMARY - SGB EARTHQUAKES

DATE		TIME (UTC)	LATITUDE (DEG. N)	LONGITUDE (DEG. W)	STAND ERROR H(KM)	DEPTH (KM)	STAND ERROR Z(KM)	AZI GAP (DEG)	QQD 12S	MAGNITUDE ESTIMATES Mca	Md	MLh	MLv	MLc	DEL-MIN (KM)	RMS RES. (SEC)	#N PH.	U.S.G.S. QUADRANGLE
APR	1	3:21: 6	37.417	114.490	1.8	5.82*	—	265	CDI	2.02		2.03	1.89		30.3	0.11	9	***QUAD. NOT LISTED*
	1	7:26:26	36.501	116.937	0.3	3.09*	—	67	CCI	1.83		1.61	1.72		19.0	0.14	32	CHLORIDE CLIFF
	1	10:24:50	36.498	116.942	0.5	2.01	1.4	86	ACI	1.62		1.40	1.40		18.4	0.15	21	FURNACE CREEK
	1	12:24:53	36.759	116.234	0.5	3.84	0.7	133	ABI	1.08		1.22	0.42		3.8	0.11	14	SKULL MTN
	1	13:57:17	36.884	116.214	0.4	1.72	1.6	133	ABI	1.30			0.87	0.9	4.6	0.10	14	MINE MTN
	1	17:33:51	36.507	116.950	0.4	5.32	1.9	149	ACI	1.39		1.06	1.01		18.5	0.09	17	CHLORIDE CLIFF
	2	9:20:58	37.879	116.128	0.5	-0.12	0.7	111	ACI	1.97		1.86	1.97		21.3	0.15	18	REVEILLE PEAK
	3	2:26:47	36.500	116.927	0.6	0.92	0.9	120	ACI	1.44		1.15	1.02		19.6	0.10	12	CHLORIDE CLIFF
	3	5:47:58	37.962	117.114	0.2	6.29	0.5	177	ACI	2.65		3.26	3.23		37.6	0.06	44	MUD LAKE
	3	12: 1: 6	36.037	117.721	1.3	5.87	2.1	267	BDI	2.29			2.43		68.4	0.18	22	COSO PEAK
	3	23:28: 7	35.583	115.553	1.9	3.32*	—	227	CDI	2.05		1.73	1.95		81.2	0.20	12	CLARK MTN
	4	3:42:31	36.021	117.725	1.5	3.28*	—	283	CDI	1.78		1.65	1.68		69.7	0.14	11	COSO PEAK
	4	6:17:46	35.806	116.796	2.4	3.09*	—	275	CDI	1.86		1.95	1.87		18.7	0.23	18	WINGATE WASH
	4	6:18:26	35.840	116.758	20.1	1.00*	—	313	DDI	1.55		1.67	1.51		16.9	0.02	5	WINGATE WASH
	4	6:39:28	37.860	116.144	0.5	0.37	0.8	106	BCI	2.01		2.08	2.15		21.1	0.18	17	REVEILLE PEAK
	4	11:29:31	36.086	117.467	4.1	3.03*	—	271	CDI	1.44		1.40	1.31		47.4	0.23	10	MATURANGO
	4	13:11:24	36.652	115.838	1.4	7.22	1.8	178	BDI	1.37		0.81	1.09		5.3	0.06	5	MERCURY NE
	4	19:46:13	36.066	117.697	5.0	7.00*	—	278	CDI	1.80		1.89	1.72		64.7	0.18	8	COSO PEAK
	5	2:38:12	35.906	117.792	6.8	9.64	3.2	279	DDI	1.62		2.00	1.71		82.4	0.16	7	LITTLE LAKE
	5	20:25:27	37.109	116.753	0.4	0.09	0.3	109	ABI	1.37		1.08	1.32	1.1	4.8	0.10	17	SPRINGDALE
	5	20:25:56	37.120	116.756	0.8	1.65	1.7	150	ACI	1.40			1.27	1.1	4.0	0.10	11	SPRINGDALE
	5	23:11:30	35.620	115.569	1.8	2.18*	—	223	CDI	1.00			1.91		77.2	0.15	9	CLARK MTN
	6	1:57:10	37.113	116.755	0.5	0.24	0.4	147	ACI	1.26			0.85	1.1	4.6	0.08	11	SPRINGDALE
	6	16:58: 9	36.047	117.699	2.1	5.61*	—	280	CDI	2.21		2.36	2.24	2.7	66.1	0.17	12	COSO PEAK
	7	8:49:54	37.196	116.380	0.7	8.89	0.8	134	ABI	1.36		1.35	1.17	1.4	5.3	0.11	20	SCRUGHAM PEAK
	7	9:18: 9	37.195	116.384	0.3	7.63	0.4	68	AAI	1.44		1.55	1.26	1.1	5.8	0.09	22	SCRUGHAM PEAK
	7	21:51: 3	37.196	116.382	1.1	8.34	1.5	134	BBI			0.96	0.79		5.6	0.08	9	SCRUGHAM PEAK
	9	10:58:15	36.007	117.778	6.3	2.25*	—	299	DDI	2.12		2.12	2.12		74.5	0.13	13	HAIWEE RESERVOIR
	9	11:32:11	36.793	115.949	—	1.51	—	255	ADI	1.11			0.87	1.1	14.7	0.02	4	FRENCHMAN FLAT
	9	11:32:30	36.789	115.949	0.4	5.26	1.7	254	ADI	1.19			1.13	1.2	14.3	0.01	5	FRENCHMAN FLAT
	9	14:41:47	36.047	117.689	2.4	7.00	1.7	292	BDI	2.37			2.32	2.7	65.4	0.17	16	COSO PEAK
	9	14:47:27	36.052	117.654	7.8	2.01*	—	310	DDI	1.61		1.50	1.50		62.5	0.08	8	COSO PEAK
	9	16:45:36	38.390	117.896	9.2	-1.04*	—	277	DDI	1.98		2.07	1.94		75.4	0.30	9	***QUAD. NOT LISTED*
	10	8:17: 3	37.222	116.936	0.5	8.40	2.3	147	BCI	1.21		1.05	1.06		20.5	0.13	14	SPRINGDALE
	10	8:20:23	37.218	116.935	0.3	-0.71	0.4	136	ACI	1.16		1.09	1.07		20.2	0.08	18	SPRINGDALE
	10	8:25:19	37.219	116.928	0.2	7.20	1.3	145	ACI	1.34		1.03	0.99		19.7	0.05	17	SPRINGDALE
	11	11:19:14	35.929	117.739	2.4	1.30	4.1	276	BDI	1.97		2.20	1.79		77.1	0.27	17	MOUNTAIN SPRINGS CANYON
	13	6: 0:46	37.766	115.029	0.6	1.89	1.5	140	ADI	1.37			0.84		13.3	0.06	5	WHITE RIVER NARROWS
	13	19:35:45	37.117	117.084	1.9	3.05*	—	121	CDI			0.95	0.63		15.6	0.16	5	BONNIE CLAIRE SE
	13	23:29:60	37.229	114.928	3.3	0.56	4.2	232	CDI	1.13		1.44	1.26		22.5	0.13	5	DELAMAR 3 NW
	14	1:58:11	37.263	117.521	2.9	10.25	4.5	127	CBI			0.79	0.76		11.6	0.32	8	MAGRUDER MTN
	14	1:59:47	37.227	117.510	1.8	2.40	6.4	150	CCI			0.79	0.80		12.1	0.10	9	LAST CHANCE RANGE
	14	3:12:14	37.242	117.508	0.7	2.51	2.2	113	BCI	1.17		1.31	1.18		12.3	0.10	15	LAST CHANCE RANGE
	14	4:42:55	37.224	117.503	3.9	1.49*	—	154	CCI			0.61	0.56		12.8	0.06	6	LAST CHANCE RANGE

1990 LOCAL HYPOCENTER SUMMARY - SGB EARTHQUAKES

DATE - TIME (UTC)		LATITUDE (DEG. N)	LONGITUDE (DEG. W)	STAND ERROR H(KM)	DEPTH (KM)	STAND ERROR Z(KM)	AZI GAP (DEG)	QQD 12S	MAGNITUDE ESTIMATES Mca	Md	MLh	MLv	MLc	DEL-MIN (KM)	RMS RES. (SEC)	#N PH.	U.S.G.S. QUADRANGLE
APR 14	5:14: 2	37.233	117.509	0.4	4.50	2.5	119	BCI	1.17		1.32	1.18	1.5	12.2	0.11	15	LAST CHANCE RANGE
14	5:24:20	37.234	117.505	0.2	0.76	0.4	118	ACI	1.02		1.09	1.15		12.6	0.04	12	LAST CHANCE RANGE
14	6:17: 2	37.234	117.505	0.2	0.95	0.4	117	ACI	1.07		1.13	0.95		12.5	0.05	12	LAST CHANCE RANGE
14	6:57:21	37.235	117.511	0.3	4.94	1.3	118	ACI	1.16		1.36	1.17	1.5	12.1	0.06	16	LAST CHANCE RANGE
14	8: 8:59	37.238	117.510	0.3	4.49	1.8	143	ACI	0.91		0.81	0.78		12.1	0.05	8	LAST CHANCE RANGE
14	9:44:57	37.239	117.508	0.4	1.49	1.1	97	BCI	1.34		1.45	1.33	1.5	12.3	0.15	23	LAST CHANCE RANGE
14	11: 9:58	37.237	117.507	0.4	2.22	1.0	144	ACI	1.13		1.16	1.11		12.4	0.06	14	LAST CHANCE RANGE
14	14:32:41	37.233	117.510	0.2	2.95	2.2	101	BCI	1.91		2.05	1.92	2.1	12.1	0.08	26	LAST CHANCE RANGE
14	15:17: 4	35.750	117.962	1.2	18.16	0.7	285	BDI	1.99		2.41	2.15		101.6	0.07	10	LITTLE LAKE
14	15:42:18	37.236	117.510	0.3	4.51	1.9	117	ACI	1.22		1.33	1.09		12.1	0.07	14	LAST CHANCE RANGE
14	19:15: 4	37.234	117.511	0.3	5.53	1.2	118	ACI	1.34		1.42	1.38	1.5	12.0	0.07	14	LAST CHANCE RANGE
15	15:22:29	37.236	117.508	0.4	0.65	0.9	99	ACA		2.20				12.3	0.11	14	LAST CHANCE RANGE
16	5:49:55	38.332	116.514	8.9	7.90	3.6	338	DDA		1.75				12.8	0.15	5	GEORGES CANYON RIM S
17	1: 7: 2	37.234	117.509	1.3	-0.27	2.6	118	BCA		1.64				12.2	0.18	8	LAST CHANCE RANGE
19	5:39:36	36.507	116.943	0.5	9.55	1.7	104	ABA		1.89				18.9	0.10	10	CHLORIDE CLIFF
20	0:35:36	37.121	117.061	0.4	5.23	3.0	104	BCI	1.02		0.71	0.82		15.6	0.09	12	BONNIE CLAIRE SE
20	0:47: 0	37.125	117.058	0.0	5.22	0.4	128	ADI				0.44		16.0	0.00	5	BONNIE CLAIRE SE
21	10:58:31	36.202	117.901	2.0	2.90	5.8	265	CDI	1.51		2.09	1.70		74.5	0.17	12	HAIWEE RESERVOIR
21	17:55:53	37.121	117.063	0.2	7.24	1.4	51	ACI	2.12		2.03	2.00	2.2	15.7	0.12	42	BONNIE CLAIRE SE
21	17:58:10	37.130	117.062	0.3	-1.99	0.4	140	ACI	1.21		0.97	0.95		16.6	0.10	17	BONNIE CLAIRE NE
21	18: 4:42	37.130	117.059	0.4	-1.33	0.5	139	ACI	1.23		0.93	0.80		16.6	0.11	15	BONNIE CLAIRE NE
22	8:56:26	37.199	117.175	0.3	0.82	0.6	96	ACI	1.16			1.07	1.4	13.4	0.07	20	BONNIE CLAIRE NW
24	0:19:44	37.124	117.966	0.9	2.75	3.1	244	BDI	1.45		1.28	1.38	1.9	30.8	0.07	8	WAUCOBA SPRING
24	2:20:37	37.461	115.143	6.1	3.82*	——	214	DDI			1.50	0.91	1.1	10.1	0.04	5	ASH SPRINGS
25	17:19:46	36.455	114.502	1.0	6.18	1.1	217	ADI	2.69		2.36	2.01	2.5	59.2	0.10	10	MUDDY PEAK
25	23:37:20	37.340	114.929	0.8	0.23	1.3	201	ADI	1.59		1.33	1.10		13.1	0.04	5	DELAMAR LAKE
26	8:41: 8	37.077	116.003	0.6	-1.67*	——	122	CCI			0.98	1.06		13.6	0.14	13	YUCCA FLAT
27	8: 7:30	36.795	117.488	0.7	-0.51	0.6	190	BDI	1.42		1.22	1.25	1.3	7.5	0.15	13	TIN MTN
27	13:35: 0	36.743	116.028	0.4	-0.89	0.5	112	ACI	1.46		2.03	1.19	1.5	10.9	0.09	17	CAMP DESERT ROCK
27	14:45:29	36.862	115.927	0.3	0.25	0.5	136	ACI	1.35		0.81	1.14		13.8	0.08	18	FRENCHMAN FLAT
27	19: 3:39	38.150	118.044	6.1	3.48*	——	275	DDI				1.53		76.5	0.18	7	***QUAD. NOT LISTED*
27	20:25:59	37.086	117.358	0.4	-0.04	0.6	115	ABI	1.24		1.57	1.28	1.2	9.7	0.11	14	UBEHEBE CRATER
27	22:37: 1	37.211	117.627	0.6	11.02	0.7	157	BCI		1.16		1.10	1.5	3.0	0.15	14	LAST CHANCE RANGE
29	22:37:22	35.559	116.338	4.4	2.25*	——	275	CDI	1.78		1.72	1.71		65.2	0.17	10	AVAWATZ PASS
30	20:40:29	37.055	117.926	1.5	5.41	11.5	234	CDI	2.03		2.13	2.11	2.2	31.8	0.17	15	WAUCOBA SPRING
MAY 1	3:50:56	37.261	114.814	1.5	2.90	7.3	203	CDI	1.78		1.68	1.90	1.9	26.5	0.18	13	GREGERSON BASIN
1	21: 1:55	36.158	115.352	1.8	2.72*	——	151	CCI	2.05		1.75	1.91	1.9	27.7	0.17	8	BLUE DIAMOND
2	4:13:24	36.699	116.277	0.4	2.99	0.4	123	ABI				0.33	0.9	4.9	0.08	12	STRIPED HILLS
2	6:28:21	37.818	116.155	3.9	1.04	9.2	223	CDA		1.52				19.9	0.11	6	REVEILLE PEAK
2	22:20:10	36.360	114.928	1.1	-1.56	2.8	155	BCI	1.64		1.97	1.50		26.4	0.17	11	DRY LAKE
4	12:18:15	36.967	117.436	0.5	7.83	1.1	149	BCI	1.55		1.54	1.61	1.7	8.8	0.20	30	TIN MTN
5	23: 2:55	35.920	116.974	0.7	2.24	0.9	275	ADI	1.44		1.57	1.53	1.3	10.8	0.04	7	WINGATE WASH
6	4:33:20	36.133	117.800	1.5	13.48	1.2	264	BDI	1.81		2.12	1.90		69.1	0.16	16	HAIWEE RESERVOIR
7	23:45:27	37.854	116.133	0.7	3.13*	——	106	CCI	1.28			1.46	1.8	20.0	0.16	11	REVEILLE PEAK

1990 LOCAL HYPOCENTER SUMMARY - SGB EARTHQUAKES

DATE - TIME (UTC)			LATITUDE (DEG. N)	LONGITUDE (DEG. W)	STAND ERROR H(KM)	DEPTH (KM)	STAND ERROR Z(KM)	AZI GAP (DEG)	QQD 12S	MAGNITUDE ESTIMATES Mca	Md	MLh	MLv	MLc	DEL-MIN (KM)	RMS RES. (SEC)	#N PH.	U.S.G.S. QUADRANGLE
MAY	8	1:18: 5	37.114	117.940	2.0	-1.02	2.1	258	BDI	1.55		1.44	1.46	1.8	29.2	0.14	13	WAUCOBA SPRING
	8	9:46:43	36.625	116.260	0.9	3.40	3.5	142	BCI	1.09			0.71		7.5	0.16	11	STRIPED HILLS
	8	17:27:36	37.303	115.481	1.5	1.55	11.0	91	CCI	1.37		1.63	1.41	1.7	26.1	0.20	8	CUTLER RESE
	9	0: 7:10	36.205	117.907	1.2	6.14	1.4	254	BDI	2.38			2.58	2.7	74.6	0.20	25	HAIWEE RESERVOIR
	9	12:55:58	36.443	116.967	1.2	11.01	1.9	88	CBA		1.74				13.2	0.31	14	FURNACE CREEK
	11	1:11:34	36.838	117.503	0.8	2.48	1.0	200	ADI	1.34		1.41	1.52	1.5	9.5	0.10	13	DRY MTN
	11	19:21:53	35.999	117.896	3.1	3.50*	—	292	CDU	1.85		2.54	1.96		83.8	0.32	10	LITTLE LAKE
	12	11: 0:28	37.158	117.609	0.5	8.91	0.5	191	ADI	1.19		0.87	0.90	1.5	8.9	0.07	10	LAST CHANCE
	12	17:38:26	37.026	116.298	0.5	2.73	0.7	149	ACI	1.14			0.72	0.8	6.2	0.07	11	BUCKBOARD M
	13	0:48:12	37.117	117.035	0.3	6.28	1.5	50	ACI	1.84		1.90	1.87	1.8	14.9	0.13	31	BONNIE CLAI
	14	5:28: 1	37.477	114.618	1.6	-2.02	1.3	272	BDI	1.45		1.60	1.51		17.8	0.04	8	ELIGN NE
	14	17:47:41	37.243	114.966	1.4	2.93	4.8	221	BDI	1.48		1.09	1.40	1.8	19.7	0.11	8	DELAMAR 3 N
	15	1:23: 8	37.729	115.977	1.4	4.53	1.8	199	BDA		1.67				4.3	0.14	9	WHITE BLOTCH SPRINGS
	15	19:25:52	36.367	114.913	1.0	-1.54	1.9	179	BCI	1.72		1.79	1.69		27.0	0.16	12	DRY LAKE
	16	6:54:38	37.115	117.030	0.3	6.59	1.8	105	ACI	1.51		1.44	1.42	1.8	14.7	0.13	24	BONNIE CLAIRE SE
	16	7:50:37	37.114	117.034	0.3	1.51	1.5	86	ACI	1.56		1.56	1.53	1.8	14.6	0.10	23	BONNIE CLAIRE SE
	16	10:17:36	37.370	115.207	1.0	6.62	3.2	132	BDI			1.15	0.95	1.3	14.4	0.07	5	ALAMO
	16	13:49:19	36.608	117.004	0.4	10.05	1.5	80	ABI	1.57		1.53	1.45		20.0	0.12	21	STOVEPIPE WELLS
	16	21:32:17	36.666	116.655	0.8	-0.76	0.8	221	ADI	1.23			0.73		14.7	0.09	15	BIG DUNE
	17	0:50: 5	36.880	115.982	0.3	0.64	0.4	123	ABI	1.34		0.44	1.07		8.7	0.11	21	PLUTONIUM VALLEY
	17	11:58:19	37.635	117.334	1.4	-0.16	1.0	154	BCI	1.24		1.31	1.15		8.5	0.16	12	MONTEZUMA PEAK
	17	12:44:27	36.619	116.260	0.2	4.59	0.4	147	ACI	0.88			0.56		7.7	0.02	10	LATHROP WELLS
	17	12:45:47	36.616	116.259	0.5	4.32	1.3	150	ACI	0.99		1.41	0.70	1.3	7.9	0.07	13	LATHROP WELLS
	17	14:48:57	37.395	117.890	0.9	8.86	0.8	188	BDI	1.30			1.33	1.8	3.7	0.17	15	SOLDIER PASS
	17	19: 3:44	37.215	115.792	0.7	9.86	1.3	86	BBI	1.62		1.78	1.81	1.5	13.2	0.17	18	PAPOOSE LAKE
	18	0:27:12	37.118	117.029	0.4	4.11	4.1	128	BCI			0.64	0.85		15.1	0.08	10	BONNIE CLAIRE SE
	18	1:26:13	37.643	117.331	0.8	0.42	1.1	159	ACI	1.30		1.40	1.20		8.0	0.12	9	MONTEZUMA PEAK
	18	6:44:24	36.741	116.194	0.4	2.14	1.1	117	ABI	0.82		1.22	0.51		6.9	0.10	17	SPECTER RANGE
	18	18:40:16	37.262	117.521	0.4	9.10	0.9	85	ABI	0.96		1.00	0.86		11.6	0.10	13	MAGRUDER MTN
	18	18:40:54	37.259	117.519	0.3	9.59	0.6	103	ABI	0.92		0.93	0.79		11.7	0.06	11	MAGRUDER MTN
	19	2:21:13	35.851	117.764	7.3	-1.02	11.6	295	DDI	1.70		2.24	1.72		81.9	0.25	13	LITTLE LAKE
	19	3: 3:12	37.025	116.455	0.4	9.35	0.6	140	ACI	0.95			0.61		6.1	0.09	18	TIMBER MTN
	20	1:27: 3	36.152	117.814	1.5	7.00	1.3	293	BDI			1.53	1.50		69.4	0.20	17	HAIWEE RESE
	20	15:57:38	36.578	115.887	0.3	7.20	1.0	109	ABI	0.88			0.79		11.3	0.07	14	MERCURY SW
	20	19:13:27	37.138	118.013	1.5	2.46	6.7	241	CDI	1.79		1.75	1.80	1.9	33.2	0.17	15	***QUAD. NOT LISTED
	20	23:31:34	37.415	115.612	0.8	-0.36	1.1	124	BCI	1.55		1.69	1.49	1.6	16.8	0.20	15	GROOM RANGE NE
	21	11:12:28	36.836	115.394	0.6	-0.44	0.8	124	BCI	2.22		2.27	2.16	2.1	40.4	0.24	29	DOG BONE LAKE SOUTH
	21	21:32:53	37.073	117.003	0.4	6.15	2.2	95	BBI	1.14		1.11	1.10		10.4	0.14	17	BONNIE CLAIRE SE
	21	23:18:23	37.204	115.011	0.6	6.58	2.3	161	BCI	1.80		2.14	1.83	2.0	16.2	0.12	13	LOWER PAHRANAGAT LAKE
	23	6:38:56	37.218	116.514	0.3	-0.33	0.4	146	ACI	1.31		1.04	0.95		13.9	0.09	20	THIRSTY CANYON NE
	23	8:11:27	37.230	116.505	0.3	8.89	0.7	157	ACI	1.11			0.75		13.8	0.06	16	THIRSTY CANYON
	24	3:30:50	36.681	116.277	0.2	-0.63	0.2	147	ACI	1.27		1.81	0.91	0.8	6.8	0.06	15	STRIPED HILLS
	24	15:52:35	37.249	115.032	1.2	3.41	3.4	195	BDI	2.05		1.98	1.85	1.8	16.4	0.23	15	LOWER PAHRANAGAT LAKE
	25	7:56:10	36.670	116.660	0.5	3.85	3.3	156	BCI	1.02			0.50		11.6	0.06	16	BIG DUNE

1990 LOCAL HYPOCENTER SUMMARY – SGB EARTHQUAKES

DATE	TIME (UTC)	LATITUDE (DEG. N)	LONGITUDE (DEG. W)	STAND ERROR H(KM)	DEPTH (KM)	STAND ERROR Z(KM)	AZI GAP (DEG)	QQD 12S	MAGNITUDE ESTIMATES Mca	Md	MLh	MLv	MLc	DEL-MIN (KM)	RMS RES. (SEC)	#N PH.	U.S.G.S. QUADRANGLE
MAY 25	12:13:11	36.154	117.692	4.8	10.22	1.4	287	CDI				1.26		77.1	0.13	12	COSO PEAK
25	17:50:34	37.207	115.146	0.4	0.49	1.4	142	ACI	2.28			2.36	2.6	5.7	0.13	27	LOWER PAHRANAGAT LAKE
25	18:41:25	37.048	116.138	0.5	0.17	0.8	127	BBI	1.59		0.69	1.19	1.4	8.2	0.17	18	TIPPIPAH SPRING
26	23:38: 1	37.030	116.479	0.4	2.61	1.1	107	ABI				0.63		8.2	0.11	16	TIMBER MTN
27	18:21:11	37.169	117.877	0.6	-0.84	0.6	213	ADI	2.21		2.48	2.34	2.6	21.7	0.14	27	WAUCOBA SPRING
27	18:34:60	37.174	117.870	1.0	-0.04	1.1	219	BDI	1.23		0.78	1.18		20.9	0.13	13	WAUCOBA SPRING
28	0:48:49	36.736	115.657	0.3	1.50	1.0	94	ACI	1.61		1.29	1.46	2.0	14.5	0.08	19	INDIAN SPRINGS
28	16:40:26	36.226	116.847	0.3	0.23	0.4	126	ACI	1.28		1.13	1.03		16.5	0.10	14	BENNETTS WELL
28	18:49:32	38.002	118.086	5.5	3.27*	—	312	DDI			1.67	1.55		40.4	0.21	7	***QUAD. NOT LISTED
28	22:41:31	37.180	117.860	0.9	-1.02	1.0	238	ADI	1.36		0.96	1.36	1.6	19.9	0.10	18	WAUCOBA SPRING
29	0:44:31	36.640	116.939	0.4	6.10	2.0	117	BCI	1.36		0.91	1.11		13.9	0.09	17	CHLORIDE CLIFF
29	21:21: 6	36.186	115.459	1.3	-1.95	2.4	149	BCI	2.04		1.98	2.02	2.3	18.8	0.22	12	LA MADRE MTN
30	1:13:21	36.823	116.241	0.3	4.31	0.9	64	ABI	1.57		1.33	1.06	1.1	7.4	0.13	24	SKULL MTN
30	4:30:27	38.419	117.895	7.5	2.96	6.8	279	DDI	1.92		1.80	1.95		78.5	0.28	12	***QUAD. NOT LISTED
30	8:45:56	37.202	116.385	0.5	7.03	0.9	143	ACI	1.28			0.69		5.5	0.08	16	SCRUGHAM PEAK
31	0:25:22	37.290	117.289	1.0	5.51	1.0	122	ABI	0.97		1.14	0.79		3.1	0.04	6	GOLD POINT
31	1:53:60	37.295	117.272	—	6.45	—	128	ADI			0.82	0.60		1.4	0.00	4	GOLD POINT
31	8:49:46	37.290	115.129	2.0	1.33	4.6	173	BCI	1.48		1.54	1.12	1.6	14.4	0.13	9	ALAMO
31	14:29:10	37.289	115.850	1.0	-0.09	1.7	74	BBI	1.20			1.16	1.2	8.5	0.17	12	GROOM MINE
31	22:34: 5	35.665	116.327	3.2	-1.49	3.7	226	CDI	1.87		1.87	1.72		53.6	0.27	12	AVAWATZ PASS
JUN 1	18:22:52	36.112	115.321	7.9	2.79*	—	292	DDI	1.95		2.24	1.76		33.3	0.20	7	BLUE DIAMOND
2	7:11: 5	37.338	117.590	0.4	2.04	1.0	86	ACI			0.98	0.92		12.7	0.11	14	MAGRUDER MTN
2	7:11:42	37.328	117.569	—	1.93	—	186	ADI				0.72		12.7	0.04	4	MAGRUDER MTN
2	21:33:44	36.420	117.885	1.4	5.43	7.3	240	CDI	2.19			2.37	2.8	59.9	0.22	22	KEELER
3	17:11:26	37.092	116.883	0.3	9.92	2.0	99	ACI	1.29		0.87	0.89	1.6	30.9	0.07	16	SPRINGDALE
4	1:46:40	36.142	117.384	1.9	2.91	7.9	245	CDI	1.39		1.69	1.40		37.7	0.21	16	MATURANGO
4	8:47:14	37.094	116.877	0.3	0.91	0.8	94	ACI	1.52		1.52	1.51	1.6	14.7	0.12	31	SPRINGDALE
5	3: 2: 6	37.366	114.679	1.4	3.06*	—	255	CDI	1.35		1.41	1.46		27.1	0.08	7	ELGIN SW
5	3: 3:18	37.106	117.385	0.6	4.30	2.1	224	BDI			0.84	0.75		12.4	0.05	8	UBEHEBE CRATER
5	5: 4:46	36.469	117.505	1.3	3.38*	—	217	CDI	1.92			1.98	2.1	28.3	0.28	25	DARWIN
5	5:23:50	37.335	114.585	4.1	-1.02	3.6	275	CDI	1.30		1.53	1.30		32.9	0.11	7	ELGIN
5	10:55:53	37.097	116.875	0.3	1.50	1.0	72	ACI	1.29		0.92	0.95	1.5	14.4	0.13	21	SPRINGDALE
6	11: 4:26	37.097	116.874	0.4	2.37	1.4	99	ACI	1.26		0.90	1.09	1.5	14.3	0.14	20	SPRINGDALE
7	7:48:52	37.093	116.879	0.2	0.45	0.4	99	ACI	1.28		0.82	1.03	1.5	14.9	0.09	22	SPRINGDALE
7	15:45:38	36.965	117.599	0.9	2.64	4.5	187	BDI	1.20		0.92	1.23		22.8	0.21	13	DRY MTN
7	21:48:15	35.976	114.821	1.2	-1.08	0.7	163	BCI	1.84			1.47		8.4	0.18	12	BOULDER CITY
8	8:52:37	36.010	114.814	1.4	-1.38	0.4	215	BDI	1.84			1.65		11.1	0.11	5	BOULDER BEACH
8	10:58:43	36.276	117.447	1.2	2.78	4.6	240	BDI	1.32		1.71	1.51		33.7	0.15	15	PANAMINT BUTTE
8	19:43:43	37.062	117.966	1.1	3.14*	—	234	CDI	2.31		2.42	2.35	2.5	34.2	0.24	27	WAUCOBA SPRING
8	20:51:46	37.226	116.404	0.5	-0.65	0.5	93	ABI	1.54		1.61	1.32		7.2	0.12	14	SCRUGHAM PEAK
8	22:40:41	37.805	115.218	0.7	0.90	1.4	116	ACI	1.62		1.88	1.64	1.6	15.1	0.15	10	SEAMAN WASH
8	22:54:53	37.011	116.603	0.4	-0.54*	—	139	CCI				0.72		18.2	0.07	8	THIRSTY CANYON
10	15:59: 6	36.696	117.556	1.0	8.41	1.9	287	BDA		0.77				18.1	0.02	5	UBHEBE PEAK
11	13:39: 5	37.351	117.255	1.2	8.43	6.1	181	CDA		1.29				23.8	0.17	9	GOLD POINT

1990 LOCAL HYPOCENTER SUMMARY - SGB EARTHQUAKES

DATE	TIME (UTC)	LATITUDE (DEG. N)	LONGITUDE (DEG. W)	STAND ERROR H(KM)	DEPTH (KM)	STAND ERROR Z(KM)	AZI GAP (DEG)	QQD 12S	MAGNITUDE ESTIMATES Mca	Md	MLh	MLv	MLc	DEL-MIN (KM)	RMS RES. (SEC)	#N PH.	U.S.G.S. QUADRANGLE
JUN 11	13:39:41	37.349	117.265	1.3	-0.25	0.8	160	BCA		1.27				5.4	0.16	7	GOLD POINT
11	13:40:45	37.359	117.263	1.5	14.78	5.2	183	CDA		1.15				22.8	0.15	8	GOLD POINT
11	13:43:15	37.360	117.261	1.3	12.59	4.8	183	BDA		1.08				22.9	0.12	8	GOLD POINT
11	13:45: 9	37.360	117.261	1.6	13.09	5.9	184	CDA		1.12				22.9	0.16	8	GOLD POINT
11	14:43:41	37.346	117.260	0.3	0.38	0.4	76	ABI	1.30			1.19		5.1	0.12	24	GOLD POINT
11	15:20:45	36.479	117.954	2.7	5.93*	—	242	CDI	1.73		1.87	1.91		61.0	0.23	16	KEELER
11	16:52:36	37.349	117.266	0.6	2.47	1.0	112	BBI	1.33			1.17		5.4	0.16	18	GOLD POINT
11	21:57:27	36.706	116.450	0.2	6.32	0.9	179	ACI	0.98			0.37		9.5	0.04	11	LATHROP WELLS
11	21:57:59	36.703	116.452	0.3	6.07	1.0	123	ABI	1.32		1.04	0.93	1.4	9.7	0.10	24	LATHROP WELLS
11	21:59: 8	36.703	116.453	0.4	6.58	1.3	134	ABI	0.95			0.42		9.6	0.06	10	LATHROP WELLS
12	7:12:16	36.100	114.654	2.0	-1.83	1.3	227	BDI	1.62			1.81	1.5	21.8	0.10	7	HOOVER DAM
12	21:31:11	38.190	116.946	2.4	0.15	2.9	228	BDA		1.83				44.8	0.24	11	BLACK BUTTE
14	16:52:46	35.784	116.202	6.1	1.83*	—	297	DDA		1.86				38.3	0.17	5	TECOPA
15	3: 3:50	37.857	116.141	1.5	3.16*	—	195	CDA		1.07				20.7	0.15	6	REVEILLE PEAK
15	11:29:34	37.086	117.369	1.0	4.79	3.6	173	BCA		2.53				9.9	0.11	8	UBEHEBE CRATER
16	15:11:49	36.417	116.313	0.4	5.50	2.8	106	BCI	1.13			1.11		14.7	0.12	13	ASH MEADOWS
17	18:58:40	37.410	117.446	0.5	5.37	1.0	53	BBI	1.68		1.82	1.75	2.1	5.8	0.19	27	LIDA
17	22:38:46	36.058	116.107	1.7	4.85	1.7	250	BDI	1.36			1.40	1.2	8.8	0.11	10	STEWART VALLEY
18	2:18: 7	36.103	117.692	2.5	2.65	8.6	276	CDI	1.92		2.08	2.06	2.2	62.2	0.15	14	COSO PEAK
18	3:36:19	36.726	115.944	1.8	2.02	2.0	241	BDI	1.32			0.79	0.9	7.4	0.13	11	MERCURY
18	6:35:56	36.784	115.978	0.5	7.01	0.9	196	ADI	1.28			1.22	1.2	13.8	0.08	16	FRENCHMAN FLAT
18	6:53:45	36.100	117.695	1.6	6.00	3.5	276	BDI			2.00	1.99		62.5	0.20	16	COSO PEAK
18	11:46: 7	35.778	117.923	4.2	13.14	2.1	291	CDI	2.32		2.55	2.26		97.5	0.29	15	LITTLE LAKE
18	18:44:23	38.134	115.901	1.1	3.41*	—	199	CDA		1.63				31.9	0.14	8	QUINN CANYON RANGE
19	3: 4:37	36.931	116.156	1.2	4.53	4.8	118	BBI	0.97			0.74		8.6	0.17	9	MINE MTN
20	0:35: 9	37.319	115.493	0.9	0.38	1.4	152	BCI	1.32		1.43	1.24		24.8	0.19	11	CUTLER RESERVOIR
20	19:57: 6	36.730	116.054	1.0	1.49	2.1	169	BCI	1.02			0.40		11.3	0.09	8	CAMP DESERT ROCK
20	21:33:10	37.196	117.559	0.5	4.86	1.5	135	ABI	1.41		1.38	1.52	1.6	8.8	0.13	20	LAST CHANCE
22	2:28:33	36.505	117.777	3.8	2.90*	—	278	CDI	1.48		1.70	1.45		47.0	0.18	17	NEW YORK BUTTE
22	21:24:41	37.092	117.359	0.5	1.79	2.2	114	BCI	1.51		1.71	1.57		10.4	0.15	18	UBEHEBE CRATER
23	4: 9:49	37.090	117.362	0.5	2.45	1.4	115	ACA		1.81				10.2	0.11	10	UBEHEBE CRATER
23	4:36:26	35.594	117.260	5.3	0.97*	—	293	DDA		1.96				54.2	0.25	9	SEARLES LAKE
24	8:54:25	37.304	116.447	0.2	4.35	1.4	102	ACI	1.57		1.07	1.32	1.5	14.8	0.08	22	SILENT BUTTE
24	10: 3:23	37.089	117.356	0.4	2.84	1.1	114	ACI	1.63		1.90	1.78	1.7	10.0	0.13	24	UBEHEBE CRATER
24	18:17:26	37.092	117.364	0.4	1.58	1.2	115	ACI	1.26		1.52	1.41		10.5	0.10	18	UBEHEBE CRATER
24	23:55:39	37.291	116.738	0.2	0.17	0.3	53	ABI	1.84		1.92	1.83	2.1	8.7	0.10	40	BLACK MTN SW
25	3:34:15	37.290	116.732	0.3	-0.23	0.3	120	ABI	1.43			1.23		8.2	0.08	19	BLACK MTN S
25	7:45:58	37.152	115.150	1.1	5.70	1.8	130	BBI	1.39		1.71	1.68		3.8	0.27	19	LOWER PAHRANAGAT LAKE
26	7: 8: 4	37.215	115.792	0.6	7.21	1.4	124	ABI	1.34		1.61	1.55	1.5	13.2	0.14	18	PAPOOSE LAKE
27	5:23:14	36.120	117.682	3.4	-2.05	3.0	274	CDI	1.87		1.86	1.90		60.4	0.14	11	COSO PEAK
27	11:51:20	38.177	114.939	3.5	-0.30	2.3	252	CDI	2.56		2.53		2.8	34.7	0.29	18	SILVER KING
27	19: 7:35	37.061	117.899	1.3	5.47	9.6	223	CDI			1.34	1.49	1.8	29.4	0.14	13	WAUCOBA SPRINGS
27	21:34: 4	38.143	114.961	2.2	-1.02	2.1	247	BDI	2.31		2.03	2.39	2.8	30.5	0.19	14	SILVER KING MTN
27	22:31: 1	35.727	116.671	5.4	3.29*	—	280	DDI	1.50		1.81	1.56		31.8	0.14	7	LEACH LAKE

1990 LOCAL HYPOCENTER SUMMARY – SGB EARTHQUAKES

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JUN	28	10:16:45	36.097	114.642	2.3	-1.94	1.7	211	BDI	1.69			1.71		22.0	0.16	9	HOOVER DAM
	28	10:49:17	37.204	117.552	0.5	2.74	1.0	132	ABI	1.26		1.41	1.29		8.9	0.15	25	LAST CHANCE
	29	6:48: 6	38.161	114.951	2.3	-1.02	1.7	250	BDI	2.20		1.91	2.08		32.7	0.19	14	SILVER KING MTN
	29	9:19:29	36.102	117.701	1.0	5.94*	——	276	CDI	2.01		1.87	1.82		62.9	0.10	15	COSO PEAK
	29	9:54:55	36.843	116.257	0.5	8.98	0.9	109	ABI	0.84			0.44		5.7	0.09	11	JACKASS FLATS
	29	13:21:43	37.484	114.814	1.1	1.97	3.9	221	BDI	1.14		1.09	1.05		15.1	0.09	6	DELAMAR
	29	21:22:47	36.719	115.951	0.9	1.77	2.8	155	BCI				0.78	0.8	6.6	0.10	10	MERCURY
	30	5:10:31	38.182	117.804	3.0	-1.02	2.3	261	CDI	1.83		1.99	2.02	2.3	51.8	0.17	14	COALDALE NE
	30	5:30:18	37.059	116.305	0.2	-0.19	0.1	115	ABI	1.13			0.62		7.2	0.06	14	BUCKBOARD MESA
	30	11:53:27	37.337	115.429	0.7	0.27	1.0	57	BCI	1.39		1.71	1.41	1.8	28.4	0.25	18	CUTLER RESE
	30	12:50:33	37.347	114.829	1.0	1.85	2.3	195	BDI	1.04		1.17	1.08	1.4	20.7	0.11	9	GREGERSON BASIN
	30	15:47:13	37.094	117.358	0.5	0.90	0.7	114	ACI	1.63		1.19	0.98		10.5	0.14	17	UBEHEBE CRATER
JUL	1	12:30:60	37.945	117.448	3.5	3.38*	——	238	CDI	1.63			1.49		56.2	0.29	13	PAYMASTER CANYON
	1	14:56:31	37.260	116.425	0.5	0.90	0.8	84	ACI	0.88		1.51	0.95		10.3	0.11	13	SILENT BUTTE
	1	17:19: 1	37.257	116.426	0.6	-1.78	0.7	78	BCI	1.76		1.91	1.46	1.3	10.2	0.21	23	SILENT BUTTE
	2	5: 8:55	37.447	117.185	0.4	0.93	0.6	141	ACI	1.09		1.02	1.17		17.4	0.11	14	STONEWALL PASS
	2	11:21:17	37.237	114.842	0.9	1.33	2.0	200	ADI	1.37		1.44	1.45		26.4	0.13	11	DELAMAR 3 NE
	2	11:24:36	37.237	114.851	1.6	3.21*	——	242	CDU	1.20			1.26	1.5	25.9	0.13	7	DELAMAR 3 NE
	2	16:25:18	37.325	115.420	0.7	3.21*	——	83	CCI	1.39		1.65	1.43		27.0	0.20	14	CUTLER RESERVOIR
	4	17: 7:21	37.052	117.461	0.5	1.75	1.8	147	BCI	1.53		1.73	1.63	1.8	11.8	0.18	22	UBEHEBE CRATER
	5	11:42:14	36.559	116.828	0.3	7.12	1.2	72	ABI	0.92		0.98	0.92		9.6	0.12	26	CHLORIDE CLIFF
	6	0:26:44	37.113	115.179	0.4	0.07	0.3	167	ACI	1.48		1.83	1.60		6.2	0.08	12	LOWER PAHRANAGAT LAKE
	6	8:10:16	37.130	115.177	0.9	0.36	0.5	166	BCI	1.34		1.37	1.21		4.4	0.17	13	LOWER PAHRANAGAT LAKE
	6	19:52:18	37.808	115.220	0.5	0.64	0.9	118	BCI	1.43		1.70	1.49		15.3	0.15	12	SEAMAN WASH
	7	11:11:34	38.155	114.961	2.6	-1.54	2.4	248	CDI	1.48			1.52		31.7	0.15	9	SILVER KING MTN
	7	22:55:40	37.530	115.322	0.5	4.23	5.5	166	CCI	1.06		1.08	1.24		16.9	0.13	12	MT IRISH
	8	0:21:24	36.666	116.378	0.4	4.84	0.6	167	ACI	1.25			0.90		4.2	0.08	14	LATHROP WELLS
	8	6:41: 4	37.249	114.810	2.2	7.00*	——	246	CDU	1.53		1.82	1.58		27.6	0.11	7	DELAMAR 3 NE
	8	20:20: 5	36.933	115.611	0.5	3.03*	——	90	CCI	1.92		1.74	1.94	1.9	32.0	0.26	39	QUARTZ PEAK
	9	20:34:40	36.817	116.266	0.3	3.78	0.9	97	ABI	1.26		1.18	0.83	1.1	6.9	0.10	19	JACKASS FLATS
	10	7:50: 4	36.024	117.374	1.4	3.70*	——	260	CDI	1.87			2.00	2.2	46.1	0.23	18	MATURANGO
	12	6:10:37	37.779	116.127	0.3	5.17	2.6	93	BCI	1.69		1.94	1.81	2.0	16.4	0.15	25	REVEILLE PEAK
	12	10:26:33	37.202	117.554	0.6	2.95	1.2	129	ABI	1.09			0.74	1.3	8.9	0.10	14	LAST CHANCE RANGE
	13	13:45:48	37.240	116.570	0.3	1.59	0.8	47	ABI	1.42		1.03	1.31	1.1	8.4	0.11	31	THIRSTY CANYON
	13	15:30:59	36.451	114.493	1.5	3.14	4.0	220	BDI	1.68		2.39	1.59		60.1	0.18	13	***QUAD. NOT LISTED
	16	1:24:20	35.689	116.618	3.4	6.30*	——	278	CDI	1.62		1.67	1.81		55.3	0.22	14	LEACH LAKE
	17	20:14: 2	36.459	116.165	0.3	10.65	0.5	78	AAI	1.16			1.02	1.4	5.8	0.11	21	AMARGOSA FLAT
	18	12:40:23	37.471	117.957	2.2	5.59	2.0	247	BDI	1.62		1.38	1.61		6.8	0.23	15	SOLDIER PASS
	18	17:21: 4	37.080	114.912	1.0	3.26*	——	193	CDI	2.20		2.19	2.24		26.4	0.21	19	DELAMAR 3 SW
	19	11:11:13	38.428	117.909	7.6	-0.46	6.3	300	DDI	1.39		1.65	1.56		79.7	0.32	11	***QUAD. NOT LISTED
	19	14:37:40	38.458	117.910	2.4	3.46	2.3	301	BDI	1.86		2.19	2.12		83.0	0.19	12	***QUAD. NOT LISTED
	19	18:35:44	35.894	117.846	7.7	4.72	5.4	311	DDI	1.84			2.12		141.0	0.37	9	LITTLE LAKE
	19	20:42: 0	38.523	117.935	3.0	3.02*	——	304	CDI	1.75		1.87	1.87		90.4	0.19	10	***QUAD. NOT LISTED
	19	21:12:42	37.897	117.477	0.6	3.04*	——	225	CDI	1.41		1.75	1.58	2.0	23.3	0.10	13	PAYMASTER CANYON

1990 LOCAL HYPOCENTER SUMMARY - SGB EARTHQUAKES

DATE	TIME (UTC)	LATITUDE (DEG. N)	LONGITUDE (DEG. W)	STAND ERROR H(KM)	DEPTH (KM)	STAND ERROR Z(KM)	AZI GAP (DEG)	QQD 12S	MAGNITUDE ESTIMATES Mca	Md	MLh	MLv	MLc	DEL-MIN (KM)	RMS RES. (SEC)	#N PH.	U.S.G.S. QUADRANGLE
JUL 19	23:38:44	37.270	114.831	5.1	-1.54	3.8	251	DDI	1.80		1.83	1.97		24.7	0.28	10	GREGERSON BASIN
20	20:23:55	37.418	117.195	0.7	0.60	1.1	86	CCI	1.59			1.63		14.1	0.32	27	STONEWALL PASS
21	5:26:38	35.560	116.920	1.4	9.12	0.9	286	BDI	2.17		2.19	2.35		45.1	0.18	26	QUAIL MTNS
22	5:27:22	36.188	116.709	7.1	7.00	4.2	205	DDI	1.28		1.21	0.69		3.5	1.39	10	FUNERAL PEAK
22	8:17:14	36.863	116.318	0.4	2.62	0.4	64	BAI	1.38			1.12	1.5	0.2	0.16	27	JACKASS FLATS
23	10:57:33	36.843	116.220	0.3	0.98	0.5	128	ABI	0.97			0.55		4.8	0.14	21	SKULL MTN
24	0:52:52	36.302	117.103	1.1	5.88	1.3	184	BDI	0.96		1.39	0.97		10.1	0.13	11	EMIGRANT CANYON
24	11:46:22	37.078	117.967	1.2	7.00	7.8	233	CDU	1.62		1.77	1.66		33.2	0.20	19	WAUCOBA SPRINGS
25	0: 3:38	37.838	117.813	3.4	0.27	2.8	265	CDI	1.64		2.09	1.84		13.7	0.19	15	RHYOLITE RIDGE
25	0:52:50	36.556	117.045	0.2	8.85	0.8	100	ACI	2.07		2.32	2.16	2.7	18.7	0.13	51	STOVEPIPE WELLS
25	10:43:30	37.836	115.353	0.5	0.98	0.7	131	BCI	1.89		1.98	1.82	1.8	18.7	0.18	17	
25	17:33:38	37.039	116.213	0.8	4.98	0.8	125	BBI	1.11			0.78	1.1	1.5	0.18	16	TIPPIPAH SPRING
25	20:31:45	37.838	115.349	0.8	0.92	1.3	132	BCI	1.43		1.54	1.42	1.7	18.8	0.27	15	
25	21:22:47	36.911	115.985	0.6	0.34	1.0	125	BBI	1.50		0.68	1.08	1.4	6.6	0.18	24	PLUTONIUM VALLEY
25	21:59:35	36.054	117.725	2.0	2.64	5.4	266	CDI	1.53		1.68	1.62		67.6	0.21	14	COSO PEAK
26	7:33:28	37.247	114.485	1.8	6.12	3.9	253	BDI	1.77		1.90	1.88		45.6	0.28	19	***QUAD. NOT LISTED
26	18:45:50	36.311	116.066	0.2	6.78	1.1	113	ACI	1.35		1.11	1.11		14.7	0.08	17	MT SCHADER
27	4:35:18	36.845	116.179	0.6	2.06	0.5	131	ABI	0.96			0.58		1.4	0.14	18	SKULL MTN
28	1:31: 4	37.265	114.738	3.0	5.11*	——	216	CDI	1.48		1.44	1.46		31.9	0.29	12	ELGIN SW
31	12:52:29	36.655	116.352	0.5	5.74	0.7	66	BAI	1.14		1.41	0.74		1.5	0.17	26	STRIPED HILLS
31	20:39:35	36.966	116.132	0.2	2.82	0.4	80	ABI	1.62		1.12	1.46	2.0	7.8	0.11	34	MINE MTN
AUG 1	2:54:12	36.886	116.734	0.4	2.95	2.6	94	BCI	1.25			0.77		13.8	0.19	23	BARE MTN
2	5:15: 3	37.147	116.983	0.3	2.84	2.8	76	BCI	1.22		1.17	1.06		18.9	0.12	31	SPRINGDALE
2	6:58:54	36.772	116.095	0.3	-0.59	0.4	172	ACI	1.07			0.43		11.2	0.06	14	CANE SPRING
3	14:54:20	36.012	114.700	1.9	1.60	5.0	244	CDI	1.80			1.56		11.2	0.11	10	HOOVER DAM
3	17:14:24	37.290	117.380	0.4	0.87	0.7	116	ACI	1.09		1.17	1.00		11.0	0.10	13	GOLD POINT
3	20:23:56	37.085	116.755	0.3	-0.89	0.4	42	BBI	2.23		2.41	2.27	2.2	7.4	0.17	55	SPRINGDALE
4	7:34:52	37.243	114.796	1.2	4.61*	——	249	CDI	1.49		1.70	1.57		29.0	0.15	7	DELAMAR 3 NE
4	18:48:20	36.119	115.564	0.3	2.29	1.4	155	ACI	2.38		2.48	2.34		22.4	0.11	37	MOUNTAIN SPRINGS
5	16:46: 9	37.369	117.165	0.5	0.83	0.9	125	BCI	1.21			1.00	1.2	11.1	0.15	19	SCOTTYS JUNCTION SW
5	20: 8:40	36.702	116.246	0.5	0.25	0.4	78	BBI	0.92		1.59	0.67		5.1	0.16	19	SPECTER RANGE
5	20:25:15	36.703	116.247	0.4	0.61	0.6	134	ABI	0.77		1.26	0.49		4.9	0.11	13	SPECTER RANGE
5	21:12:43	36.702	116.247	0.4	0.79	0.6	134	ABI			0.98	0.26		5.1	0.08	10	SPECTER RANGE
5	22:47:28	36.703	116.250	0.5	0.69	0.7	132	ABI			1.05	0.21		4.8	0.10	11	STRIPED HILLS
6	13:23: 9	36.229	117.144	1.1	1.43	2.9	200	BDI	1.84		1.54	1.83		18.6	0.22	16	TELESCOPE PEAK
6	14: 0: 0	37.666	114.876	0.7	5.34	1.1	154	ACI	1.23		1.07	1.17	1.2	5.6	0.15	11	PAHROC SPRINGS
6	15:31: 2	37.666	114.873	0.9	5.26	1.7	155	BCI	0.95		1.11	1.15		5.9	0.19	11	PAHROC SPRINGS
6	22:21:52	36.703	116.246	0.5	0.99	0.7	134	ABI	0.83		1.43	0.59		5.0	0.12	13	SPECTER RANGE NW
7	8:30:31	36.074	117.713	1.7	7.00	3.7	254	BDI	1.76		1.96	1.84		65.5	0.19	15	COSO PEAK
9	1:48:36	37.743	115.180	1.9	11.13	3.2	162	BCI			1.08	1.17		11.3	0.18	8	FOSSIL PEAK
9	2:12:32	37.721	115.136	0.5	1.40	2.0	92	ACI	1.35		1.43	1.48	1.5	13.5	0.09	9	FOSSIL PEAK
9	11:39:37	36.265	117.165	1.7	-1.21	1.9	205	BDI	1.04		1.14	1.07		15.3	0.15	7	EMIGRANT CANYON
10	20: 4:16	37.666	114.871	1.0	5.31	1.7	155	BCI	1.05		1.24	1.36		6.0	0.18	10	PAHROC SPRING
13	10:13: 3	37.059	116.173	0.4	4.61	1.2	179	ACI	1.21			0.86		5.5	0.14	27	TIPPIPAH SPRING

1990 LOCAL HYPOCENTER SUMMARY - SGB EARTHQUAKES

DATE	TIME (UTC)	LATITUDE (DEG. N)	LONGITUDE (DEG. W)	STAND ERROR H(KM)	DEPTH (KM)	STAND ERROR Z(KM)	AZI GAP (DEG)	QQD 12S	MAGNITUDE ESTIMATES Mca	Md	MLh	MLv	MLc	DEL-MIN (KM)	RMS RES. (SEC)	#N PH.	U.S.G.S. QUADRANGLE
AUG 13	15:47: 9	37.325	117.680	0.2	0.78	0.4	135	ACI	1.29		1.00	1.17		10.7	0.07	14	MAGRUDER MTN
13	16:30:36	38.164	114.953	1.9	7.00	3.8	250	BDI	2.26		2.39	2.45	2.7	32.9	0.27	18	SILVER KING
13	19:56:58	36.364	115.834	0.2	7.00	1.2	111	ACI	1.68		1.55	1.48	1.6	22.7	0.08	23	MT STIRLING
13	23:54:46	37.547	117.173	0.3	0.18	0.5	88	BCI	1.96		2.07	1.95	2.2	25.3	0.17	41	GOLDFIELD
14	5:37:34	37.352	115.265	0.4	4.02	8.6	106	CCI	1.59		1.39	1.05		20.0	0.07	8	BADGER SPRING
14	13: 5:37	38.474	116.545	1.9	8.40	2.0	244	BDI	2.02		1.99	2.17		28.3	0.20	16	***QUAD. NOT LISTED
14	15: 4:27	38.406	116.496	4.6	5.00*	—	250	CDI	1.72		1.59	1.73	1.8	74.4	0.28	13	***QUAD. NOT LISTED*
14	15:23:20	37.353	117.676	0.3	0.93	0.6	122	ACI	1.26		1.48	1.43		13.6	0.12	16	MAGRUDER MTN
14	18:33:24	37.144	117.393	0.3	0.40	0.6	112	ACI	1.48		1.40	1.34		16.6	0.13	21	UBEHEBE CRATER
15	4:32:58	36.633	117.170	0.8	7.99	1.9	111	ABI	0.69		0.87	0.60		9.8	0.07	11	STOVEPIPE WELLS
15	19:22:34	37.556	117.168	0.6	2.41	5.8	124	CCI			1.30	1.20		25.1	0.14	13	GOLDFIELD
15	20:50:48	37.352	117.668	0.5	0.36	0.8	126	ACI			0.87	1.09		13.4	0.11	9	MAGRUDER MTN
15	23:25: 7	37.110	116.961	0.3	0.56	0.5	106	BCI	1.24		1.19	1.07		15.6	0.16	30	SPRINGDALE
17	10:56:55	37.353	117.672	0.3	0.99	0.5	121	ACI			0.80	1.12		13.5	0.10	14	MAGRUDER MTN
17	12:16: 6	36.789	115.812	3.8	8.81	3.3	256	CDI	1.14			0.98		10.5	0.27	11	FRENCHMAN LAKE
18	17:54:48	37.133	117.316	0.5	0.86	0.7	98	BCI	1.22			1.17	1.3	15.2	0.15	19	UBEHEBE CRATER
18	18:50:47	37.291	116.735	0.2	0.57	0.4	53	ABI	2.39		2.37	2.35	2.6	8.4	0.13	53	BLACK MTN SW
18	18:51:55	37.290	116.737	0.2	0.25	0.5	53	ABI	2.32		2.46	2.33	2.7	8.6	0.13	48	BLACK MTN SW
18	18:54:37	37.126	117.323	0.4	4.70	3.1	104	BCI	1.10		1.37	0.99		14.3	0.11	12	UBEHEBE CRATER
19	2:16: 1	36.955	117.771	1.5	3.07*	—	211	CDI			1.42	1.57		32.7	0.22	15	WAUCOBA WASH
20	7:58:20	37.311	116.038	0.4	-0.19	0.9	74	BCI	1.59		1.53	1.73	1.6	12.6	0.16	26	OAK SPRING
20	10:47:12	36.613	116.273	0.3	4.70	0.7	159	ACI	1.18		1.10	0.83		7.0	0.08	21	LATHROP WELLS
20	14: 7:33	36.340	117.458	0.8	5.23	5.6	237	CDI				1.52		32.5	0.17	18	PANAMINT BUTTE
20	21: 7: 5	37.909	116.412	0.5	5.32	4.7	97	BCI	1.52			1.63	1.6	18.7	0.22	22	KAWICH PEAK
21	2:10: 6	37.911	116.415	0.3	5.72	2.0	102	ACI	1.48			1.56		19.0	0.10	18	KAWICH PEAK
21	22: 0:24	37.440	117.229	0.2	0.86	0.4	64	ACI	1.87			1.89	2.1	15.7	0.14	40	STONEWALL PASS
22	1:42:40	35.649	116.328	4.5	-1.02	3.7	264	CDI	1.64		1.83	1.62		55.3	0.25	10	AVAWATZ PASS
22	2:34: 4	35.996	117.818	2.1	10.00**	2.2	265	BDI	1.59		1.95	1.77		78.2	0.28	17	LITTLE LAKE
23	0: 7: 4	37.098	117.197	0.4	1.54	1.4	94	ACI	0.99		0.93	0.90		17.2	0.14	18	BONNIE CLAIRE SW
23	2:10:14	37.100	117.199	0.5	4.90	3.7	117	BCI	1.00		0.99	0.89		17.3	0.14	16	BONNIE CLAIRE SW
23	4:38:36	37.129	117.314	0.4	4.96	2.1	99	BCI	1.41		1.69	1.41	1.4	14.7	0.18	32	UBEHEBE CRATER
23	9: 7:40	37.404	115.223	0.4	0.89	0.5	127	ACI	1.26		1.38	0.97		15.3	0.08	8	ASH SPRINGS
23	19:32: 6	35.900	117.659	4.2	1.17*	—	276	CDI	1.90		2.12	1.98		71.8	0.20	14	MOUNTAIN SPRING
23	22:24:11	35.759	117.979	1.6	7.00	2.0	293	BDI	2.10		2.47	2.22		102.9	0.17	14	LITTLE LAKE
24	9:51:42	36.829	116.030	0.5	9.83	1.1	165	ACI	0.86			0.50		12.7	0.09	14	CANE SPRING
24	22:18:36	38.424	117.387	—	11.66	—	259	ADI				1.63		80.3	0.08	4	SAN ANTONIA
25	3:37:10	37.229	116.507	0.5	0.00	0.8	85	ACI			1.11	1.03		13.8	0.15	16	THIRSTY CANYON
25	5: 5:51	36.008	117.085	—	11.82	—	238	ADI				0.44		20.2	0.15	4	TELESCOPE PEAK
25	8:27: 5	36.521	117.886	1.5	7.00*	—	251	CDI	1.89		2.05	2.09		53.3	0.20	24	NEW YORK BUTTE
25	23:58:35	37.313	116.035	1.0	-0.86	1.4	126	BCI			1.52	1.61		12.8	0.29	14	OAK SPRING BUTTE
26	6:54: 3	36.775	116.103	0.6	10.14	1.0	143	ACI	1.39			0.93		10.6	0.10	11	CANE SPRING
27	4: 3:26	37.438	115.846	0.5	-1.13	0.8	61	CCI	2.46		2.72	2.50	2.5	25.0	0.30	42	GROOM MINE NE
27	4:52:50	35.659	115.929	2.9	2.06*	—	217	CDI	1.97			1.92		55.8	0.20	8	KINGSTON PEAK
27	22:40:15	36.717	116.401	0.3	6.11	0.6	148	ACI				0.67	1.2	7.8	0.07	17	LATHROP WELLS

1990 LOCAL HYPOCENTER SUMMARY - SGB EARTHQUAKES

DATE	TIME (UTC)	LATITUDE (DEG. N)	LONGITUDE (DEG. W)	STAND ERROR H(KM)	DEPTH (KM)	STAND ERROR Z(KM)	AZI GAP (DEG)	QQD 12S	MAGNITUDE ESTIMATES Mca	Md	MLh	MLv	MLc	DEL-MIN (KM)	RMS RES. (SEC)	#N PH.	U.S.G.S. QUADRANGLE
AUG 27	23:44: 6	36.947	117.528	0.7	4.69	6.1	195	CDI	1.14			1.19	1.5	17.2	0.10	9	DRY MTN
28	11:23:50	37.476	118.416	3.0	0.46	2.3	288	CDI	2.00		2.13	2.06	2.4	45.3	0.23	24	***QUAD. NOT LISTED
28	13:22:22	36.694	115.988	0.5	5.67	1.3	93	BBI	1.48			1.32		4.4	0.16	21	MERCURY
29	14:56:34	37.302	117.574	1.6	8.60	3.9	164	BCI			1.18	1.06		10.0	0.17	7	MAGRUDER MTN
30	5: 9:20	37.231	117.552	0.6	12.04	0.9	126	ABI		0.83		1.03		8.3	0.09	8	LAST CHANCE RANGE
30	10:31:23	37.227	117.549	0.6	12.00	1.2	109	ABI			1.14	1.02		8.6	0.13	11	LAST CHANCE RANGE
30	13: 9:30	36.838	116.138	0.7	2.39	0.6	193	ADI	1.22			0.77	0.9	3.3	0.14	16	SKULL MTN
30	14:31:39	36.756	116.674	0.4	-0.86	0.6	124	ABI	1.18			0.46		6.2	0.13	15	BARE MTN
30	19:29: 0	35.993	117.838	4.0	2.94*	——	289	CDI	2.00		1.85	1.99		79.8	0.17	14	LITTLE LAKE
30	22:16: 7	36.234	117.569	1.7	2.21	6.3	258	CDI	1.84		1.73	2.05		45.6	0.17	15	COSO PEAK
31	0:48:47	37.306	116.033	0.5	4.75	2.5	90	BCI	1.38		1.08	1.44	1.6	12.0	0.19	21	OAK SPRING
31	2:59:60	36.570	116.499	0.5	6.46	3.3	112	BCI				1.26		16.5	0.09	12	LATHROP WELLS
31	12:42:33	36.791	115.925	0.5	9.99	0.9	174	ACI				0.67		14.8	0.08	13	FRENCHMAN FLAT
31	13:57:43	36.764	116.683	0.5	-0.04	0.5	142	ACI	1.27			0.73		6.2	0.13	17	BARE MTN
31	14:40:14	37.147	115.588	0.5	5.16*	——	115	CCI	1.70	1.27		1.57		35.6	0.16	19	FALLOUT HILLS NE
31	15: 6:60	36.502	114.333	4.6	5.00**	7.1	256	CDI	2.27			1.84		74.1	0.43	8	***QUAD. NOT LISTED*
31	19:27: 2	37.309	116.037	0.4	-0.78	0.6	74	BCI	1.81		1.52	1.89	1.9	12.4	0.18	32	OAK SPRING
31	19:33:58	37.309	116.028	0.6	0.39	1.0	93	BCI	1.80			1.95	1.9	12.2	0.24	25	OAK SPRING
31	21:54:24	37.912	116.415	0.3	-0.15	0.4	102	ACI	1.87			1.85	1.5	19.1	0.11	20	KAWICH PEAK
SEP 1	4: 0:20	37.091	116.876	0.4	4.01	4.8	99	BCI	1.58		0.97	0.81	1.5	14.8	0.14	18	SPRINGDALE
1	5:14:20	37.112	117.038	0.2	8.36	1.1	103	ABI	1.52		1.26	1.26		14.4	0.10	27	BONNIE CLAIRE
1	6:20:44	37.307	116.019	0.7	1.99	1.9	82	BCI	1.74			1.55	1.6	12.0	0.28	30	OAK SPRING
1	19:26:59	36.639	115.917	0.3	6.45	0.8	83	AAI	1.52	1.32		1.02	0.9	4.7	0.08	14	MERCURY
2	0:34:37	37.314	116.066	4.4	7.00*	——	101	DBI			1.01	0.88		13.5	0.91	10	OAK SPRING BUTTE
2	16:36:26	37.304	117.122	2.2	10.98	5.2	266	CDA		0.99				39.2	0.14	11	SCOTTYS JUNCTION
3	1:13:34	36.879	116.726	0.5	5.08	2.7	148	BCA		0.44				12.8	0.07	8	BARE MTN
3	4:54:17	37.130	117.041	1.1	0.31	1.1	204	BDA		0.82				16.4	0.23	15	BONNIE CLAIRE
3	16:45: 7	37.122	116.901	1.7	8.28	3.4	202	BDA		1.52				15.8	0.27	17	SPRINGDALE
3	21:55: 3	36.862	116.740	0.4	9.69	0.9	144	ACI	1.17			0.58		12.4	0.06	11	BARE MTN
4	1:17:10	37.311	116.029	0.6	4.23	8.5	99	CCI	1.69		1.21	1.09		20.9	0.18	16	OAK SPRING
4	2:26:19	37.095	116.878	0.2	0.14	0.4	67	ACI	1.82		1.76	1.84	1.6	14.7	0.14	45	SPRINGDALE
4	3:36:59	37.309	116.034	0.4	0.65	0.8	90	ACI	1.28		1.33	1.24		12.3	0.14	18	OAK SPRING
4	14:51:40	37.095	116.878	0.2	-0.01	0.4	100	ACI	1.58		1.30	1.23		14.7	0.11	27	SPRINGDALE
4	18:29:37	36.682	116.264	0.5	11.21	0.4	215	ADI				0.74		6.8	0.07	13	STRIPED HILLS
5	4:58:34	37.092	116.877	0.3	0.97	0.5	46	ACI	1.80			2.00	1.8	14.8	0.14	45	SPRINGDALE
5	6:35:20	37.120	117.217	0.5	-0.43	0.7	80	ACI			0.89	0.50		17.7	0.14	11	BONNIE CLAIRE
5	7:56:36	37.092	116.879	0.2	-0.15	0.3	99	ACI	1.62	1.60	1.50	1.68	1.6	15.0	0.10	33	SPRINGDALE
5	8:57:10	37.092	116.877	0.3	-0.02	0.4	99	ACI	1.28			0.79	1.5	14.8	0.08	15	SPRINGDALE
6	10:10:20	37.094	116.878	0.3	1.72	1.0	100	ACI	1.65			1.38	1.5	14.8	0.10	18	SPRINGDALE
6	10:32:19	37.094	116.877	0.2	0.76	0.5	46	ACI	2.23	2.12		2.23	2.2	14.7	0.12	50	SPRINGDALE
7	10:23:21	37.864	116.135	0.4	0.82	0.6	108	BCI	1.96		1.86	2.07	2.1	20.7	0.20	28	REVEILLE PEAK
7	14:14:31	37.097	116.874	0.3	0.92	0.6	100	ACI	1.27		0.67	0.90	1.5	14.3	0.13	19	SPRINGDALE
8	1:39:49	37.094	116.878	0.3	0.01	0.6	100	ACI	1.24		1.01	0.93	1.5	14.7	0.10	17	SPRINGDALE
8	7:57:28	38.179	114.938	3.3	-1.02	2.6	252	CDI	2.31			2.51	2.7	34.9	0.27	19	SILVER KING MTN

1990 LOCAL HYPOCENTER SUMMARY - SGB EARTHQUAKES

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SEP 8	9:38:48	38.185	114.929	4.0	-1.02	2.9	253	CDI	1.91	1.84		1.97	1.7	35.8	0.31	17	SILVER KING MTN
8	10:53:38	37.287	115.002	0.7	6.13	1.5	194	ADI	1.84		1.38	1.80	1.7	14.0	0.11	11	ALAMO SE
8	12:33:46	37.270	115.402	1.7	11.30	3.2	162	BCI	1.71		1.18	1.65		22.1	0.18	7	CUTLER RESERVOIR
8	17:53:23	37.094	116.876	0.3	0.39	0.5	100	ACI			0.88	1.06		14.6	0.09	17	SPRINGDALE
9	1:21:58	37.285	117.585	0.4	9.45	0.7	99	ABI	0.98		0.82	0.77		8.0	0.06	9	MAGRUDER MTN
9	18:56:51	37.094	116.876	0.2	0.56	0.3	100	ACI	1.38		0.93	0.91		14.6	0.07	20	SPRINGDALE
9	22:52:48	36.757	116.108	0.5	9.84	1.1	91	BBI	1.39			0.91	1.4	12.1	0.16	20	CANE SPRING
10	5:32:17	37.097	116.876	0.3	0.38	0.5	100	ACI			0.94	0.84	1.5	14.5	0.11	22	SPRINGDALE
10	7:39:29	37.094	116.880	0.5	-0.07	0.7	100	ACI	1.35		1.09	1.07	1.5	14.9	0.14	16	SPRINGDALE
10	17:30:10	37.093	116.879	0.3	1.73	0.9	99	ACI	1.44		1.09	1.12	1.5	14.9	0.13	22	SPRINGDALE
11	20:19:10	36.726	116.273	0.6	2.79	0.5	180	ADI	1.10		1.62	0.58		1.9	0.11	16	STRIPED HILLS
12	1:40:29	37.557	117.171	1.0	1.46	3.8	124	BCI	1.24		1.38	1.34		24.7	0.20	13	GOLDFIELD
12	8:28:10	35.714	117.980	5.8	2.56	6.0	307	DDU	2.04	2.10	2.32	2.07		104.3	0.44	11	INYOKERN
13	8:35:57	36.596	116.099	0.2	11.05	0.6	58	ABI	1.59		1.40	1.30	1.6	14.3	0.11	34	SPECTER RANGE SE
13	11:22: 6	37.863	116.136	0.7	-0.26	1.2	107	BCI				1.41		20.7	0.26	14	REVEILLE PEAK
14	12:45: 5	37.292	114.955	2.7	-0.76	2.7	208	CDI	1.81		1.22	1.16	1.7	15.3	0.44	12	DELAMAR LAKE
14	12:46:27	37.283	114.954	1.3	2.02	2.6	210	BDI	1.62			1.33	1.8	16.1	0.18	10	DELAMAR LAKE
15	5: 2:17	37.091	116.879	0.2	0.05	0.3	98	ACI	1.81		1.43	1.33	1.5	15.0	0.10	29	SPRINGDALE
17	9:26:33	37.193	117.637	0.9	10.09	0.9	163	BCI			0.78	1.10		4.4	0.18	12	LAST CHANCE RANGE
17	14:49:28	37.096	116.873	0.3	0.82	0.4	100	ACI			0.95	0.90		14.3	0.10	19	SPRINGDALE
17	18:46:52	37.288	118.200	1.8	5.33	11.4	299	CDI	1.66			1.57	1.9	30.1	0.18	11	LONG VALLEY REGION
17	19:34:50	36.759	116.635	2.1	2.64	2.4	146	BCI				0.77		4.2	0.18	15	BARE MTN
18	1: 2:13	37.100	116.732	0.4	-1.16	0.4	80	BBI	1.50		1.02	1.12		5.2	0.15	25	THIRSTY CANYON
18	2:16:33	37.092	116.879	0.2	0.37	0.3	99	ACI	1.93			1.88	1.8	14.9	0.10	32	SPRINGDALE
18	10:31:20	37.042	115.984	2.0	16.55	2.3	217	BDI				1.15		13.7	0.15	8	PAIUTE RIDGE
19	12:49:28	37.095	116.876	0.4	0.54	0.5	100	BCI	1.39	1.48	1.13	0.95	1.5	14.6	0.15	20	SPRINGDALE
19	18:25:49	36.765	116.640	2.3	4.59	1.8	156	BCI	1.45			0.72		3.7	0.18	11	BARE MTN
20	3:29:56	37.082	117.418	0.4	8.65	0.8	150	ACI	1.34		1.37	1.27	1.3	11.2	0.07	11	UBEHEBE CRATER
20	7:31:19	37.455	116.704	0.8	11.93	1.1	154	ACI			1.05	1.19		22.4	0.14	10	CLOVER MTNS
20	18:15:18	37.043	115.174	2.7	5.06	6.1	270	CDI	2.02		1.50	1.42	1.7	14.0	0.28	11	LOWER PAHRANAGAT LAKE
20	19: 4:36	36.902	116.651	0.7	0.06	1.8	78	BCI	2.55			1.43		11.9	0.17	15	BARE MTN
21	11:15:35	36.595	116.256	0.4	0.88	0.4	165	ACI				0.86		9.3	0.05	10	LATHROP WELLS
21	21:28:36	36.075	116.833	5.7	2.61*	—	132	DCI			1.28	0.76		12.7	0.32	7	BENNETTS WELL
23	1: 1:32	36.735	116.022	0.3	-1.14	0.5	85	ABI	1.73	1.43	1.46	1.46	1.0	9.9	0.11	26	CAMP DESERT ROCK
23	10:31:31	36.357	117.567	2.4	1.70	7.7	231	CDI	1.60		1.69	1.57		41.2	0.17	14	DARWIN
23	16:20:19	36.826	116.129	1.0	0.10	0.7	198	BDI	1.74		0.89	1.29	0.9	4.8	0.18	16	SKULL MTN
23	17:30:45	36.790	116.039	8.7	2.89*	—	304	DDI				-0.02		13.5	0.10	7	CANE SPRING
23	18: 2: 9	37.159	117.351	0.5	8.26	1.2	100	ACI			1.36	1.13		17.8	0.14	12	UBEHEBE CRATER
24	19:47:32	37.103	116.389	0.7	5.10	2.3	88	BBI	1.46			1.19	1.2	7.5	0.24	24	TIMBER MTN
25	13: 4: 2	36.758	116.088	0.6	8.45	1.5	126	ABI		0.83		0.83		12.9	0.12	15	CANE SPRING
26	2:26:21	36.537	115.405	0.6	-1.87	0.8	115	BCI	1.91	1.72	1.55	1.72	1.8	22.2	0.21	17	BLACK HILLS
26	9:30:32	36.961	116.604	0.5	7.00	1.9	146	ACI				0.37		13.5	0.10	16	BARE MTN
26	22:28:17	38.451	117.387	—	11.99	—	262	BDU				1.79		83.3	0.27	4	SAN ANTONIA
26	23:59:32	37.117	117.203	0.7	8.58	2.7	123	BCI				0.80		18.3	0.16	10	BONNIE CLAIRE

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SEP 27	0: 6:13	37.119	117.200	0.6	0.16	0.9	110	BCI				0.82		18.7	0.18	11	BONNIE CLAIRE
27	10:30:59	36.607	116.277	0.4	0.70	0.7	62	BBI	2.06	2.24	2.45	1.91	2.3	7.0	0.21	35	LATHROP WELLS
27	10:43: 2	38.201	116.208	9.0	1.88*	——	211	DDI	1.50			1.53		20.4	0.46	15	TWIN SPRINGS SLOUGH
27	12:19:58	36.640	116.283	4.7	-1.82	3.7	253	CDI				0.64		5.1	0.15	9	STRIPED HILLS
27	15:56:34	36.700	115.767	0.4	0.09	0.3	120	BBI	1.74		1.22	1.73	1.4	4.0	0.17	29	MERCURY NE
27	18: 2:47	37.004	116.053	0.6	1.70	1.5	175	ACI	1.96			1.67	1.7	8.3	0.13	14	YUCCA FLAT
27	22:53:22	37.269	114.969	1.6	-2.00	1.6	201	BDI	2.01		1.95	1.95		22.3	0.23	13	DELAMAR LAKE
28	4:41:59	36.696	115.761	1.4	-0.09	0.8	205	BDI				0.83	1.2	4.5	0.19	11	MERCURY NE
28	11:29:57	36.747	116.027	0.3	0.97	0.5	115	ACI	1.51			1.51	1.5	11.2	0.11	23	CAMP DESERT ROCK
28	14:18:14	38.238	116.170	1.1	5.84	8.0	204	CDI	2.16		1.90	1.95	2.4	23.3	0.22	16	TWIN SPRINGS SLOUGH
29	6: 7: 1	35.997	114.794	0.8	-1.42	1.1	166	ACI	2.01			2.12		9.0	0.06	13	BOULDER CITY
29	9:38:21	36.028	116.096	0.8	-1.55	1.4	169	BCI	2.20			1.97	2.2	12.2	0.19	22	STEWART VALLEY
29	19:21:41	37.506	118.439	6.6	0.10	5.4	314	DDU	2.52				2.7	47.9	0.10	7	LONG VALLEY REGION
30	2: 5:58	37.369	115.204	1.1	10.75	2.4	173	BCI			1.24	0.96	1.4	14.2	0.09	7	ALAMO
30	2:21:35	36.636	116.232	0.4	10.01	0.9	124	ABI	1.16			0.81		9.7	0.07	11	SPECTER RANGE
30	10: 9:46	36.921	117.588	0.7	8.66	1.5	195	ADU	2.81				2.3	20.8	0.09	10	DRY MTN
30	10:18:15	36.931	117.571	1.2	6.50	6.4	187	CDI	1.59			1.51	1.8	20.4	0.17	11	DRY MTN
30	10:53:36	36.926	117.579	1.0	6.25	4.6	188	BDI	1.80			1.63	1.9	20.5	0.20	15	DRY MTN
30	17: 9:16	36.920	117.587	1.1	0.60	1.0	195	BDI	1.16			1.10		20.7	0.14	9	DRY MTN
30	17:14:33	37.309	117.316	0.7	9.61	1.1	147	ACI			1.00	0.85		5.3	0.05	6	GOLD POINT
30	19:59: 8	36.014	116.082	0.7	4.75	2.3	237	BDI	1.66		1.64	1.79	2.1	14.1	0.13	16	STEWART VALLEY
OCT 1	2:12:21	38.216	116.221	2.0	3.13*	——	264	CDI	2.19			1.74		54.4	0.26	12	TWIN SPRINGS SLOUGH
1	4:43:20	36.632	116.236	0.6	8.75	1.2	137	ACI	0.89			0.47		9.4	0.09	13	SPECTER RANGE NW
1	10:53:28	38.227	116.183	2.1	-1.02	2.0	200	CDI	1.39			1.58		22.2	0.33	12	TWIN SPRINGS SLOUGH
1	13:28:11	37.381	115.203	1.4	11.05	2.6	114	BBI	1.23		1.62	1.31		13.7	0.23	13	ASH SPRINGS
1	13:56:37	37.256	116.416	2.8	-1.60	2.7	116	CBU	1.19		1.58		1.1	8.0	0.28	6	SILENT BUTTE
2	1: 9:51	38.165	116.143	2.0	-1.13	2.5	186	CDI	1.87			1.83		26.8	0.50	16	TWIN SPRINGS SLOUGH
2	2:38:24	38.147	116.217	4.8	2.43*	——	269	DDU						47.2	0.65	11	TWIN SPRINGS SLOUGH
2	5:42:16	36.029	116.060	2.4	-1.97	2.1	212	DDI	2.18			1.99	2.2	13.8	0.54	24	STEWART VALLEY
2	6: 8:29	36.775	115.789	1.4	-1.08	1.2	215	BDI	1.22			0.99		9.2	0.25	15	FRENCHMAN LAKE SE
2	8:30:47	35.907	116.721	5.0	0.30	3.5	263	CDI	1.93			1.36		31.3	0.36	11	CONFIDENCE HILLS
3	20: 6:58	36.500	116.568	0.5	-0.47	0.8	55	BCI	1.57			1.50		14.1	0.19	19	BIG DUNE
4	9: 8:37	35.995	116.070	1.7	-0.19	1.6	217	CDI	1.86			1.98	2.1	16.5	0.38	27	TECOPA
4	11:54: 0	37.153	117.377	0.4	-0.85	0.5	170	ACI	1.26		1.15	1.13		17.3	0.14	18	UBEHEBE CRATER
5	1:49:56	37.919	117.766	1.2	3.06*	——	266	CDI				1.81	1.8	22.9	0.21	18	RHYOLITE RIDGE
5	3:18:44	35.999	115.663	——	1.05	——	172	DDI	2.03			1.73		36.2	1.23	4	SHENANDOAH PEAK
5	6: 4:19	37.055	122.032	1.0	11.00	2.8	165	BCI	3.80			3.90		372.5	0.30	14	Regional (NEIC)
5	6:31: 8	37.171	114.935	1.7	4.65	2.8	249	BDI	1.32		1.49	1.48	1.6	22.4	0.20	10	DELAMAR 3 NW
5	7:41: 3	36.694	116.271	0.5	6.47	0.6	202	ADI				0.45	1.1	5.4	0.06	10	STRIPED HILLS
5	11:31:44	37.308	117.568	0.7	-1.90	0.8	92	BCI				0.84		10.8	0.22	15	MAGRUDER MTN
5	21:40:20	37.874	116.128	0.7	-0.47	1.1	110	BCI	1.65			1.44		20.9	0.29	19	REVEILLE PEAK
6	7:44:32	37.088	116.875	0.3	-0.16	0.4	173	ACI	1.22			1.09		14.8	0.09	14	SPRINGDALE
6	11:46:14	36.749	116.011	0.4	0.97	0.7	152	ACI	2.14			1.44	1.5	10.7	0.09	13	CAMP DESERT ROCK
6	13: 1:35	36.743	116.012	0.4	-0.13	0.5	155	ACI	1.39			1.23		10.2	0.08	13	CAMP DESERT ROCK

1990 LOCAL HYPOCENTER SUMMARY - SGB EARTHQUAKES

DATE - TIME (UTC)		LATITUDE (DEG. N)	LONGITUDE (DEG. W)	STAND ERROR H(KM)	DEPTH (KM)	STAND ERROR Z(KM)	AZI GAP (DEG)	QQD 12S	MAGNITUDE ESTIMATES Mca	Md	MLh	MLv	MLc	DEL-MIN (KM)	RMS RES. (SEC)	#N PH.	U.S.G.S. QUADRANGLE
OCT 7	12: 3:38	35.990	117.223	9.5	0.00*	—	313	DDI	1.11			1.58		97.4	0.26	7	MANLY PEAK
8	2:29:28	37.863	116.128	0.8	0.88	1.1	111	BCI	1.58			1.38		20.1	0.17	9	REVEILLE PEAK
8	15:47:18	36.218	117.580	3.4	-1.02	2.6	260	CDI	1.97			1.97		47.3	0.41	21	COSO PEAK
8	18:39:17	36.440	116.985	1.4	13.53	1.8	190	CDI	1.15			0.94		11.6	0.31	20	FURNACE CREEK
8	18:51: 7	37.307	116.037	0.1	4.34	0.9	113	ACI	1.14		0.91	1.21		12.1	0.03	10	OAK SPRING BUTTE
10	5:50:44	36.955	116.386	0.3	7.63	0.6	76	ABI	0.99			0.65		8.8	0.11	22	TOPOPAH SPRING NW
10	11:24:48	37.250	114.611	5.9	-1.02	4.4	276	DDI	1.68		1.70	1.65		41.0	0.37	12	ELGIN
10	18:37:22	37.918	117.723	1.2	3.15*	—	262	CDI	1.56			1.86	1.8	23.6	0.14	10	SILVER PEAK
11	4:48:25	37.625	114.627	0.9	-1.36	0.4	291	BDI	1.19			1.00		10.1	0.18	7	CALIENTE NW
11	14:39:49	35.696	115.867	2.4	3.62*	—	268	CDI	2.11			1.90		54.4	0.36	18	KINGSTON PEAK
12	7:30: 8	37.458	115.273	1.4	0.34	1.6	192	BDU				1.18		20.5	0.17	8	HANCOCK SUMMIT
13	1:44:47	36.709	115.879	0.9	6.98	1.4	163	ACI	1.40			1.27		6.4	0.11	10	MERCURY
13	11:26: 8	36.696	117.223	0.4	8.36	0.7	85	AAI	1.41		1.92	1.50		7.4	0.07	14	STOVEPIPE WELLS
13	11:44: 7	36.500	115.950	0.7	10.84	1.7	125	ABI	1.33		0.89	1.08		15.4	0.09	8	MERCURY SW
13	19:52:38	36.764	116.237	1.2	4.36	0.7	239	BDI	1.45				0.9	3.9	0.07	8	SKULL MTN
14	0:26:49	37.252	116.499	0.5	1.82	1.6	123	ACI	2.66				1.9	13.2	0.06	7	SILENT BUTTE
14	14:40: 2	37.240	117.903	2.1	-1.23	2.2	241	BDI	1.57		1.66	1.67		20.5	0.19	11	WAUCOBA SPRING
14	19:43:43	36.005	116.068	1.5	5.80	2.7	215	BDI	2.99				3.4	15.6	0.15	14	STEWART VALLEY
15	7:43: 2	37.695	117.392	1.3	-1.50	1.9	181	BDI	1.23			1.24		29.8	0.14	8	SPLIT MTN
15	20: 4:35	36.625	116.440	0.8	4.27	1.8	266	ADI	1.67				1.6	9.2	0.08	13	LATHROP WELLS NW
15	23:48:15	37.702	117.383	1.8	5.73	1.5	213	BDI	1.32			1.52	1.4	0.2	0.15	8	SPLIT MTN
16	8:14:41	36.922	116.762	0.3	0.45	0.4	96	BCI	1.46			1.13	0.9	18.4	0.17	25	BULLFROG
16	13:58:19	37.241	117.519	0.5	10.87	0.8	191	ADI		1.03	0.75	0.98		11.4	0.05	8	LAST CHANCE RANGE
16	14: 2:43	37.247	117.521	0.6	8.66	1.4	138	ACI			1.04	0.93	1.5	11.2	0.09	9	LAST CHANCE RANGE
17	0:23:41	36.282	117.578	2.3	5.19*	—	256	CDI	1.82		2.28	1.85		44.6	0.27	12	DARWIN
17	2:55:42	35.897	116.882	5.2	0.70	4.4	272	DDI	1.51			1.45	1.1	7.5	0.30	9	WINGATE WASH
17	15:41:55	36.154	117.891	2.7	-0.33	2.3	288	CDI	2.00			2.07		75.8	0.16	14	HAIWEE RESERVOIR
17	15:55:49	35.770	116.536	2.3	-1.02	1.8	251	BDI	2.03		2.17	2.09	2.1	36.8	0.22	16	CONFIDENCE HILLS
17	17:26:51	36.143	117.902	2.0	4.07	2.2	286	BDI	1.88	0.64	2.37	1.91		77.1	0.20	12	HAIWEE RESERVOIR
17	20:18:24	37.552	114.097	2.7	2.45*	—	326	DDU	1.80	1.63		2.08		56.9	0.15	8	***QUAD. NOT LISTED*
18	19:25:51	37.091	116.209	0.9	7.61	1.8	117	BBI	1.26		1.33	1.01	1.3	6.2	0.21	12	TIPPIPAH SPRING
18	22: 1:57	35.966	116.893	—	20.22	—	244	ADI				0.88		2.3	0.14	4	WINGATE WASH
20	0:29:35	35.682	115.659	5.0	7.00	11.7	281	DDI	1.66			1.56		71.1	0.29	7	CLARK MTN
20	5:27:28	35.898	115.702	4.5	2.61*	—	289	CDI	1.77		1.63	1.71		47.9	0.20	10	SHENANDOAH PEAK
20	20:49:15	36.683	116.286	0.5	1.44	1.9	134	ABI	1.77		2.63	1.66	0.9	6.4	0.08	11	STRIPED HILLS
21	14: 2:27	36.299	117.548	4.2	-1.02	3.9	252	CDI	1.81		2.03	1.80		41.5	0.22	8	DARWIN
21	21:19:55	36.174	117.916	2.0	3.02*	—	289	CDI	1.63		1.88	1.78		77.2	0.21	10	HAIWEE RESERVOIR
22	10:43:56	37.234	117.548	0.7	10.48	0.8	148	ACI	0.99		0.95	1.11		8.8	0.08	8	LAST CHANCE RANGE
23	22:55:21	36.294	117.554	2.8	2.81*	—	253	CDI	1.44		1.79	1.44		42.1	0.15	7	DARWIN
24	5: 4: 6	37.347	117.880	—	11.02	—	267	ADI	1.48		1.09	0.90		41.4	0.01	4	SOLDIER PASS
24	8:38:55	36.744	116.217	0.6	6.82	0.9	206	ADA		0.63				5.0	0.11	14	SPECTER RANGE NW
24	18:59:49	36.057	116.793	2.7	-1.02	6.1	131	CCI				0.67		12.3	0.35	7	BENNETTS WELL
25	0:15:11	35.717	115.733	10.3	5.00	8.6	124	DBI	1.93		0.88	0.87		80.2	0.19	6	CA-NV BORDER
25	21:57:37	36.119	115.361	1.9	3.34*	—	159	CCI	1.94		1.54	1.82		30.1	0.36	11	BLUE DIAMOND SE

1990 LOCAL HYPOCENTER SUMMARY – SGB EARTHQUAKES

DATE	– TIME (UTC)	LATITUDE (DEG. N)	LONGITUDE (DEG. W)	STAND ERROR H(KM)	DEPTH (KM)	STAND ERROR Z(KM)	AZI GAP (DEG)	QQD 12S	MAGNITUDE ESTIMATES Mca	Md	MLh	MLv	MLc	DEL-MIN (KM)	RMS RES. (SEC)	#N PH.	U.S.G.S. QUADRANGLE
OCT 26	4:41:14	37.150	114.925	7.4	-1.12	9.0	255	DDI	1.50			1.37		23.4	0.44	10	DELAMAR 3 NW
26	12:18: 7	36.715	116.434	0.7	7.97	1.2	196	ADI	1.00			0.31		8.2	0.11	11	LATHROP WELLS NW
26	15:21:13	35.902	116.905	3.4	7.66	2.7	272	CDI	1.50		1.35	1.41		7.7	0.26	8	WINGATE WASH
26	16:46: 4	38.622	116.448	6.5	0.41	5.8	275	DDI	2.57			2.57	2.9	43.2	0.26	9	***QUAD. NOT LISTED*
26	17:44:29	36.885	116.335	0.2	9.18	0.3	82	AAI	1.20			0.58	1.4	2.9	0.03	13	TOPOPAH SPRING
26	18: 3:32	37.438	116.659	0.4	-0.39*	—	92	CCI	1.34		0.98	1.02		16.3	0.12	11	BLACK MTN NW
26	21:20:10	36.165	117.422	6.0	2.39*	—	273	DDI	0.66		1.67	1.33		38.4	0.60	10	MATURANGO
26	21:20:54	36.155	117.297	4.7	3.38*	—	234	CDI	0.90		1.59	1.41		31.7	0.45	8	MATURANGO
27	14:54:15	35.853	116.904	2.3	1.25	3.6	314	BDI	1.59		1.33	1.23		12.7	0.18	7	WINGATE WASH
28	19:25:39	35.898	116.904	2.5	-0.51	1.9	269	BDI	2.28		2.23	2.09	2.3	8.1	0.14	13	WINGATE WASH
28	19:35: 3	37.425	116.532	0.3	0.12	0.9	168	ACI	1.46		1.84	1.27	1.2	17.6	0.04	10	BLACK MTN NE
28	20: 7:17	35.866	116.922	4.6	3.61*	—	277	CDI	1.41		1.59	1.65		42.1	0.29	6	WINGATE WASH
28	20:13: 2	37.405	117.915	1.9	8.27	1.2	244	BDI	1.34			1.41	1.4	2.3	0.15	11	SOLDIER PASS
29	2:37:27	37.190	116.955	0.2	-1.36	0.7	55	ACI	2.68		2.64		3.0	20.9	0.10	53	SPRINGDALE
29	6:56:16	37.197	114.402	8.6	2.86*	—	301	DDI	2.26		2.44	2.05	2.1	54.3	0.34	9	***QUAD. NOT LISTED*
29	8:52:47	35.880	116.939	7.1	3.34*	—	277	DDI	1.57		1.22	1.42		41.7	0.25	5	WINGATE WASH
29	10:56: 4	37.186	116.963	0.5	9.03	2.5	132	BCI	1.43			1.09		21.6	0.13	12	SPRINGDALE
30	6:50: 2	37.265	114.956	2.5	11.01	4.2	216	CDI	1.43			1.45		17.9	0.08	7	DELAMAR LAKE
30	13:54:59	36.017	117.281	3.9	3.18*	—	261	CDI	1.84			1.37		37.8	0.25	10	MATURANGO
30	13:55:43	35.972	117.342	1.3	3.49*	—	273	CDI	1.61		1.97	1.73		42.8	0.14	10	TRONA
31	18:58: 5	36.733	116.089	0.4	7.34	1.1	149	ACI	1.33			1.27	1.4	13.9	0.08	14	CAMP DESERT ROCK
NOV 1	7:51:47	37.531	116.521	0.3	5.98	1.4	58	BCI	2.43		2.47	2.30	2.9	22.8	0.16	47	MELLAN
1	7:52:48	37.523	116.519	0.5	0.91	0.8	105	ACI	1.88			1.94	1.8	23.5	0.11	11	MELLAN
1	8: 5:28	37.530	116.525	0.4	4.41	6.7	80	CCI	1.85		2.44	1.68	1.8	22.7	0.11	15	MELLAN
1	10: 9:55	37.466	114.561	2.5	1.96	3.0	283	CDI	2.04			2.01	1.9	22.0	0.08	7	ELIGN NE
1	20:54:44	37.123	116.926	0.4	8.66	1.3	110	ACI	1.88			1.54	1.9	18.0	0.10	13	SPRINGDALE
1	20:57:20	36.775	116.142	0.4	6.58	1.2	143	ACI	0.94			0.76		9.2	0.05	7	SKULL MTN
1	21:29:31	36.736	116.085	0.4	8.14	1.8	146	ACI	1.70			1.48	1.5	13.9	0.05	7	CAMP DESERT ROCK
2	2: 7: 8	36.734	116.085	0.4	3.56	5.6	147	CCI	1.62			1.49	1.4	13.7	0.08	14	CAMP DESERT ROCK
2	5:48:46	37.615	114.927	0.5	0.00	0.4	112	ABI	1.37			1.05	1.5	4.2	0.11	7	PAHROC SUMMIT PASS
2	16:27:31	35.891	116.771	3.7	1.13	7.5	248	CDI	1.57			1.30	1.3	11.9	0.15	7	WINGATE WASH
3	19:12: 3	36.553	116.538	1.3	39.86	2.0	149	BCI	1.39		1.50	1.30	1.9	23.9	0.11	10	BIG DUNE
6	1:16:20	37.402	117.203	1.4	-0.31	2.0	205	BDI	1.22			1.19	1.4	12.3	0.17	8	STONEWALL PASS
6	9:28:57	37.176	117.631	0.8	9.94	1.0	191	ADI	1.22		1.40	1.35		6.4	0.15	12	LAST CHANCE RANGE
6	9:30:14	37.125	117.676	2.4	3.04*	—	213	CDI	2.18		1.26	1.27		12.3	0.16	6	LAST CHANCE RANGE
6	9:30:54	37.174	117.622	0.4	9.92	0.9	165	ACI	1.76			1.70	2.0	6.8	0.08	15	LAST CHANCE RANGE
6	15:17:13	36.840	117.455	1.2	-0.46	1.7	191	BDI	1.50		1.51	1.51	1.4	5.9	0.18	12	TIN MTN
7	16:31: 7	37.396	117.199	1.0	-0.44	1.8	129	BCI	1.36			1.17	1.2	11.8	0.17	9	STONEWALL PASS
7	22:37:17	37.404	114.754	2.2	-1.35	2.4	232	BDI	1.43			1.54		22.4	0.15	8	DELAMAR
8	21:22:20	36.950	117.458	0.8	6.17	2.2	159	BCI	1.67			1.71	2.0	11.3	0.18	15	TIN MTN
8	22:15:16	36.947	117.435	1.3	6.49	3.4	159	BCI	1.13			1.12	1.3	9.8	0.21	8	TIN MTN
10	8: 1:45	36.879	116.737	4.4	2.36	5.9	229	CDI	1.29			0.83		13.4	0.26	11	BARE MTN
11	13:35: 6	37.108	116.256	0.4	4.81	1.1	99	ABI	1.13			0.83	1.3	8.2	0.07	10	BUCKBOARD MESA
12	0:53:16	36.758	115.824	1.8	6.44	2.5	219	BDI	1.04			0.89		7.2	0.13	8	FRENCHMAN LAKE SE

1990 LOCAL HYPOCENTER SUMMARY - SGB EARTHQUAKES

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NOV 12	23:29:45	36.840	115.996	1.3	10.38	2.2	215	BDI	0.99			0.66		15.4	0.11	9	FRENCHMAN FLAT
13	3:14:21	36.892	117.433	0.6	6.67	1.1	168	ACI	1.10			1.03		10.0	0.10	10	TIN MTN
13	17:53:27	36.778	115.993	1.2	11.76	2.0	156	BCI	1.43			1.10		13.3	0.12	9	FRENCHMAN FLAT
13	19:35:13	37.125	117.966	1.7	7.00	9.5	238	CDI	1.84			2.04	1.9	30.7	0.18	12	WAUCOBA SPRING
14	17:24:22	36.431	116.949	0.8	11.07	1.7	116	ABI	1.32			1.10	1.7	14.2	0.07	8	FURNACE CREEK
14	17:46:13	37.118	116.259	0.4	5.99	0.9	100	ABI	1.13		1.14	1.15	1.3	9.3	0.07	9	BUCKBOARD MESA
15	2:45:53	37.466	116.709	0.5	2.21	2.0	147	ACI	1.54			1.12		20.3	0.10	16	BLACK MTN NW
16	2: 0:52	37.158	116.867	0.6	10.85	1.0	166	ACI	2.59			0.68		12.7	0.10	11	SPRINGDALE
17	14:58:55	36.615	116.430	0.7	5.53	1.7	207	ADI	1.21			0.56	1.4	8.7	0.08	14	LATHROP WELLS SW
17	18:21: 9	37.339	117.596	0.4	1.29	1.4	88	ACI	1.04		1.02	0.99		12.7	0.11	11	MAGRUDER MTN
17	21:44:49	36.857	116.262	0.4	9.07	0.7	121	ABI	0.88			0.57		4.8	0.06	10	JACKASS FLATS
18	9:19:29	36.907	116.271	0.2	9.88	0.2	98	ABI	1.27			0.45		4.9	0.03	11	TOPOPAH SPRING
18	13: 5:28	36.977	117.462	0.6	4.38	3.5	156	BCI	1.33		1.36	1.40		10.6	0.14	13	TIN MTN
19	6: 0:23	36.615	116.417	0.9	8.32	1.1	275	ADI	1.09			0.77		7.7	0.07	10	LATHROP WELLS SW
19	6:28:12	37.636	114.873	0.5	2.13	1.0	178	ACI	1.03			1.08		5.9	0.05	7	PAHROC SPRING NE
19	13: 6:20	36.618	116.229	0.2	6.73	0.5	136	ACI	1.75		2.34	1.30	1.7	10.3	0.04	17	SPECTER RANGE SW
20	6: 6:51	36.374	117.531	2.2	-0.13	2.1	246	BDI	1.85			1.91	2.1	37.8	0.16	12	DARWIN
20	14:56:24	37.406	115.801	5.0	10.60	4.8	159	CCI	1.17		1.37	1.30		8.4	0.11	6	GROOM MINE NE
21	1:38:51	37.121	116.211	0.4	2.60	0.7	127	ABI	1.35			0.85	1.3	9.4	0.08	10	TIPPIPAH SPRING
21	21:28:53	36.976	117.471	0.5	2.73	1.3	159	ACI	1.91		1.94	1.78	1.9	11.4	0.12	15	TIN MTN
21	22:25:35	36.191	117.399	1.2	4.97*	——	242	CDI	1.59		2.04	1.54	1.9	34.9	0.15	15	MATURANGO
22	1:43:59	36.799	115.855	1.1	5.17	4.7	213	BDI	1.30			1.10		12.3	0.13	10	FRENCHMAN LAKE SE
22	4:33:56	36.918	117.557	0.7	4.53	5.8	202	CDI	1.79		1.76	1.69	1.9	18.5	0.14	14	DRY MTN
22	4:48:12	36.914	117.556	0.7	6.45	2.4	202	BDI	2.18		2.36	1.84	2.2	18.1	0.13	16	DRY MTN
22	5:23:45	36.917	117.557	0.7	2.08	1.3	202	BDI	1.68		1.68	1.69	1.7	18.4	0.16	16	DRY MTN
22	10:33:45	37.131	116.984	0.3	7.27	1.6	112	ACI	1.31			1.17		17.1	0.10	15	SPRINGDALE
22	12:24:56	37.134	116.978	0.3	3.97	5.1	113	CCI	1.39			1.06		17.6	0.09	14	SPRINGDALE
22	19:44: 7	36.622	116.254	0.3	4.64	0.9	142	ACI	1.43			1.21	1.4	8.1	0.05	13	LATHROP WELLS SE
23	0:21:22	36.651	116.393	0.5	6.83	0.6	136	ACI	1.73		2.21	1.74	1.4	4.9	0.07	14	LATHROP WELLS NW
23	15: 3:12	36.801	115.853	0.8	6.17	1.8	208	ADI	1.31			1.19		12.4	0.12	13	FRENCHMAN LAKE SE
24	18:39:59	36.620	116.423	0.6	6.75	1.1	149	ACI	1.41			0.89	1.4	8.0	0.06	12	LATHROP WELLS SW
25	2: 8: 4	36.806	117.627	1.8	2.89	7.5	224	CDI	1.37		1.18	1.30		19.9	0.22	11	DRY MTN
25	18:45:43	37.676	116.259	0.4	4.53	2.5	86	BCI	1.96		2.64	1.78	2.4	13.1	0.12	16	QUARTZITE MTN
26	2:39:20	37.238	116.778	0.4	0.35	0.7	123	ACI	1.48			1.00	1.4	11.2	0.10	13	SPRINGDALE
28	13:51:12	36.682	116.292	0.4	1.62	1.3	118	ABI	1.16			0.35	1.0	5.9	0.09	12	STRIPED HILLS
28	18:27: 1	36.769	116.648	0.7	3.67	0.6	172	ACI	1.28			0.78		3.6	0.07	12	BARE MTN
29	1: 0:21	37.247	116.737	0.2	-0.20	0.4	84	ABI	1.45		1.53	1.03	1.7	9.9	0.06	17	THIRSTY CANYON NW
29	3: 8:12	36.835	117.467	0.8	6.01	1.0	183	ADI	1.56			1.59	1.5	6.5	0.15	14	TIN MTN
29	11:17:14	37.552	117.167	0.7	7.00	4.9	123	BCI	1.35			1.46	1.7	25.3	0.17	12	GOLDFIELD
29	14:31:50	36.363	116.842	0.9	13.41	2.2	187	BDI	1.29			1.10		25.0	0.12	8	FURNACE CREEK
29	17:59:55	36.726	116.234	0.3	8.65	0.7	84	AAI	1.23			0.93	1.1	3.8	0.08	15	SPECTER RANGE NW
29	22:52:13	36.619	116.008	0.4	5.88	0.7	89	ABI	1.23			1.52		6.2	0.09	14	SPECTER RANGE SE
30	15:27:56	37.455	115.538	1.1	11.84	3.8	140	BCI	1.23		0.89	1.10		19.4	0.17	9	GROOM RANGE NE
DEC 1	17: 5:35	36.818	116.322	0.4	3.99	1.3	94	ABI	0.74			0.46		5.0	0.11	12	JACKASS FLATS

1990 LOCAL HYPOCENTER SUMMARY - SGB EARTHQUAKES

DATE	TIME (UTC)	LATITUDE (DEG. N)	LONGITUDE (DEG. W)	STAND ERROR H(KM)	DEPTH (KM)	STAND ERROR Z(KM)	AZI GAP (DEG)	QQD 12S	MAGNITUDE ESTIMATES Mca	Md	MLh	MLv	MLc	DEL-MIN (KM)	RMS RES. (SEC)	#N PH.	U.S.G.S. QUADRANGLE
DEC 1	22:16:39	36.658	116.388	0.3	6.95	0.5	71	AAI	1.58			1.19	1.5	4.5	0.09	18	LATHROP WELLS NW
3	8:31: 7	37.276	117.665	0.8	-1.52	0.8	185	ADI	1.14		1.14	1.04		5.1	0.10	10	MAGRUDER MTN
3	12:53:24	36.923	116.738	0.3	0.74	0.4	139	ACI	1.45			1.13	1.1	17.2	0.05	13	BARE MTN
3	16: 1:40	37.465	117.889	1.7	6.57	2.1	175	BCI	1.30			1.36		4.7	0.12	8	SOLDIER PASS
3	18: 4:22	37.468	117.896	1.1	7.11	1.2	185	BDI	1.38			1.52	1.3	4.9	0.12	11	SOLDIER PASS
3	21:31:15	37.023	117.460	2.9	8.59	3.4	222	CDI	1.33		1.12	1.25	1.4	10.4	0.16	7	UBEHEBE CRATER
3	22:30:13	37.461	117.918	1.0	4.14*	——	243	CDI	1.19			1.41		29.9	0.16	8	SOLDIER PASS
4	9:46: 9	37.471	117.901	0.7	6.17	0.7	192	BDI	2.46		2.66		2.7	5.1	0.21	32	SOLDIER PASS
4	13:39:55	37.474	117.899	1.5	7.74	1.5	190	BDI	1.18			1.03	1.4	5.5	0.11	9	SOLDIER PASS
4	18:28:32	37.462	117.909	1.0	8.14	1.1	200	BDI	1.49		1.52	1.76	1.4	4.1	0.16	13	SOLDIER PASS
5	4:23:48	37.470	117.902	0.7	7.94	0.7	193	ADI	1.35			1.54	1.5	5.0	0.07	10	SOLDIER PASS
5	5:36:22	37.465	117.875	1.8	7.15	2.3	161	BCI	1.17			1.19	1.3	5.2	0.15	9	SOLDIER PASS
5	6:47:18	37.928	116.129	0.5	3.21*	——	121	CCI	1.77		2.25	1.70		25.1	0.12	12	REVEILLE PEAK
5	9:47:43	36.023	116.992	8.8	2.71*	——	220	DDI	2.27			1.94	2.4	13.0	1.27	14	BENNETTS WELL
5	14:17:23	37.127	116.039	0.4	1.52	0.7	187	ADI	1.29		1.72	0.94	1.6	8.2	0.05	10	OAK SPRING
5	19:14:54	37.461	117.909	2.2	10.79	2.0	200	BDI	1.15			1.21	1.5	4.0	0.15	7	SOLDIER PASS
5	22:39:29	37.465	117.881	2.3	6.71	3.1	166	BCI	1.19			1.35	1.4	5.0	0.13	7	SOLDIER PASS
6	3:28:50	37.325	117.263	0.4	2.79	0.4	110	ABI	1.08			0.85	0.9	2.8	0.06	9	GOLD POINT
8	19:36: 4	37.456	117.909	1.3	10.30	1.4	200	BDI	1.27			1.51	1.6	3.4	0.16	10	SOLDIER PASS
9	23:10:49	37.708	115.007	1.0	1.92	2.5	131	BBI	1.41			1.15	1.6	8.8	0.19	10	HIKO NE
10	6:16:26	37.310	117.537	0.5	8.03	1.6	145	ACI	0.95		0.91	0.91		13.0	0.09	8	MAGRUDER MTN
10	17: 3:32	37.368	117.341	2.5	2.01	4.7	196	CDI	0.96		0.82	0.92		10.5	0.19	9	GOLD POINT
10	20: 5:49	36.678	116.285	0.7	2.48	0.7	205	ADI	1.36		2.15	1.05	1.4	6.1	0.10	13	STRIPED HILLS
10	22:38:54	37.372	117.339	——	1.45	——	199	ADI	0.90		0.30	0.66		10.8	0.06	4	GOLD POINT
10	23:43:57	36.672	116.273	0.6	2.32	0.7	218	ADI	1.49		2.18	1.27	1.3	6.7	0.10	14	STRIPED HILLS
11	3:58:39	36.363	115.998	0.6	0.67	0.8	184	BDI	1.63			1.57	1.9	12.8	0.19	10	MT STIRLING
11	4: 1:46	37.362	117.357	0.4	1.76	1.1	152	ACI	1.26			1.30	1.4	11.1	0.13	10	GOLD POINT
11	13: 1:17	37.225	117.675	0.9	0.78	0.2	316	ADI	1.11		1.00	1.18		2.7	0.03	5	LAST CHANCE RANGE
11	18:23:23	37.458	117.909	1.7	9.95	2.2	200	BDI	1.64			1.56	2.4	3.6	0.18	10	SOLDIER PASS
12	13: 5:54	37.131	116.836	2.3	10.35	4.1	108	CBA		0.94				10.0	0.38	10	SPRINGDALE
13	1: 1: 0	37.368	117.358	0.2	2.82	1.0	56	ACI	2.59	2.50		2.80	3.2	11.7	0.14	51	GOLD POINT
13	22:37:10	37.361	117.353	0.6	0.52	0.8	117	ACI	1.03		0.71	1.07		10.8	0.12	10	GOLD POINT
13	22:44:21	36.452	116.575	0.3	0.35	0.5	63	ACI	1.80			1.59	1.6	10.7	0.11	22	RYAN
14	4: 1:12	37.378	117.337	0.4	3.74	2.1	204	BDI	1.52		1.00	1.02		11.1	0.03	7	MOUNT JACKSON
14	5: 9:51	36.674	116.212	0.2	4.53	0.9	95	ABI	1.16			0.90	1.2	9.3	0.06	15	SPECTER RANGE NW
14	11:57:46	36.595	116.386	1.4	3.57	1.5	317	BDI	0.95			0.78		7.0	0.03	5	LATHROP WELLS SW
14	15:10:46	37.388	117.325	0.7	5.06	1.6	217	ADI	0.75		0.62	0.78		11.4	0.12	7	MOUNT JACKSON
15	9:42:37	36.773	115.897	0.5	9.71	1.1	178	ACI	1.29			1.24		11.7	0.06	8	FRENCHMAN FLAT
15	13:17:34	37.241	116.405	0.7	4.44	1.4	180	ACI	1.15		1.56	0.83		6.4	0.11	13	SCRUGHAM PEAK
15	15:36:52	36.691	115.675	1.4	0.94	1.7	222	BDI	2.31				2.3	12.2	0.15	12	INDIAN SPRINGS NW
16	18:27:10	36.749	115.940	1.9	10.41	2.5	219	BDI	1.02			1.19		10.0	0.17	7	MERCURY
17	1:57:13	36.698	115.698	3.5	0.14	3.2	283	CDI	1.58			1.23	1.4	10.0	0.11	9	INDIAN SPRINGS NW
17	17:50:43	36.708	115.628	1.6	3.06*	——	247	CDI	1.31			1.40	1.5	16.4	0.16	11	INDIAN SPRINGS NW
18	0:55: 5	37.460	117.894	1.4	8.39	1.6	179	BCI	1.38			1.25	1.4	4.1	0.13	8	SOLDIER PASS

1990 LOCAL HYPOCENTER SUMMARY - SGB EARTHQUAKES

DATE	TIME (UTC)	LATITUDE (DEG. N)	LONGITUDE (DEG. W)	STAND ERROR H(KM)	DEPTH (KM)	STAND ERROR Z(KM)	AZI GAP (DEG)	QQD 12S	MAGNITUDE ESTIMATES Mca	Md	MLh	MLv	MLc	DEL-MIN (KM)	RMS RES. (SEC)	#N PH.	U.S.G.S. QUADRANGLE
DEC 18	2: 7:57	36.690	115.877	0.2	10.39	0.3	130	ABI	1.28		1.06	1.34	1.5	5.9	0.03	11	MERCURY
18	2:21:29	36.696	115.869	1.2	10.35	1.2	149	BCI	1.00			0.84		5.2	0.13	9	MERCURY NE
18	6:24:53	36.677	115.872	0.7	9.86	0.8	147	ACI	1.04		0.44	0.98		5.8	0.10	12	MERCURY NE
19	5:36:59	37.231	116.498	1.1	4.34	6.7	154	CCI	1.56		1.95	1.15	1.7	14.2	0.17	13	SCRUGHAM PEAK
19	12:51:43	37.122	115.810	4.0	15.95	5.3	219	CDI	1.34		1.14	1.09		20.3	0.14	10	PAPOOSE LAKE SE
20	9:18:16	36.880	116.231	0.6	4.92	1.5	107	ABA		0.86				5.1	0.11	11	MINE MTN
21	1:18: 8	36.807	115.785	—	1.65	—	251	ADI	0.96			1.00		12.8	0.07	4	FRENCHMAN LAKE SE
21	21:24:27	36.916	116.827	0.7	14.51	0.9	170	ACI	1.13			0.78		19.9	0.08	12	BULLFROG
22	5:53:15	36.735	116.208	0.2	5.36	0.6	119	ABI	1.68		2.12	1.24	2.0	5.8	0.05	14	SPECTER RANGE NW
24	4:15:21	37.018	116.235	0.7	5.65	0.8	108	ABI	1.22			0.99		2.3	0.11	13	TIPPIPAH SPRING
24	7: 9:58	36.610	115.939	0.4	0.35	0.6	168	ACI	1.12		0.38	0.65	0.8	6.0	0.05	8	MERCURY SW
24	13:33: 0	37.268	117.009	0.8	10.39	1.7	196	ADI	1.46		1.03	1.04		22.4	0.10	12	SCOTTYS JUNCTION
24	19:36:60	36.906	116.831	1.2	0.86	1.6	159	BCI	1.09			0.59		20.0	0.17	10	BULLFROG
24	21:57:31	37.123	117.180	0.6	9.83	1.8	114	ACI	1.10		1.26	1.09		20.1	0.14	14	BONNIE CLAIRE SW
25	3:19:39	36.968	117.558	1.2	8.92	3.4	186	BDI	1.29	0.40	0.93	1.30	1.5	19.1	0.18	10	DRY MTN
25	9:11: 3	36.898	116.009	1.5	3.50	3.0	223	BDI	1.12			0.88		5.6	0.11	7	YUCCA LAKE
25	17:23:24	36.673	116.402	0.8	10.46	1.0	209	ADI				0.12		6.3	0.09	9	LATHROP WELLS NW
25	13:56: 6	36.632	116.016	0.4	5.20	0.7	131	ABI	1.18			0.87	0.9	5.8	0.08	14	CAMP DESERT ROCK
26	15:49: 9	36.766	116.200	1.5	3.87	3.1	207	BDI	0.89			0.51		6.9	0.22	11	SKULL MTN
27	3:35:25	36.697	116.268	0.6	-0.40	0.6	126	ABI	0.90		1.42	0.47		5.0	0.15	11	STRIPED HILLS
27	22: 4:46	36.722	116.202	0.5	10.59	1.0	128	ABI	1.15			0.76	1.2	6.6	0.12	14	SPECTER RANGE NW
31	11:24:24	37.925	116.135	0.4	0.93	0.7	120	BCA		1.80				25.2	0.21	12	REVEILLE PEAK
31	15:36:30	37.227	117.545	0.6	11.30	1.0	129	ABI	0.88		1.07	1.03		9.1	0.10	10	LAST CHANCE RANGE
31	18:56:28	37.120	117.181	0.6	8.97	1.9	114	ACI			0.88	0.76		19.9	0.14	11	BONNIE CLAIRE SW
31	19:26:42	36.902	116.856	0.6	13.59	1.8	132	ABI	1.18			0.63		18.3	0.13	15	BULLFROG

Appendix B

Chemical explosion location data for the year 1990

The southern Great Basin of Nevada is seismically active from both natural and man-made sources. Chemical explosion seismic data acquired by the SGBSN have been scaled to provide information on the accuracy of the crustal model and location algorithm used by the SGBSN. The following companies have been contacted and have provided helpful information on source locations, times, and in some cases, TNT-equivalent source size:

(1) Bond International Gold, Denver, Colorado. Blasting at Ladd Mountain, Nev. (Bullfrog Hills quadrangle), approximately daily (weekdays, 4 PM to 5 PM).

(2) Chemstar, Inc., Las Vegas, Nevada. Blasting at two limestone quarries, one in the Dry Lake, Nevada, quadrangle, and one in the Sloan, Nevada, quadrangle. The Dry Lake quarry coordinates are 36.361° North latitude, 114.915° West longitude.

(3) Cyprus Tonopah Mining, Tonopah, Nevada. Blasting in the San Antonia Mountains (San Antonia Ranch quadrangle), usually in the AM.

(4) Frehner Construction, North Las Vegas, Nevada. Blasting at limestone quarry in Sloan, Nevada, quadrangle.

(5) Saga Exploration Co., Beatty, Nevada. Blasting at Bare Mountain, Nevada, usually early to late afternoon.

A number of other organizations are also known to be engaged in blasting in the southern Great Basin of Nevada, but have not been contacted.

Column headings for this Appendix are identical to those for Appendix A. The depth of all blasts is at the surface (plus $<$ 100 feet, usually), but in many instances, hypocenters have been located with depth as a free parameter, to examine the location algorithm and velocity model. If the hypocenter depth is reported as -1.00, it was fixed at that value during hypocenter determination. All other depths are freely determined. If the letters "PB" follow the depth estimate, the event is a probable blast, but just enough ambiguity was present in the seismograms to prevent a certain judgment. Far more hypocentral data from chemical explosions than are presented in this Appendix have been detected and archived by the SGBSN, especially for years preceeding 1989. The decision was made in late 1988 to scale data and to include all resulting hypocenters for known and probable blasts into the catalog, but to flag them as blasts (or probable blasts).

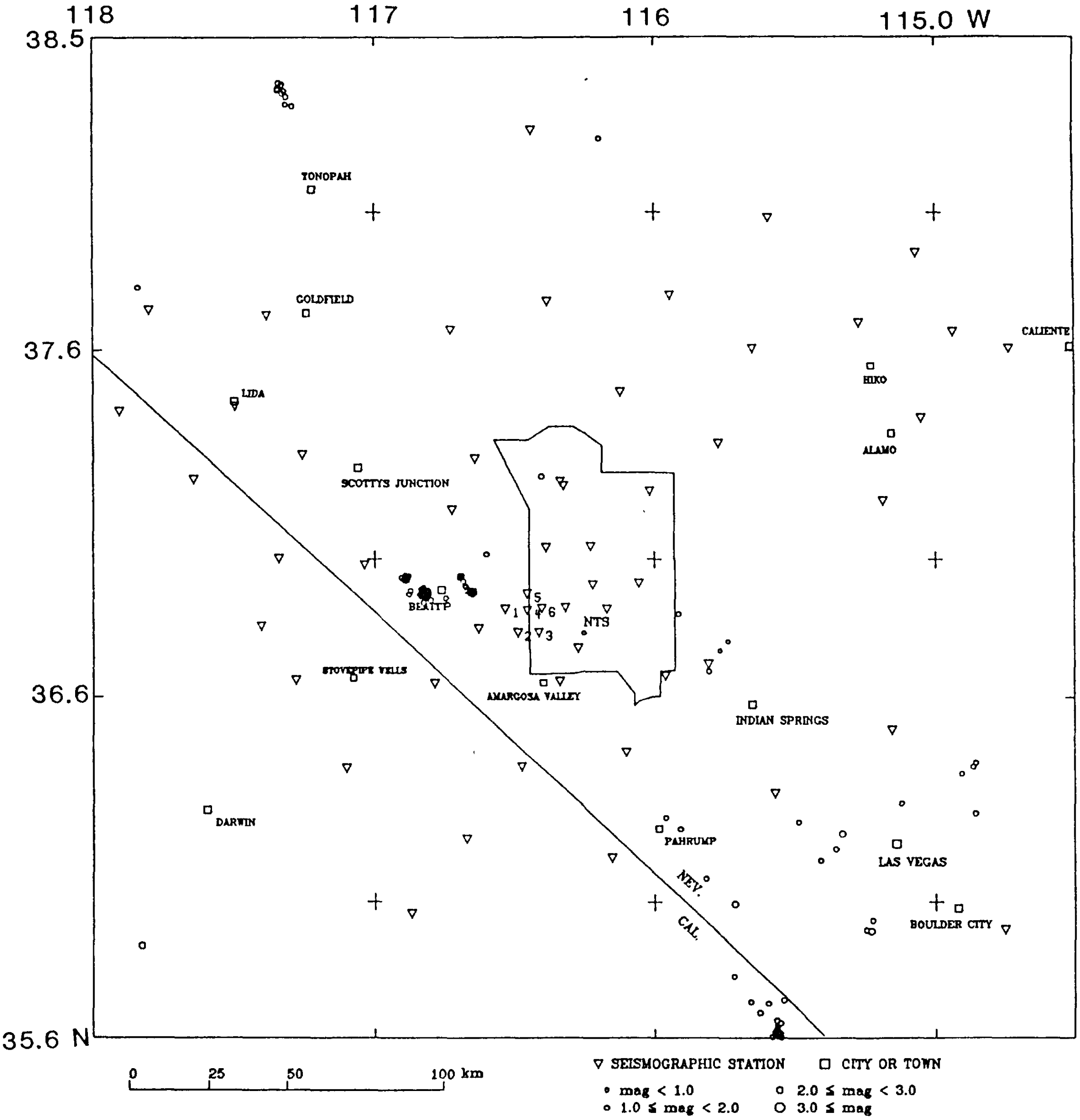


Figure B1. Epicenters for known and suspected chemical explosions detected by the SGBSN for the calendar year 1990 are plotted in map view.

1990 LOCAL HYPOCENTER SUMMARY - SGB CHEMICAL EXPLOSIONS

DATE - TIME (UTC)			LATITUDE (DEG. N)	LONGITUDE (DEG. W)	STAND ERROR H(KM)	DEPTH (KM)	STAND ERROR Z(KM)	AZI GAP (DEG)	QQD 12S	MAGNITUDE ESTIMATES Mca	Md	MLh	MLv	MLc	DEL-MIN (KM)	RMS RES. (SEC)	#N PH.	U.S.G.S. QUADRANGLE
JAN	2	18:53:33	36.943	116.886	0.5	-1.09PB	3.0	101	BCI	1.73			1.38		14.0	0.16	20	BULLFROG
	3	0:37:45	36.887	116.816	0.4	-1.92PB	0.8	56	BCI	2.16			1.85		19.6	0.17	24	BULLFROG
	4	1: 4:37	36.896	116.812	0.4	-1.00BL	1.8	109	ACI	2.10			2.08		19.8	0.14	20	BULLFROG
	5	19: 9:25	36.942	116.883	0.5	-1.89PB	1.7	69	ACI	1.86					14.2	0.14	21	BULLFROG
	5	23:31:49	36.904	116.650	0.5	-1.00BL	16.6	62	CCI						12.0	0.15	18	BARE MTN
	6	0:54:38	36.900	116.809	0.6	-1.00BL	2.4	81	BCI	1.74			1.67		19.9	0.14	12	BULLFROG
	6	23:45:16	36.896	116.839	0.5	-1.00BL	0.8	82	BCI	1.60	1.14		1.38		19.9	0.30	28	BULLFROG
	7	22: 7:18	37.110	117.039	0.2	0.00BL	0.4	103	ACI	1.66		1.19	0.93		14.2	0.08	17	BONNIE CLAIRE SE
	8	23:21:12	36.941	116.887	0.5	-1.00BL	1.5	69	ACI	1.61			1.44		13.9	0.15	16	BULLFROG
	9	0:43:35	36.895	116.820	0.6	-0.11BL	2.9	80	BCA		2.11				20.4	0.14	11	BULLFROG
	10	0:37:35	36.893	116.810	0.8	-1.00BL	1.9	85	BCI	1.70					19.5	0.16	8	BULLFROG
	10	19:18:46	36.941	116.885	0.4	-1.99PB	1.1	69	BCI	1.97		1.37	1.66		14.1	0.15	24	BULLFROG
	10	20:10:35	36.907	116.811	0.5	-1.00BL	1.2	60	BCI	2.53					20.5	0.20	16	BULLFROG
	11	16: 4:52	36.897	116.833	1.2	0.30PB	3.1	131	BCI				0.55		20.4	0.10	7	BULLFROG
	11	23:29:47	36.257	116.859	0.5	0.00BL	0.7	123	ACI	1.23		1.45	1.23		18.7	0.12	11	FURNACE CREEK
	12	0: 1:35	36.898	116.812	0.6	-1.33*	——	57	CCI				1.45		20.0	0.13	11	BULLFROG
	12	19: 6: 5	36.943	116.883	0.4	-0.04*	——	104	CCI	1.39					14.2	0.12	14	BULLFROG
	12	23:24:53	36.904	116.657	0.3	-1.00BL	13.5	134	CCI	1.86			1.44		12.2	0.04	11	BARE MTN
	12	23:42:37	36.894	116.814	0.6	-1.00BL	1.9	57	BCI	2.51		1.99			19.9	0.18	19	BULLFROG
	15	18:28:42	36.892	116.833	0.4	-1.54PB	10.0	64	CCI	1.42			1.13		20.6	0.11	17	BULLFROG
	15	23:47:36	36.900	116.808	1.2	-1.00BL	3.1	107	BCI	1.94					19.8	0.24	10	BULLFROG
	16	19: 4:13	36.943	116.886	0.5	-1.00BL	1.1	114	ACI	2.16			1.46		14.0	0.12	13	BULLFROG
	16	20: 4:36	36.648	117.367	6.5	0.00BL	9.3	190	DDU	1.92	1.46	2.05	1.32		7.9	2.70	13	MARBLE CANYON
	16	23:47:45	36.890	116.817	0.4	-1.00BL	0.9	124	ACI				1.90		19.9	0.11	15	BULLFROG
	17	23:43:40	36.894	116.817	0.4	-1.00BL	1.1	92	ACI	1.89			1.74		20.2	0.13	19	BULLFROG
	18	23:29:46	36.902	116.652	0.3	-1.00BL	1.2	133	ACI	2.72					11.9	0.06	12	BARE MTN
	18	23:58:36	36.904	116.807	0.3	-1.00BL	2.1	78	BCI	1.88	1.93		2.28		20.0	0.17	22	BULLFROG
	19	12:39:14	34.993	118.305	11.6	0.00BL	25.8	332	DDU	3.12			3.14		169.2	0.11	7	***QUAD. NOT LISTED*
	19	23:55:37	36.889	116.817	0.5	-1.00BL	1.4	78	BCI				2.05		19.9	0.17	21	BULLFROG
	20	0:37: 8	36.943	116.886	0.3	-1.71PB	0.6	69	BCI	1.99			1.61	2.0	14.0	0.22	29	BULLFROG
	20	17:40:14	37.456	115.307	0.7	0.00BL	1.0	137	BCI	1.46		1.55			23.3	0.18	11	HANCOCK SUMMIT
	20	20:30: 9	36.904	116.822	0.7	-1.79PB	1.8	159	ACI	1.26			0.79		20.9	0.11	10	BULLFROG
	22	20: 2:29	36.901	116.643	0.8	-1.29PB	1.7	111	BCI	2.10			1.21		11.2	0.26	11	BARE MTN
	22	23:49:46	36.896	116.809	0.6	-1.00BL	1.7	80	BCI				1.74		19.7	0.20	19	BULLFROG
	23	18:18:12	36.938	116.888	0.4	-1.00BL	1.3	69	ACI	1.74			1.50		13.9	0.13	18	BULLFROG
	24	0:38:46	36.890	116.817	0.3	-1.00BL	10.5	124	CCI				1.66		19.9	0.11	17	BULLFROG
	24	20: 4:18	36.905	116.657	0.5	-1.00BL	19.2	84	CCI				1.15		12.3	0.08	11	BARE MTN
	25	0: 4:46	36.900	116.808	0.5	-1.00BL	1.2	78	BCI			2.14	1.80		19.8	0.20	16	BULLFROG
	26	23:47:48	36.907	116.814	0.5	-1.00BL	1.2	84	ACI	1.87		1.69		2.1	20.6	0.12	19	BULLFROG
	27	21:46:42	36.943	116.882	0.4	-1.00BL	1.6	69	ACI				1.41		14.3	0.14	17	BULLFROG
	29	16:43: 6	36.900	116.835	0.8	-1.00BL	1.2	162	BCI				1.11		20.0	0.17	8	BULLFROG
	29	20:46: 3	36.909	116.826	1.0	-1.00BL	1.6	132	BCI				1.21		20.3	0.14	12	BULLFROG
	29	21:38:22	35.915	115.230	1.8	-0.90BL	1.8	197	BDI	1.68		2.23			42.9	0.25	10	SLOAN
	29	23:59:47	36.892	116.818	0.5	-1.00BL	1.4	57	BCI	2.18		1.91			20.1	0.18	19	BULLFROG

1990 LOCAL HYPOCENTER SUMMARY - SGB CHEMICAL EXPLOSIONS

DATE	TIME (UTC)	LATITUDE (DEG. N)	LONGITUDE (DEG. W)	STAND ERROR H(KM)	DEPTH (KM)	STAND ERROR Z(KM)	AZI GAP (DEG)	QQD 12S	MAGNITUDE ESTIMATES Mca	Md	MLh	MLv	MLc	DEL-MIN (KM)	RMS RES. (SEC)	#N PH.	U.S.G.S. QUADRANGLE
JAN 30	19: 8:56	36.941	116.893	0.3	-1.00BL	0.8	126	ACI	1.99			1.41		13.5	0.05	11	BULLFROG
FEB 1	0: 1:46	36.887	116.813	0.5	-1.00BL	0.8	56	BCI	2.10					19.4	0.19	25	BULLFROG
1	0:18:44	36.952	116.890	0.5	-1.76PB	0.9	74	BCI	1.13			1.20		13.3	0.24	17	BULLFROG
1	23:56:51	36.894	116.811	0.5	-1.00BL	1.3	109	BCI	2.38					19.7	0.15	15	BULLFROG
2	23:52:48	36.892	116.817	0.5	-1.00BL	0.8	57	BCI						20.0	0.22	30	BULLFROG
6	0:44: 8	36.900	116.818	0.5	-1.00BL	0.9	60	BCI	1.74			1.96		20.5	0.19	26	BULLFROG
6	13:31:36	37.446	115.409	11.2	0.00BL	9.1	286	DDI			1.22	1.44		32.0	0.24	5	CRESCENT RESERVOIR
6	16:44: 4	36.892	116.836	0.4	-1.00BL	0.8	114	BCI	1.85	1.48		1.39		20.4	0.19	17	BULLFROG
7	0: 6:37	36.891	116.820	0.5	-1.00BL	0.9	53	BCI	1.92			1.99		20.1	0.20	34	BULLFROG
7	19:17: 2	36.949	116.889	0.5	-1.45PB	0.7	70	BCI				0.74		13.6	0.16	23	BULLFROG
8	0: 7:57	36.902	116.812	0.4	-1.00BL	0.7	82	ACI	1.95		1.76	1.62		20.2	0.14	20	BULLFROG
8	19: 9:19	36.942	116.891	0.5	-1.00BL	0.8	55	BCI	1.66					13.6	0.21	30	BULLFROG
9	0: 7:37	36.898	116.814	0.3	-1.00BL	10.9	91	CCI	2.29					20.2	0.10	16	BULLFROG
9	23:17:51	36.901	116.652	0.2	-1.00BL	1.3	133	ACI				1.43		11.8	0.04	13	BARE MTN
9	23:46:41	35.867	115.776	3.1	0.00BL	30.0	190	DDU				1.85		44.7	0.92	12	HORSE THIEF SPRINGS
9	23:54:47	36.894	116.817	0.6	-1.00BL	1.4	70	BCI	2.08			1.89		20.1	0.16	15	BULLFROG
10	18:26:33	36.908	116.830	0.5	-1.00BL	1.9	158	ACI		1.56		0.91		20.1	0.11	13	BULLFROG
12	23: 6:14	36.950	116.878	0.7	-1.00BL	0.8	150	BCI	1.73					14.4	0.16	12	BULLFROG
12	23:59:47	36.896	116.815	0.4	-1.00BL	1.3	122	ACI	1.74			1.75		20.1	0.10	12	BULLFROG
13	23:57:47	36.896	116.813	0.6	-1.00BL	1.9	109	ACI			1.51	1.81		19.9	0.15	16	BULLFROG
15	1: 5:47	36.891	116.813	0.5	-1.00BL	1.8	78	BCI				2.39	1.9	19.6	0.16	20	BULLFROG
16	23:50:48	36.898	116.810	0.5	-1.00BL	1.6	90	ACI				1.61		19.8	0.15	13	BULLFROG
20	0:26:34	36.945	116.886	0.5	-1.00BL	2.6	70	BCI				0.83	1.4	13.9	0.16	17	BULLFROG
20	0:28:48	36.888	116.819	1.2	-1.00BL	13.7	164	CCI				1.13		19.9	0.14	9	BULLFROG
21	23:54:35	36.898	116.815	0.3	-1.00BL	1.9	70	BCI			1.52	2.17	1.9	20.2	0.16	30	BULLFROG
23	19: 9:11	36.945	116.902	1.2	10.08PB	4.7	126	BDI				1.26		12.6	0.04	5	BULLFROG
23	19:22:10	36.898	116.812	0.3	-1.00BL	1.9	120	ACI				1.65		19.9	0.14	15	BULLFROG
24	0:40: 8	36.937	116.884	0.6	-1.00BL	1.1	155	ACI				1.42		14.3	0.15	11	BULLFROG
26	23:31:33	36.946	116.884	0.4	-1.00BL	10.4	152	CDI				1.12		14.0	0.08	5	BULLFROG
27	0: 5:49	36.892	116.811	0.5	-1.00BL	1.3	56	ACI	1.98		2.19		2.0	19.6	0.14	16	BULLFROG
27	19: 7:30	36.945	116.884	0.5	-1.00BL	15.7	113	CCI				1.07		14.1	0.10	8	BULLFROG
28	1:38:39	36.896	116.814	0.6	-1.00BL	2.4	80	BCI				2.05		20.0	0.16	16	BULLFROG
MAR 1	0:16: 2	36.899	116.815	0.6	-1.00BL	20.3	171	CCI				0.86		20.3	0.06	6	BULLFROG
2	0:11:42	36.893	116.820	0.7	-1.00BL	1.7	93	BCI	1.90		0.62		2.0	20.3	0.22	18	BULLFROG
2	20:30:39	36.893	116.817	0.3	-1.00BL	13.1	123	CCI				0.63		20.0	0.09	12	BULLFROG
2	23:36: 1	36.903	116.657	0.5	-1.00BL	18.8	104	CCI	2.97			1.52		12.1	0.06	11	BARE MTN
3	0:12:39	36.896	116.809	0.4	-1.00BL	1.1	56	BCI			1.94		2.2	19.6	0.17	19	BULLFROG
3	17:39: 8	36.940	116.888	0.4	-1.00BL	2.0	69	ACI			1.83			13.9	0.10	15	BULLFROG
6	0: 3:45	36.888	116.818	0.5	-1.00BL	1.0	57	BCI			1.93		2.0	19.9	0.15	19	BULLFROG
7	17:18:36	36.941	116.883	0.4	-1.00BL	2.0	87	ACI			1.46	1.56	1.4	14.3	0.09	16	BULLFROG
8	0:10:55	36.890	116.815	0.4	-1.00BL	1.1	57	BCI			2.01	1.85	2.5	19.8	0.17	27	BULLFROG
8	7:33:28	36.292	118.340	6.9	0.00BL	4.5	272	DDU				1.98		101.3	0.37	14	***QUAD. NOT LISTED*
8	23:55:38	36.893	116.813	0.5	-1.00BL	2.6	70	BCI				1.62		19.8	0.13	12	BULLFROG
10	0: 4:57	36.899	116.811	0.3	-1.00BL	1.5	120	ACI			0.92		1.9	19.9	0.09	15	BULLFROG

1990 LOCAL HYPOCENTER SUMMARY - SGB CHEMICAL EXPLOSIONS

DATE (UTC)	TIME (UTC)	LATITUDE (DEG. N)	LONGITUDE (DEG. W)	STAND ERROR H(KM)	DEPTH (KM)	STAND ERROR Z(KM)	AZI GAP (DEG)	QQD 12S	MAGNITUDE ESTIMATES Mca	Md	MLh	MLv	MLc	DEL-MIN (KM)	RMS RES. (SEC)	#N PH.	U.S.G.S. QUADRANGLE
MAR 12	23:56: 3	36.896	116.808	0.5	-1.00BL	1.8	80	BCI	1.99		1.68	2.07	2.0	19.6	0.19	24	BULLFROG
13	23:54:14	36.896	116.815	0.2	-1.00BL	6.8	109	CCI	1.88			1.84		20.1	0.15	19	BULLFROG
15	0:17:43	36.893	116.817	0.5	-1.00BL	1.9	101	BCI	1.81		1.39	1.73	1.7	20.0	0.16	21	BULLFROG
16	0: 6:55	36.902	116.812	0.4	-1.00BL	10.3	108	CCI			2.15	1.83		20.3	0.12	13	BULLFROG
16	0:18:55	36.945	116.884	0.7	-1.00BL	1.7	102	ACI	1.37			1.30		14.1	0.13	11	BULLFROG
16	23:54:16	36.889	116.818	0.6	-1.00BL	1.1	86	BCI	2.01		1.96	1.86		19.9	0.19	14	BULLFROG
19	23:53:58	36.895	116.815	0.4	-1.00BL	1.3	57	BCI	1.89			2.03		20.0	0.16	28	BULLFROG
22	0: 8:40	36.892	116.812	0.4	-1.00BL	0.9	85	BCI	2.05		1.85	1.93	1.6	19.6	0.18	29	BULLFROG
22	23:30:29	36.901	116.649	0.4	-1.00BL	1.6	78	ACI	1.74		1.26	1.40	1.5	11.8	0.12	19	BARE MTN
23	0: 3:46	36.892	116.811	0.5	-1.00BL	1.1	56	BCI	1.75		1.86	2.05		19.6	0.18	29	BULLFROG
24	0: 1:11	36.888	116.812	0.4	-1.00BL	1.0	77	BCI	1.94		1.83	1.93		19.3	0.17	31	BULLFROG
24	23:25:60	36.939	116.892	0.4	-1.00BL	0.9	49	BCI	2.47		2.24	2.36	2.5	13.6	0.21	43	BULLFROG
27	0:31: 5	36.890	116.816	0.4	-1.00BL	1.2	102	BCI	1.88		1.86	1.79		19.8	0.15	26	BULLFROG
27	23:58: 6	36.890	116.820	0.5	-1.00BL	0.9	128	BCI	2.28		2.16	2.24		20.1	0.17	22	BULLFROG
29	0: 0:52	36.887	116.826	0.3	-1.00BL	0.8	130	BCI	2.05			2.04		20.4	0.21	24	BULLFROG
29	23:27:58	36.900	116.657	0.3	-1.00BL	0.7	84	ACI	1.13			1.28		11.8	0.07	13	BARE MTN
29	23:50:20	36.893	116.814	0.5	-1.00BL	1.2	79	BCI	2.11		1.91	2.00		19.8	0.20	24	BULLFROG
30	20:11:60	36.901	116.817	0.9	-1.00BL	1.7	121	BCI	1.74			1.41		20.5	0.22	13	BULLFROG
30	23:51:21	36.886	116.820	0.5	-1.00BL	1.2	126	ACI	1.66			1.39		19.9	0.14	16	BULLFROG
APR 2	23:10:56	36.891	116.814	0.4	-1.00BL	1.3	56	BCI	1.69		1.86	1.92		19.7	0.16	26	BULLFROG
3	23:41: 2	36.890	116.807	0.5	-1.00BL	1.2	79	ACI	2.05		1.86	1.83		19.1	0.15	22	BULLFROG
4	20:42:57	36.398	114.868	—	-1.73PB	—	235	ADI	1.82		1.43	2.15		28.8	0.06	3	DRY LAKE
4	23:41:40	36.893	116.815	0.4	-1.00BL	1.1	101	ACI	1.67		1.77	1.76		19.9	0.12	19	BULLFROG
5	23:12: 4	36.892	116.809	0.5	-1.00BL	1.4	79	BCI	2.04		1.87	1.73	1.9	19.3	0.16	20	BULLFROG
6	23:21:50	36.895	116.812	0.4	-1.00BL	1.3	57	ACI	2.12		1.90	1.98	1.6	19.8	0.15	24	BULLFROG
7	18: 5: 3	36.895	116.811	0.4	-1.00BL	0.9	121	ACI	1.39			0.81		19.8	0.13	14	BULLFROG
9	22:27:31	36.901	116.654	0.2	-1.00BL	0.6	83	ACI	1.94			1.45	1.9	11.8	0.06	15	BARE MTN
9	23: 8:51	36.892	116.815	0.4	-1.00BL	1.0	57	BCI	1.93		1.95	1.82	2.0	19.8	0.16	27	BULLFROG
10	22:45:38	35.617	115.555	1.1	2.40*	—	223	CDI				1.91		78.0	0.07	8	CLARK MTN
10	23:28:16	36.891	116.816	0.4	-1.00BL	1.2	57	ACI	1.93		1.80	1.77	1.7	19.8	0.14	23	BULLFROG
12	23:12:47	36.889	116.814	0.3	-1.00BL	1.1	56	ACI	1.91		1.78	1.90	1.9	19.6	0.12	28	BULLFROG
13	22:44:59	35.607	115.561	2.5	1.25*	—	224	CDI				1.78		78.8	0.21	9	CLARK MTN
14	0:25:44	36.900	116.811	0.5	-1.00BL	1.0	57	BCI	1.93		2.00	1.79	1.9	20.1	0.19	25	BULLFROG
16	23:32:40	36.887	116.809	0.3	2.40BL	4.2	94	BCA		2.32				19.1	0.07	12	BULLFROG
17	16:22: 1	36.899	116.649	0.3	-1.52PB	0.8	107	ACI		2.00				11.6	0.06	14	BARE MTN
17	23: 4:38	36.891	116.805	0.8	0.16BL	19.3	131	CCA		2.15				19.0	0.08	8	BULLFROG
18	23:24:17	36.891	116.814	0.5	-0.17BL	1.4	82	ACA		2.34				19.7	0.09	11	BULLFROG
20	22:39: 4	35.677	115.626	1.2	-1.00BL	30.0	215	CDI				1.61		69.1	0.08	6	CLARK MTN
20	23:23:35	36.893	116.823	0.9	-1.00BL	3.8	80	BCI	2.26			2.11	2.2	20.5	0.18	10	BULLFROG
23	22:53:23	35.629	115.565	2.0	-1.00BL	30.0	222	CDI				1.52		76.7	0.11	6	CLARK MTN
23	22:58: 5	36.884	116.824	0.3	0.00BL	0.7	128	ACI	1.28			0.73		20.1	0.03	8	BULLFROG
24	22:58:38	36.871	116.822	1.5	-1.00BL	30.0	172	CCI	1.75		1.29	1.64	2.0	19.3	0.19	8	BULLFROG
25	23: 7:36	36.895	116.807	0.4	-1.00BL	1.2	78	BCI	1.63		1.21	1.81	1.9	19.4	0.16	23	BULLFROG
25	23:16:30	35.596	115.506	1.5	-1.00BL	30.0	226	CDI				1.72		76.9	0.14	12	CLARK MTN

1990 LOCAL HYPOCENTER SUMMARY - SGB CHEMICAL EXPLOSIONS

DATE	TIME (UTC)	LATITUDE (DEG. N)	LONGITUDE (DEG. W)	STAND ERROR H(KM)	DEPTH (KM)	STAND ERROR Z(KM)	AZI GAP (DEG)	QQD 12S	MAGNITUDE ESTIMATES Mca	Md	MLh	MLv	MLc	DEL-MIN (KM)	RMS RES. (SEC)	#N PH.	U.S.G.S. QUADRANGLE
APR 26	23:54: 1	36.895	116.813	0.4	-1.00BL	12.9	109	CCI				1.82		19.9	0.16	9	BULLFROG
27	18:58:17	36.903	116.662	0.3	-1.00BL	0.7	80	ACI	1.48			1.42	2.0	12.2	0.08	18	BARE MTN
27	23:24:40	36.885	116.744	2.3	-1.00BL	5.7	128	CCI	1.80		2.03	1.87	2.0	14.3	0.15	11	BARE MTN
29	23:37:42	36.890	116.816	0.3	-1.00BL	0.6	57	ACI	2.20		1.98	1.88	2.1	19.8	0.13	35	BULLFROG
30	23:28:35	36.894	116.815	0.4	-1.00BL	0.7	57	BCI	1.96		2.06	1.95	1.9	20.0	0.15	28	BULLFROG
MAY 1	22:52:49	35.595	115.616	3.1	-1.00BL	30.0	240	CDI				1.73		76.5	0.21	9	CLARK MTN
2	22:59:39	36.247	115.961	6.7	-1.00BL	30.0	124	DCI				1.13		21.9	3.45	6	PAHRUMP
2	23: 7:57	36.867	116.739	0.8	-1.00BL	3.2	61	BCI	2.19		2.17	1.79		12.7	0.22	17	BARE MTN
3	3: 2: 6	37.955	117.116	1.3	0.00BL	2.1	176	BCI	1.53			1.67		36.8	0.18	11	MUD LAKE
3	23:11:37	36.894	116.812	0.4	-1.00BL	0.8	62	ACI	1.94		1.87	1.89	2.1	19.7	0.14	25	BULLFROG
4	18:59:17	36.901	116.652	0.5	-1.00BL	1.3	64	ACI	1.41		0.83	1.23	1.7	11.8	0.14	21	BARE MTN
4	22:20:17	36.880	116.797	1.3	-0.84*	——	55	DCI	2.09		2.13	1.80	2.4	17.7	0.61	24	BULLFROG
7	23:51: 8	35.593	115.571	4.0	-1.00BL	30.0	240	CDI				1.71		79.3	0.17	7	CLARK MTN
8	22: 7: 1	36.896	116.818	0.3	-1.00BL	8.0	57	CCI	2.07		2.15	1.94	2.5	20.3	0.12	29	BULLFROG
9	22:20:35	36.892	116.813	0.4	-1.00BL	1.1	56	BCI	2.11		1.94	1.88	2.6	19.7	0.15	25	BULLFROG
10	19:34: 1	37.181	114.918	0.2	0.00BL	0.3	177	ACI	1.89		1.51	1.72	2.0	23.9	0.02	9	DELAMAR 3 NW
10	22:12:34	36.891	116.814	0.3	-1.00BL	0.7	56	ACI	1.74		1.98	1.90	1.9	19.7	0.14	27	BULLFROG
10	23:20:55	35.610	115.566	2.0	-1.00BL	30.0	224	CDI				1.96		78.2	0.13	7	CLARK MTN
11	17:46:29	36.947	116.885	0.4	0.71PB	1.7	73	ACI	1.08		1.15	1.14	1.4	13.9	0.12	20	BULLFROG
11	21:40:26	36.888	116.816	0.6	-1.00BL	1.3	111	ACI	1.64		1.56	1.31	1.7	19.7	0.13	13	BULLFROG
13	0:15: 9	36.911	116.833	0.9	-1.00BL	1.8	158	ACI				1.02		19.7	0.12	9	BULLFROG
14	23: 5:39	36.887	116.816	0.6	0.03BL	2.4	63	BCA		2.37				19.6	0.13	11	BULLFROG
15	19:42:50	36.903	116.656	0.3	-1.00BL	0.7	83	ACI	1.76			1.39	1.9	12.1	0.08	18	BARE MTN
15	22:34:33	36.893	116.811	0.4	-1.00BL	1.0	56	BCI	2.15		1.80	1.69	1.9	19.6	0.15	22	BULLFROG
15	23:11:50	35.654	115.567	2.7	-1.00BL	30.0	218	CDI				1.93		73.9	0.26	10	CLARK MTN
16	16:37:53	36.881	116.832	2.5	0.10BL	7.6	169	CCA		1.47				20.6	0.11	10	BULLFROG
16	22:14:51	36.895	116.812	0.3	-1.00BL	10.0	109	CCI				0.96		19.8	0.15	13	BULLFROG
16	22:23:46	38.361	117.329	3.5	-1.00BL	30.0	250	CDI			1.43	1.71		73.5	0.22	12	SAN ANTONIA
17	20:10:11	36.916	116.824	1.1	-0.94PB	2.7	154	BCI				0.89		20.2	0.12	8	BULLFROG
17	22:26:38	36.891	116.813	0.4	-1.00BL	1.4	56	ACI			1.67	1.88	2.2	19.6	0.14	25	BULLFROG
18	18:31:21	38.369	117.338	2.3	-1.00BL	30.0	251	CDI	1.94		1.80	1.83		74.3	0.16	11	SAN ANTONIA
18	22:24: 2	38.328	117.312	3.6	-1.00BL	30.0	245	CDI	1.88		1.58	1.56		69.9	0.24	7	SAN ANTONIA
19	21:58:33	36.893	116.813	0.4	-1.00BL	0.8	57	BCI	1.96		1.81	1.86	2.1	19.7	0.15	27	BULLFROG
21	22:17:23	36.895	116.816	0.4	-1.00BL	1.0	57	ACI	1.82		1.74	1.76		20.1	0.14	29	BULLFROG
21	23:40:28	35.601	115.569	2.7	-1.00BL	30.0	225	CDI			1.63	1.72		78.7	0.20	9	CLARK MTN
22	18: 8:40	36.943	116.883	0.4	-0.44PB	0.9	55	ACI	1.92		1.50	1.52	2.0	26.6	0.14	28	BULLFROG
22	22:20:33	36.891	116.815	0.3	-1.00BL	0.7	57	BCI	2.20		2.12	1.90		19.8	0.15	32	BULLFROG
23	23:15:35	36.894	116.816	0.4	-1.00BL	1.3	57	ACI	2.52			1.90	2.2	20.1	0.14	19	BULLFROG
24	20:38:57	36.331	114.950	5.8	0.00BL	30.0	203	DDI	1.86			1.66		27.1	0.08	5	DRY LAKE
24	22:24:14	38.338	117.326	3.5	-1.00BL	20.0	247	CDI	2.00		1.63	1.61		70.9	0.26	12	SAN ANTONIA RANCH
24	23:11:27	35.620	115.572	2.4	-1.00BL	30.0	222	CDI				1.43		77.0	0.22	9	CLARK MTN
25	22:11:56	36.894	116.815	0.4	-1.00BL	0.8	110	BCI	2.02		1.98	1.87	2.4	19.9	0.19	19	BULLFROG
29	23:54:34	36.893	116.817	0.4	0.00BL	1.2	57	ACI	2.20			1.77	2.5	20.0	0.15	30	BULLFROG
30	22:12: 1	36.891	116.818	0.6	-1.00BL	1.5	111	ACI	1.16			0.81		20.0	0.12	13	BULLFROG

1990 LOCAL HYPOCENTER SUMMARY – SGB CHEMICAL EXPLOSIONS

DATE	TIME (UTC)	LATITUDE (DEG. N)	LONGITUDE (DEG. W)	STAND ERROR H(KM)	DEPTH (KM)	STAND ERROR Z(KM)	AZI GAP (DEG)	QQD 12S	MAGNITUDE ESTIMATES Mca	Md	MLh	MLv	MLc	DEL-MIN (KM)	RMS RES. (SEC)	#N PH.	U.S.G.S. QUADRANGLE
MAY 31	22: 1: 2	36.893	116.814	0.5	-1.00BL	1.3	57	BCI	2.04			2.01	2.3	19.8	0.16	25	BULLFROG
31	22:23:12	38.353	117.342	3.9	-1.00BL	30.0	250	CDI			1.70	1.54		72.5	0.23	10	SAN ANTONIA
JUN 1	0:28:11	36.942	116.885	0.5	-1.00BL	1.1	72	ACI	1.91		1.79	1.68		14.1	0.12	14	BULLFROG
1	22:47:34	36.893	116.814	0.4	-1.00BL	1.0	57	ACI	2.14		2.23	1.91		19.9	0.15	27	BULLFROG
1	23:34: 9	35.615	115.561	2.8	-1.00BL	30.0	223	CDI				1.55		78.1	0.23	8	CLARK MTN
4	18:34:24	36.897	116.814	0.5	-1.00BL	16.3	109	CCI				0.75		20.0	0.14	14	BULLFROG
4	23:32:19	35.589	115.568	3.8	-1.00BL	30.0	226	CDI				1.82		79.8	0.24	7	CLARK MTN
5	18: 9: 2	36.942	116.885	0.4	-1.00BL	1.3	69	ACI			1.29	1.37	1.4	14.0	0.14	23	BULLFROG
5	22:26:31	36.890	116.813	0.4	-1.00BL	1.4	56	ACI				1.71	1.9	19.6	0.14	24	BULLFROG
5	23:29:39	35.601	115.569	2.0	-1.00BL	30.0	225	CDI				1.83		78.8	0.16	9	CLARK MTN
6	21:47: 3	36.900	116.809	0.3	-1.00BL	7.5	158	CCI	0.99			0.84		19.9	0.12	13	BULLFROG
6	23:23:41	36.896	116.810	0.3	-1.00BL	9.4	57	CCI	2.20		1.76		2.5	19.7	0.15	30	BULLFROG
7	22:52:30	36.890	116.817	0.4	-1.00BL	0.9	57	BCI			2.06	1.69	1.8	19.9	0.18	29	BULLFROG
7	23:11:57	35.594	115.573	2.4	-1.00BL	30.0	226	CDI				1.42		79.1	0.20	9	CLARK MTN
8	0:19:39	37.241	116.401	0.3	-0.20PB	0.3	96	ABI	1.67		1.71	1.17		7.5	0.09	18	SCRUGHAM PEAK
8	22: 3:52	36.892	116.810	0.3	-1.00BL	9.0	109	CCI	2.01		2.03	1.79	1.9	19.4	0.14	14	BULLFROG
11	22:23: 4	38.364	117.326	3.4	-1.00BL	30.0	250	CDI	2.08			1.77		73.8	0.27	13	SAN ANTONIA
11	22:26:33	36.893	116.815	0.3	-1.00BL	0.8	57	ACU	1.88		1.92	1.69		19.9	0.13	26	BULLFROG
11	22:26:33	36.893	116.815	0.3	-1.00BL	0.8	57	ACI	1.88		1.92	1.69		19.9	0.13	26	BULLFROG
12	0:48: 5	36.067	115.816	6.3	-1.00BL	30.0	164	DCI	1.99		2.00	1.70		31.2	1.98	9	PAHRUMP
12	0:59: 3	36.098	117.910	3.8	0.00BL	4.0	261	CDI	1.77		1.97	1.77		79.8	0.19	10	HAIWEE RESERVOIR
12	10:39:19	37.041	115.939	0.7	0.00BL	1.4	101	BCI	1.27		0.69	0.86		18.9	0.18	14	PAIUTE RIDGE
12	19:38: 2	36.262	114.859	1.8	-1.43PB	1.3	211	BDI	1.39			1.25		38.3	0.12	10	DRY LAKE
12	19:38: 5	36.291	115.121	3.8	7.00*	——	150	DCI	1.39			1.16		24.1	1.11	10	VALLEY
13	23:37:32	36.901	116.816	0.6	0.20BL	2.8	85	BCA		2.17				20.5	0.16	14	BULLFROG
14	22: 7:32	36.897	116.810	0.9	0.20BL	2.8	108	BCA		2.08				19.8	0.13	8	BULLFROG
15	23:16:34	36.892	116.814	0.5	-1.00BL	2.0	57	BCI	1.53		1.59	1.82	1.9	22.1	0.15	19	BULLFROG
15	23:24:58	35.710	115.659	6.7	-1.00BL	30.0	258	DDI				1.43		64.4	0.34	9	CLARK MTN
17	21:58:12	36.100	117.705	2.1	0.00BL	2.0	252	BDI	2.69			2.77	2.7	63.3	0.18	23	COSO PEAK
18	22:41:28	36.889	116.816	0.5	-1.00BL	1.3	56	BCI	1.70		1.97	1.79	2.0	22.1	0.17	20	BULLFROG
18	23: 7:43	36.936	116.888	0.5	-1.00BL	1.2	68	BCI			1.34	1.52		14.0	0.15	17	BULLFROG
19	21:44:33	36.898	116.823	0.5	-1.00BL	1.5	111	BCI				0.75		20.8	0.15	14	BULLFROG
19	22:22:10	38.302	117.291	4.3	-1.00BL	30.0	241	CDI			1.63	1.50		67.3	0.21	9	SAN ANTONIA
20	22:25:18	36.899	116.815	0.3	-1.00BL	10.8	109	CCI	2.14		1.89	1.66	2.0	20.3	0.11	12	BULLFROG
21	17:18:40	37.014	116.599	0.4	0.89PB	0.8	58	ACI	1.61		1.14	0.99	1.2	18.2	0.13	20	THIRSTY CANYON
21	22:38:38	36.895	116.807	0.8	-1.00BL	2.0	61	BCI	2.19		2.00	1.59		19.4	0.22	18	BULLFROG
22	22:54:35	36.891	116.819	0.3	-1.00BL	1.2	57	ACI	1.97		1.93	1.95		20.1	0.14	26	BULLFROG
25	15:43: 6	36.941	116.887	0.4	-1.00BL	12.2	69	CCI	1.31		1.36	1.49		13.9	0.16	16	BULLFROG
25	22:34:32	36.893	116.814	0.4	-1.00BL	1.7	57	ACI			1.33	1.63		19.9	0.14	20	BULLFROG
27	0:27:31	36.888	116.820	0.4	-1.00BL	0.8	57	BCI	2.15		2.08	1.86		20.0	0.16	27	BULLFROG
27	17: 4:45	36.902	116.654	0.3	-1.00BL	9.4	69	CCI			1.46	1.66		12.0	0.08	19	BARE MTN
27	22:18:26	36.893	116.811	0.5	-1.00BL	1.2	62	ACI			1.86	1.75	1.9	19.6	0.13	16	BULLFROG
29	22:27:29	36.892	116.814	0.4	-1.00BL	1.0	110	BCI	1.84		1.84	2.07		19.8	0.17	25	BULLFROG
30	19:46:45	36.913	116.824	0.9	-1.00BL	2.6	131	BCI	1.31			1.28		20.3	0.15	13	BULLFROG

1990 LOCAL HYPOCENTER SUMMARY - SGB CHEMICAL EXPLOSIONS

DATE - TIME (UTC)			LATITUDE (DEG. N)	LONGITUDE (DEG. W)	STAND ERROR H(KM)	DEPTH (KM)	STAND ERROR Z(KM)	AZI GAP (DEG)	QQD 12S	MAGNITUDE ESTIMATES Mca	Md	MLh	MLv	MLc	DEL-MIN (KM)	RMS RES. (SEC)	#N PH.	U.S.G.S. QUADRANGLE
JUL	1	20: 7:15	36.939	116.884	0.3	-1.00BL	9.4	100	CCI	1.29			1.38		14.2	0.11	13	BULLFROG
	2	22:57:28	36.895	116.815	0.5	-1.00BL	2.3	62	BCI	2.06		1.93	1.69		20.0	0.15	15	BULLFROG
	3	0:44:26	35.603	115.553	3.0	-1.00BL	30.0	253	CDI	2.05		2.13	1.80		79.5	0.19	10	CLARK MTN
	3	22:43:33	36.889	116.820	0.6	-1.00BL	1.4	69	BCI	1.58		1.51	1.65		20.0	0.17	15	BULLFROG
	4	16:55:56	36.899	116.831	0.5	-1.00BL	15.1	112	CCI				0.79		20.4	0.12	9	BULLFROG
	5	17:58:46	36.904	116.656	0.4	-1.00BL	13.5	134	CCI				1.41		12.2	0.08	13	BARE MTN
	5	22:15:27	36.894	116.815	0.5	-1.00BL	1.2	70	ACI	1.95		2.06	1.82	2.0	20.0	0.15	16	BULLFROG
	5	23:30:42	35.604	115.552	3.1	-1.00BL	30.0	253	CDI			1.90	1.57		79.5	0.20	10	CLARK MTN
	6	21:57:27	36.894	116.817	0.5	-1.00BL	1.2	69	ACI	1.96		2.07	1.73		20.1	0.14	15	BULLFROG
	7	21:10:39	36.942	116.884	0.4	-1.00BL	0.7	73	ACI	1.48		1.34	1.48		14.1	0.10	14	BULLFROG
	9	0:38:32	36.892	116.838	0.7	-0.64BL	17.9	115	CCA		1.70				20.2	0.15	11	BULLFROG
	9	21:26:59	36.377	114.907	1.1	-1.00BL	6.1	159	CCI	1.66		1.99	1.79		26.9	0.18	11	DRY LAKE
	9	22:26:24	36.897	116.817	0.5	-1.00BL	1.2	70	BCI	1.86		1.88	1.82		20.3	0.16	15	BULLFROG
	10	23:42:40	36.895	116.815	0.4	-1.00BL	1.3	62	ACI	2.15			1.77		20.0	0.13	20	BULLFROG
	11	22:17:22	36.893	116.820	0.4	-1.00BL	1.3	69	ACI	2.09		2.16	1.68		20.3	0.13	15	BULLFROG
	12	18: 6: 3	36.903	116.651	0.6	-1.00BL	19.2	54	CCI				1.49		12.0	0.14	17	BARE MTN
	12	21:36:58	36.916	116.823	1.1	-1.00BL	2.1	154	BCI	1.23			0.95		20.3	0.19	14	BULLFROG
	12	23: 4: 7	35.636	115.565	4.0	-1.00BL	30.0	221	CDI			2.02	1.85		75.9	0.41	13	CLARK MTN
	13	22:16:48	38.347	117.344	2.7	-1.00BL	18.0	249	CDI			1.60	1.45		71.8	0.20	12	SAN ANTONIA
	14	0:32:12	36.891	116.815	0.6	-1.00BL	2.1	69	BCI	2.16			1.70	2.3	19.8	0.14	14	BULLFROG
	16	23:17:26	36.895	116.817	0.5	-1.00BL	1.3	70	ACI	2.02		2.07	1.81		20.1	0.12	15	BULLFROG
	17	22:25: 3	38.307	117.314	2.8	-1.00BL	30.0	243	CDI	1.83		1.80	1.51		67.6	0.25	13	SAN ANTONIA
	17	22:53:26	36.892	116.816	0.7	-1.00BL	1.4	188	ADI	2.08		2.13	1.94	2.0	21.9	0.14	19	BULLFROG
	19	21:35:57	36.900	116.654	0.5	-1.00BL	8.8	168	CCI	1.34			1.35	1.9	17.8	0.10	9	BARE MTN
	19	22:32:28	36.894	116.821	1.0	-1.00BL	2.3	188	BDI	1.89		1.95	1.79		21.5	0.17	12	BULLFROG
	20	20:21:56	36.914	116.828	0.8	-1.00BL	2.0	131	ACI				1.11		19.9	0.15	14	BULLFROG
	20	22:30:32	36.891	116.814	0.6	-1.00BL	2.2	69	BCI	2.01		1.97	1.70	2.0	19.7	0.14	14	BULLFROG
	23	22:19:26	36.899	116.815	0.4	-1.00BL	12.4	70	CCI	2.07		2.13	1.81		20.3	0.12	13	BULLFROG
	23	23:26:52	35.625	115.568	2.9	-1.00BL	30.0	222	CDI				1.57		76.8	0.31	12	CLARK MTN
	24	18:48:56	36.905	116.829	0.5	-1.00BL	14.5	84	CCI				0.87		20.3	0.19	13	BULLFROG
	24	22:20:39	36.891	116.819	0.5	-1.00BL	1.5	69	BCI	1.85		1.84	1.77		20.1	0.17	15	BULLFROG
	25	16:41:53	36.912	116.824	1.0	-1.00BL	1.9	131	BCI	1.18			0.93		20.4	0.19	15	BULLFROG
	25	17:46:46	35.947	115.226	0.9	-1.54PB	1.1	177	BCI	1.29		1.68	1.95	2.6	42.6	0.18	14	SLOAN
	25	22:18:25	36.892	116.821	0.6	-1.00BL	1.7	69	BCI	2.05		2.15	1.71	2.0	20.3	0.18	15	BULLFROG
	26	18:11:29	36.908	116.645	0.5	-1.00BL	16.8	55	CCI	1.34		1.33	1.40		11.8	0.17	23	BARE MTN
	26	21: 9:22	36.901	116.828	0.8	-1.00BL	1.7	111	BCI	1.23		0.73	0.88		20.5	0.19	14	BULLFROG
	26	22:14:24	36.898	116.817	0.5	-1.00BL	1.5	70	ACI	1.91		1.95	1.69	2.1	20.4	0.13	15	BULLFROG
	27	23: 2:24	36.896	116.818	0.4	-1.00BL	1.1	62	ACI	2.12		2.11	1.80		20.3	0.14	16	BULLFROG
	28	21:44: 4	36.894	116.816	0.6	-1.00BL	1.4	70	BCI	2.16			1.81	2.2	20.0	0.15	15	BULLFROG
	30	22:24:28	38.345	117.319	2.8	-1.00BL	30.0	248	CDI	1.95		1.75	1.77		71.8	0.18	10	SAN ANTONIA
	30	23:49:24	36.890	116.816	0.6	-1.00BL	1.6	69	ACI	2.18		2.23	1.73		19.8	0.14	15	BULLFROG
	31	22:38:23	36.887	116.816	0.5	-1.00BL	1.3	63	ACI	1.63		1.88	1.59		19.6	0.15	16	BULLFROG
	31	22:58: 6	36.732	115.767	1.4	-1.65PB	1.2	275	BDI				0.88	1.2	5.7	0.07	6	MERCURY NE
	31	22:58:33	36.760	115.738	3.1	1.69PB	5.7	220	CDI			0.72	1.05		9.8	0.17	7	QUARTZ PEAK

1990 LOCAL HYPOCENTER SUMMARY - SGB CHEMICAL EXPLOSIONS

DATE	TIME (UTC)	LATITUDE (DEG. N)	LONGITUDE (DEG. W)	STAND ERROR H(KM)	DEPTH (KM)	STAND ERROR Z(KM)	AZI GAP (DEG)	QQD 12S	MAGNITUDE ESTIMATES Mca	Md	MLh	MLv	MLc	DEL-MIN (KM)	RMS RES. (SEC)	#N PH.	U.S.G.S. QUADRANGLE
AUG 1	18: 2:17	36.905	116.654	0.3	-1.00BL	10.4	63	CCI				1.42		12.3	0.12	20	BARE MTN
1	23:20:24	36.892	116.818	0.5	-1.00BL	1.5	63	ACI			1.82	1.68	1.9	20.1	0.15	16	BULLFROG
1	23:33:30	36.122	115.412	1.1	-1.00BL	30.0	152	CCI				1.84	2.1	27.0	0.21	9	BLUE DIAMOND
1	23:39:46	36.675	115.806	1.6	-1.00BL	1.8	164	BCI				1.30	0.8	2.1	0.11	8	MERCURY NE
4	0: 7:25	36.890	116.818	0.5	-1.00BL	2.2	63	BCI	2.14		2.16	1.69		20.0	0.12	15	BULLFROG
4	20:44: 2	36.904	116.829	0.4	-1.00BL	7.7	159	CCI				1.03		20.4	0.11	10	BULLFROG
4	21:53:23	36.893	116.817	0.5	-1.00BL	1.3	62	ACI			2.12	1.77		20.0	0.13	16	BULLFROG
6	18:43:60	36.898	116.829	0.7	-1.00BL	2.2	81	BCI				1.19		20.6	0.16	14	BULLFROG
6	22:53:23	36.893	116.817	0.5	-1.00BL	1.4	62	ACI	2.24			1.69	2.2	20.1	0.14	16	BULLFROG
7	0: 1:30	35.705	115.597	4.1	-1.00BL	30.0	241	CDI				1.37		68.2	0.19	7	CLARK MTN
7	21:29:41	36.903	116.651	0.4	-1.00BL	1.4	41	ACI	1.37		1.50	1.48	1.8	12.0	0.14	20	BARE MTN
7	22:42:24	36.894	116.816	0.5	-1.00BL	1.5	57	ACI	2.18			1.89	2.2	20.0	0.14	17	BULLFROG
8	22:36:43	36.891	116.817	0.6	-1.00BL	18.0	79	CCI				1.52		19.9	0.17	13	BULLFROG
9	22:33:23	36.892	116.815	0.4	-1.00BL	1.4	57	ACI	2.21		2.16	1.92	2.0	19.9	0.13	17	BULLFROG
10	22:12:31	36.892	116.813	0.4	-1.00BL	1.8	56	ACI			1.65	1.62		19.7	0.13	16	BULLFROG
10	22:40:50	35.599	115.561	2.2	-1.00BL	30.0	225	CDI			1.43	1.64		79.4	0.19	10	CLARK MTN
11	21:26:30	35.617	115.561	1.5	-1.00BL	30.0	223	CDI			1.46	1.41		77.9	0.13	9	CLARK MTN
13	17:48:25	36.214	115.908	2.5	-1.00BL	30.0	179	CDI				1.10		24.2	0.18	5	PAHRUMP
13	22: 5:25	36.896	116.809	0.5	-1.00BL	1.4	57	ACI			1.67	1.60	1.6	19.7	0.15	17	BULLFROG
14	23:31:52	36.890	116.816	0.6	-1.00BL	1.8	78	BCI	1.75			1.83	1.8	19.8	0.15	19	BULLFROG
16	22:29:17	36.900	116.813	0.6	-1.00BL	2.7	58	BCI	2.28			1.89		20.2	0.17	16	BULLFROG
16	23:27:44	35.613	115.573	2.3	-1.00BL	30.0	223	CDI				1.63		77.5	0.18	8	CLARK MTN
17	0:17:46	36.235	115.490	5.2	-1.00BL	30.0	242	DDI				1.73		58.5	0.26	7	LA MADRE MTN
17	22:32: 6	36.888	116.819	0.4	-1.00BL	1.2	57	ACI	2.22		2.17	1.82		19.9	0.12	17	BULLFROG
20	18: 5:36	36.904	116.651	0.8	-1.00BL	28.9	57	CCI			1.10	1.23		12.0	0.13	14	BARE MTN
20	22:39:56	36.896	116.816	0.5	-1.00BL	2.1	57	BCI				1.51	1.9	20.1	0.16	16	BULLFROG
20	23:19: 0	35.606	115.582	1.9	-1.00BL	30.0	224	CDI			1.24	1.49		77.5	0.17	11	CLARK MTN
21	16:10:58	36.462	114.495	1.2	-1.54PB	1.0	211	BDI	1.98		2.18	1.62		59.8	0.18	13	***QUAD. NOT LISTED*
22	0:25:23	36.891	116.817	0.5	-1.00BL	1.1	57	ACI	2.22		2.24	1.83		19.9	0.14	17	BULLFROG
22	22:36:23	36.894	116.814	0.5	-1.00BL	1.5	57	ACI	2.20		2.08	1.76		19.9	0.14	17	BULLFROG
23	18: 7:30	36.901	116.652	0.3	-1.00BL	1.4	78	ACI	1.40		1.11	1.18	1.6	11.9	0.11	16	BARE MTN
23	22:26:34	36.891	116.816	0.5	-1.00BL	2.3	63	BCI	1.56		1.66	1.47	1.8	19.8	0.12	16	BULLFROG
24	22:33:21	36.892	116.818	0.5	-1.00BL	1.9	51	BCI			3.14	1.93	2.0	20.1	0.16	24	BULLFROG
24	23:45:57	35.523	115.595	8.3	-1.00BL	30.0	263	DDI				1.72		84.0	0.34	7	CLARK MTN
25	18:36:38	36.905	116.648	0.8	-1.00BL	2.2	107	BCI				1.13		11.9	0.12	10	BARE MTN
27	22: 6:20	36.897	116.817	0.4	-1.00BL	0.9	47	BCI		1.91		1.72		20.3	0.21	39	BULLFROG
28	22:45:19	36.898	116.808	0.4	-1.00BL	1.6	78	ACI	1.70		2.74	1.68		19.7	0.15	22	BULLFROG
29	18: 6: 2	36.907	116.656	0.5	-1.00BL	19.1	79	CCI				1.56		12.6	0.12	14	BARE MTN
29	22:27:17	35.546	115.599	4.4	-1.00BL	30.0	261	DDI				1.54		81.7	0.38	6	CLARK MTN
29	22:40:19	36.893	116.817	0.4	-1.00BL	1.9	79	ACI	2.41	1.99		1.78		20.1	0.15	23	BULLFROG
30	22: 8:21	36.893	116.816	0.5	-1.00BL	5.9	81	CCI	1.64		2.51	1.98		20.0	0.17	22	BULLFROG
30	22:27:10	35.646	115.551	7.6	0.00BL	30.0	247	DDI				1.91		74.8	0.24	6	CLARK MTN
31	22:10:20	36.894	116.814	0.4	-1.00BL	1.1	57	ACI	1.90		1.96		2.0	19.9	0.13	21	BULLFROG
SEP 4	14:49:13	36.049	117.918	5.0	0.00BL	4.7	275	CDI			1.58			82.8	0.23	13	HAIWEE RESERVOIR

1990 LOCAL HYPOCENTER SUMMARY - SGB CHEMICAL EXPLOSIONS

DATE	TIME (UTC)	LATITUDE (DEG. N)	LONGITUDE (DEG. W)	STAND ERROR H(KM)	DEPTH (KM)	STAND ERROR Z(KM)	AZI GAP (DEG)	QQD 12S	MAGNITUDE ESTIMATES Mca	Md	MLh	MLv	MLc	DEL-MIN (KM)	RMS RES. (SEC)	#N PH.	U.S.G.S. QUADRANGLE
SEP 4	23:15:20	36.892	116.816	0.3	-1.00BL	0.7	46	BCI	2.07			2.07	2.5	20.0	0.16	50	BULLFROG
5	19:15:23	37.780	117.841	8.4	-1.60PB	4.2	274	DDI				1.26		7.9	0.24	6	RHYOLITE RIDGE
5	22:59:20	38.426	116.924	5.2	0.00BL	5.0	249	DDI				2.05		47.7	0.67	12	***QUAD. NOT LISTED
5	23:46:10	36.888	116.818	0.4	-1.00BL	1.4	78	ACI				1.93		19.8	0.15	25	BULLFROG
6	17:51:58	38.623	117.861	3.7	7.00PB	7.7	287	DDI				1.93		101.0	0.30	7	***QUAD. NOT LISTED*
6	22:31:19	36.897	116.819	0.4	-1.00BL	1.3	58	BCI	2.27			1.95	2.2	20.5	0.20	20	BULLFROG
7	18: 3:12	35.873	117.829	5.4	-1.00BL	8.5	296	DDI	2.85			2.51		87.4	0.19	19	LITTLE LAKE
7	21:54:33	36.155	115.357	4.2	-1.00BL	30.0	152	CCI				1.55	2.1	27.6	0.48	7	BLUE DIAMOND
7	21:58: 2	35.783	115.717	3.7	2.72*	——	265	DDI				1.75		54.9	0.46	9	SHENANDOAH
7	22:21:40	36.894	116.818	0.4	-1.00BL	1.6	80	BCI				1.98	2.6	20.2	0.16	25	BULLFROG
10	22:24:18	36.896	116.813	0.5	-1.00BL	1.4	54	BCI	1.61			1.73	1.9	19.9	0.20	26	BULLFROG
11	18:12:24	36.898	116.810	0.4	-1.00BL	1.2	120	ACI	2.02			1.82	1.7	19.9	0.12	20	BULLFROG
11	18:48:34	36.784	116.252	0.4	0.44PB	0.4	117	ABI	1.31			0.83		4.9	0.11	13	JACKASS FLATS
11	22:22:29	36.897	116.877	0.6	-1.00BL	1.0	85	BCI	1.68	1.27		1.23		17.0	0.24	20	BULLFROG
12	22:14:21	36.898	116.810	0.3	-1.00BL	1.1	120	ACI				2.13		19.8	0.10	16	BULLFROG
12	23:39:34	35.714	115.542	4.9	-1.00BL	30.0	211	DDI			1.38	1.63		67.4	0.53	12	CLARK MTN
13	22:17:18	36.900	116.810	0.4	-1.00BL	1.4	78	ACI	2.05			2.02		20.0	0.12	19	BULLFROG
14	21:57:17	36.899	116.812	0.3	-1.00BL	12.1	120	CCI	2.18				1.7	20.1	0.11	16	BULLFROG
17	22:32:17	36.892	116.811	0.4	-1.00BL	1.3	79	BCI	1.72			1.92		19.6	0.16	23	BULLFROG
17	22:36: 6	36.903	116.654	0.6	-1.00BL	2.0	78	BCI				1.10		12.0	0.14	14	BARE MTN
17	23:23:48	35.646	115.554	3.4	-1.00BL	30.0	248	DDI				1.51		74.9	0.30	6	CLARK MTN
18	14:41: 7	38.125	117.880	4.9	0.00BL	4.1	263	CDI			1.57	1.96		46.0	0.23	11	ROCK HILL
19	18: 7:56	35.918	115.249	2.0	-1.00BL	1.4	196	CDI	1.94			1.77		44.6	0.40	8	SLOAN
19	22:26:19	36.896	116.814	0.4	-1.00BL	1.1	79	ACI	1.78			1.94		20.0	0.14	21	BULLFROG
20	18:39: 7	36.410	114.858	1.1	-1.00BL	6.4	239	CDI	1.31			1.50		29.1	0.11	5	DRY LAKE
20	22:13:14	36.891	116.817	0.4	-1.00BL	1.3	68	BCI	2.05		1.90	1.98	2.4	19.9	0.17	26	BULLFROG
21	22:14:16	36.897	116.813	0.5	-1.00BL	1.4	79	BCI	1.93			2.18	1.8	20.0	0.18	22	BULLFROG
23	0:12:42	37.642	116.197	6.1	-1.00BL	16.4	188	DDI				1.20		19.7	0.07	5	BELTED PEAK
24	22:28:16	36.895	116.816	0.5	-1.00BL	1.3	110	ACI	2.50			1.80	2.5	20.1	0.13	19	BULLFROG
25	19:35:36	38.211	116.193	1.7	0.22PB	1.8	194	BDI	1.34			1.80		21.5	0.28	11	TWIN SPRING
25	22:57:25	36.899	116.809	0.5	-1.00BL	1.8	108	ACI				1.57		19.8	0.15	18	BULLFROG
26	0:23:41	35.529	115.556	——	-1.00BL	——	227	DDI				1.10		0.2	7.21	4	Quad not listed
27	7:16:13	38.230	116.214	2.1	0.00BL	3.9	216	CDI	2.36					19.5	0.31	19	TWIN SPRINGS SLOUGH
28	17:18: 2	36.907	116.871	1.2	8.25PB	4.7	86	CCI	1.71			1.24		16.8	0.33	15	BULLFROG
28	22:10:16	36.898	116.810	0.5	-1.00BL	1.4	108	BCI	1.78			1.92	2.5	19.9	0.16	19	BULLFROG
28	22:41:53	36.905	116.651	0.6	-1.00BL	1.5	78	ACI	2.43			1.51	1.7	12.1	0.14	13	BARE MTN
OCT 2	4:24:19	38.239	116.183	3.0	0.00BL	2.9	210	DDI	1.59			1.61		22.3	0.50	13	TWIN SPRINGS SLOUGH
3	22:27:43	36.896	116.813	0.7	-1.00BL	1.3	79	CCI	1.99				1.7	20.0	0.35	33	BULLFROG
4	22: 6:11	36.200	115.334	2.8	2.38*	——	161	CCI	2.62			2.17		26.3	0.32	7	BLUE DIAMOND NE
4	22:33:33	36.890	116.809	0.9	-1.00BL	1.6	70	CCI	2.18			1.90		19.3	0.40	21	BULLFROG
6	19: 6:49	35.993	115.714	1.4	-1.67PB	1.5	189	CDI	2.13			2.00	2.3	38.0	0.39	21	SHENANDOAH PEAK
12	22: 2:10	36.891	116.816	0.5	-1.00BL	1.0	51	BCI	2.24			1.93	2.0	19.8	0.22	34	BULLFROG
12	22:40:47	36.909	116.657	0.3	-1.00BL	1.2	83	BCI	2.08			1.38	1.9	12.7	0.20	14	BARE MTN
16	22:15:12	36.895	116.813	0.5	-1.00BL	1.2	109	BCI	1.90			2.16	2.0	19.9	0.17	24	BULLFROG

1990 LOCAL HYPOCENTER SUMMARY - SGB CHEMICAL EXPLOSIONS

DATE (UTC)	TIME (UTC)	LATITUDE (DEG. N)	LONGITUDE (DEG. W)	STAND ERROR H(KM)	DEPTH (KM)	STAND ERROR Z(KM)	AZI GAP (DEG)	QQD 12S	MAGNITUDE ESTIMATES Mca	Md	MLh	MLv	MLc	DEL-MIN (KM)	RMS RES. (SEC)	#N PH.	U.S.G.S. QUADRANGLE
OCT 18	23: 9:22	36.892	116.812	0.7	-1.96PB	1.9	161	ACI	2.50			1.75	1.9	19.6	0.14	15	BULLFROG
20	22: 0:21	36.900	116.818	0.5	11.08PB	3.1	82	BBI	2.00			2.02	2.1	20.6	0.09	11	BULLFROG
22	2:55:43	36.839	115.914	1.1	4.87PB	5.4	202	CDI	1.56			1.39	1.3	16.3	0.12	10	FRENCHMAN FLAT
23	22:14: 8	36.896	116.818	0.4	0.00BL	2.5	122	BBI	2.23			1.55	1.5	20.3	0.08	11	BULLFROG
24	22:12:10	36.895	116.821	0.4	9.46PB	2.4	124	BCI	2.48			1.85	2.0	20.5	0.07	12	BULLFROG
25	22: 9: 8	36.898	116.815	0.4	8.65PB	3.1	121	BCI	1.96			1.74	1.9	20.2	0.08	12	BULLFROG
26	22: 8: 9	36.900	116.815	0.6	7.17PB	6.4	121	CCI	2.46			1.45	2.1	20.3	0.08	11	BULLFROG
27	19: 0:27	36.893	116.822	0.4	9.60PB	2.8	124	BCI	2.20			1.69	1.7	20.4	0.07	11	BULLFROG
29	23: 3:24	36.899	116.817	0.4	10.74PB	2.1	121	BBI	1.86			1.58	1.7	20.4	0.07	12	BULLFROG
30	23: 9:26	36.899	116.812	0.6	0.96PB	1.5	108	ACI	2.47			1.89	2.0	20.1	0.13	14	BULLFROG
31	23:14:15	36.897	116.819	0.4	9.70PB	2.2	122	BCI	2.68			1.81	2.1	20.4	0.08	13	BULLFROG
NOV 1	23: 9:14	36.898	116.822	0.5	-1.00BL	0.9	123	ACI	2.42			1.64	2.0	20.7	0.13	13	BULLFROG
2	19:25: 8	36.919	116.675	1.3	1.21PB	3.3	259	BDI	2.02		1.17	1.78	1.8	14.3	0.11	9	BARE MTN-blast
2	22:51: 5	36.894	116.816	0.4	-1.00BL	0.8	122	ACI	2.38			1.78	1.8	20.1	0.13	14	BULLFROG
5	23:12:45	36.895	116.816	0.3	-1.00BL	1.1	122	ACI	2.45		1.89		2.0	20.1	0.11	15	BULLFROG
6	23:29:48	36.895	116.812	0.6	-1.00BL	1.6	121	ACI	2.06		1.53	1.65	1.8	19.8	0.14	13	BULLFROG
7	23:23:23	36.900	116.813	0.4	-1.00BL	1.1	120	ACI	2.15		1.75	1.75	2.1	20.2	0.09	13	BULLFROG
8	23:16:12	36.895	116.811	0.4	-1.00BL	0.8	121	ACI	2.12		1.54	1.82	2.0	19.8	0.12	13	BULLFROG
9	23: 1:17	36.897	116.815	0.6	-1.00BL	1.5	121	ACI	2.75			1.90	2.0	20.1	0.12	12	BULLFROG
12	23: 9:12	36.899	116.814	0.5	-1.00BL	1.4	120	ACI	2.37			1.71	2.0	20.2	0.13	14	BULLFROG
13	23: 5:22	36.893	116.814	0.5	-1.00BL	1.0	122	BCI	2.58			1.70	2.0	19.8	0.17	14	BULLFROG
14	23:10:45	36.890	116.821	0.3	-1.00BL	0.6	125	ACI	2.76				2.0	20.2	0.09	14	BULLFROG
15	23: 6:12	36.895	116.814	0.4	-1.00BL	0.9	122	ACI	2.40			1.96	2.1	20.0	0.10	12	BULLFROG
16	23: 6:11	36.898	116.812	0.4	-1.00BL	1.1	120	ACI	2.05		1.35	1.74	2.0	20.0	0.10	13	BULLFROG
17	23: 2:12	36.895	116.813	0.6	-1.00BL	1.5	121	ACI	2.36			1.68	1.9	19.9	0.15	13	BULLFROG
19	23: 7:27	36.889	116.818	0.4	-1.00BL	0.7	125	ACI	2.28			1.83	2.1	19.9	0.10	13	BULLFROG
20	23:17: 8	36.891	116.812	0.5	-1.00BL	1.6	109	BCI		1.77				19.6	0.18	20	BULLFROG
21	23:15: 9	36.897	116.811	0.4	-1.00BL	0.8	120	BCI	2.30			1.23	1.9	19.9	0.19	15	BULLFROG
22	19:16:21	36.889	116.819	0.4	-1.00BL	0.6	125	ACI	2.06			1.45	1.8	19.9	0.13	16	BULLFROG
23	23: 4: 7	36.898	116.830	0.4	-1.00BL	0.6	125	BCI	2.30		1.63	1.80	2.1	20.6	0.17	16	BULLFROG
24	22:38:18	36.900	116.827	0.6	-1.00BL	1.0	124	BCI	2.05		1.64	1.77	2.0	20.7	0.17	15	BULLFROG
26	23:14: 7	36.895	116.821	0.7	-1.00BL	1.1	124	BCI	2.41			1.69	1.8	20.5	0.22	15	BULLFROG
27	23:17: 7	36.900	116.812	0.4	-1.00BL	0.9	120	BCI	2.45				2.0	20.1	0.16	15	BULLFROG
29	23:23:58	36.892	116.817	0.6	-1.00BL	1.4	123	ACI	2.57		2.37	2.04	2.1	20.0	0.14	13	BULLFROG
30	20:37:46	36.922	116.676	0.8	-1.10BL	0.8	227	ADI	1.71			1.26	1.3	14.6	0.11	12	BARE MTN
30	23:24:36	36.895	116.818	0.5	-1.00BL	1.0	123	BCI	2.32		1.66	2.03	2.0	20.3	0.16	15	BULLFROG
DEC 3	23:21:12	36.897	116.816	0.4	-1.00BL	0.7	122	ACI	2.25		1.60	2.04	2.1	20.3	0.12	15	BULLFROG
4	23: 8:29	36.899	116.815	0.3	-1.00BL	0.6	121	ACI	2.31			1.82	2.0	20.3	0.12	15	BULLFROG
5	23:22:22	36.896	116.819	0.5	-1.00BL	0.8	123	BCI	2.19			1.85	1.9	20.4	0.21	15	BULLFROG
6	23:53:42	36.891	116.818	0.4	-1.00BL	0.8	124	ACI	2.44		1.60	1.68	1.8	20.0	0.12	14	BULLFROG
7	23:15:38	36.895	116.812	0.5	-1.00BL	1.1	121	ACI	2.42			1.77	1.9	19.8	0.13	13	BULLFROG
10	18: 4:33	36.922	116.674	1.1	-1.00BL	1.1	260	BDI	1.59		0.87	0.95		14.6	0.09	11	BARE MTN
11	0:15: 3	36.900	116.819	0.5	-1.00BL	0.9	121	BCI	2.14		1.77	1.75	1.8	20.6	0.23	14	BULLFROG
11	23:18: 3	36.908	116.810	0.5	-1.37BL	11.9	155	CCI		1.88				20.5	0.12	13	BULLFROG

1990 LOCAL HYPOCENTER SUMMARY - SGB CHEMICAL EXPLOSIONS

DATE (UTC)	TIME (UTC)	LATITUDE (DEG. N)	LONGITUDE (DEG. W)	STAND ERROR H(KM)	DEPTH (KM)	STAND ERROR Z(KM)	AZI GAP (DEG)	QQD 12S	MAGNITUDE ESTIMATES Mca	Md	MLh	MLv	MLc	DEL-MIN (KM)	RMS RES. (SEC)	#N PH.	U.S.G.S. QUADRANGLE
DEC 12	17: 3:34	36.951	116.694	0.5	6.83PB	2.6	113	BCI	1.31			0.92		18.1	0.12	16	BARE MTN
12	23: 2:13	36.901	116.813	0.5	-1.00BL	1.4	119	ACI	2.55				1.9	20.2	0.14	13	BULLFROG
13	23: 5:27	36.893	116.823	0.4	-1.00BL	0.7	125	ACI	2.23		1.57	2.16	2.0	20.5	0.15	16	BULLFROG
14	20:30:40	36.952	116.693	0.2	2.87PB	1.9	113	ACI	2.46			1.69	2.0	18.1	0.09	12	BARE MTN
14	23:43:15	36.890	116.817	0.3	-1.00BL	0.7	124	ACI	2.25		1.89	1.97	2.2	19.9	0.09	13	BULLFROG
15	0:57:57	36.951	116.687	0.2	4.10PB	2.5	115	BCI	1.94		1.51		2.0	17.6	0.05	17	BARE MTN
15	0:58:40	36.948	116.692	0.4	5.68PB	2.3	159	BCI	1.52			1.09		17.8	0.07	12	BARE MTN
15	1: 0:20	36.944	116.697	1.3	5.27PB	5.5	195	CDI	1.23			0.78		17.5	0.17	12	BARE MTN
15	16:55:18	36.936	116.683	1.8	8.68PB	2.9	299	BDI	1.40			1.07	1.0	16.3	0.10	10	BARE MTN
15	21:47: 8	36.944	116.692	1.5	5.08PB	5.6	236	CDI	1.06			0.69		17.3	0.10	10	BARE MTN
15	23:24:33	36.894	116.811	0.5	-1.00BL	1.3	121	ACI	2.03		1.64	1.75	1.8	19.7	0.14	13	BULLFROG
16	11:27:18	36.949	116.695	0.9	1.86PB	1.4	193	ADI	1.17			0.62		18.0	0.13	12	BARE MTN
17	3:38:38	36.951	116.691	0.3	5.04PB	2.1	115	BCI	1.30			1.20		18.0	0.06	10	BARE MTN
17	11:42:59	36.952	116.690	0.5	1.88PB	1.0	189	ADI	1.51			1.31	1.0	17.9	0.06	12	BARE MTN
17	23:11:22	36.897	116.811	0.5	-1.00BL	1.0	120	ACI	2.25		1.52	1.88	1.6	19.8	0.15	15	BULLFROG
18	19:58:53	36.944	116.697	1.6	4.01PB	10.8	237	CDI	1.11			0.44		17.5	0.13	12	BARE MTN
18	23: 1:18	36.895	116.814	0.4	-1.00BL	0.8	122	ACI	2.06		1.54	1.57	2.0	20.0	0.13	15	BULLFROG
20	0:28:20	36.897	116.812	0.5	-1.00BL	1.0	120	BCI	2.12		1.83		2.0	20.0	0.17	13	BULLFROG
20	18:52: 3	36.907	116.669	1.2	-2.03PB	1.1	254	BDI	1.67			1.03	1.1	12.9	0.07	8	BARE MTN
20	23:19:60	36.893	116.814	0.5	-1.00BL	0.8	122	BCI	2.28		1.59		2.0	19.8	0.17	17	BULLFROG
21	23:36: 5	36.896	116.814	0.4	-1.00BL	0.7	121	ACI	2.24		1.52	1.70	2.0	20.0	0.12	15	BULLFROG
26	22:27:41	36.902	116.833	0.8	0.00BL	1.2	161	BCI	1.16			0.83		20.1	0.15	11	BULLFROG
26	23: 6: 0	36.897	116.822	0.5	-1.00BL	0.8	123	BCI	2.22		1.72	1.83	1.8	20.7	0.18	17	BULLFROG
27	23:38:59	36.901	116.812	0.5	-1.00BL	0.8	119	BCI	2.57			1.99	2.0	20.2	0.16	16	BULLFROG
31	23:17:56	36.900	116.814	0.4	-1.00BL	0.7	120	BCI	2.04		1.52	1.81	1.8	20.2	0.17	16	BULLFROG

Appendix C

Nuclear device tests and low-frequency shallow seismicity in the NTS, 1990

Hypocenter data for announced Nevada Test Site nuclear device tests occurring in 1990 are listed in Table C1. Hypocenter parameters are listed as they are reported to the National Earthquake Information Center (NEIC) by the U. S. Department of Energy. Magnitude estimates are provided by Berkeley Seismographic Laboratory or by the NEIC. NTS nuclear detonation ground motions recorded at SGBSN stations are generally well beyond the seismograph dynamic range; thus, only initial P-wave arrival times can be reliably scaled from SGBSN seismograms of nuclear tests. The epicenters of the tests listed in Table C1 are plotted as octogons in Figure C1, along with epicenters of located induced seismicity, plotted with the symbol "L."

Relatively high levels of seismicity are regularly recorded by SGBSN stations for periods ranging from hours to days following NTS nuclear device tests. The seismicity listed in Appendix C consists of events having characteristically lower-frequency seismic P coda and S coda than that of the vast majority of earthquakes in the SGB. Most of the low-frequency activity can be associated with nuclear device testing at Pahute Mesa, Yucca Flat, and in a few instances, at Rainier Mesa. Some of these events may be identified as *the* cavity collapses of given tests, although, in general, the heightened level of post-test seismicity often continues for days, with no single event having clearly greater magnitude, as determined from SGBSN seismograms, than many others in its vicinity. The grouping of these post-test events into Appendix C is based on the visual appearance of their seismic coda, and on their spatial and, to a lesser degree, temporal association with tests. Figure C2 is an example of four SGBSN seismograms of an aftershock (or collapse) at Silent Canyon Caldera. A working hypothesis for the lower-than-average frequency content for NTS test aftershock seismograms is that *all* of the aftershocks originate at very shallow depths, where the seismic attenuation of rock is very high, due to relatively low confining pressure.

The majority of post-test seismicity is not routinely located by SGBSN staff, but the seimic data are permanently archived on magnetic tapes. A list of event times for archived low-frequency NTS seismicity that has not been analysed for hypocenter parameters is also included in the latter part of Appendix C.

A few low-frequency events that are not located at NTS are included in Appendix C, because their seismic coda appears more similar to post-test, collapse-like seismicity than to earthquake coda. Many of these are undoubtedly blasts in unconsolidated alluvium or intensely fractured tuff. The verification that other explanations of these phenomena are invalid is left to future investigation.

Table C1. Announced nuclear device tests at Nevada Test Site in the calendar year 1990.

YRMODA	HR MN SECND UTC	M_L (SRC)[1]	Latitude (°N)	Longitude (°W)	Depth (km)	NAME
900310	16 00 0.83	5.1 BRK	37.1125	116.0552	-0.77	METROPOLIS
900613	16 00 0.01	5.6 BRK	37.2616	116.4201	-1.28	BULLION
900621	18 15 0.00	4.1 BRK	36.9928	116.0045	-0.90	AUSTIN
900725	15 00 0.06	4.8 NEIC	37.2069	116.2143	-1.84	MINERAL QUARRY
901012	17 30 0.08	5.4 BRK	37.2479	116.4942	-1.30	TENABO
901114	19 17 0.71	5.1 BRK	37.2274	116.3712	-1.46	HOUSTON

[1] SRC: BRK=Seismographic Laboratory, Berkeley, California; NEIC= National Earthquake Information Center, Golden, Colorado.

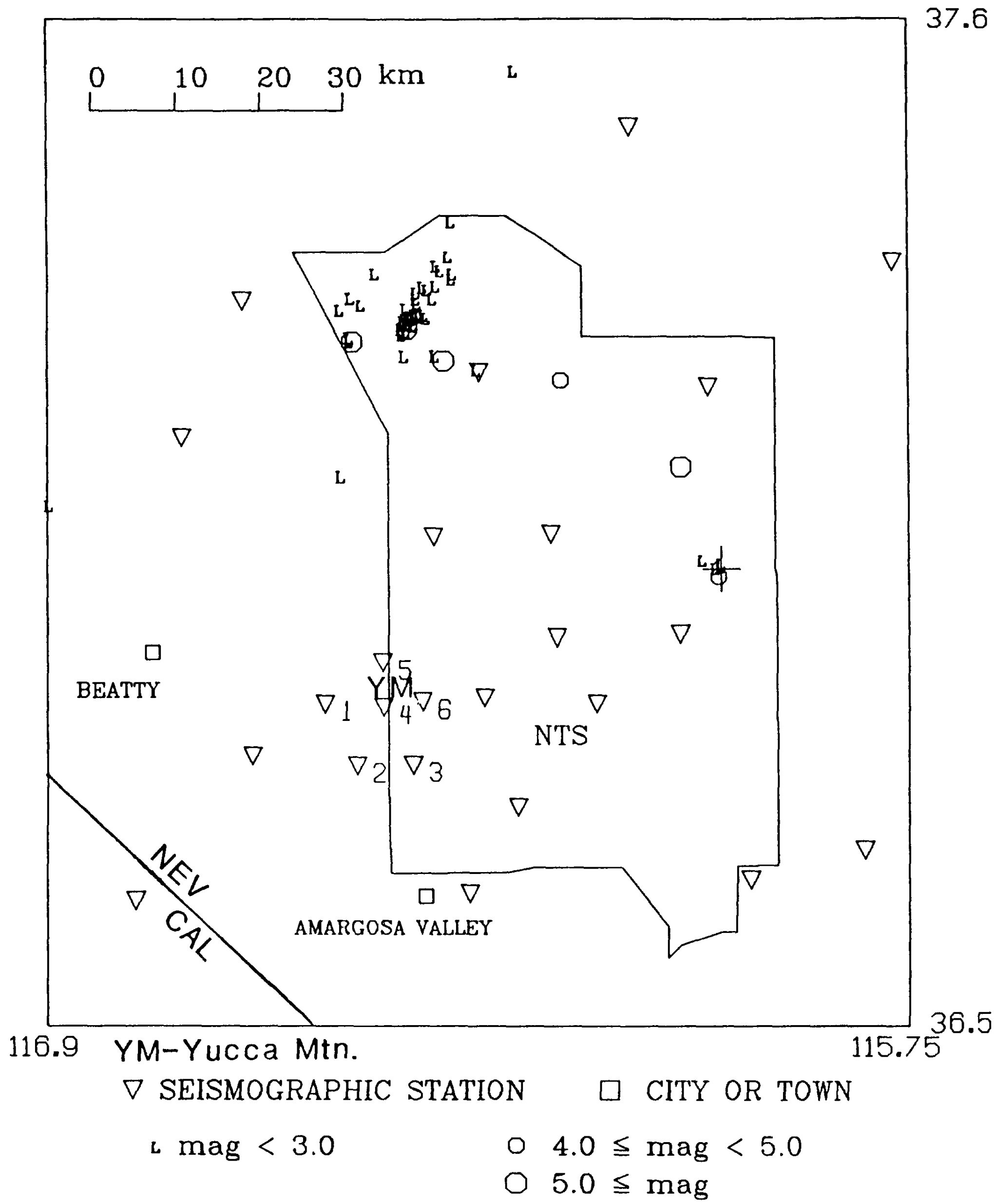


Figure C1. Epicenters for announced NTS nuclear device tests detonated during the calendar year 1990 are shown in map view (octogon symbols), along with some nuclear-testing-induced activity ("L" symbols). Location uncertainty of the "Ls" is high, due to low signal-to-noise ratios in the seismograms of SGBSN instruments that record the collapses.

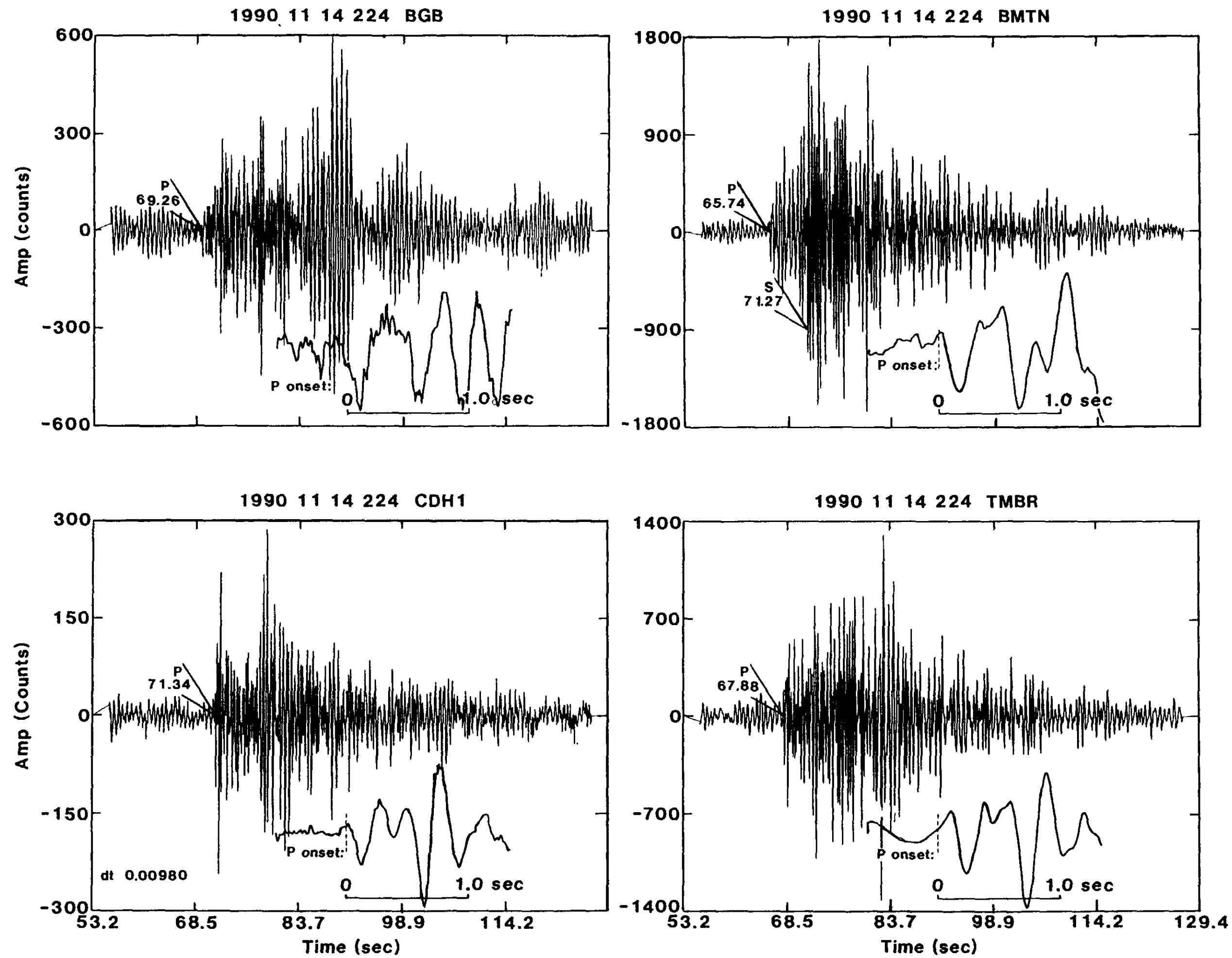


Figure C2. Seismograms from SGBSN stations **BGB, BMTN, CDH1,** and **TMBR** for a seismic disturbance at Silent Canyon, NTS, about 33 hours after the detonation of "Tenabo." Each plot also displays about one second of post-P record on an expanded time axis. P-wave first arrivals are indicated. These seismograms have dominant frequency in the neighborhood of 3 Hz, about one-third the dominant frequency of seismograms from typical SGB earthquakes having the same magnitude. They also display prominant reverberations or beating, and difficult-to-observe S onsets. Neither of these features is typical of most earthquake seismograms.

1990 LOCAL HYPOCENTER SUMMARY - SGB LOW-FREQUENCY PHENOMENA

DATE - TIME (UTC)		LATITUDE (DEG. N)	LONGITUDE (DEG. W)	STAND ERROR H(KM)	DEPTH (KM)	STAND ERROR Z(KM)	AZI GAP (DEG)	QQD 12S	MAGNITUDE ESTIMATES Mca	Md	MLh	MLv	MLc	DEL-MIN (KM)	RMS RES. (SEC)	#N PH.	U.S.G.S. QUADRANGLE
FEB 18	17: 8: 9	37.258	116.421	2.1	-1.35	2.3	179	BCI			1.43			9.9	0.28	10	SILENT BUTTE
MAR 4	15:47:51	37.286	116.481	5.0	11.17*	—	207	DDI				1.39		14.1	0.29	8	SILENT BUTTE
4	15:53:49	37.281	116.510	0.7	0.46*	—	186	CDI				1.37		11.6	0.11	14	TRAIL RIDGE
22	7:46:41	37.300	116.407	1.0	3.00	3.6	201	BDI						12.1	0.07	8	SILENT BUTTE
22	9: 8:53	37.324	116.375	2.7	6.27	2.3	258	CDI	1.77		1.44			13.0	0.12	10	SILENT BUTTE
22	13: 8:46	37.321	116.359	2.2	10.78	1.4	263	BDI			1.25			12.2	0.13	11	DEAD HORSE FLAT
22	13:17:14	37.277	116.402	0.9	2.49	2.4	173	BCI						9.9	0.18	16	SILENT BUTTE
22	14:36: 1	37.293	116.385	3.9	7.12	2.7	239	CDI						10.3	0.11	8	SILENT BUTTE
26	12:58:26	37.294	116.495	1.0	-0.44*	—	195	CDI						12.9	0.15	15	SILENT BUTTE
27	15:34:23	37.329	116.380	2.2	6.37	1.9	259	BDI						13.7	0.09	7	SILENT BUTTE
APR 29	19:14:35	37.626	116.966	11.3	10.85*	—	140	DCI						44.3	2.16	15	CACTUS SPRING
JUN 13	16: 9:37	37.282	116.421	0.7	0.71	1.3	107	BCI	1.81		1.89	1.96	2.2	11.5	0.18	14	SILENT BUTTE
13	18:11:15	37.273	116.410	0.3	0.27	0.6	46	ACI	2.01		1.68	1.75	2.1	10.0	0.12	29	SILENT BUTTE
13	18:21:27	37.293	116.407	1.8	6.57	2.7	231	BDI	1.31		1.37	0.92		11.5	0.19	9	SILENT BUTTE
13	18:29:27	37.287	116.406	3.0	4.37	7.3	227	CDI	0.97		1.30	1.13		10.9	0.17	8	SILENT BUTTE
13	20:12: 9	37.275	116.398	2.1	6.83	3.6	170	BCI	1.78		1.84	1.43	1.4	9.5	0.27	12	SILENT BUTTE
16	1:25:50	37.268	116.425	0.5	-1.14	0.5	115	ACI	1.60		1.53	1.69	1.4	10.8	0.13	15	SILENT BUTTE
17	17:16:28	37.340	116.364	2.5	8.86	9.9	307	CDI				1.13		33.9	0.22	6	DEAD HORSE FLAT
19	12:49:36	37.271	116.414	0.4	-1.00	0.3	161	ACI	1.87		1.81	1.81	2.0	10.2	0.09	18	SILENT BUTTE
19	13: 0:13	37.265	116.421	0.4	-1.46	0.6	75	BCI	2.20		2.20	2.32		10.3	0.15	24	SILENT BUTTE
21	18:25:30	37.000	116.007	0.4	-1.60	1.1	176	ACI	1.88		1.66	1.53	1.8	8.6	0.09	16	YUCCA FLAT
21	18:26:44	37.005	116.000	0.5	-0.92	0.9	179	ACI	1.89			1.82	1.9	9.4	0.10	16	YUCCA FLAT
21	18:33:48	37.002	116.001	0.4	-1.62	0.5	178	ACI				1.42		9.1	0.07	10	YUCCA FLAT
24	14: 0:11	37.009	116.025	0.9	-1.25	1.2	95	BBI				0.93		8.9	0.23	11	YUCCA FLAT
JUL 11	7:27:57	37.249	116.496	0.4	-1.28*	—	94	CCI				1.45		13.6	0.17	13	SCRUGHAM PEAK
11	8:22: 6	37.264	116.411	1.1	-0.02	3.4	88	BBI	1.65			1.40		9.5	0.24	11	SILENT BUTTE
11	8:26:56	37.273	116.408	0.7	2.41	1.9	129	BBI				1.33		9.9	0.18	14	SILENT BUTTE
24	0:11:36	37.273	116.404	0.6	6.70	1.4	131	BBI	1.92		1.42	1.47	1.5	9.7	0.16	15	SILENT BUTTE
24	4:43: 6	37.254	116.426	0.6	-1.88	0.7	115	BCI	1.64		1.65	1.20		10.1	0.16	15	SILENT BUTTE
26	18:26:34	37.231	116.424	1.6	-1.24	1.9	70	DBI			1.57	1.21	1.5	9.1	0.66	17	SCRUGHAM PEAK
26	23:26:32	37.231	116.383	1.7	-0.72	1.5	183	BDI			2.11	1.19		5.5	0.21	14	SCRUGHAM PEAK
29	6:26:56	37.272	116.394	1.6	4.07	5.0	135	CBI			1.20	1.11		8.9	0.37	15	SILENT BUTTE
29	11:14:48	37.272	116.419	1.0	4.24	3.7	124	BCI			1.44	1.36		10.6	0.24	15	SILENT BUTTE
26	18:26:34	37.231	116.424	1.6	-1.24	1.9	70	DBI			1.57	1.21	1.5	9.1	0.66	17	SCRUGHAM PEAK
26	23:26:32	37.231	116.383	1.7	-0.72	1.5	183	BDI			2.11	1.19		5.5	0.21	14	SCRUGHAM PEAK
29	6:26:56	37.272	116.394	1.6	4.07	5.0	135	CBI			1.20	1.11		8.9	0.37	15	SILENT BUTTE
29	11:14:48	37.272	116.419	1.0	4.24	3.7	124	BCI			1.44	1.36		10.6	0.24	15	SILENT BUTTE

1990 LOCAL HYPOCENTER SUMMARY – SGB LOW-FREQUENCY PHENOMENA

DATE	TIME (UTC)	LATITUDE (DEG. N)	LONGITUDE (DEG. W)	STAND ERROR H(KM)	DEPTH (KM)	STAND ERROR Z(KM)	AZI GAP (DEG)	QQD 12S	MAGNITUDE ESTIMATES Mca	Md	MLh	MLv	MLc	DEL-MIN (KM)	RMS RES. (SEC)	#N PH.	U.S.G.S. QUADRANGLE
AUG 5	10:50:42	37.260	116.428	0.3	-1.73	0.4	81	ACI			1.96	1.10		10.5	0.11	21	SILENT BUTTE
11	4:12:17	37.265	116.411	1.0	5.58	2.0	84	BBI			1.74	1.19		9.6	0.23	17	SILENT BUTTE
12	9:26: 4	37.379	116.360	2.6	4.75	10.1	166	CCI			1.62	1.23		18.5	0.29	12	SILENT CANYON NE
14	10:25:21	37.267	116.420	0.5	4.28	2.4	56	BCI			1.60	1.62		10.4	0.15	19	SILENT BUTTE
28	23:47:18	37.321	116.462	3.5	5.92*	—	210	CDI						16.1	0.38	8	SILENT BUTTE
29	15:31:30	37.276	116.410	0.4	-1.41	0.4	133	ACI	1.38		1.32	0.94	1.4	10.3	0.05	7	SILENT BUTTE
SEP 5	5:59:50	37.307	116.381	2.9	5.73	4.3	248	CDI			1.61			11.5	0.12	7	SILENT BUTTE
7	5:54:20	37.274	116.416	4.8	-0.66*	—	187	CDI	1.51			1.04		10.5	0.27	6	SILENT BUTTE
7	7:14:41	37.266	116.418	1.3	-1.65	1.1	206	BDI						10.1	0.07	7	SILENT BUTTE
12	6:31:21	37.303	116.393	3.8	5.75	8.8	241	CDI	1.35			1.01		11.6	0.21	7	SILENT BUTTE
16	8:28:45	37.306	116.399	7.0	10.92	5.3	241	DDI	2.23			1.11	1.6	12.2	0.37	8	SILENT BUTTE
19	20:40: 6	37.315	116.360	1.6	8.24	2.8	255	BDI				1.03	1.5	11.7	0.08	6	DEAD HORSE FLAT
29	1:56:56	37.068	116.898	—	4.01*	—	345	DDI						40.4	2.00	5	SPRINGDALE
30	11:19:39	37.293	116.495	12.4	11.86*	—	134	DBI	1.99			1.36	1.5	12.9	1.51	8	SILENT BUTTE
OCT 3	16:34:46	37.542	116.276	8.9	12.45	6.0	248	DDI	2.13			1.51		36.7	0.87	14	QUARTZITE MTN
11	13:56:20	37.100	116.509	7.4	1.26*	—	134	DCI	1.09			0.47		13.0	1.67	14	THIRSTY CANYON SE
12	16:43:53	37.216	116.326	—	10.79*	—	146	DDI						0.2	7.18	5	AMMONIA TANKS
12	18:57:23	37.251	116.497	0.3	4.04	1.8	147	ACI	2.04				1.4	13.5	0.14	6	SILENT BUTTE
DEC 23	20:14:15	37.247	116.497	0.8	5.24	2.9	170	BCI	1.74		2.31	1.50	1.4	14.6	0.15	14	SCRUGHAM PEAK

1990 SGB LOW-FREQUENCY EVENTS WITHOUT HYPOCENTER DETERMINATIONS

MONTH	DA HR:MN	DA HR:MN	DA HR:MN	DA HR:MN	DA HR:MN	DA HR:MN	DA HR:MN
MARCH	10 16:13	10 16:18	10 16:28	10 16:34	10 16:38	10 16:41	10 16:49
	10 17:04	10 17:06	10 17:10	10 17:14	10 17:26		
APRIL	28 19:17						
MAY	6 19:13						
JUNE	13 16:16	13 16:18	13 16:17	13 16:23	13 16:27	13 16:29	13 16:34
	13 16:38	13 16:41	13 17:11	13 18:13	13 18:36	13 19:29	13 19:31
	13 19:39	17 23:52	21 18:38	21 19:09	21 19:32	21 19:35	
JULY	14 17:10	26 2:26	26 9:19	26 11:22	26 12:44	26 12:53	26 18:17
	26 19:01	26 20:34	26 2:26	26 9:19	26 11:22	26 12:44	26 12:53
	26 18:17	26 19:01	26 20:34				
SEPTEMBER	15 5:43	20 0:09	26 0:04	28 11:00	29 0:08	29 0:10	29 6:23
OCTOBER	5 0:08	7 2:55	7 4:04	10 7:31	12 0:20	12 16:43	12 18:03
	12 18:22	12 19:06	12 20:00	12 20:18	12 21:17	12 23:05	12 23:15
	13 0:23	13 1:11	13 1:26	13 1:57	13 1:59	13 2:20	13 2:24
	13 3:47	13 5:01	13 5:23	13 6:23	13 7:29	13 8:58	13 10:43
	13 12:26	13 13:50	13 16:45	13 16:48	13 23:51	14 0:34	14 2:59
	14 3:05	14 4:31	14 6:07	14 6:13	14 7:44	14 8:16	14 9:01
	14 10:01	14 10:05	14 10:08	14 10:18	14 11:24	14 11:45	14 13:08
	14 13:22	14 13:32	14 13:40	14 13:45	14 14:08	14 14:25	14 14:43
	14 15:12	14 15:35	14 15:50	14 16:37	14 17:00	14 17:20	14 17:46
	14 18:20	14 18:35	14 18:37	14 18:39	14 18:43	14 18:59	14 19:07
	14 19:10	14 19:19	14 19:49	14 20:05	14 20:19	14 20:58	14 21:18
	14 21:44	14 21:54	14 22:11	14 23:00	14 23:02	14 23:05	14 23:07
	14 23:11	14 23:14	14 23:18	14 23:20	14 23:21	14 23:24	14 23:26
	14 23:28	14 23:39	14 23:51	14 23:59	15 0:03	15 0:37	15 0:44
	15 0:47	15 0:53	15 0:55	15 1:12	15 1:28	15 1:40	15 1:44
	15 1:47	15 2:27	15 2:37	15 2:46	15 2:55	15 3:15	15 3:28
	15 3:45	15 3:57	15 4:11	15 4:17	15 4:30	15 4:41	15 4:53
	15 4:57	15 5:01	15 5:07	15 5:18	15 5:32	15 5:49	15 6:15
	15 6:28	15 6:30	15 6:38	15 6:42	15 6:47	15 7:44	15 8:40
	15 8:49	15 19:04	15 20:21	15 20:34	15 20:56	15 21:28	16 3:49
	16 8:42	16 10:13	16 13:02	16 14:46	17 10:45	17 13:14	17 19:57
	17 23:27	18 12:47	18 12:53	18 20:19	18 22:00	18 23:53	19 21:16
	20 2:08	20 11:05	20 11:11	20 18:32	20 22:49	21 0:34	21 0:50
	21 10:28	22 4:31	22 13:23	23 0:05	23 13:02	25 0:02	26 1:19
	26 16:42	29 11:13					
NOVEMBER	1 1:47	1 15:35	2 0:43	3 14:54	5 21:22	7 15:16	8 0:44
	8 0:46	13 5:50	13 7:58	13 9:00	13 9:24	13 9:37	13 9:45
	13 14:18	13 23:21	13 23:26	13 23:47	14 0:11	14 0:37	14 2:23
	14 2:24	14 2:55	14 2:57	14 4:25	14 4:35	14 19:34	14 19:42
	14 20:12	14 21:10	14 21:12	14 22:12	14 22:30	14 23:10	14 23:14
	14 23:20	14 23:26	14 23:34	14 23:35	16 16:18	16 20:09	16 20:12
	17 5:53	17 5:58	20 2:58	21 16:33	22 2:25	22 8:50	22 15:08
	22 15:14	25 9:07	25 11:28	23 6:29	27 10:03	29 23:48	30 15:20
	30 15:40	30 16:00					
DECEMBER	4 15:33	6 2:08	8 13:15	10 2:39	10 5:22	14 15:24	19 0:48
	19 15:25						

Appendix D

Earthquake focal mechanisms for 1990

The focal mechanisms of Appendix D were obtained by selecting the best-fitting solution(s) from the application of the computer program "FOCMEC" (Snoke and others, 1984) to the ray data generated by HYPO71, and in some instances, to amplitude data. We plot data on the lower focal hemisphere using the equal-area projection (Lee and Stewart, 1979). The symbols represent first-motion $P-$polarities, and their positions represent the points where the HYPO71-determined raypaths intersect the focal hemisphere. The darkened circles represent impulsive compressional arrivals, the + symbols represent emergent compressionals, the open circles represent impulsive dilitationals, the − symbols represent emergent dilatationals, and the × symbols represent indeterminate or nodal readings. The + symbol at the center of each mechanism is *not* a compression; it is a point of reference for readers who may wish to search for alternative solutions using a Schmidt (equal area) net. SGBSN station names are printed adjacent to the first-motion symbol for many of the solutions presented in Appendix D. In the following figures the **P** and **T** symbols represent the pressure and tension axes, respectively. The **X** and **Y** symbols represent slip vectors for each nodal plane, and **B** is the null axis. Primed **P** and **T** symbols are the respective vectors for alternate (dashed) solutions when they are presented. Some mechanisms from previous SGB data reports are composited using data from several events that are clustered in time and space. Composite solutions are not present in the 1990 data set.

For several mechanisms, the information contained in P-wave polarities was not adequate to effectively constrain the range of permissable nodal planes. In these instances, first motion P- and SV- amplitude data were gathered at selected stations, indicated by a large square around the polarity symbol. The observed and theoretical $\log_{10}(SV/P)_z$ ratios and the difference between the logarithms of observed and theoretical ratios are computed for hundreds of potential solutions whose nodal planes conform to P-wave first-motion polarities. The theoretical values shown in each figure are for the "optimum" solution shown, having the lowest rms error and fewest polarity inconsistencies. If the difference between observed and theoretical values is greater than a specified limit, err_{max}, that station's amplitude data are not used in the solution and an asterisk is placed by its name in the solution table. We always set $err_{max} \leq 0.3$, corresponding to a maximum factor between theoretical and observed amplitude ratios of 2.0.

Kisslinger and others (1981 and 1982) and Rogers and others (1987) discuss several assumptions that must be satisfied for the $(SV/P)_z$ amplitude ratio method to be valid. Their comments and observations are included herein by reference. For completeness, the actual formula used to compute the theoretical (SV/P) amplitude ratio, as coded in *focmec.for*, is explicitly stated (from Kisslinger and others, 1981 and 1982). The formula for the ratio of SV to P wave displacement amplitude in the far field for elastic waves leaving a shear dislocation point source may be written

$$(SV/P)_0 = \left(\frac{V_p}{V_s}\right)^3 \cot\phi$$

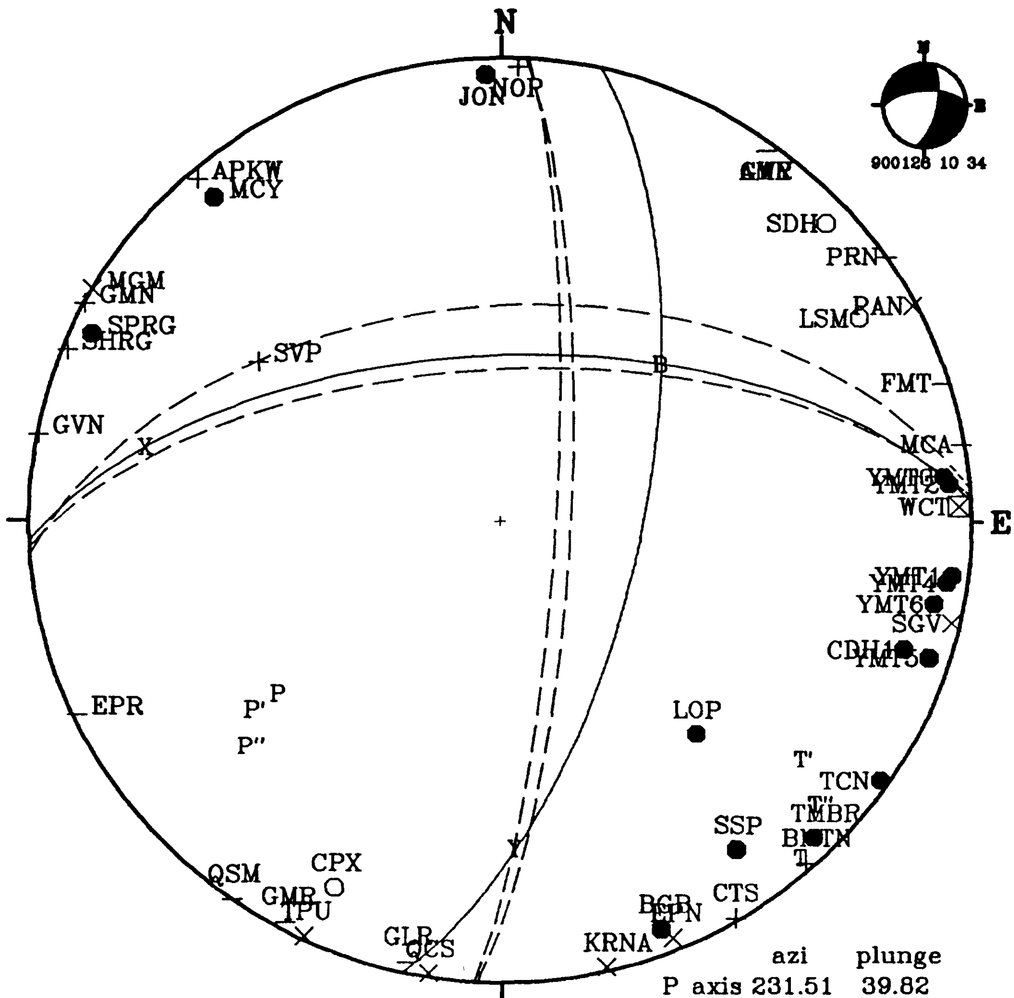
$$\left[1 - \frac{(\cot\delta - \tan\delta)\sin\lambda\tan\phi\sin A + 2\sin\lambda + \csc\delta\cos\lambda\tan\phi\cos A}{2D}\right],$$

where

$$D = \cos\lambda\cos A\sin\phi[-\sin\phi\sin A\sec\delta + \cos\phi\csc\delta]$$

$$+\sin\lambda\sin\phi\cos\phi\sin A(\cot\delta - \tan\delta) + \sin\lambda(\cos^2\phi - \sin^2\phi\sin^2 A).$$

In this formula, V_p is the compressional wave velocity at the source, V_s is the shear wave velocity, ϕ is the takeoff angle of the ray, measured upward from the $z-$axis, which points downward, δ is the angle between the fault plane normal and the z axis, λ is the rake angle, measured in the fault plane, and A is the source-to-station azimuth. While this formula is used to constrain focal mechanism solution sets, we recognize that it is written for a point source in a homogeneous, isotropic medium. For example, it would not be appropriate for fault zones having strongly contrasting rock properties in the hanging wall and foot wall. If the reader is uncomfortable with the assumptions required by the $(SV/P)_z$ method, he should give little weight to the focal mechanisms constrained by such data in his assessments of SGB seismicity.



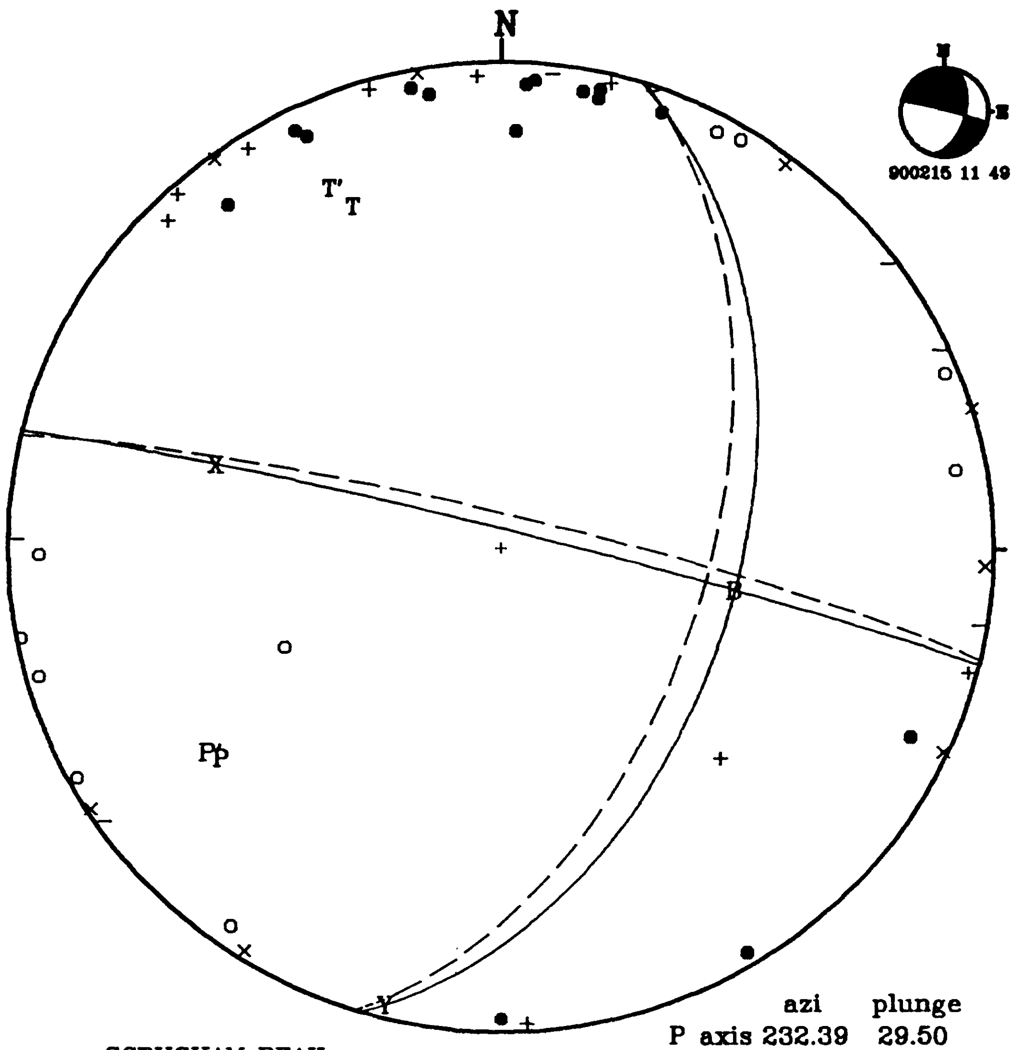
	azi	plunge
P axis	231.51	39.82
T axis	138.83	3.21
B axis	44.99	50.00
X axis	282.26	24.40
Y axis	177.39	29.50

	strike	dip	rake
Soln 1	267.39	60.50	−28.34
Var 2'	265.72	51.61	−12.25
Var 2''	266.70	63.05	−13.71

CANE SPRING
DATE&TIME: 900126 10 34 15.61
LAT: 36.811 LONG: 116.121
DEPTH, km: 5.06 +/− 1.5 ML: 2.5
DMIN (km)= 6.4

This is the mainshook of a series of earthquakes SE of Lookout Peak. NTS, on January 26 and 27, 1990. A moderate constraint on the solution set is imposed by the (SV/P)z amplitude ratio at station WCT, where the observed log10(SV/P)z equals 1.540. Most nearby station seismograms were clipped for this earthquake.

Figure D1. The focal mechanism solutions for this earthquake at Skull Mountain, Nevada Test Site, indicate predominantly right-lateral strike-slip motion on a north to north-northeast trending fault, or predominantly left-lateral strike-slip motion on an east-west trending, north-dipping fault. Some constraint on the range of solutions is imposed by the $(SV/P)_Z$ amplitude ratio at station **WCT**. The small mechanism in the upper right of this figure (and all other figures of Appendix D) is a copy of the large mechanism's preferred solution, with compressional quadrants darkened, shown here to help the reader identify this mechanism when discussed in the main text of this report.



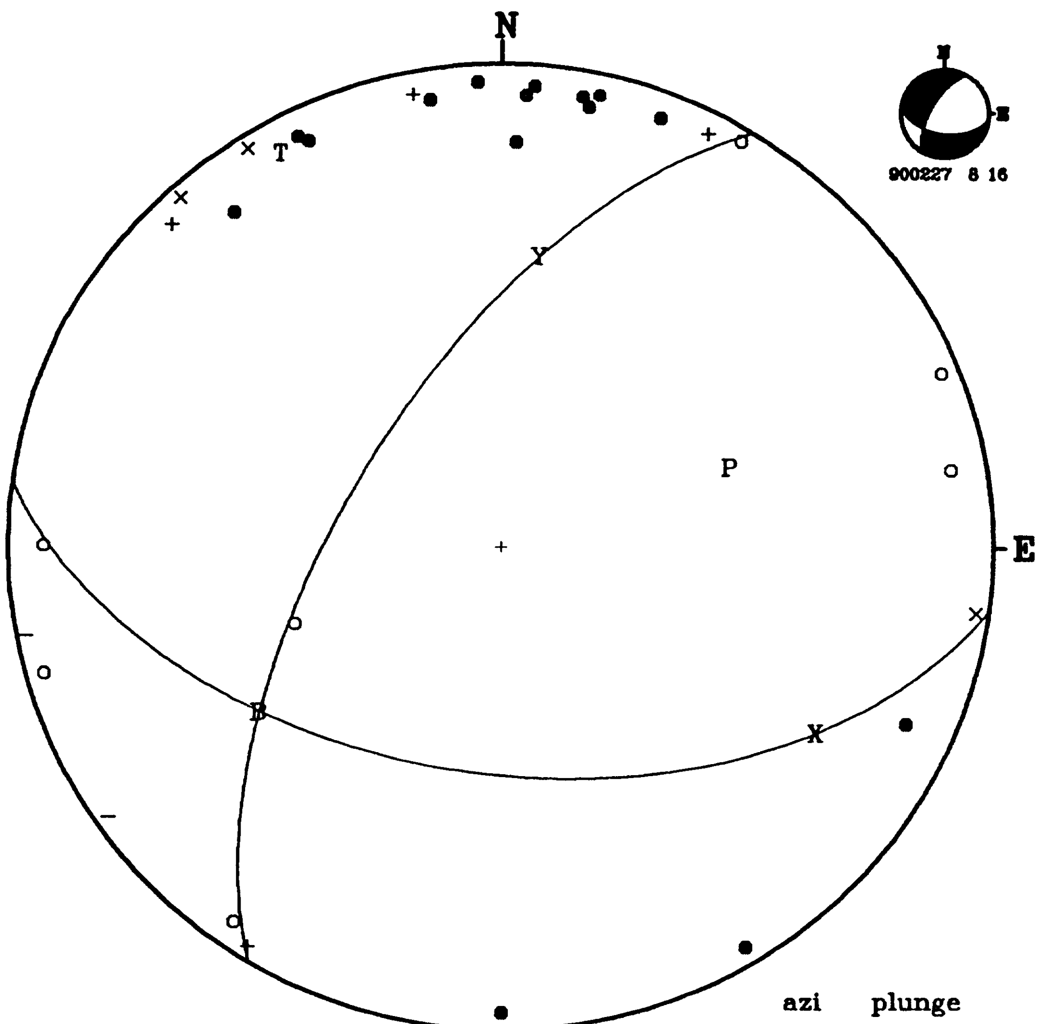
SCRUGHAM PEAK
DATE&TIME: 900215 11 49 57.83
LAT: 37.193 LONG: 116.379
DEPTH, km: 5.80 +/− 0.4 ML: 2.3
DMIN (km)= 5.4

This earthquake may be the mainshock of a short-lived series that occurred near Echo Peak, Nevada Test Site, on February 15, 1990.
This hypocenter obtained from a velocity model in which vp/vs=1.81, following a Wadati diagram for the horizontal-comp S-wave arrivals.

	azi	plunge
P axis	232.39	29.50
T axis	337.26	24.40
B axis	100.00	50.00
X axis	286.51	39.81
Y axis	193.83	3.21

	strike	dip	rake
Soln 1	283.83	86.79	−39.89
Var 2'	283.22	84.28	−34.59

Figure D2. The focal mechanism solutions for this southern Silent Canyon caldera mainshock of February 15, 1990, indicate right-lateral strike slip motion on a north-northeast trending, east dipping fault, or oblique motion on a nearly vertically dipping, east-southeast trending fault.



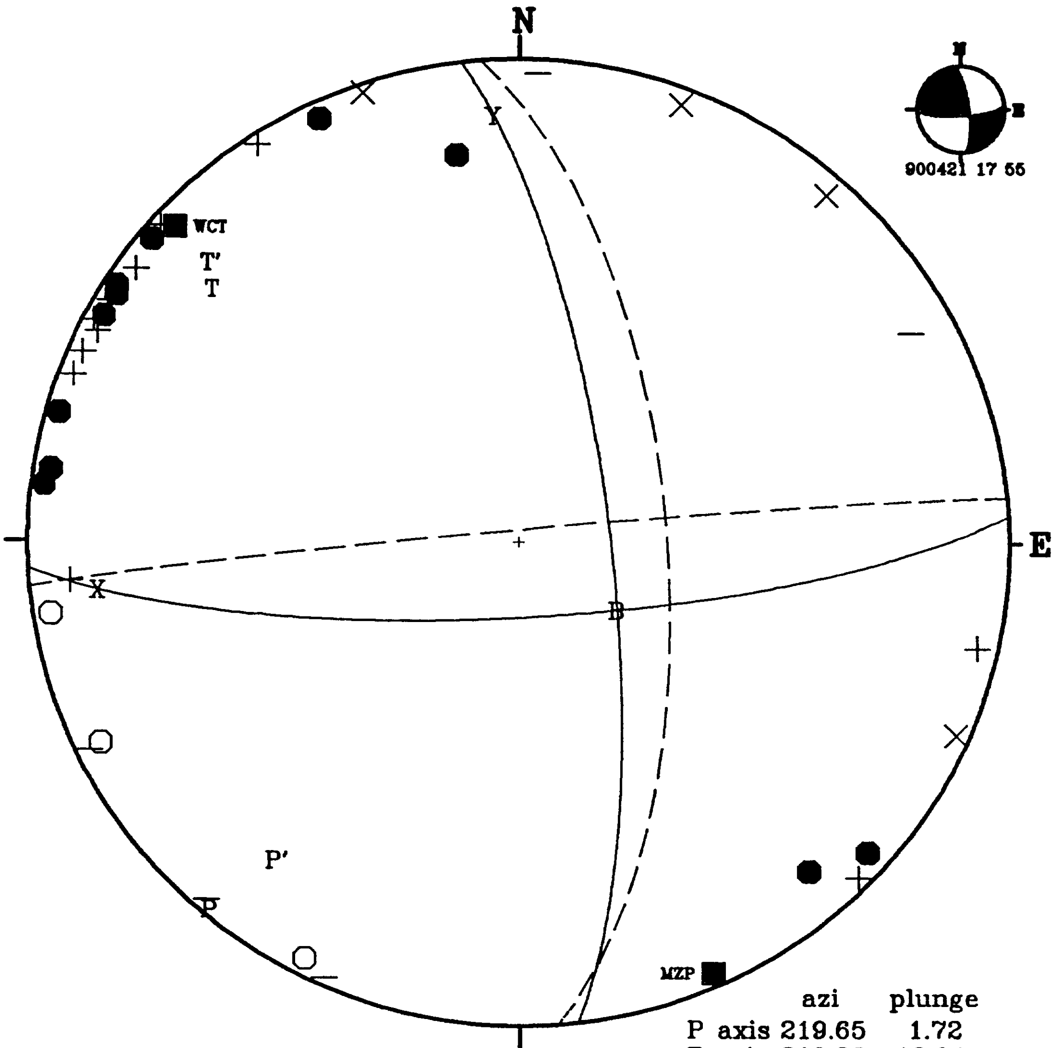
SCRUGHAM PEAK
DATE&TIME: 900227 8 16 59.24
LAT: 37.197 LONG: 116.379
DEPTH, km: 6.46 +/- 0.6 ML: 2.0
DMIN (km)= 5.3

	azi	plunge
P axis	70.34	48.98
T axis	331.47	7.64
B axis	235.00	39.99
X axis	120.77	26.07
Y axis	7.55	38.87

	strike	dip	rake
Soln 1	97.55	51.13	−34.36

This earthquake may be the
2nd largest shock of a short-lived
series that occurred near
Echo Peak, Nevada Test Site,
on February 27, 1990.
This hypocenter obtained from
a velocity model in which vp/vs=1.81.

Figure D3. The focal mechanism solution for this southern Silent Canyon caldera earthquake of February 27, 1990, indicates oblique normal-slip strike-slip motion on nodal planes trending northeast-southwest and east-west, respectively.



	azi	plunge
P axis	219.65	1.72
T axis	310.28	19.94
B axis	124.92	69.98
X axis	263.19	15.21
Y axis	356.70	12.70

BONNIE CLAIRE SE
DATE&TIME: 900421 17 55 52.77
LAT: 37.124 LONG: 117.062
DEPTH, km: 6.64 +/− 1.9 ML: 2.0
DMIN (km)= 16.0

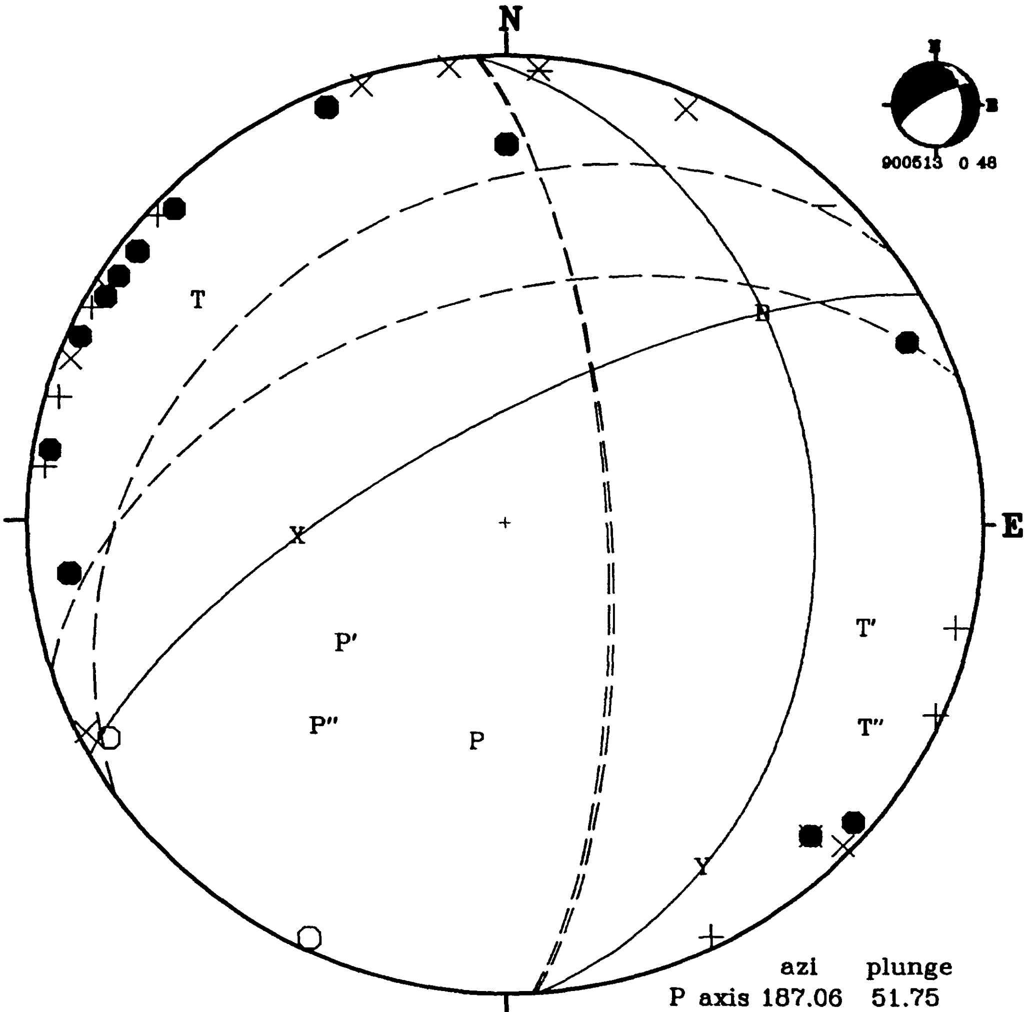
	strike	dip	rake
Soln 1	86.70	77.30	15.60
Var 2'	264.50	87.90	−24.70

Log10(S/P)z Amplitudes for Above Solutions

		Dashed (Extensional)		Solid (Compr.)	
STA	Observed	Theoretical	Difference	Theor.	Diff.
WCT	0.1427	0.0295	0.1132	0.1299	0.0128
MZP	0.5206	0.5935	-0.0729	0.5168	0.0038

RMS average error Extensional 0.10 Compress. 0.01

Figure D4. The focal mechanism solutions for this earthquake in northwest Sarcobatus Flat (Bonnie Claire SE quadrangle), Nevada indicate predominantly right-lateral strike slip on a north trending fault or left-lateral strike slip on an east trending fault. Solutions are constrained by two $(SV/P)_z$ amplitude ratios, but include members having a small component of reverse slip and others having a small component of normal slip.



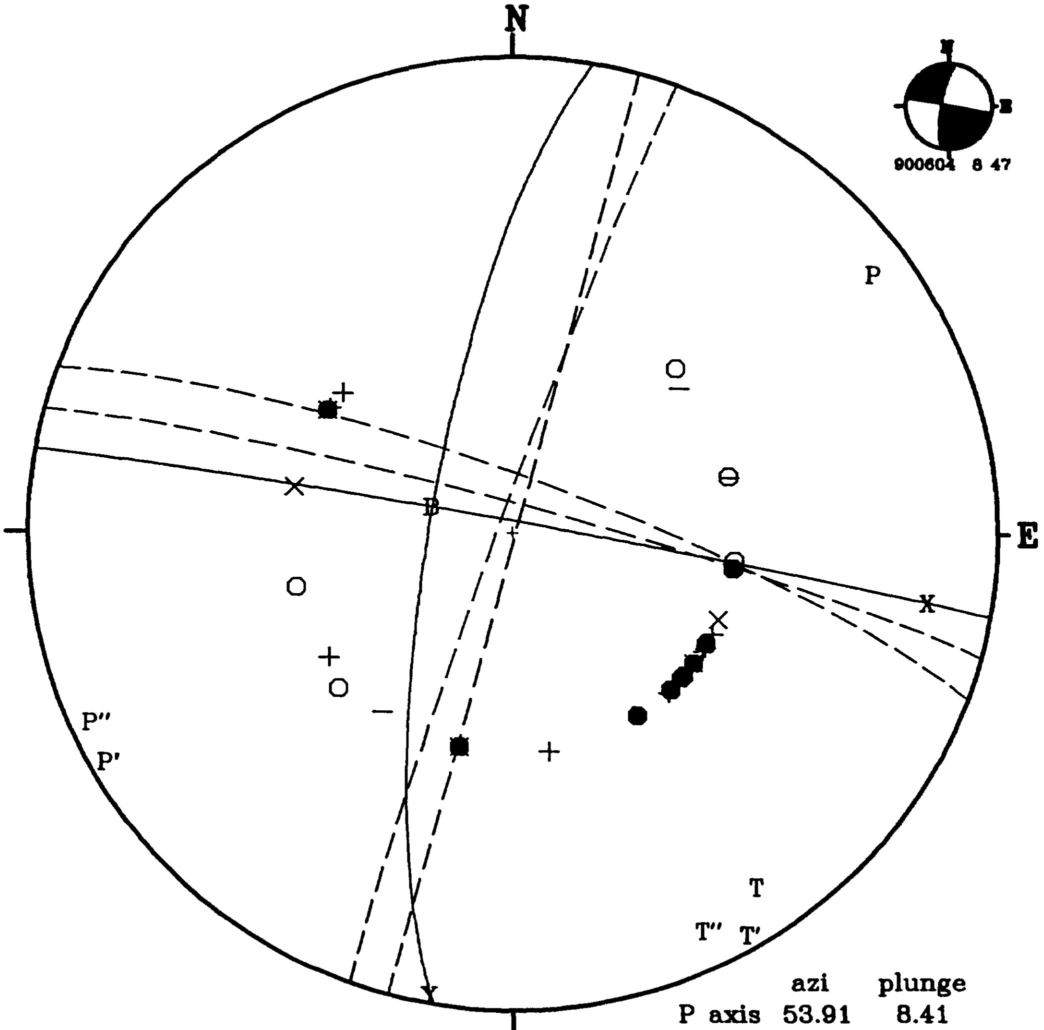
BONNIE CLAIRE SE
DATE&TIME: 900513 0 48 11.70
LAT: 37.117 LONG: 117.035
DEPTH, km: 6.20 +/− 1.0 ML: 1.9

	azi	plunge
P axis	187.06	51.75
T axis	306.85	21.39
B axis	49.93	30.02
X axis	266.10	54.41
Y axis	150.30	17.30

	strike	dip	rake
Soln 1	240.30	72.70	−58.40
Var 2'	234.30	31.60	−36.30
Var 2''	251.60	50.10	−22.90

This Sarcobatus Flat earthquake is the first and largest of several that occurred in May. 1990 at this location. First motion constraint is not great. but provides only extentional to strike-slip possibilities.

Figure D5. The focal mechanism for this Sarcobatus Flat earthquake is not well constrained, but solutions are all predominantly strike slip to predominantly normal slip, with **T** axes oriented west-northwest to east-southeast.



SPRINGDALE
DATE&TIME: 900604 8 47 13.69
LAT: 37.096 LONG: 116.876
DEPTH, km: 0.97 +/- 0.5 ML: 1.5
DMIN (km): 14.5

The 8:47 UTC event is one of the larger
of several shallow earthquakes at Soroobatus
Flats. early June. 1990.
The oompressional (+) inoonsistenoy
at station TMO is noisy.

	azi	plunge
P axis	53.91	8.41
T axis	145.60	11.28
B axis	287.97	75.86
X axis	99.50	13.99
Y axis	190.00	2.00

	strike	dip	rake
Soln 1	280.00	88.00	14.00
Var 2'	285.00	85.00	-0.44
Var 2''	290.20	80.30	2.60

Figure D6. The focal mechanism solutions for this Sarcobatus Flat earthquake are all predominantly strike-slip on steeply dipping nodal planes. Sense of slip is right lateral on the approximately north-south trending nodal planes, and is left lateral on the approximately east-west trending nodal planes.

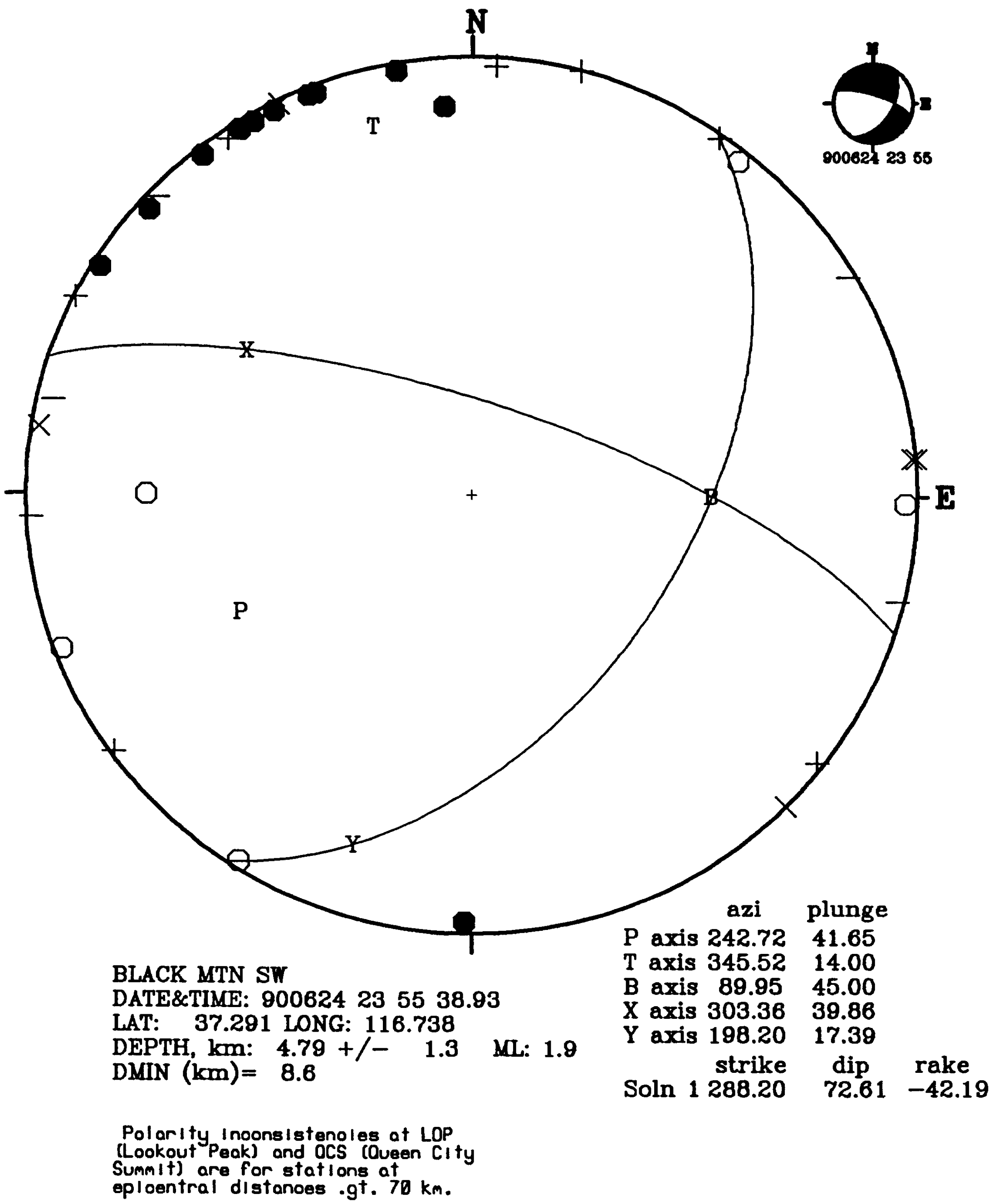
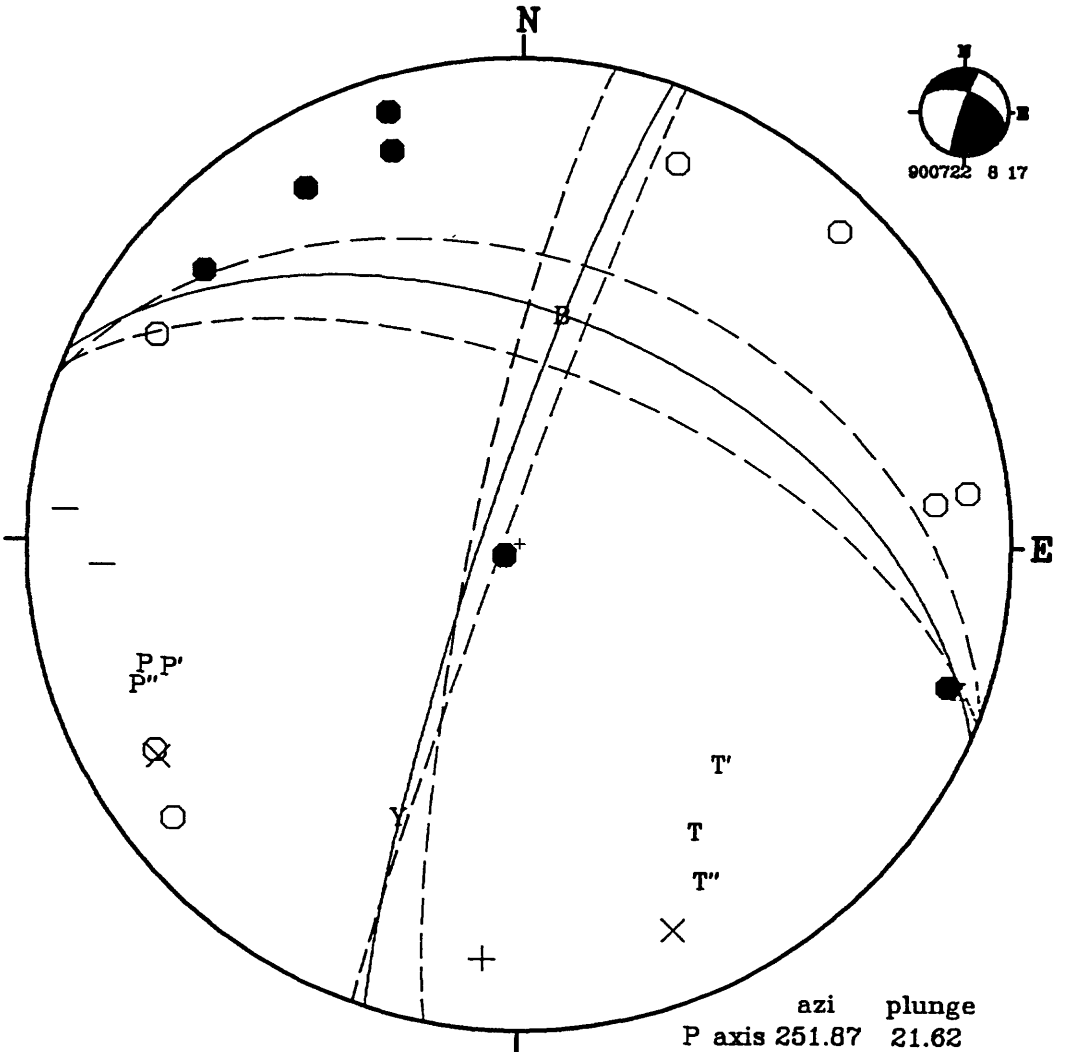


Figure D7. The focal mechanism for this northern Oasis Valley earthquake, whose epicenter lies just west of the Black Mountain Caldera, indicates oblique strike-slip normal-slip motion. The strike slip component of motion is right lateral on the northeast-southwest trending nodal plane, and is left lateral on the west-northwest trending nodal plane.



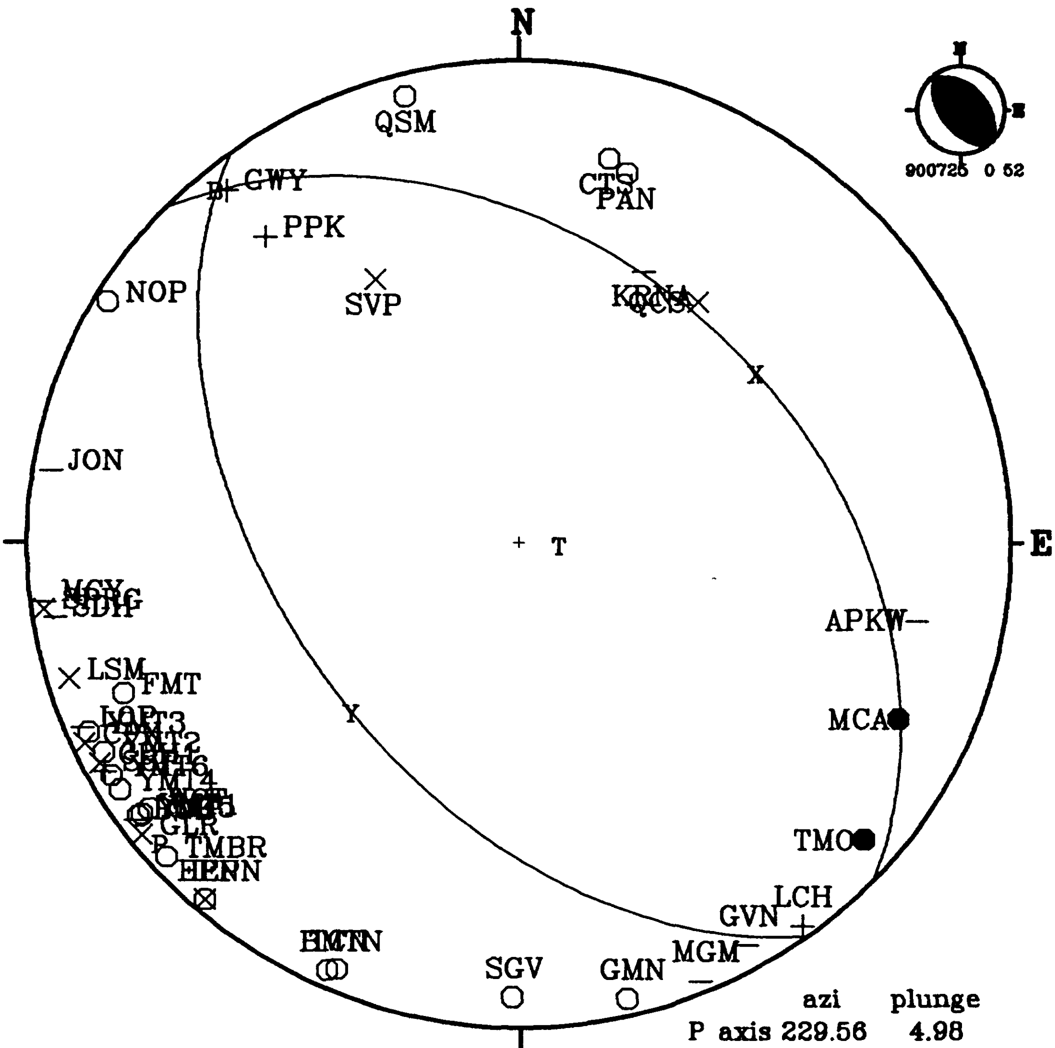
JACKASS FLATS
DATE&TIME: 900722 8 17 14.02
LAT: 36.863 LONG: 116.318
DEPTH, km: 2.62 +/- 0.4 ML: 1.1
DMIN (km)= 0.2

These solutions are fairly
well constrained using P arrival
data only. For this earthquake
almost directly under the Calico Hills
seismometer (CDHI).

	azi	plunge
P axis	251.87	21.62
T axis	147.85	31.43
B axis	10.41	50.32
X axis	107.95	6.21
Y axis	203.00	39.00

	strike	dip	rake
Soln 1	293.00	51.00	8.00
Var 2'	290.00	41.00	12.00
Var 2''	291.00	60.00	2.90

Figure D8. The focal mechanism solutions for this Jackass Flats earthquake indicate predominantly strike-slip motion, oblique right lateral on the north-northeast trending nodal planes, or left-lateral on the north-dipping, west-northwest trending nodal planes.



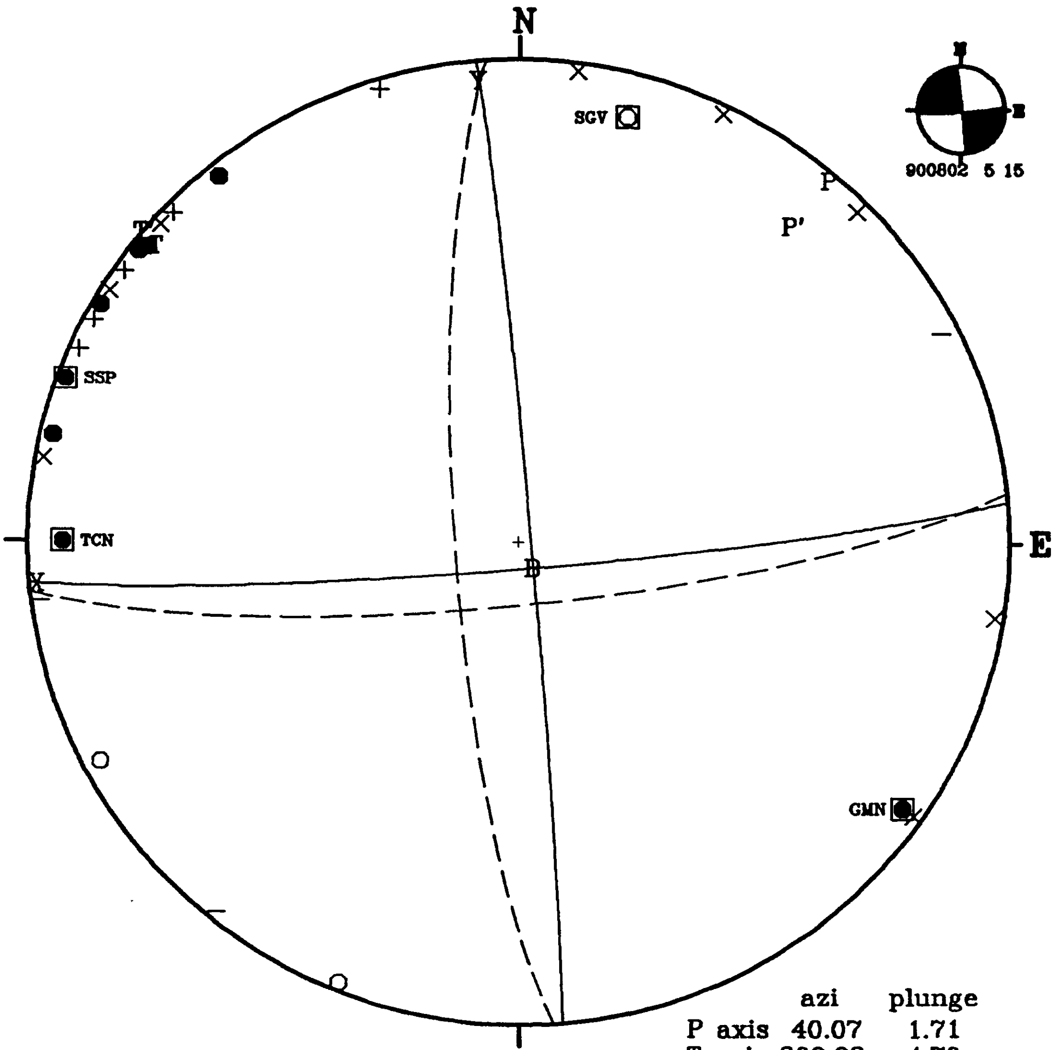
STOVEPIPE WELLS
DATE&TIME: 900725 0 52 50.39
LAT: 36.556 LONG: 117.044
DEPTH, km: 8.05 +/- 0.7 ML: 2.2
DMIN (km)= 18.8

	azi	plunge
P axis	229.56	4.98
T axis	94.89	82.93
B axis	320.00	5.00
X axis	54.18	39.82
Y axis	224.07	49.74

	strike	dip	rake
Soln 1	314.07	40.26	82.25

The earthquake epicenter is at the eastern edge of Tuoki Mountain, California. The earthquake is at the southeast end of a series that occurred over a several year period, whose epicenters define a northwest-southeast linear trend parallel to the Furnace Creek Fault.

Figure D9. The focal mechanism solutions for this Sarcobatus Flat earthquake indicate right lateral strike slip on north trending, steeply dipping nodal planes or left lateral strike slip on west trending, steeply dipping nodal planes. Some constraint on the range of solutions is provided by $(SV/P)_z$ ratios at stations **SGV** and **GMN**.



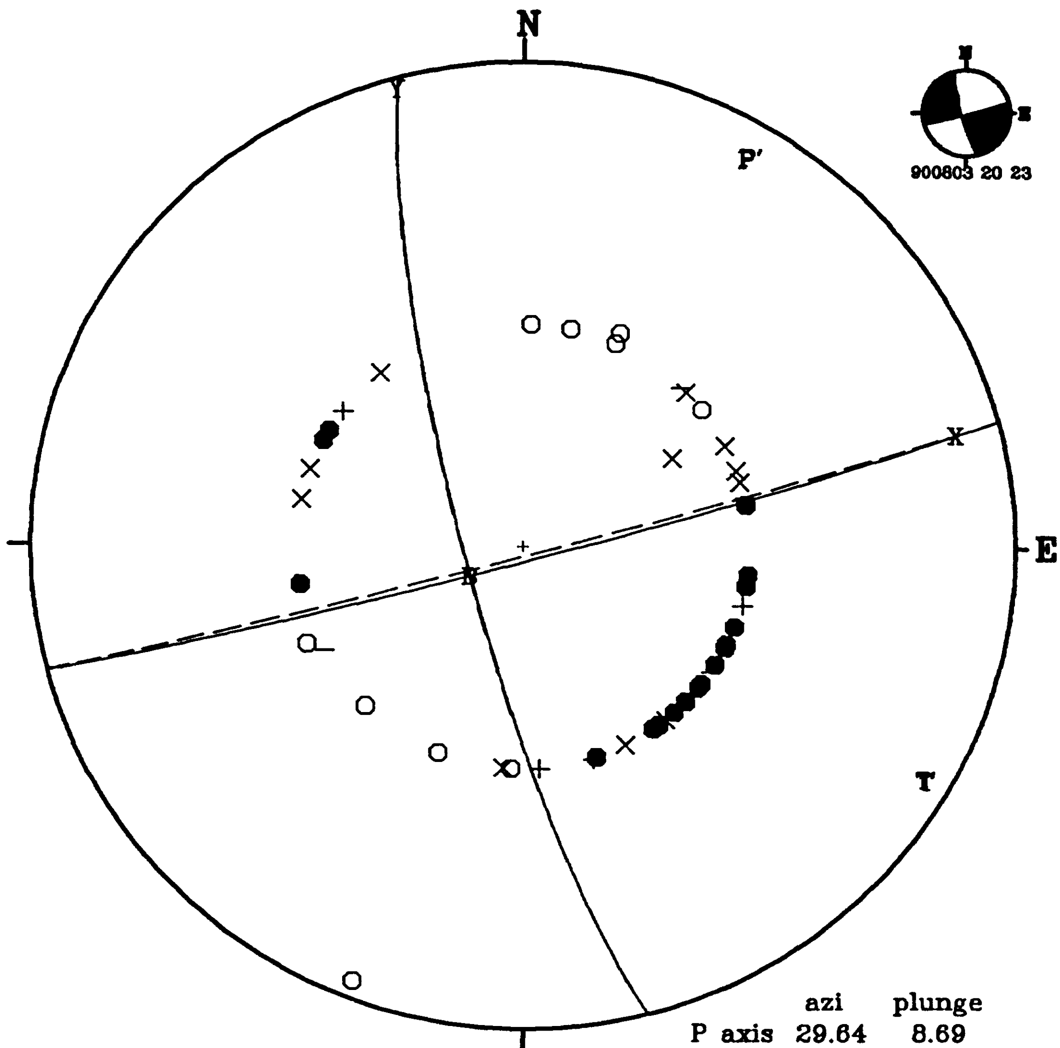
SPRINGDALE
DATE&TIME: 900802 5 15 2.68
LAT: 37.147 LONG: 116.982
DEPTH, km: 5.00 +/- 3.2 ML: 1.1
DMIN (km)= 18.9

	azi	plunge
P axis	40.07	1.71
T axis	309.93	4.70
B axis	149.97	85.00
X axis	264.91	2.11
Y axis	355.08	4.53

	strike	dip	rake
Soln 1	85.08	85.47	2.12
Var 2'	84.01	79.45	−10.73

Two station ratios showing distinctly larger P amplitude than S amplitude were used to constrain the set of acceptable nodal planes for this Sarcobatus Flat earthquake.

Figure D10. The focal mechanism for this earthquake at the western edge of Death Valley indicates almost pure reverse slip motion on the two northwest trending nodal planes. Reverse faulting is almost never observed by the SGBSN for SGB earthquakes.



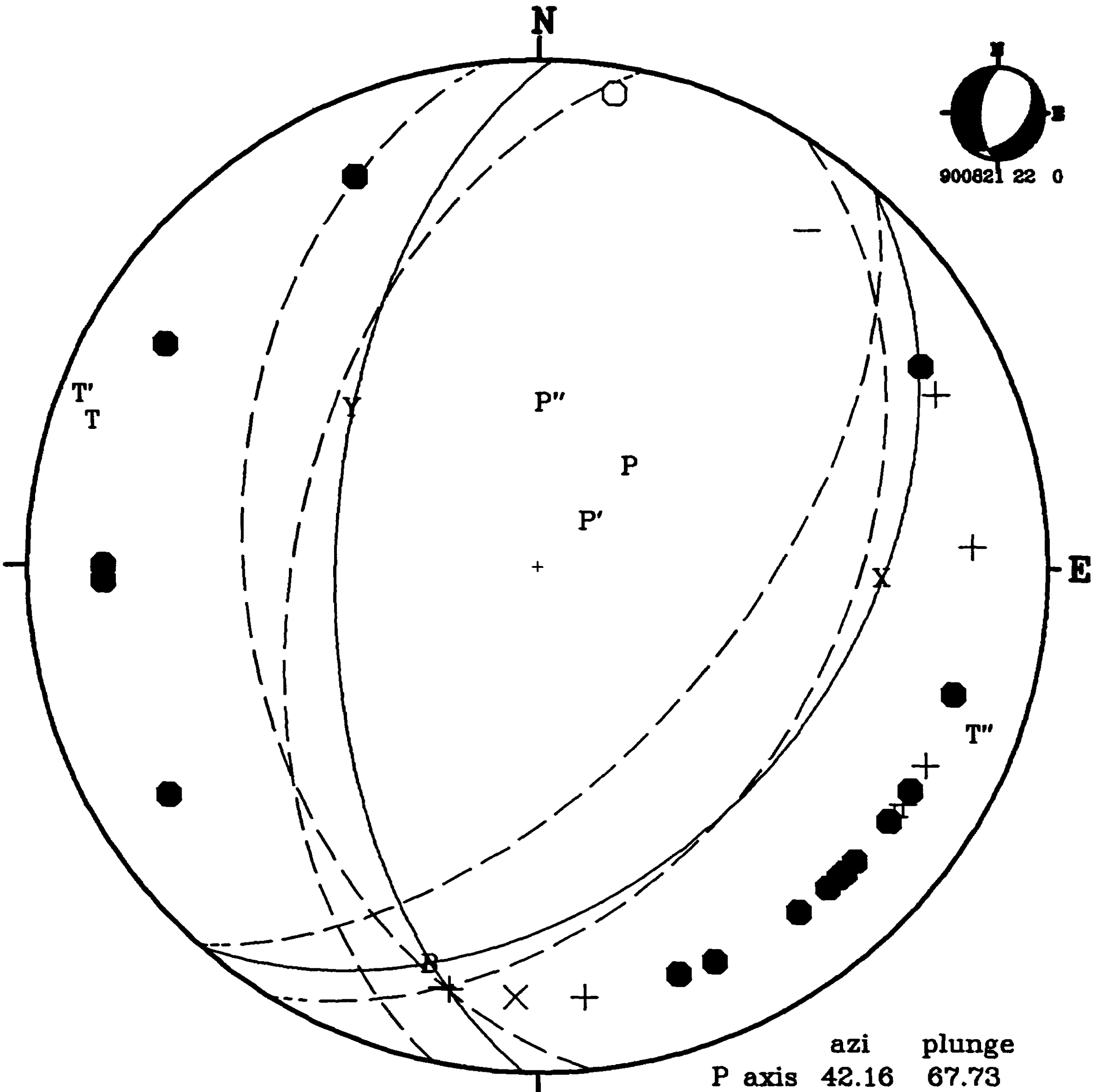
SPRINGDALE
DATE&TIME: 900803 20 23 55.89
LAT: 37.087 LONG: 116.754
DEPTH, km: −1.03 +/− 0.4 ML: 2.3
DMIN (km)= 7.1

	azi	plunge
P axis	29.64	8.69
T axis	120.40	4.99
B axis	239.94	79.96
X axis	75.24	9.69
Y axis	344.80	2.60

	strike	dip	rake
Soln 1	74.80	87.40	−9.70
Var 2'	74.90	88.30	−9.85

These two solutions are found by focmec, using slip vector increments of 5 degrees in azimuth and plunge. One polarity error at station MCY (distance 85 km) is present.

Figure D11. The focal mechanism solutions for this Sarcobatus Flat earthquake are predominantly strike slip, right lateral on the north-northwest trending nodal plane, or left lateral on the west-southwest trending nodal plane. The depth-of-focus estimate is at the earth's surface, which is an unlikely depth for earthquakes. A deeper-focus hypocenter would yield a wider range of acceptable focal mechanism solutions from the same first-motion polarities when compared to the two solutions shown in this figure.



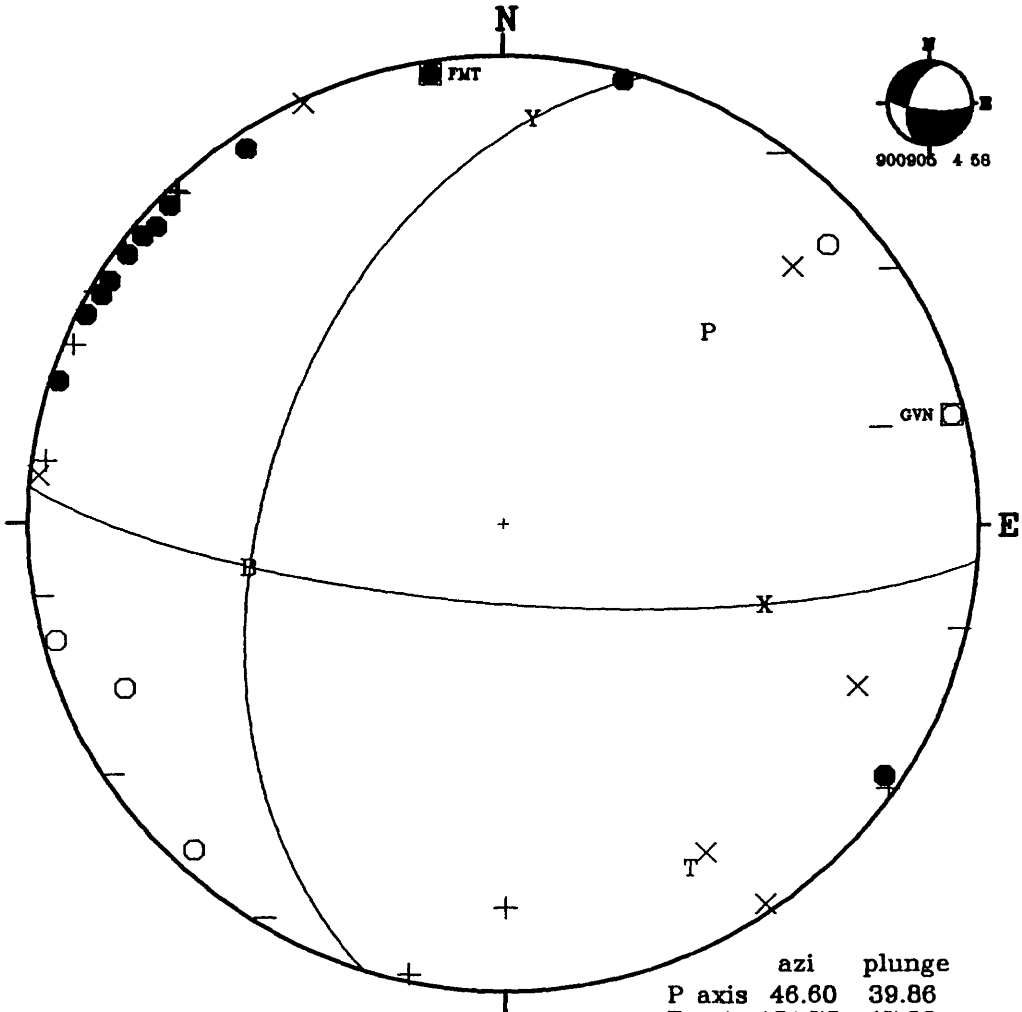
STONEWALL PASS
DATE&TIME: 900821 22 0 24.17
LAT: 37.439 LONG: 117.229
DEPTH, km: 2.38 +/- 1.1 ML: 1.9
DMIN (km)= 15.6

	azi	plunge
P axis	42.16	67.73
T axis	288.42	9.36
B axis	194.97	20.02
X axis	91.48	32.64
Y axis	311.00	50.30

	strike	dip	rake
Soln 1	41.00	39.70	-57.60
Var 2'	31.70	41.00	-74.70
Var 2''	41.50	58.70	-60.40

Piercing points for this solution at 96 and 74 degrees due to shallow-focus hypocenter. The constraint on these focal mechanism solutions is provided, in part, by GVN's + and HCR & TMO's - P waves, all very emergent.

Figure D12. The focal mechanism solutions for this earthquake at Stonewall Flat, Nevada, indicate predominantly normal slip on north trending and northeast trending nodal planes. The velocity model used for preliminary hypocenter and focal mechanism determination has an interface at 12 km below sea level, below which $V_p = 6.5$ km/sec, to a depth of 24 km.



SPRINGDALE
DATE&TIME: 900905 4 58 34.41
LAT: 37.092 LONG: 116.876
DEPTH, km: 5.00 +/- 1.2 ML: 2.0
DMIN (km)= 14.7

	azi	plunge
P axis	46.60	39.86
T axis	151.75	17.38
B axis	259.99	45.00
X axis	107.24	41.64
Y axis	4.43	14.00

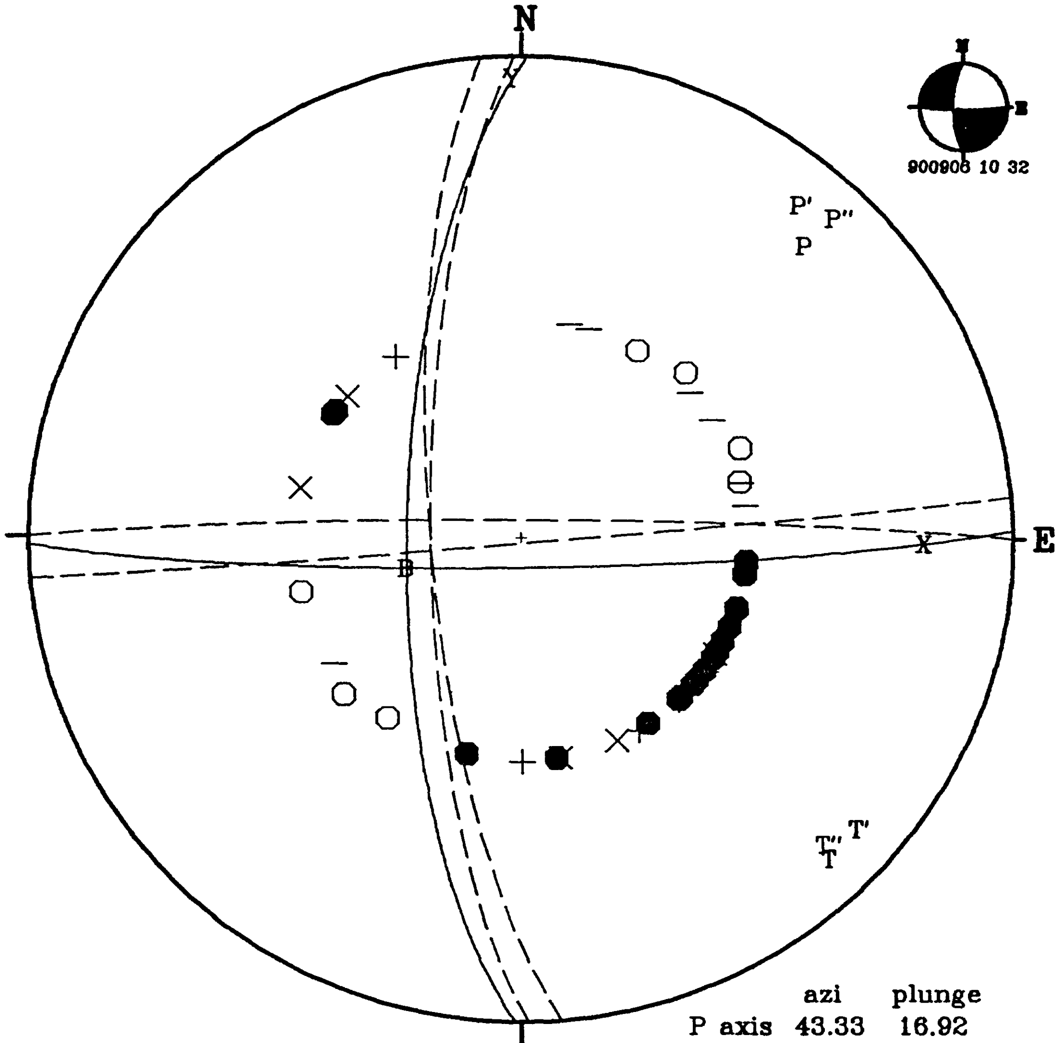
	strike	dip	rake
Soln 1	94.43	76.00	-43.22

The above hypocenter has depth fixed at five km below sea level. A small improvement in RMS travel time residual occurs for a free-depth solution at about one km below sea level (0.12 sec vs 0.14 sec). but the initial P-wave arrivals at most SGB stations appear to be direct rather than refracted. suggesting that the true depth of focus is greater than one km.

Log10(SV/P)z for 5 km hypocenter:

Observed	Theoretical	Difference	Station
0.4599	0.6136	-0.1537	GVN
0.6884	0.7213	-0.0329	FMT

Figure D13. The focal mechanism for this Sarcobatus Flat earthquake indicates predominantly right lateral strike slip on a north-south trending, west dipping nodal plane, or oblique normal slip strike slip on an east-west trending, steeply dipping nodal plane. $(SV/P)_z$ amplitude ratios were collected at stations **GVN** and **FMT** to constrain the range of acceptable focal mechanism solutions.

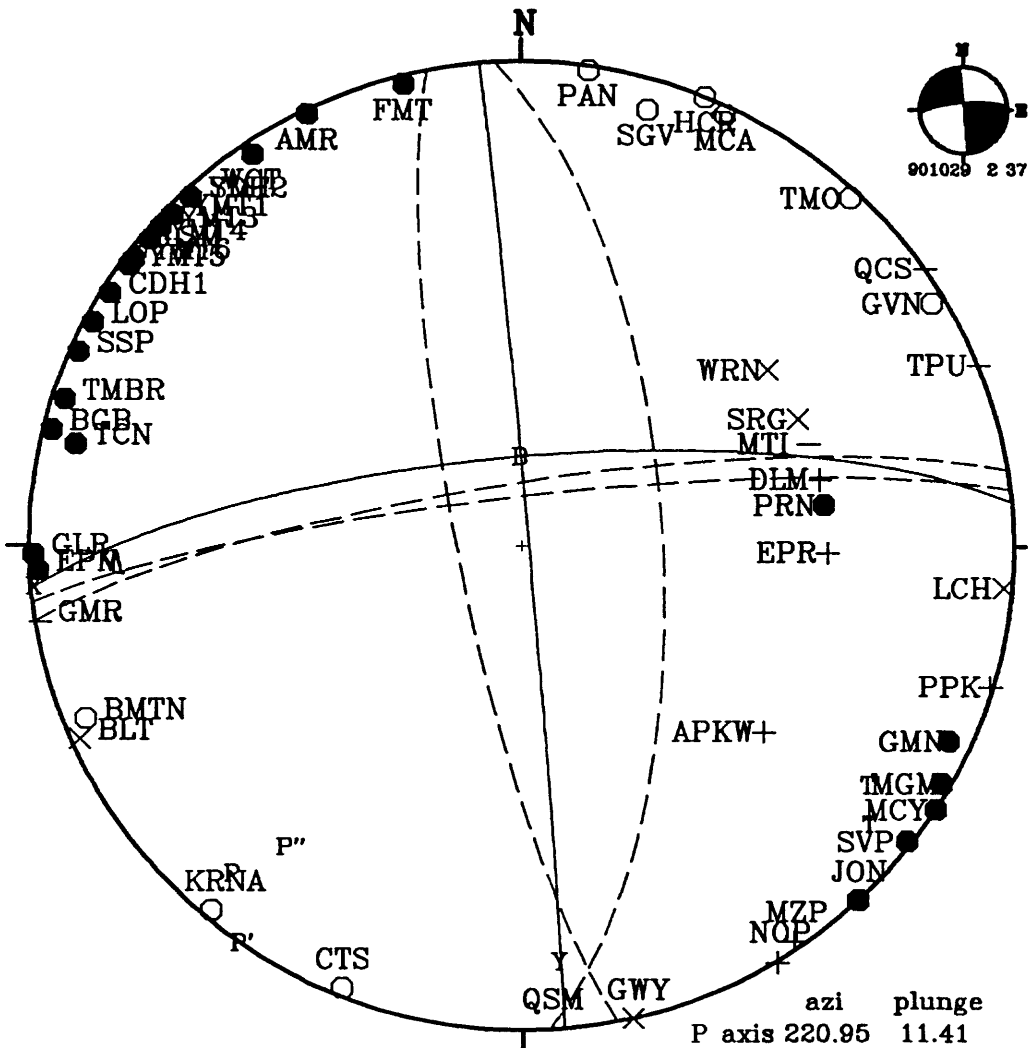


SPRINGDALE
DATE&TIME: 900906 10 32 18.73
LAT: 37.094 LONG: 116.877
DEPTH, km: 0.77 +/- 0.5 ML: 2.2
DMIN (km)= 14.7

	azi	plunge	
P axis	43.33	16.92	
T axis	136.30	9.65	
B axis	254.80	70.38	
X axis	90.72	18.92	
Y axis	359.00	5.00	
	strike	dip	rake
Soln 1	89.00	85.00	−19.00
Var 2'	85.00	89.00	−15.00
Var 2''	270.00	87.00	15.00

This Sarcobatus Flat earthquake
has predominantly strike-slip
focal mechanism solutions, some
with a small normal slip component,
some with a small reverse slip component.

Figure D14. The focal mechanism solutions for this shallow Sarcobatus Flat earthquake all indicate right-lateral strike slip on north trending nodal planes, or left-lateral strike slip on west trending nodal planes.



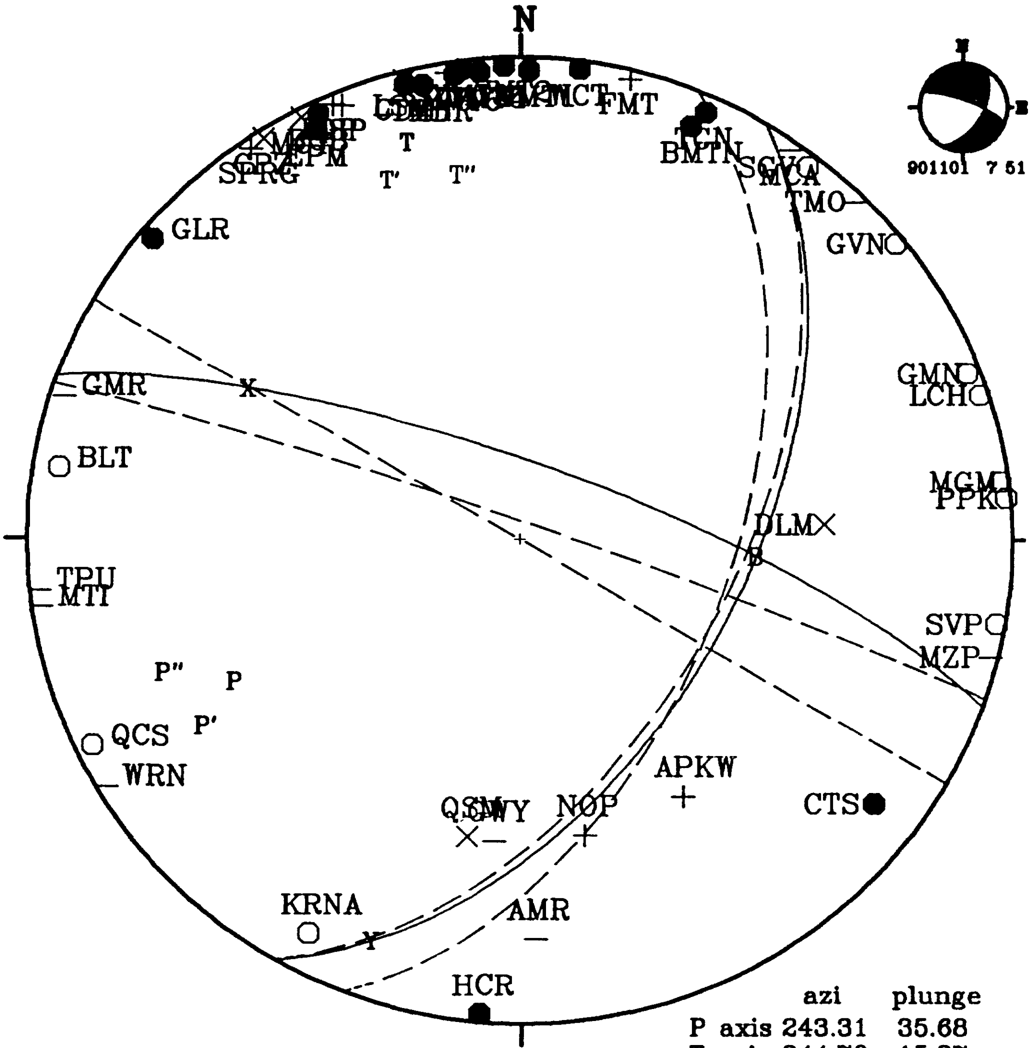
SPRINGDALE
DATE&TIME: 901029 2 37 27.24
LAT: 37.188 LONG: 116.959
DEPTH, km: 4.96 +/− 1.0 ML: 2.6
DMIN (km)= 21.3

This is the largest SGB earthquake for October 1990. All solutions are predominantly strike slip, some having a modest component of thrust or normal slip.

	azi	plunge
P axis	220.95	11.41
T axis	129.00	9.60
B axis	359.83	75.00
X axis	265.14	1.26
Y axis	174.80	14.94

	strike	dip	rake
Soln 1	264.80	75.06	−1.30
Var 2'	260.99	79.45	10.72
Var 2"	263.26	81.70	−23.70

Figure D15. The focal mechanism solutions for this 5 km below sea level Sarcobatus Flat earthquake all indicate right-lateral strike slip on approximately north trending nodal planes, or left-lateral strike slip on west trending nodal planes.



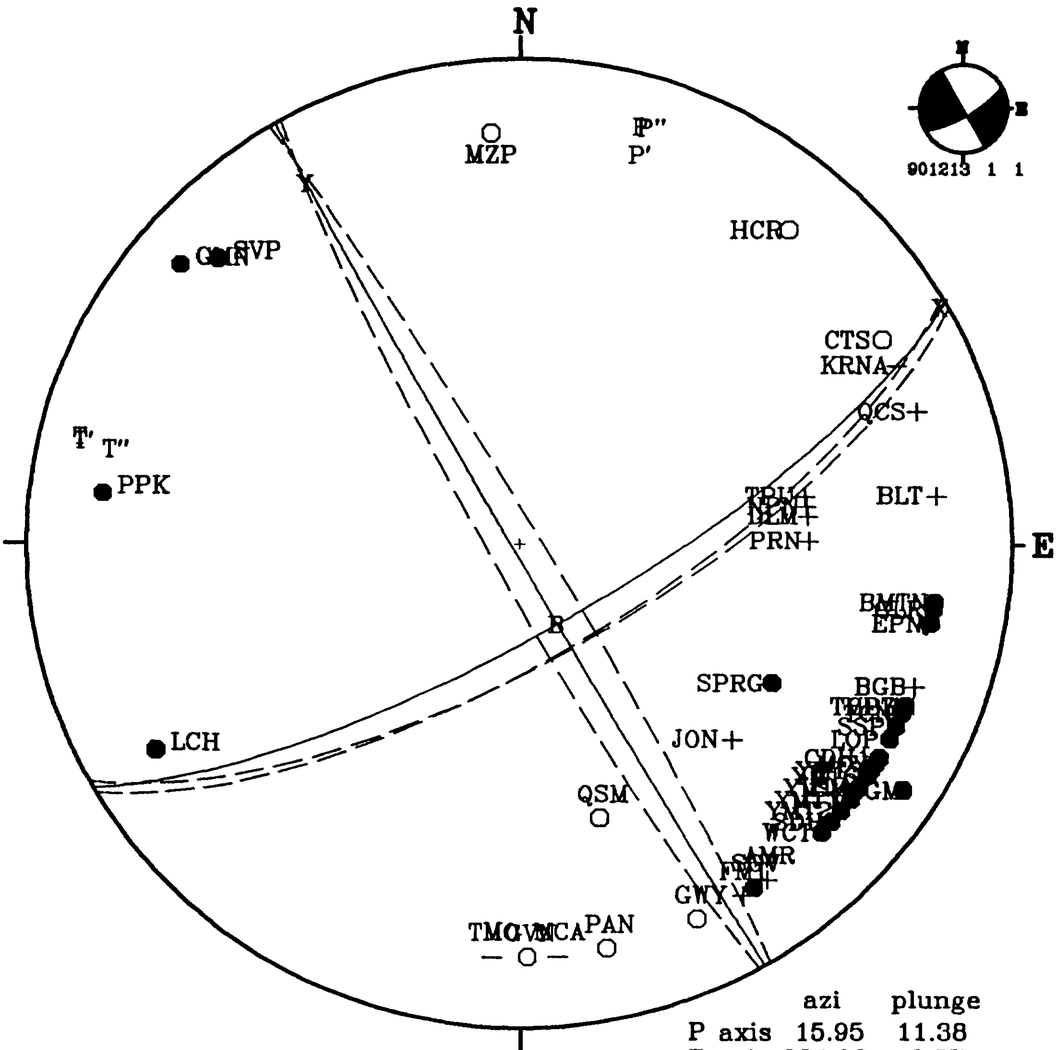
MELLAN
DATE&TIME: 901101 7 51 46.78
LAT: 37.531 LONG: 116.521
DEPTH, km: 5.98 +/- 1.4 ML: 2.4
DMIN (km)= 22.8

	azi	plunge
P axis	243.31	35.68
T axis	344.70	15.37
B axis	93.94	50.16
X axis	299.97	36.86
Y axis	200.00	13.00

	strike	dip	rake
Soln 1	290.00	77.00	-38.00
Var 2'	289.00	87.00	-35.00
Var 2"	120.00	90.00	35.00

This Gold Flat earthquake is the mainshock of a three-event series that occurred in an otherwise seismically quiet area during 1990. The epicenters lie in a featureless part of Gold Flat, about 16 km west of the Kawich Range. The RMS travel-time residual graph for this earthquake is essentially flat for fixed-depth hypocenters ranging from surface focus to six km below sea level.

Figure D16. The focal mechanism solutions for this Gold Flat, Nevada, earthquake indicate oblique normal (or reverse) slip - strike slip on the west-northwest trending, almost vertical-dipping nodal planes, or right lateral strike slip on the east-northeast trending, southeast dipping nodal planes. The depth of focus is poorly resolved for this earthquake, with a virtually flat minimum in the RMS travel time residual function from surface focus to 6 km below sea level.



GOLD POINT
DATE&TIME: 901213 1 1 0.36
LAT: 37.368 LONG: 117.357
DEPTH, km: 2.72 +/- 0.6 ML: 2.8
DMIN (km)= 11.6

Repicked several P-onsets.
QCS polarity is questionable. SH 2/28/91

	azi	plunge
P axis	15.95	11.38
T axis	284.00	9.57
B axis	154.84	75.04
X axis	60.13	1.26
Y axis	329.80	14.90

	strike	dip	rake
Soln 1	59.80	75.10	−1.30
Var 2'	59.08	70.71	−5.38
Var 2"	60.60	70.30	3.60

Figure D17. The focal mechanism solutions for this earthquake about 8 km north of Slate Ridge, Nevada indicate predominantly strike slip deformation on all nodal planes, with right lateral motion on the north-northwest trending, near vertical dipping planes, or left lateral motion on the west-southwest, steeply southeast-dipping planes.

Appendix E

Station codes, locations, and instrumentation

Appendix E contains a list of SGBSN station names, coordinates, and other descriptive information. Instrument codes refer to the seismometer, amplifier/VCO, and discriminator packages for each station. For the current network, codes 1 through 7 are valid. Any other codes are for systems having unknown frequency response, which are no longer operating in the SGBSN. The following table shows the major components comprising the seven current seismographic systems.

Table E1. Major components in seismographic systems comprising the SGBSN during 1990. All seismometers have natural frequency, $f_n = 1.0$ Hz. The (analog) output of the discriminators is digitized on a PDP 11/34 computer, with sampling rate = 104.167 sps/channel.

KIND	SEISMOMETER	Motion	Amplifier/VCO	Discriminator
1	Mark L4C	vertical	Tricom 649	Tricom 642
2	Teledyne S13	vertical	Tricom 649	Tricom 642
3	Teledyne S13	vert., horiz.	Teledyne Geotech 42.50	Teledyne 4612
4	Mark L4C	vertical	Teledyne Geotech 42.50	Tricom 642
5	Mark L4C	horizontal	Teledyne Geotech 42.50	Teledyne 4612
6	Teledyne S13	vertical	Teledyne Geotech 42.50	Tricom 642
7	Ranger RR-1	vertical	Teledyne Geotech 42.50	Teledyne 4612

Magnification curves for representative seismograph systems in the SGBSN may be found in Rogers and others (1987) and in Harmsen and Bufe (1991).

STATION INFORMATION - SOUTHERN GREAT BASIN SEISMOGRAPHIC NETWORK

CODE	STATION	PERIOD OF OPERATION (YR/MO/DA-YR/MO/DA)	LATITUDE (DEG MINUTES)	LONGITUDE (DEG MINUTES)	ELEVATION (METERS)	SEISMOMETER MODEL/COMP.	GAIN (DB)	INST. CODE	S L
AMR	Amargosa, Cal.	78/07/24-present	36 23.85 N	116 28.56 W	690	L-4C	84	1	*
APK	Angels Peak, Nev.	75/06/15-81/03/21	36 19.17 N	115 34.46 W	2680	S-13	84	2	
APK		81/03/21-83/08/04				L-4C	84	1	
APKW	Angels Peak, Nev.	83/08/05-88/08/10	36 19.19 N	115 35.25 W	2600	L-4C	84	1	*
APKW		88/08/11-present				L-4C	84	4	*
BGB	Big Butte, Nev.	79/01/23-present	37 02.24 N	116 13.75 W	1730	L-4C	84	1	*
BLT	Belted Range, Nev.	79/05/30-present	37 28.98 N	116 07.41 W	1854	L-4C	84	1	*
BMT	Black Mountain, Nev.	80/02/26-83/04/01	37 17.02 N	116 38.74 W	2191	L-4C	84	1	
BMTN	Black Mountain, Nev.	83/04/01-present	37 17.50 N	116 38.41 W	2040	L-4C	84	1	*
BRO	Bare Mountain, Nev.	78/11/28-81/04/08	36 45.76 N	116 37.52 W	920	L-4C	84	1	
CDH1	Calico Hills, Nev.	80/02/06-81/11/18	36 51.82 N	116 18.97 W	1353	L-1-3DS (vert.)	90	1	
CDH1		81/11/18-present				L-4C	84	1	*
CDH5	Calico Hills, Nev.	80/02/06-81/11/18	36 51.82 N	116 18.97 W	1055	L-1-3DS horzntl	108	1	*
CPX	CP-1, Nev.	77/—/——80/03/01*	36 55.94 N	116 03.26 W	1258	NGC-21	?	8	*
CPX		80/08/05-90/08/29				L-4C	84	1	*
CPZ	CP-1, Nev.	90/08/29-91/01/15	36 55.73 N	116 03.53 W	1368	L-4C	84	1	*
CPY	CP-1, Nev.	91/01/15-present	36 55.73 N	116 03.53 W	1368	L-4C	84	4	*
CTS	Cactus Peak, Nev.	79/04/24-present	37 39.37 N	116 43.59 W	1868	L-4C	84	1	*
DLM	Delamar Mountains, Nev.	78/06/08-present	37 36.35 N	114 44.27 W	1730	L-4C	84	1	*
EMN	Eldorado Mtns., Nev.	88/08/11-present	35 55.31 N	114 45.33 W	846	Ranger SS-1	84	7	*
EPN	Echo Peak, Nev.	75/09/02-80/04/25	37 12.84 N	116 19.43 W	2260	S-13	84	2	*
EPN		80/04/25-90/09/26				L-4C	84	4	*
EPM		90/09/26-present	37 13.57 N	116 20.08 W	2408	L-4C	84	4	*
EPNH	Echo Peak, Nev.	84/06/06-86/01/28	37 12.84 N	116 19.43 W	2260	L-4C horizontal	78	5	*
HEPN		86/01/29-90/09/26				L-4C horizontal	60	5	*
HEPM		90/09/26-present	37 13.57 N	116 20.08 W	2408	L-4C horizontal	60	5	*
EPR	East Pahranagat Rng, Nv	79/01/23-present	37 10.12 N	115 11.23 W	1305	L-4C	84	1	*
FMT	Funeral Mountains, Cal.	78/11/28-present	36 38.27 N	116 47.00 W	1025	L-4C	84	1	*

GLR	Groom Lake Road, Nev.	75/11/20–present	37 11.94 N	116 01.01 W	1432	L-4C		84	1	*
GMN	Gold Mountain, Nev.	79/07/13–present	37 18.04 N	117 15.44 W	2192	L-4C		84	4	*
GMNH	Gold Mountain, Nev.	84/07/30–present	37 18.04 N	117 15.44 W	2192	L-4C	horizontal	78	5	*
GMR	Groom Range, Nev.	79/01/23–present	37 20.02 N	115 46.36 W	1528	L-4C		84	4	*
GMRH	Groom Range, Nev.	84/09/09–present	37 20.02 N	115 46.36 W	1528	L-4C	horizontal	78	5	*
GVN	Grapevine, Cal.	78/11/28–present	36 59.94 N	117 20.78 W	812	L-4C		84	1	*
GWV	Greenwater Valley, Cal.	78/07/24–88/02/16	36 11.11 N	116 40.22 W	1530	L-4C		84	1	*
GWY	Greenwater Valley, Cal.	88/04/01–present	36 11.15 N	116 40.21 W	1540	L-4C		84	1	*
HCR	Hot Creek Range, Nev.	81/07/21–present	38 14.01 N	116 26.20 W	2040	L-4C		84	1	*
JON	Johnnie, Nev.	78/07/24–present	36 26.39 N	116 06.28 W	910	L-4C		84	4	*
JONH	Johnnie, Nev.	84/06/22–present	36 26.39 N	116 06.28 W	910	L-4C	horizontal	78	5	*
KRN	Kawich Range, Nev.	79/05/30–80/04/22	37 42.37 N	116 20.07 W	2570	L-4C		84	1	
KRNA	Kawich Range, Nev.	80/04/23–present	37 44.53 N	116 22.89 W	1963	L-4C		84	1	*
LCH	Last Change Range, Cal.	79/07/13–present	37 13.95 N	117 38.78 W	1404	L-4C		84	1	*
LOP	Lookout Peak, Nev.	79/01/23–present	36 51.27 N	116 10.11 W	1648	L-4C		84	1	*
LSM	Little Skull Mt., Nev.	79/12/13–84/07/20	36 44.55 N	116 16.33 W	1113	L-4C		84	4	*
LSM		84/07/20–present				S-13		84	6	*
LSMN	Little Skull Mt., Nev.	84/07/17–85/07/02	36 44.55 N	116 16.33 W	1113	L-4C	horizontal	78	5	*
LSMN		85/07/02–86/01–28				L-4C	horizontal	72	5	*
LSMN		86/01/28–86/06/24				L-4C	horizontal	60	5	*
LSMN		86/06/24–present				S-13	horizontal	38	3	*
LSME	Little Skull Mt., Nev.	84/07/17–85/07/02	36 44.55 N	116 16.33 W	1113	L-4C	horizontal	78	5	*
LSME		85/07/02–86/01–28				L-4C	horizontal	72	5	*
LSME		86/01/28–86/06/24				L-4C	horizontal	60	5	*
LSME		86/06/24–present				S-13	horizontal	38	3	*
MCA	Marble Canyon, Cal.	79/01/23–present	36 38.77 N	117 16.69 W	270	L-4C		84	1	*
MCY	Mercury, Nev.	80/03/07–present	36 39.64 N	115 57.67 W	1303	S-13		84	2	*
MGM	Magruder Mountain, Nev.	79/07/13–present	37 26.44 N	117 29.93 W	2075	L-4C		84	1	*
MTI	Mount Irish, Nev.	79/06/08–present	37 40.68 N	115 16.72 W	1540	L-4C		84	1	*
MZP	Montezuma Peak, Nev.	79/07/13–present	37 42.03 N	117 23.10 W	2353	L-4C		84	1	*
NMN	Nasa Mountain, Nev.	78/11/28–83/11/01	37 04.85 N	116 49.09 W	1500	L-4C		84	1	

NOP	Nopah Range, Cal.	78/07/24-80/04/25	36 07.63 N	116 09.26 W	911	L-4C	84	1	*
NOP		80/04/25-present				S-13	84	2	*
NPN	North Pahroc Rg, Nev.	79/06/08-present	37 39.12 N	114 56.21 W	1660	L-4C	84	1	*
PAN	Panamint Range, Cal.	88/04/01-present	36 23.59 N	117 06.05 W	1690	L-4C	84	4	*
PANH	Panamint Range, Cal.	88/04/01-present	36 23.59 N	117 06.05 W	1690	L-4C horizontal	78	5	*
PGE	Panamint Range, Cal.	78/11/28-88/02/13	36 20.93 N	117 03.95 W	1850	L-4C	84	4	
PGEH	Panamint Range, Cal.	84/10/11-88/02/13	36 20.93 N	117 03.95 W	1850	L-4C horizontal	78	5	
PPK	Piper Mountain, Cal.	79/07/13-present	37 25.51 N	117 54.42 W	1851	L-4C	84	1	*
PRN	Pahroc Range, Nev.	72/01/21-80/06/19	37 24.40 N	115 03.05 W	1402	NGC-21	?	8	*
PRN		80/06/19-present				S-13	84	6	*
PRNH	Pahroc Range, Nev.	84/08/28-present	37 24.40 N	115 03.05 W	1402	L-4C horizontal	78	5	*
QCS	Queen City Summit, Nev.	79/06/08-present	37 45.39 N	115 56.58 W	1914	L-4C	84	1	*
QSM	Queen of Sheba Mine, Ca	78/11/28-present	35 57.85 N	116 52.05 W	450	L-4C	84	1	*
SDH	Striped Hills, Nev.	78/07/24-present	36 38.72 N	116 20.38 W	1050	L-4C	84	1	*
SGV	South Grapevine Mts, Ca	78/11/28-81/06/15	36 58.92 N	117 02.11 W	1550	L-4C	84	1	*
SGV		81/06/15-82/06/16				S-13	84	2	*
SGV		82/06/15-present				L-4C	84	1	*
SHRG	Sheep Range, Nev.	79/05/22-present	36 30.33 N	115 09.61 W	1590	L-4C	84	1	*
SPRG	Spotted Range, Nev.	79/05/28-present	36 41.64 N	115 48.63 W	1191	L-4C	84	1	*
SRG	Seaman Range, Nev.	79/06/08-present	37 52.93 N	115 04.15 W	1640	L-4C	84	1	*
SSP	Shoshone Peak, Nev.	73/10/10-80/05/25	36 55.53 N	116 13.26 W	2021	NGC-21	?	8	
SSP		80/05/27-present				L-4C	84	1	*
SVP	Silver Peak Range, Nev.	79/07/13-present	37 42.89 N	117 48.20 W	2595	L-4C	84	1	*
TCN	Thirsty Canyon, Nev.	84/11/02-present	37 08.80 N	116 43.52 W	1469	L-4C	84	1	*
TMBR	Timber Mt., Nev.	82/02/19-87/05/05	37 02.11 N	116 23.21 W	1754	L-4C	84	1	*
TMBR		87/05/05-present				S-13	84	6	*
TMO	Tin Mountain, Cal.	78/11/28-present	36 48.29 N	117 24.30 W	2113	L-4C	84	1	*
TPU	Tempiute Mountain, Nev.	79/06/08-present	37 36.27 N	115 39.06 W	1910	L-4C	84	1	*
WCT	Wildcat Mountain, Nev.	81/04/08-88/01/05	36 47.79 N	116 37.62 W	930	L-4C	84	1	*
WCT		88/01/05-88/03/11				L-4C	66	1	*
WCT		88/03/11-present				L-4C	84	1	*
WRN	Worthington Mts., Nev.	79/06/08-present	37 58.89 N	115 35.58 W	1725	L-4C	84	1	*

YMT1	Yucca Mountain, Nev.	81/03/05-present	36 51.22 N	116 31.86 W	1006	S-13	84	3	*
YMT2	Yucca Mountain, Nev.	81/03/05-present	36 47.14 N	116 29.22 W	1006	S-13	84	3	*
YMT3	Yucca Mountain, Nev.	81/03/05-present	36 47.21 N	116 24.75 W	1060	S-13	84	3	*
YMT4	Yucca Mountain, Nev.	81/04/01-81/10/13	36 50.99 N	116 27.18 W	1248	S-13	84	3	*
YMT4		81/10/13-83/07/01				S-13	72	3	*
YMT4		83/07/02-present				S-13	84	3	*
YM4N	Yucca Mountain, Nev.	84/06/29-85/05/23	36 50.99 N	116 27.18 W	1248	L-4C horizontal	78	5	*
YM4S		85/05/24-86/01/28				L-4C horizontal	72	5	*
NYM4		86/01/28-present				L-4C horizontal	60	5	*
YM4E	Yucca Mountain, Nev.	84/06/29-85/05/23	36 50.99 N	116 27.18 W	1248	L-4C horizontal	78	5	*
YM4W		85/05/24-86/01/28				L-4C horizontal	72	5	*
EYM4		86/01/28-present				L-4C horizontal	60	5	*
YMT5	Yucca Mountain, Nev.	81/04/01-81/10/13	36 53.91 N	116 27.25 W	1355	S-13	84	3	*
YMT5		81/10/13-83/07/02(?)				S-13	72	3	*
YMT5		83/07/02-present				S-13	84	3	*
YMT6	Yucca Mountain, Nev.	81/04/01-81/10/13	36 51.36 N	116 24.02 W	1090	S-13	78	3	*
YMT6		81/10/13-83/07/02(?)				S-13	66	3	*
YMT6		83/07/02-present				S-13	84	3	*

NOTES: All instruments are vertical-component unless otherwise noted. If one horizontal-component instrument exists at a site, it has north-south polarity; if two horizontals exist at a site, they have north-south and east-west polarities, resp. The polarity is suggested by the station name. A * in the final column indicates satellite-determined station coordinates. Elevations of stations with *s in the final column were obtained using altimeters calibrated against nearest USGS benchmark. Locations are preliminary.

Appendix F

Input parameters to HYPO71

HYPO71.FOR, version 1.001, was baselined for use by the Yucca Mountain Project, with CID YMP-USGS/GDD0001.02, on October 22, 1990. This version of HYPO71 requires a minimum of three input files, (1), a header file, containing crustal velocity information, weighting scheme information, iteration-controlling parameters, and I/O-controlling parameters, (2), a station file, containing most of the information shown in Appendix E, above, and (3), a phase file, containing P and S phase arrival times and information for determining earthquake magnitude. The data of item (1) are presented in Appendix E, and will not be repeated here. The data of item (3) are too bulky for inclusion in this report, but are available on request.

Two header files are used, depending on the source zone. For most earthquakes occurring in the SGB, the file **nvhead.dat**, having the velocity model shown in Figure F1 (a) is input. For earthquakes occurring in the immediate vicinity of Yucca Mountain, the file **nvhead.ymt**, having the velocity model shown in Figure F1 (b), is input. Copies of these two files are shown below. For meanings of the "Control Card" parameters, the reader should consult Lee and Lahr (1975).

The below lines are a listing of nvhead.dat, used as an input file to HYPO71.

```
HEAD
RESET TEST( 1)=   0.5500
RESET TEST( 2)=  20.0000
RESET TEST( 3)=   0.5000
RESET TEST( 4)=   0.0500
RESET TEST( 5)=   5.0000
RESET TEST( 6)=   1.0000
RESET TEST( 7)=  -1.27600
RESET TEST( 8)=   1.66600
RESET TEST( 9)=  0.00227
RESET TEST(10)= 100.0000
RESET TEST(11)=  12.0000                  !max # of iterations/solution
RESET TEST(12)=   0.5000
RESET TEST(13)=   1.0000
RESET TEST(14)=  -2.0500
RESET TEST(15)=   0.0000
RESET TEST(16)=   0.852
RESET TEST(17)=   -1.766
   .38000000E+01   .00000000E+00
   .59000000E+01   .10000000E+01
   .61500000E+01   .30000000E+01
   .65000000E+01   .15000000E+02
   .69000000E+01   .24000000E+02
   .78000000E+01   .32000000E+02
   .00000000E+00   .00000000E+00
   7.  10. 220. 1.71    3    0    0    0    7    0    1 1111    0  0.00    0  0.00
```

The below lines are a listing of nvhead.ymt, used as an input file to HYPO71.

```
HEAD
RESET TEST( 1)=   0.1000
RESET TEST( 2)=  30.0000
RESET TEST( 3)=   0.5000
RESET TEST( 4)=   0.0500
RESET TEST( 5)=   5.0000
RESET TEST( 6)=   1.0000
RESET TEST( 7)=  -1.27600
RESET TEST( 8)=   1.66600
RESET TEST( 9)=  0.00227
RESET TEST(10)= 100.0000
RESET TEST(11)=   8.0000
RESET TEST(12)=   0.5000
RESET TEST(13)=   1.0000
RESET TEST(14)=  -1.2000
RESET TEST(15)=   0.0000
RESET TEST(16)=   0.852
RESET TEST(17)=   -1.766
   .32000000E+01   .00000000E+00
   .46000000E+01   .05000000E+01
   .57000000E+01   .25000000E+01
   .62000000E+01   .40000000E+01
   .65000000E+01   .15000000E+02
   .78000000E+01   .32000000E+02
   .00000000E+00   .00000000E+00
   7.   5.  90. 1.71    3    0    0    0    7    0    1 1111    0  0.00    0  0.00
```

In this file, a slightly different weighting scheme with respect to distance is invoked than in nvhead.dat, above. In the former file, weights taper from 1. to 0. in a linear manner for epicentral distances between 10 and 220 km. In the latter file, weights taper from 1. to 0. for distances between 5 and 90 km.

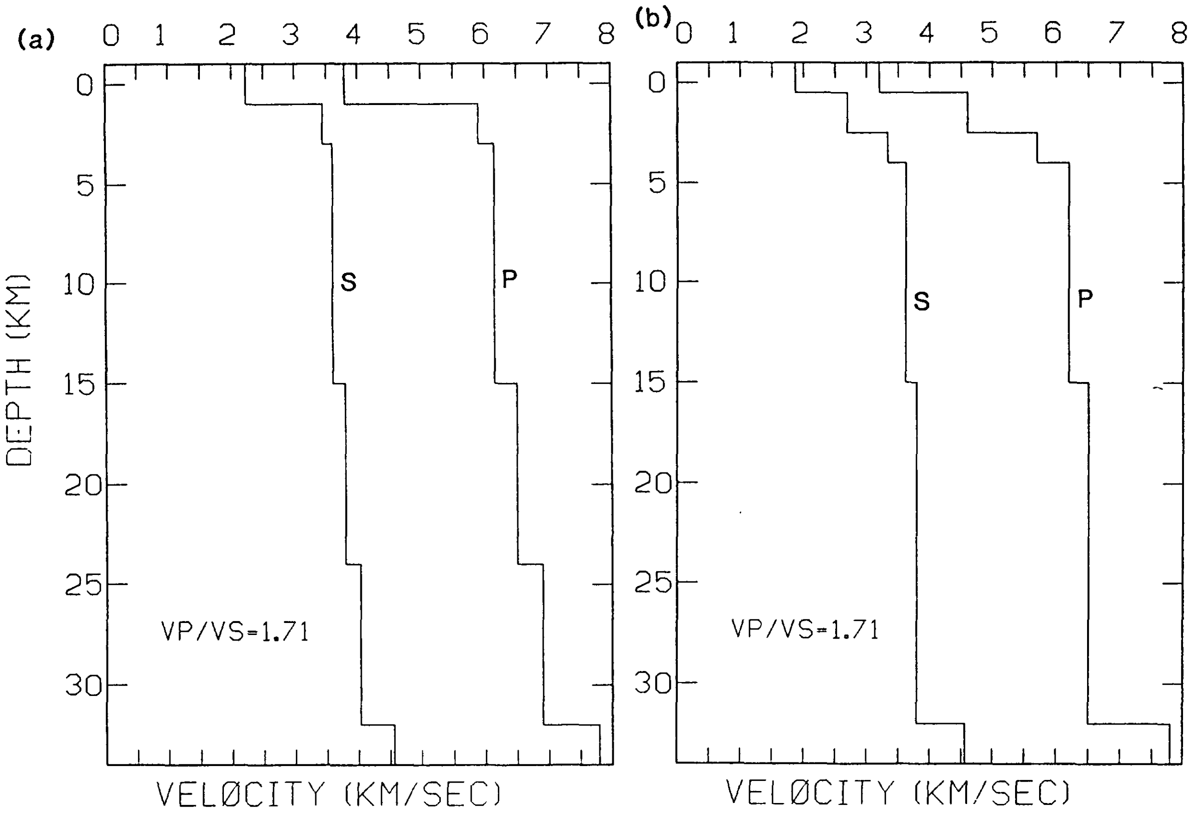


Figure F1. (a) Primary (P) and secondary (S) wave velocities as a function of depth (0.0 = sea level) for the standard model used to locate southern Great Basin earthquakes. The interface at 15 km is optional. (b) P and S wave velocities as a function of depth for the Yucca Mountain region, being an idealization of the model proposed by Hoffman and Mooney (1984).