STATE OF WASHINGTON
DEPARTMENT OF NATURAL RESOURCES

BRIAN J. BOYLE, Commissioner of Public Lands
ART STEARNS, Supervisor

DIVISION OF GEOLOGY AND EARTH RESOURCES
RAYMOND LASMANIS, State Geologist

INFORMATION CIRCULAR 79

COMPILATION OF EARTHQUAKE HYPOCENTERS IN WESTERN WASHINGTON - 1979

By

LINDA LAWRANCE NOSON, RUTH S. LUDWIN,

and

ROBERT S. CROSSON

1985

For sale by Department of Natural Resources, Olympia, Washington
Price $ .46
.04 tax
.50

CONTENTS

ILLUSTRATIONS

TABLES

COMPILATION OF EARTHQUAKE HYPOCENTERS IN WESTERN WASHINGTON – 1979

By

LINDA LAWRANCE NOSON, RUTH S. LUDWIN,

and

ROBERT S. CROSSON [1]

INTRODUCTION

The Geophysics Program at the University of Washington operates a continuously recording, telemetered seismograph network located west of the Cascade Mountains and centered along the Puget Sound lowland. Station locations have been chosen to best record earthquakes in the central Puget Sound basin, an area of historically high seismicity. This report is the eighth in an annual series designed to provide a standardized compilation of earthquake locations determined using network data. Hypocentral locations for 367 earthquakes located in 1979 are listed in Appendix 1. "Hypocenter" refers to the subsurface point where the earthquake occurs, while "epicenter" indicates the point on the earth's surface directly above the hypocenter. Figure 3 shows the distribution of well-located earthquake epicenters in western Washington. Only those events from Appendix 1 with coda-length magnitudes (M_C) greater than or equal to 1 and which were recorded on at least 5 stations with an RMS (root mean square) time residual of .5 seconds or less are shown in figure 3. Figure 4 shows earthquakes located in western Washington which were reported as felt.

The number of events located each year depends on numerous factors: the number of stations operating, location of earthquakes relative to recording stations, earthquake magnitude, experience of the personnel handling the data, and, of course, the number of earthquakes in the monitored area. Ignoring the inherent variability of the data may lead to incorrect interpretations. When used carefully, the data in this report may enhance evaluations of seismic hazard potential as well as contribute to basic studies in seismology, earth structure, and tectonics.

NETWORK OPERATION

The seismograph network in western Washington operated by the University of Washington in 1979 consisted of 23 short-period, vertical component, telemetered seismograph stations and one on-site recording World Wide Standardized Seismograph Network (WWSSN) station at Longmire, Washington (LON). Station locations are shown in map view in figure 1. Additional information is in table 1, which provides a summary of network station information, including station coordinates, elevations, P and S time corrections (P and S delays), installation dates, and estimates of station magnification. Stations in 1979 covered approximately the region from Mount St. Helens (SHW) at 46.2 degrees north latitude to Mount Baker (MBW) at 48.8 degrees north latitude. The network monitored an area of approximately 300 km N-S by 150 km E-W. Each station, except the WWSSN station LON, consisted of a single component vertical short-period seismometer, an amplifier, and a voltage-controlled

[1] University of Washington Geophysics Program.

TABLE 1. — *Summary of network station data*

List of NEIS abbreviated stations in western Washington								
STA Name	LAT Deg Mn Sec	LON Deg Mn Sec	ELEV Km	P DEL Sec	S DEL Sec	INSTALL Date	MAG* 1 Hz	LOCATION
SPW	047 33 13.30	122 14 45.10	0.008	1.030	1.810	9/17/69	65000	SEWARD PARK
GMW	047 32 52.50	122 47 10.80	0.506	0.070	0.120	2/27/70	145000	GOLD MT
GSM	047 12 11.40	121 47 40.20	1.305	0.250	0.440	6/11/70	165000	GRASS MT
BLN	048 00 26.50	122 58 18.64	0.585	-.110	-.190	7/2/70	115000	BLYN MMT
CPW	046 58 25.80	123 08 10.80	0.792	0.100	0.180	7/29/70	135000	CAPITOL PEAK
RMW	047 27 34.95	121 48 19.20	1.024	0.210	0.370	7/27/71	190000	RATTLESNAKE MT
JCW	048 11 36.60	121 55 46.20	0.616	0.020	0.040	2/18/71	120000	JIM CREEK
FMW	046 55 54.00	121 40 19.20	1.890	-.060	-.110	9/4/72	100000	Mt FT FREMONT
BFW	046 29 12.00	123 12 53.40	0.902	-.080	-.140	10/25/72	150000	BAW FAW MT
SHW	046 11 33.00	122 14 12.00	1.423	0.260	0.460	10/25/72	45000	MT ST.HELENS
MCW	048 40 46.80	122 49 56.40	0.693	-.040	-.070	11/8/72	70000	MT CONSTITUTION
MBW	048 47 02.40	121 53 58.80	1.676	0.310	0.540	11/8/72		MT BAKER
STW	048 09 00.75	123 40 12.00	0.308	-.080	-.140	6/27/73		STRIPED PEAK
LON	046 45 00.00	121 48 36.00	0.854	-.060	-.110	1958	60000	LONGMIRE
HTW	047 48 12.50	121 46 08.65	0.829	0.030	0.050	6/11/75		HAYSTACK
LMW	046 40 04.80	122 17 28.80	1.195	0.157	0.260	6/30/75		LADD MT
SMW	047 19 10.20	123 20 30.00	0.840	0.340	0.600	3/24/75		SOUTH MT
LYW	048 32 07.20	122 06 06.00	0.107	0.260	0.460	4/18/75		LYMAN
OHW	048 19 24.00	122 31 54.60	0.054	-.050	-.090	5/27/75		OAK HARBOR
FTW	047 52 36.00	122 12 05.00	0.147	0.220	0.390	9/24/75		FAIRMONT
GHW	047 02 30.00	122 16 21.00	0.268	0.100	0.180	9/24/75		GARRISON HILL
RPW	048 26 54.00	121 30 49.00	0.850	0.200	0.350	12/1/77		ROCKPORT
MOW	047 50 46.90	122 02 52.90	0.180	0.220	0.390	9/20/79		MONROE
HDW	047 38 54.60	123 03 15.20	1.006	0.020	0.040	11/01/79		HOODSPORT

*** Magnification at 1 Hz; not determined where blank**

oscillator, which converted the output voltage from each amplifier to a frequency modulated audio tone capable of being telemetered to the central recording laboratory at the University of Washington.

Crosson (1974) contains a description of network instrumentation, background information, a glossary of terms, and a compilation of earthquake data for 1970, 1971, and 1972. Compilations of hypocenter locations for events recorded in 1973, 1974, 1975, 1976, 1977, and 1978 may be found in Crosson (1975), Crosson and Millard (1975), Crosson and Noson (1978a), Crosson and Noson (1978b), Crosson and Noson (1979), and Noson and Crosson (1980), respectively. A listing of larger historic earthquakes in Washington State from 1840 through 1965 was compiled by Rasmussen (1967).

Two new stations were added to the network in 1979. The installation of HDW (Hoodsport) increased the recording capability and improved the station distribution along the western margin of the network. MOW (Monroe) replaced FTW (Fairmont). The improved quality of the MOW site increased recording sensitivity for that area. The overall network configuration, however, remained essentially uniform throughout the year. Occasional failure occurred in the operation of some stations, which affected the uniformity of station coverage. Figure 2, a station activity graph, shows major gaps in station operation.

EARTHQUAKE ANALYSIS PROCEDURE

Two Geotech Develocorders with film speeds of 15 mm/min recorded the signals received via telemetry on sixteen millimeter film. The film was scanned on a Develocorder viewer with a magnification of 20 X. Events detected were classified into the following categories: teleseisms (greater than 1000 km distant), regionals (less than 1000 km), and local earthquakes (nominally within the network perimeter). Each 300-foot reel of film represents 4 days (96 hours) of recording time. Typically 30 or more earthquakes were detected during that period.

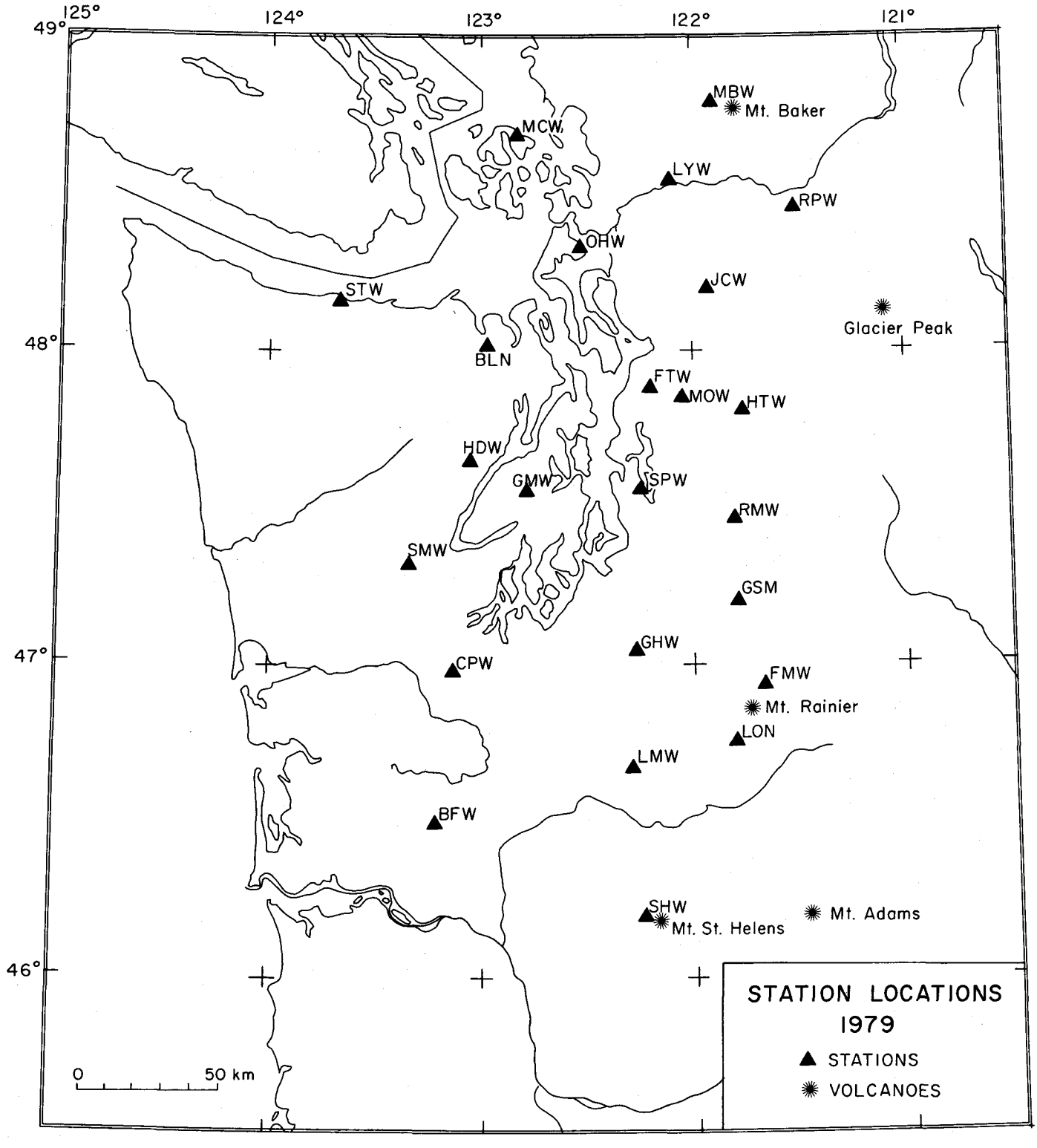

Figure 1. — Location map for stations in operation during 1979 in western Washington.

All events were classified and entered into a master catalog. Local earthquakes large enough to be well recorded on three or more stations were prepared for computer location runs. Locations determined for 1979 appear as Appendix 1.

The location program, based on the standard nonlinear least squares inversion scheme of Geiger (1912), was written and optimized for use with data from the western Washington array. The accuracy of locations determined with this program depends on the accuracy of the crustal model, the station distribution around the epicenter, station spacing, number of stations used, and quality of arrival time data. The current version of our location program does not produce arbitrarily fixed depths such as were reported in previous Information Circulars (Crosson, 1974; Crosson, 1975; Crosson and Millard, 1975; Crosson and Noson, 1978a; Crosson and Noson, 1978b; Crosson and Noson, 1979; Noson and Crosson, 1980).

A revised earth crustal model was used to locate events for this catalog. The new model was derived using a modified version of the method developed by Crosson (1976a). An important modification of the original method is that S wave readings have been incorporated in deriving the new model by using a constant P to S wave velocity ratio determined from observations. Data from 58 events (10 explosions and 48 earthquakes) which occurred between 1980 and 1984 were used. The events were well distributed over the greater western Washington region, and occurred at depths from the surface (including the fixed explosions) to a depth of approximately 53 km. A linear trend in station corrections as a function of distance from the center of the network can bias the model and was removed from the data by hand fitting. All of the arrival time data used to derive this model were obtained by a new automated picking algorithm which provides more consistent data quality than the usual hand picking process. The final model differs somewhat from the previous model in that (a) the low velocity zone in the depth range from 30 to 40 km is less pronounced (but probably better constrained) than previously, and (b) the shallow surface layer of low velocity rock is much thinner than previously. In addition, a new and more complete set of station corrections was obtained. Event locations using the new model have generally smaller RMS residuals than locations for the same events using the old model. This indicates that the new Puget Sound model performs as well or better than the previous model (Crosson, 1976b) for routine locations. Table 2 shows the revised crustal velocity structure used in the determination of earthquake locations. Station delays, which are also determined with the model, are included with other station information in table 1.

The main data set consists of P and S wave arrival times, coda lengths, and a weighting factor for each reading. Using the crustal model described in table 2 and the current station distribution (fig. 1), hypocentral parameters (that is, location and occurrence time) are modified until the observed minus predicted arrival times (residuals) are a minimum. The RMS residual is one indicator of the overall quality of the solution. It is obtained by squaring each residual, summing the squares, dividing by the number of observations, and taking the square root of that quantity. A RMS residual is included with each event solution in Appendix 1. Values less than 0.1 second indicate a solution that fits the observed arrival-time data very well. Values greater than 0.5 second usually indicate a poor solution. Earthquakes located with only three or four readings have RMS values of zero, because there is only exactly enough information to uniquely determine a solution. The RMS does not indicate the quality of the location unless more than four stations have been read. In addition, two quality factors, rated A to D, are assigned to each event. The first factor is based on the RMS residual and horizontal and vertical location error estimates. The second factor depends on number of stations read, largest angular gap between stations, and distance from the epicenter to the nearest station. In each case, A is the highest and D is the lowest quality.

TABLE 2. — *Model used in location of events*

DEPTH	P VELOCITY	P ERROR	S VELOCITY	S ERROR
0.0	5.40	0.03	3.07	0.06
4.0	6.38	0.01	3.63	0.02
9.0	6.59	0.01	3.75	0.02
16.0	6.73	0.02	3.83	0.04
20.0	6.86	0.01	3.90	0.02
25.0	6.95	0.02	3.95	0.04
32.0	6.90	0.33	3.93	0.60
41.0	7.80	0.02	4.44	0.04

Explosions are identified in the data set wherever possible. Criteria useful in distinguishing explosions are: shallow depths, positive P wave polarity, clustering, time of day of occurrence, frequency, and, of course, direct verification. When explosions occur in unusual locations and are nonrepetitive, positive identification is difficult. Suspected or possible explosions are indicated in Appendix 1 by a "P." Confirmed explosions have been deleted from the data set.

The magnitude of earthquakes is determined using a coda or signal duration technique. The method used is described by Crosson (1972), and is referred to here as M_C to distinguish it from other magnitude determination methods.

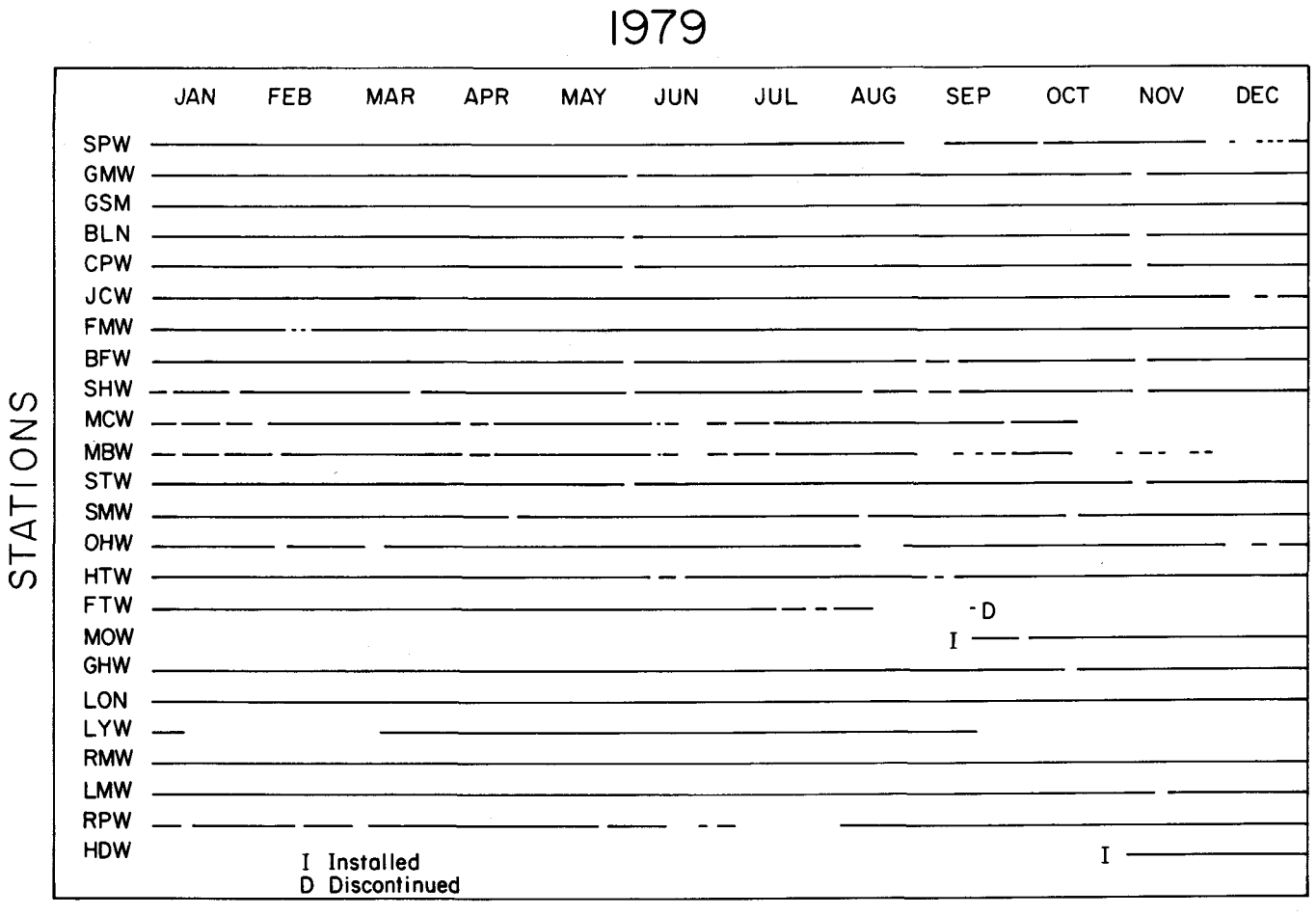

Figure 2. — Station activity graph for 1979. Solid lines indicate periods when stations are active. Newly installed stations (I), and discontinued stations (D) are indicated.

DISCUSSION OF 1979 ACTIVITY

During 1979, a total of 367 earthquakes were located. As usual most of the activity was concentrated over the lower Puget Sound area between about latitudes 47° and 48°30' with less intense activity to the north and south. The coastal region of western Washington was relatively quiet with the exception of a few deeper events along the eastern side of the Olympic Penninsula. Figure 3 shows the distribution of earthquake epicenters in western Washington for those events listed in Appendix 1 having coda-length magnitudes (M_c) greater than or equal to 1 which were also recorded on at least 5 stations and had RMS time residuals of .5 second or less.

Twelve earthquakes caused ground motion great enough to be felt by people living near the epicenter. They are flagged by an "F" in Appendix 1. No structural damage was reported to the University of Washington. Eleven of these events were located in western Washington or southern Canada and are shown in figure 4. The twelfth event was north of the map area of figure 4.

Seven felt earthquakes which were well located by the University of Washington network west of the Cascades are briefly described below:

(1) February 1 at 2018 UTC (12:18 p.m. PST) a M_c 3.5 earthquake located in the east Puget Sound basin about 6 km southwest of Fall City at a depth of less than 10 km was felt. A preliminary fault-plane solution for this event suggests a mostly strike-slip event with a NNW-SSE axis of maximum compression. Eight earthquakes with magnitudes less than 2.0 were recorded from February through September within 10 km of that epicenter.

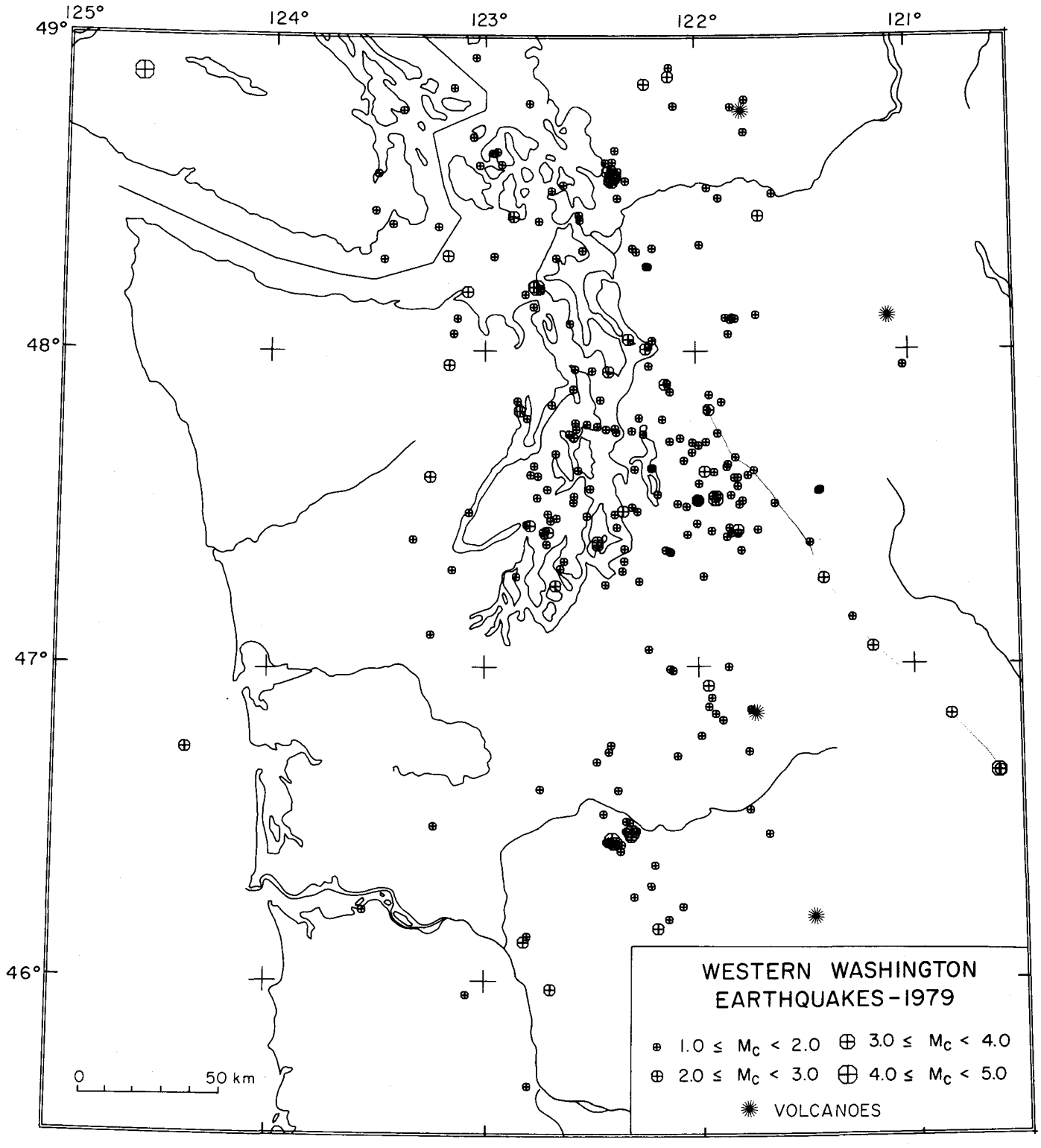

Figure 3. — Map showing epicenters for 1979 in western Washington.

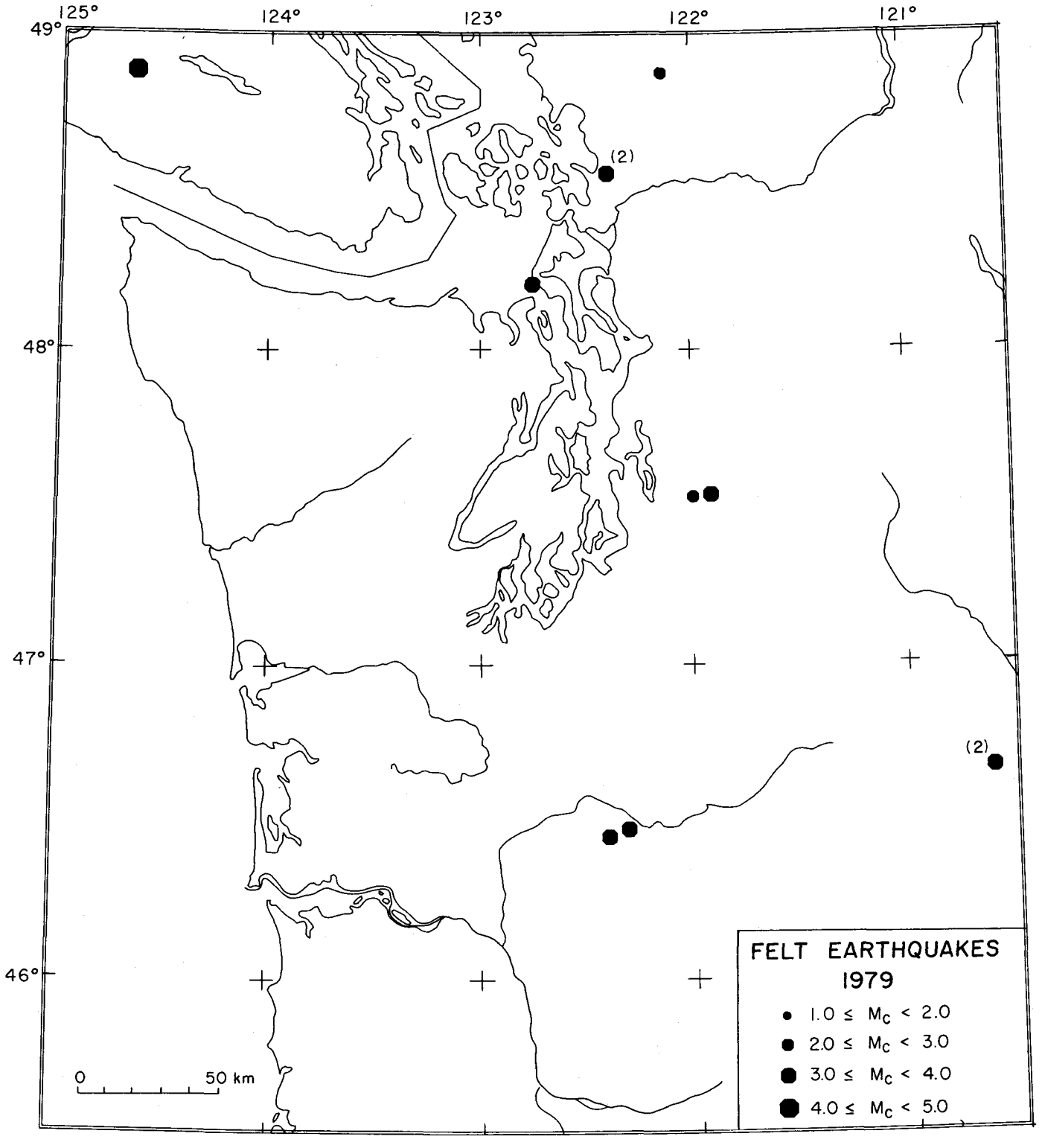

Figure 4. — Map showing felt events in 1979 in western Washington. Several events are so closely spaced that separate symbols cannot be distinguished. The numbers of events in these spatial clusters are indicated in parentheses.

(2) A M_C 3.9 event on March 11th at 1439 UTC (06:39 a.m. PST); was felt in southern Washington in the Riffe Lake area, and located south of the Cowlitz River at a depth of about 20 km near Coyote Mountain, between the towns of St. Helens and Kosmos, Washington.

(3) A second event occurred in the same region as (2) above, a M_C 3.6 event on July 7th at 2050 UTC (1:50 p.m. PDT). The depth of this earthquake was similar to the March 11th event and it was located about 12 km east of Kosmos, Washington. The epicenters of the two events were about 5 km apart. Twenty-one events with magnitudes less than 3.0 were located between February and October within 15 km of a position midway between the two epicenters.

(4) On March 12th at 1241 UTC (04:41 a.m. PST) a M_C 3.9 earthquake was felt in the Port Townsend area. The event was located offshore about 2.5 km south of Partridge Point on Whidbey Island at a depth of approximately 20 km. A preliminary fault-plane solution for this event suggests mostly strike-slip faulting with a north-south axis of maximum compression. Eight earthquakes were located within 12 km of the epicenter from January through December.

(5) On September 5th at 0349 UTC (07:49 p.m. PST) an event in the east Puget Sound basin of M_C 2.1 at a depth of 4 km was located near Tiger Mountain in Issaquah, and felt nearby. A preliminary fault-plane solution for this event suggests strike-slip faulting with a maximum axis of compression NE-SW.

(6) A M_C 3.8 event was felt in the Sedro Woolley area of northern Washington, near Samish Bay, on November 26th at 2318 UTC (04:18 p.m. PST).

(7) On November 27th at 0213 UTC (06:13 p.m. PST) a second event of M_C 3.5 occurred at essentially the same location as (6) above. These events cannot be discerned as separate points in figure 4. Both occurred at depths of about 15 km and have preliminary fault-plane solutions suggesting either a vertical fault striking east-west, or a horiztonal fault. Twelve additional earthquakes with magnitudes less than 2.0 occurred from April through December within 5 km of the two closely spaced epicenters.

Three felt events during 1979 in northernmost Washington or Canada were well recorded by the University of Washington Seismic Network. These earthquakes were located using additional readings supplied by the Pacific Geoscience Centre in Victoria, British Columbia. Locations of Canadian seismic stations are shown in the report by Horner and Wickens (1979). The locations for these events are not as reliable as other catalog locations because the events are on the edge of the University of Washington network, leaving a gap where no station coverage exists.

(1) On January 6 at 1348 UTC a shallow M_C 2.9 event located about 10 km south of Maple Falls, Washington, was felt.

(2) An event of M_C 4.1 on November 9 at 1602 UTC at a depth of about 40 km was located about 20 km west of Lake Cowichan, on Vancouver Island, B.C., and was felt at Lake Cowichan, Sydney, Parksville, Victoria, and Kitsilano, B.C. (Wickens and Wetmiller, 1980).

(3) On November 15 at 1612 UTC a M_C 3.4 event at approximately 10 km depth was felt at Hope and Langley, B.C. (Wickens and Wetmiller, 1980) and was located about 20 km east of Haney, B.C.. This event is not shown in figure 4.

Two events were felt in eastern Washington in 1979. In order to obtain well-constrained locations, additional readings from stations in eastern Washington were used. Eastern Washington station locations are listed in the "Annual technical report 1980 on earthquake monitoring of the Hanford region, eastern Washington" (University of Washington Geophysics Program, 1980).

(1) On July 28 at 0219 UTC a very shallow event of M_C 3.7 was located about 4 km west of Selah in the lower Naches Valley and felt in Naches, Selah, and Yakima, Washington.

(2) Another very shallow (less than 1 km) event of M_C 2.9 that occurred at a nearby location on December 10 at 0540 UTC was felt in Selah and Yakima. These events have nearly identical locations and appear as a single point in figure 4.

An event worthy of mention that was well recorded but not located by the University of Washington Seismic Network occurred on June 27 at 1248 UTC off the coast of Oregon, at an estimated depth of 15 km and with a body-wave magnitude of 4.5 (U.S. Geological Survey, 1979). This event was located far outside the University of Washington seismic network.

ACKNOWLEDGMENTS

The cooperation of many people and organizations is necessary to complete these reports. Although individual acknowledgment is impossible, we want to stress our appreciation to those involved. The contribution of the following merit special recognition. Laurens Engel provided major technical support and fulfilled the demanding task, often in adverse conditions, of network operation and maintenance. Marilyn Taylor and Caryl Michaelson scanned film records. Shing-Whrong Wu assisted in developing the revised velocity model used for this project. Access to lands and facilities for the purpose of station installation has been generously provided by the Washington State Department of Natural Resources, U.S. Forest Service, State Parks Commission, Weyerhaeuser Company, U.S. Navy, U.S. National Park Service, and the City of Seattle Parks Department. The U.S. Department of the Interior, Geological Survey provided support for radio telemetering operations. Research support was provided by the U.S. Geological Survey under contract 14-08-0001-16723, and support for preparation of results for publication under U.S.G.S. contract 14-08-0001-21862.

REFERENCES CITED

Crosson, R. S., 1972, Small earthquakes, structure, and tectonics of the Puget Sound region: Seismological Society of America Bulletin, v. 62, no. 5, p. 1133-1171.

Crosson, R. S., 1974, Compilation of earthquake hypocenters in western Washington [1970-1972]: Washington Division of Geology and Earth Resources Information Circular 53, 25 p.

Crosson, R. S., 1975, Compilation of earthquake hypocenters in western Washington - 1973: Washington Division of Geology and Earth Resources Information Circular 55, 14 p.

Crosson, R. S.; Millard, R. C., 1975, Compilation of earthquake hypocenters in western Washington - 1974: Washington Division of Geology and Earth Resources Information Circular 56, 14 p.

Crosson, R. S., 1976a, Crustal structure modeling of earthquake data; 1, Simultaneous least squares estimation of hypocenter and velocity parameters: Journal Geophysical Research, v. 81, p. 3036-3046.

Crosson, R. S., 1976b, Crustal structure modeling of earthquake data; 2, Velocity structure of the Puget Sound region, Washington: Journal Geophysical Research, v. 81, p. 3047-3054.

Crosson, R. S.; Noson, L. J., 1978a, Compilation of earthquake hypocenters in western Washington - 1975: Washington Division of Geology and Earth Resources Information Circular 64, 12 p.

Crosson, R. S.; Noson, L. J., 1978b, Compilation of earthquake hypocenters in western Washington - 1976: Washington Division of Geology and Earth Resources Information Circular 65, 13 p.

Crosson, R. S.; Noson, L. J., 1979, Compilation of earthquake hypocenters in western Washington - 1977: Washington Division of Geology and Earth Resources Information Circular 66, 12 p.

Horner, R. B.; Wickens, A. J., 1979, Canadian earthquakes January-February 1979: Canada Department of Energy, Mines and Resources, Earth Physics Branch Seismological Series.

Geiger, L., 1912, Probability method for the determination of earthquake epicenters from the arrival time only: St. Louis University Bulletin, v. 8, p. 56-71.

Lee, W. H. K.; Lahr, J. C., 1975, HYPO71 [revised] — A computer program for determinating hypocenter, magnitude, and first motion pattern of local earthquakes: U.S. Geological Survey Open-File Report 75-311, 113 p.

Noson, L. L.; Crosson, R. S., 1980, Compilation of earthquake hypocenters in western Washington - 1978: Washington Division of Geology and Earth Resources Information Circular 72, 18 p.

REFERENCES - Continued

Rasmussen, N. H., 1967, Washington State earthquakes 1840 through 1965: Seismological Society of America Bulletin, v. 57, no. 3, p. 463-476.

U.S. Geological Survey, 1979, Preliminary determination of epicenters, July 1979: U.S. Geological Survey National Earthquake Information Service, 13 p.

University of Washington Geophysics Program, 1980, Annual technical report 1980 on earthquake monitoring of the Hanford region, eastern Washington; prepared for the U.S. Department of Energy under contract no. EY-76-S-06-2225 Task agreement 39, and Washington Public Power Supply System contract no. C-10976: University of Washington Geophysics Program, 91 p.

Wickens, A. J.; Wetmiller, R. J., 1980, Canadian earthquakes November-December 1979: Canada Department of Energy, Mines and Resources, Earth Physics Branch Seismological Series.

APPENDIX 1

Catalog of Earthquakes (1979)

All earthquakes located in 1979 with data from the western Washington seismograph network are listed chronologically in this Appendix. The columns are generally self-explanatory except that the following features should be noted:

(a) The origin time listed is that calculated for the earthquake on the basis of multistation arrival times. It is given in Coordinated Universal Time (UTC), identical to Greenwich Civil Time; in hours:minutes (TIME); and seconds (SEC). To convert to Pacific Standard Time (PST), subtract eight hours.

(b) The epicenter location is given in north latitude (LAT) and west longitude (LONG) in degrees and minutes.

(c) DEPTH, given in kilometers, is freely calculated from arrival-time data.

(d) MAG is the local Richter magnitude as calculated using the coda length-magnitude relationship determined for western Washington.

(e) NS/NP is the number of station observations and the number of phases used to calculate the earthquake location. A minimum of three observations and four phases is required. Generally the greater the number of observations used, the better the solution quality.

(f) The root mean square (RMS) is taken about the mean of the station first-arrival residuals. It is only meaningful as a general statistical measure of the goodness of the solution when 5 or more well-distributed stations are used in the solution. Good solutions are normally characterized by RMS values less than about 0.3.

(g) QUALITY of the hypocenter indicates the general reliability of the solution. Two quality factors, rated A to D, are assigned to each event. The first factor is based on the RMS residual and horizontal and vertical location error estimates. The second factor depends on number of stations read, largest angular gap between stations, and distance from the epicenter to the nearest station. Quality criteria used are identical to those given by Lee and Lahr (1975).

(h) TYPE of event: F - earthquakes reported to have been felt; P - possible explosion.

January 1979

DAY	TIME	SEC	LAT	LON	DEPTH	MAG	NS/NP	RMS	Q	MODEL	TYPE
2	8:22	55.85	47 34.88	121 31.05	0.32	0.9	6/11	0.49	CD	P2	
6	13:48	55.41	48 52.09	122 7.91	5.92	2.9	18/18	0.21	BC	P2	F
7	3:12	58.71	46 32.44	121 46.11	3.00	1.7	10/18	0.19	BD	P2	
10	20:55	4.03	46 53.53	122 41.68	16.52	0.5	5/09	0.08	AC	P2	
12	4: 5	26.85	48 53.83	122 7.62	11.80	1.7	9/18	0.31	CD	P2	
12	6: 6	37.98	47 39.66	122 13.41	16.08	0.9	8/12	0.13	AB	P2	
13	9: 5	51.96	47 57.19	123 10.09	41.41	2.6	18/21	0.35	CB	P2	
15	22: 4	60.73	46 44.79	122 24.54	8.19	1.0	6/09	0.40	CB	P2	
16	4:30	0.55	48 35.17	123 1.61	10.68	1.1	6/09	0.24	BD	P2	
16	16: 4	15.93	47 47.24	122 16.52	13.10	1.0	10/15	0.18	BB	P2	
18	17:51	41.25	47 18.15	123 9.03	38.08	1.7	14/23	0.35	CB	P2	
19	3:36	54.89	47 32.37	122 19.07	23.16	0.9	7/12	0.31	CB	P2	
22	23:38	51.07	47 42.66	121 57.67	18.44	1.5	12/23	0.30	BB	P2	
24	12:38	41.24	48 12.13	122 46.06	21.35	2.6	19/24	0.37	CB	P2	
27	16: 1	11.18	48 11.84	122 44.05	16.80	1.4	9/14	0.23	BD	P2	

February 1979

DAY	TIME	SEC	LAT	LON	DEPTH	MAG	NS/NP	RMS	Q	MODEL	TYPE
1	0:27	15.91	47 34.58	122 20.34	14.16	0.9	7/13	0.40	CB	P2	
1	16:10	1.16	47 18.43	122 38.70	17.19	1.9	13/23	0.21	BB	P2	
1	20:18	28.56	47 31.84	121 55.00	6.22	3.5	22/21	0.28	BB	P2	F
1	20:21	16.90	47 32.19	121 54.60	10.65	0.9	5/09	0.11	AB	P2	

APPENDIX 1 - Continued

February 1979 - Continued

DAY	TIME	SEC	LAT	LON	DEPTH	MAG	NS/NP	RMS	Q	MODEL	TYPE
1	23: 6	19.34	47 32.01	121 54.60	5.32	1.6	11/20	0.33	CC	P2	
2	3:21	11.40	47 25.33	122 42.75	20.13	0.9	10/20	0.18	BA	P2	
3	7:33	20.26	47 30.80	122 5.76	14.09	1.3	9/16	0.17	BA	P2	
3	12:39	39.69	47 9.08	121 17.12	2.87	1.5	7/14	0.28	BD	P2	
6	11: 9	47.93	47 5.85	123 14.96	38.96	1.7	10/16	0.31	CD	P2	
8	22:29	34.18	46 46.63	121 59.43	2.77	1.6	12/21	0.19	BC	P2	
9	0:40	1.40	47 27.60	122 41.34	17.33	1.3	7/12	0.24	BB	P2	
9	20: 1	57.41	47 25.22	121 48.83	16.49	1.8	14/24	0.22	BC	P2	
10	19:31	24.79	46 53.86	121 56.49	2.98	1.0	5/10	0.17	BC	P2	
10	23:36	46.61	47 23.58	122 28.21	9.04	2.2	15/25	0.33	CC	P2	
11	23: 8	32.96	47 42.01	121 59.82	8.26	1.2	6/11	0.15	BC	P2	
12	3: 4	18.26	47 27.38	121 34.02	3.02	1.2	5/09	0.72	DD	P2	
12	5:30	57.98	47 52.19	122 7.80	15.19	1.4	14/27	0.23	BA	P2	
12	6: 3	15.66	47 25.66	121 56.20	21.11	1.0	9/18	0.19	BA	P2	
12	12:24	57.48	47 31.17	121 55.07	0.10	1.7	12/21	0.50	CC	P2	
13	3:29	14.51	46 50.42	120 49.96	3.11	2.1	9/15	0.38	DD	P2	
14	16:53	29.92	48 5.14	122 35.93	22.09	1.0	6/11	0.09	AC	P2	
14	21:18	31.38	46 51.40	122 14.13	8.87	1.2	7/10	0.97	DC	P2	
16	4:55	15.61	46 26.03	122 25.42	15.87	1.1	5/09	0.13	BC	P2	
18	17:39	20.70	47 25.70	122 42.73	23.59	1.0	5/10	0.13	AC	P2	
18	17:58	56.09	47 38.56	122 12.01	23.56	0.7	6/11	0.18	BA	P2	
19	0:43	44.56	48 33.61	123 30.62	25.07	1.3	5/08	0.16	BD	P2	
22	6: 6	50.22	47 25.52	122 42.95	22.26	0.8	4/08	0.18	BD	P2	

March 1979

DAY	TIME	SEC	LAT	LON	DEPTH	MAG	NS/NP	RMS	Q	MODEL	TYPE
1	19: 6	34.42	47 36.26	121 45.93	7.39	1.6	7/12	0.14	BC	P2	
2	1:24	42.36	47 32.44	121 50.72	10.07	1.0	6/09	0.14	BD	P2	
4	11:31	14.05	47 25.26	121 50.62	24.63	1.6	7/14	0.42	CC	P2	
7	0:19	58.07	47 39.85	122 16.58	19.83	0.8	6/12	0.21	BC	P2	
7	8: 8	25.26	47 38.03	122 45.99	24.72	1.5	8/15	0.10	AB	P2	
7	19:15	39.55	47 45.61	122 28.24	1.26	1.1	9/17	0.36	CC	P2	
8	3:33	44.04	48 17.67	121 43.14	0.22	1.2	4/06	0.17	BC	P2	
11	5:35	18.51	48 46.33	121 49.98	0.60	1.6	6/11	0.24	CD	P2	
11	14:39	33.23	46 26.67	122 24.36	17.95	3.9	21/19	0.32	CB	P2	F
11	14:50	36.01	46 25.60	122 23.40	20.37	1.3	6/12	0.11	AB	P2	
11	14:53	52.17	46 26.00	122 23.85	19.64	1.7	11/22	0.31	CB	P2	
11	15:33	18.73	46 25.55	122 24.15	19.35	1.4	8/15	0.21	BB	P2	
11	21: 3	36.42	46 26.21	122 23.15	20.91	2.2	13/23	0.34	CB	P2	
11	22:23	47.73	46 25.72	122 24.22	19.61	1.4	6/12	0.11	AB	P2	
12	4:14	30.34	46 26.49	122 25.02	18.53	1.2	5/10	0.16	BB	P2	
12	10:37	21.50	47 16.94	122 51.05	15.53	1.2	5/10	0.17	BB	P2	
12	12:41	36.26	48 12.04	122 45.22	22.49	3.9	24/24	0.25	BB	P2	F
13	3:29	34.06	48 19.02	122 32.23	21.71	1.0	6/12	0.25	BB	P2	
13	22:20	24.81	48 55.71	123 2.76	8.88	1.9	10/17	0.26	BD	P2	
14	7:11	55.77	47 27.06	122 0.31	17.66	1.3	11/22	0.23	BB	P2	
14	12:22	29.59	47 29.42	122 21.03	23.97	2.4	20/20	0.17	BA	P2	
17	17:29	14.06	48 47.02	122 47.29	11.96	1.5	7/11	0.23	BD	P2	
20	3:42	18.22	46 26.15	122 24.36	16.51	1.2	7/14	0.17	BB	P2	

APPENDIX 1 - Continued

March 1979 - Continued

DAY	TIME	SEC	LAT	LON	DEPTH	MAG	NS/NP	RMS	Q	MODEL	TYPE
20	5:18	56.11	47 34.63	122 28.46	7.92	0.9	4/07	0.20	CC	P2	
20	22: 6	45.23	46 29.23	123 13.86	0.07	1.5	7/07	0.20	BD	P2	
21	1: 9	47.75	47 25.28	121 44.99	18.26	0.9	5/10	0.18	CC	P2	
22	23: 5	31.22	48 17.96	123 10.51	44.51	2.4	19/24	0.19	BA	P2	
24	6:49	39.54	47 36.86	121 55.44	14.27	1.0	5/09	0.05	BD	P2	
24	15:17	26.82	48 26.50	123 31.28	19.39	1.6	5/10	0.26	BD	P2	
25	9:13	14.93	46 24.53	122 21.98	20.10	1.1	6/12	0.20	BB	P2	
26	1:39	35.74	48 49.05	122 27.32	0.86	0.7	5/10	0.09	AD	P2	
26	7: 7	41.36	47 17.78	123 46.58	38.54	1.6	6/10	0.66	DD	P2	
27	12:38	15.28	47 43.37	122 4.94	0.15	1.3	8/16	0.21	BC	P2	
28	7:10	50.57	47 25.41	122 42.57	22.12	0.9	7/14	0.21	BB	P2	
30	12:36	10.60	47 44.53	122 51.65	18.25	0.7	4/08	0.13	BC	P2	
30	23:43	55.17	47 57.07	122 13.78	22.91	1.6	8/15	0.21	BC	P2	
31	15:13	18.49	47 44.54	122 22.95	9.71	1.1	6/12	0.18	CC	P2	

April 1979

DAY	TIME	SEC	LAT	LON	DEPTH	MAG	NS/NP	RMS	Q	MODEL	TYPE
2	7:59	11.34	47 28.48	122 31.21	20.61	1.3	14/26	0.20	BB	P2	
2	11:38	8.89	47 19.87	122 1.19	13.42	0.9	4/07	0.07	BC	P2	
2	13:14	28.40	48 30.85	122 26.74	0.14	0.5	5/10	0.14	BD	P2	
2	19: 4	45.00	48 49.90	123 9.03	21.15	1.5	8/15	0.17	BD	P2	
4	2:30	24.47	47 33.35	121 25.63	7.50	1.3	7/13	0.14	AD	P2	
5	18:34	51.48	47 28.81	122 23.37	19.04	1.2	9/18	0.21	BA	P2	
5	22:53	0.77	48 24.83	122 33.08	23.73	1.5	10/19	0.36	CA	P2	
5	22:58	52.49	48 25.78	122 33.27	21.58	1.0	9/17	0.32	CB	P2	
6	1: 7	45.17	47 56.16	122 29.71	45.60	1.7	15/29	0.47	CA	P2	
6	11:56	37.85	48 12.38	122 44.58	15.27	0.5	6/12	0.22	BC	P2	
6	21:17	41.33	46 26.03	122 23.16	18.53	0.8	5/10	0.18	BB	P2	
7	8:19	38.25	47 32.61	122 11.29	21.50	1.4	12/23	0.23	BA	P2	
7	22:51	18.89	46 52.16	121 57.33	0.97	1.4	9/18	0.26	BC	P2	
8	10:35	47.65	47 33.17	121 26.08	5.61	1.5	9/17	0.28	BD	P2	
8	22: 7	3.82	47 34.17	121 48.76	17.43	1.7	16/27	0.20	BC	P2	
10	19:32	15.93	48 32.72	121 36.28	6.49	0.9	5/10	0.14	AD	P2	
11	8:52	17.77	48 32.28	122 29.81	11.73	0.8	4/08	0.26	CD	P2	
15	3:48	45.20	47 35.84	121 48.75	19.27	1.5	12/24	0.30	BC	P2	
15	6:46	30.65	47 40.39	122 39.92	19.60	1.4	14/27	0.18	BB	P2	
15	10:25	45.25	47 22.28	122 20.66	8.18	1.1	8/15	0.15	BC	P2	
15	14:21	49.89	47 19.89	122 37.61	20.59	1.2	12/24	0.15	BB	P2	
17	2:55	14.82	47 50.38	122 50.74	2.54	1.2	7/14	0.22	BC	P2	
19	5:22	49.62	46 51.61	121 45.62	0.01	1.6	12/22	0.22	BC	P2	
20	5:43	30.23	48 11.43	122 44.08	15.33	1.5	12/24	0.26	BB	P2	
20	9:40	52.36	47 52.69	122 34.96	8.63	1.9	16/32	0.36	CC	P2	
20	16:43	18.15	47 44.17	122 36.14	15.28	1.4	7/14	0.19	BB	P2	
22	6:13	5.27	47 25.89	121 43.21	16.93	1.2	7/14	0.16	CC	P2	
26	11: 0	58.63	47 46.94	122 47.84	17.07	0.7	5/10	0.09	AC	P2	
26	13:17	45.95	46 59.40	121 52.04	6.54	1.9	16/28	0.29	BC	P2	
28	21:47	25.84	47 24.55	121 51.93	18.34	1.1	6/12	0.13	BD	P2	
29	5:27	8.73	46 42.74	122 6.12	6.60	1.4	11/21	0.17	BC	P2	
29	12:21	40.87	48 45.63	123 23.57	10.64	1.5	8/13	0.30	BD	P2	
29	15:41	19.69	47 37.58	122 13.11	22.60	1.1	6/11	0.09	AB	P2	

APPENDIX 1 - Continued

May 1979

DAY	TIME	SEC	LAT	LON	DEPTH	MAG	NS/NP	RMS	Q	MODEL	TYPE
1	19:59	15.09	47 25.38	122 43.56	24.65	1.5	8/16	0.16	BA	P2	
1	20:44	4.27	47 31.95	122 45.16	21.28	1.1	9/18	0.16	BA	P2	
3	3:35	32.55	47 22.24	122 20.64	6.01	1.9	18/35	0.26	BC	P2	
3	22:55	56.26	48 47.45	121 46.63	0.27	2.2	16/23	0.53	DD	P2	
7	13:57	45.85	48 29.82	121 38.34	5.37	1.1	5/08	0.15	BD	P2	
8	18:50	42.08	47 16.79	121 28.84	11.46	1.3	4/08	0.09	BD	P2	
8	22:43	52.99	47 48.78	121 56.90	0.18	2.0	11/19	0.29	BC	P2	P
10	9:15	24.75	47 44.76	122 18.54	20.02	1.1	6/10	0.12	AC	P2	
10	12: 8	6.97	47 25.55	122 45.45	10.93	1.0	4/07	0.13	BD	P2	
10	12:20	2.98	47 37.41	122 17.80	0.15	1.0	7/13	0.22	BC	P2	
11	5:41	29.55	47 26.43	122 42.81	25.16	0.4	5/10	0.25	BB	P2	
16	1:37	9.71	47 36.56	121 43.93	6.01	0.8	5/10	0.11	BD	P2	
16	13:40	47.72	48 21.09	122 49.26	15.23	0.5	4/07	0.08	AC	P2	
16	15:59	50.52	48 35.38	122 55.31	52.70	1.4	9/17	0.25	BC	P2	
17	2:11	33.16	46 7.13	122 49.03	0.09	2.2	10/16	0.40	CD	P2	
18	0:31	39.83	48 37.81	122 56.51	15.99	1.4	7/12	0.24	BD	P2	
19	16:28	11.22	47 28.08	122 39.69	23.98	1.1	6/12	0.11	AB	P2	
20	3:10	1.51	47 43.53	122 34.76	13.16	1.0	6/12	0.18	BB	P2	
21	19:43	17.59	46 43.94	124 22.92	34.18	2.2	5/08	0.38	CD	P2	
22	0:32	12.71	47 51.63	121 56.77	1.58	1.4	5/09	0.27	CD	P2	
22	9:36	46.65	48 3.15	123 8.88	40.69	1.3	7/14	0.30	BC	P2	
24	5:42	32.68	47 17.01	121 58.59	11.99	1.3	10/18	0.35	CB	P2	
25	19:40	52.20	48 25.81	123 37.00	13.87	1.0	4/08	0.22	BD	P2	
25	19:43	22.54	46 41.59	122 28.53	0.13	1.7	6/08	0.33	CD	P2	
26	0:12	1.04	47 36.33	122 47.00	17.23	1.2	7/11	0.13	AB	P2	
26	0:47	58.46	46 15.79	122 18.41	8.24	1.6	8/15	0.21	BC	P2	
27	8:38	32.01	47 3.51	121 11.47	0.13	2.3	15/25	0.43	CD	P2	
27	17:26	18.48	47 50.66	122 27.41	3.07	1.2	5/10	0.14	AC	P2	
28	12:16	16.75	48 42.03	122 20.72	1.03	1.2	4/08	0.11	BD	P2	
29	13: 2	31.42	48 0.74	122 13.76	14.00	1.3	6/11	0.15	BC	P2	
29	22:56	7.62	47 30.68	121 48.36	0.22	1.2	6/08	0.30	CC	P2	
30	2:30	10.83	47 23.92	123 20.02	8.13	1.3	5/09	0.10	BD	P2	
30	16:12	10.30	48 6.24	121 50.02	19.54	1.2	7/12	0.24	CC	P2	
30	16:40	58.84	48 5.42	121 52.47	20.36	0.9	6/10	0.19	CC	P2	
30	22:32	47.67	48 32.28	122 20.14	2.63	1.1	6/10	0.25	BC	P2	
31	5:44	33.65	48 6.77	121 43.31	15.47	1.6	11/21	0.21	BC	P2	

June 1979

DAY	TIME	SEC	LAT	LON	DEPTH	MAG	NS/NP	RMS	Q	MODEL	TYPE
1	15:11	48.82	48 5.49	121 48.55	18.09	1.0	4/06	0.14	DC	P2	
7	16:33	24.73	46 29.20	122 44.14	10.25	1.4	3/06	0.11	CD	P2	
10	8:40	46.31	48 5.87	121 50.57	19.40	1.0	6/12	0.17	BC	P2	
11	10:31	46.13	48 6.55	121 39.82	2.68	0.9	4/07	0.09	AD	P2	
11	16:40	11.59	47 57.01	121 1.76	5.66	1.6	7/13	0.17	BD	P2	
12	13:25	13.23	48 6.23	121 51.93	19.95	1.2	6/12	0.15	CC	P2	
12	16:39	48.26	48 31.50	122 37.72	18.15	1.7	8/16	0.17	BB	P2	
13	18:39	39.77	47 40.84	121 38.82	0.19	1.0	4/07	0.16	BD	P2	
13	23:34	2.14	46 22.64	121 42.59	28.94	1.4	6/08	0.62	DD	P2	
14	8:10	5.47	48 6.07	121 49.25	19.45	1.4	7/14	0.22	CC	P2	

APPENDIX 1 - Continued

June 1979 - Continued

DAY	TIME	SEC	LAT	LON	DEPTH	MAG	NS/NP	RMS	Q	MODEL	TYPE
15	4:20	36.04	48 17.29	123 28.74	25.98	1.2	6/12	0.27	BD	P2	
16	9:36	27.41	48 13.68	122 38.55	10.96	0.9	4/08	0.19	BD	P2	
16	11:33	51.74	47 15.22	122 40.01	21.93	2.4	18/28	0.22	BB	P2	
16	15:42	2.14	47 23.14	122 42.52	19.78	1.1	6/12	0.09	AB	P2	
18	14:39	10.49	48 0.59	122 10.84	0.21	1.4	5/09	0.53	DD	P2	
18	21:15	53.23	48 43.23	121 43.80	0.16	2.4	12/19	0.54	DD	P2	
21	13:55	18.25	48 25.89	122 58.63	51.99	1.7	9/18	0.61	DD	P2	
22	9:12	9.18	48 37.52	122 57.29	16.01	1.3	6/12	0.25	BD	P2	
22	9:36	41.15	48 50.71	122 14.78	2.65	2.0	12/19	0.31	CD	P2	
23	15:34	9.56	47 22.00	122 9.12	5.95	1.7	16/29	0.33	CC	P2	
23	15:34	58.38	47 21.79	122 8.13	8.44	1.4	12/23	0.31	CC	P2	
23	20:46	3.92	47 30.27	122 3.24	0.60	1.0	6/10	0.44	CD	P2	
23	21:26	13.01	47 21.60	122 7.70	12.73	1.3	10/20	0.33	CC	P2	
24	4:21	0.51	47 52.77	122 36.61	2.99	0.9	7/13	0.24	BC	P2	
27	8:54	11.36	47 23.03	122 28.20	48.77	2.6	19/21	0.20	BA	P2	
30	0: 6	49.63	47 48.74	121 57.37	0.12	1.4	8/10	0.40	CC	P2	P
30	4:43	7.29	47 25.76	121 55.01	23.70	0.7	5/10	0.10	BD	P2	
30	8:27	37.15	47 32.53	121 54.55	8.07	1.1	7/12	0.19	BB	P2	
30	9:32	55.94	47 26.57	122 45.03	23.71	0.6	4/06	0.18	BC	P2	
30	11:50	11.84	47 24.88	122 43.11	22.40	1.1	5/09	0.06	AB	P2	

July 1979

DAY	TIME	SEC	LAT	LON	DEPTH	MAG	NS/NP	RMS	Q	MODEL	TYPE
2	23: 8	22.97	47 49.71	122 41.07	18.08	1.5	5/10	0.09	AD	P2	
4	21:27	8.78	48 6.07	123 7.87	46.59	1.5	8/15	0.25	BC	P2	
5	1:12	8.13	47 9.37	123 0.24	49.05	0.9	5/10	0.20	BB	P2	
6	8:19	13.08	46 43.59	121 46.23	1.09	1.5	6/09	0.08	AD	P2	
7	0: 0	43.81	48 29.00	121 53.66	5.72	1.9	8/12	0.26	BC	P2	
7	20:50	2.95	46 28.13	122 18.91	21.01	3.6	19/17	0.25	BB	P2	F
7	20:56	48.61	46 27.36	122 19.10	19.65	2.7	15/17	0.47	CB	P2	
8	13:27	2.56	46 28.39	122 18.45	20.40	1.9	11/15	0.19	BB	P2	
9	1:33	30.97	46 28.33	122 20.46	20.33	1.9	13/22	0.25	BB	P2	
9	15:14	55.93	48 24.61	122 44.62	9.96	1.5	6/08	0.35	CB	P2	
9	19: 5	29.50	46 28.43	122 17.65	19.13	1.7	10/17	0.24	BB	P2	
9	19: 7	37.06	46 28.40	122 17.60	18.87	1.0	7/13	0.22	BC	P2	
10	5: 6	49.84	47 26.35	122 22.78	14.51	1.1	8/11	0.16	BC	P2	
11	2: 6	42.24	47 25.41	122 42.10	20.76	2.3	16/18	0.29	BA	P2	
14	3: 6	39.03	47 29.08	123 4.36	0.18	1.6	9/14	0.22	BC	P2	
16	9:14	47.65	45 39.55	122 47.97	0.14	1.7	6/09	0.28	CD	P2	
17	15:34	17.73	45 57.08	123 4.93	22.67	1.4	5/07	0.13	BD	P2	
19	13:38	60.15	47 40.66	122 1.63	17.84	1.8	16/22	0.12	AB	P2	
20	7:36	14.60	47 29.38	122 17.05	23.92	1.1	11/19	0.15	AA	P2	
20	18:46	56.53	48 40.59	123 3.39	12.33	1.9	11/15	0.14	BD	P2	
20	21:17	4.10	48 17.88	122 57.35	46.30	1.4	6/10	0.28	BB	P2	
21	10:53	35.18	48 19.44	122 18.07	0.13	1.4	7/11	0.27	CD	P2	
21	15:32	42.50	47 23.46	121 28.72	5.66	1.2	5/09	0.14	BD	P2	
22	4:11	31.69	47 46.21	122 28.52	12.74	0.7	5/09	0.19	BC	P2	
22	18:25	27.60	47 45.08	122 25.78	15.97	1.1	12/22	0.24	BB	P2	
23	17: 3	33.36	48 47.90	122 19.26	0.13	1.7	6/10	0.80	DD	P2	

APPENDIX 1 - Continued

July 1979 - Continued

DAY	TIME	SEC	LAT	LON	DEPTH	MAG	NS/NP	RMS	Q	MODEL	TYPE
24	4: 1	53.98	47 37.22	122 33.64	19.12	1.1	10/15	0.26	BB	P2	
24	6:19	40.02	48 18.82	122 17.03	0.03	1.1	6/11	0.12	AC	P2	
24	6:23	1.71	48 18.05	122 17.35	0.12	0.8	5/08	0.17	BC	P2	
25	0:16	58.74	47 18.00	122 5.00	15.65	0.4	4/08	0.15	BD	P2	
25	2:49	9.52	46 17.86	122 13.64	2.84	1.7	6/10	0.22	BC	P2	
28	2:19	7.01	46 39.41	120 37.06	0.08	3.7	26/26	0.37	CD	P2	F
29	7:44	34.71	47 42.55	122 1.49	21.06	1.5	9/16	0.19	BB	P2	
30	11:15	8.18	48 26.97	123 14.61	19.03	0.7	4/06	0.05	AD	P2	
31	6:29	44.81	47 53.60	122 9.22	17.17	2.3	18/20	0.20	BB	P2	
31	7:17	57.74	47 53.77	122 8.56	22.69	1.8	12/18	0.20	BA	P2	
31	18:33	4.31	46 8.23	122 48.05	0.17	1.9	6/07	0.42	DD	P2	

August 1979

DAY	TIME	SEC	LAT	LON	DEPTH	MAG	NS/NP	RMS	Q	MODEL	TYPE
1	18: 1	49.33	48 10.66	122 42.97	0.13	0.4	3/06	0.32	CC	P2	
2	23:53	14.22	47 30.90	121 38.40	7.77	1.9	11/18	0.17	BD	P2	
3	0:22	54.46	46 25.78	122 21.71	0.12	1.5	9/13	0.41	CC	P2	
4	2:47	48.43	47 35.80	121 49.74	16.62	1.3	10/16	0.21	BC	P2	
6	1:32	46.12	47 35.00	122 42.78	17.75	0.8	4/08	0.37	CC	P2	
6	6:24	12.49	47 43.78	122 10.35	4.76	0.8	5/10	0.29	CD	P2	
8	11: 0	35.41	47 30.61	122 29.48	17.28	0.8	4/07	0.05	AC	P2	
8	23:44	57.59	47 39.70	121 49.41	12.91	1.6	10/16	0.18	BC	P2	
9	2: 1	34.74	48 8.33	122 46.08	12.60	1.6	6/11	0.15	BB	P2	
9	12: 8	36.04	46 13.22	123 33.47	37.01	1.3	5/09	0.21	BD	P2	
9	23:39	21.82	47 32.28	121 55.87	18.96	1.1	6/11	0.16	CD	P2	
9	23:57	26.19	46 31.64	122 26.71	19.61	1.3	6/11	0.18	BD	P2	
10	3:15	32.43	47 33.53	122 42.28	18.69	1.3	8/14	0.17	BB	P2	
10	5:22	46.48	48 16.04	122 14.17	3.05	1.3	6/10	0.12	AD	P2	
10	5:42	44.69	48 46.54	122 6.37	0.10	1.3	5/09	0.38	DD	P2	
10	17:48	8.40	48 48.10	122 7.80	5.99	1.5	6/10	0.63	DD	P2	
12	5: 9	13.56	48 29.00	122 22.43	19.88	1.0	5/10	0.21	BC	P2	
14	4: 9	43.95	47 37.67	122 12.73	23.35	1.2	6/11	0.05	AB	P2	
14	5:18	16.26	47 21.98	121 47.95	4.65	1.1	5/10	0.11	CC	P2	
14	20:36	30.94	48 11.16	123 4.81	52.30	2.7	17/17	0.14	BD	P2	
15	19:37	13.56	48 20.12	121 59.11	0.13	1.3	6/06	0.20	BC	P2	
16	4:57	12.07	48 23.66	121 54.15	0.11	0.9	5/07	0.14	BC	P2	
16	17:30	16.45	48 15.98	122 13.68	5.16	1.1	6/11	0.13	BD	P2	
18	3:45	33.69	47 32.08	123 32.90	0.15	0.9	5/09	0.57	DD	P2	
18	12:19	52.60	47 16.99	122 23.71	5.93	0.8	6/12	0.25	BC	P2	
19	16:50	57.81	46 26.28	122 25.91	14.93	1.2	6/12	0.18	BB	P2	
23	21: 4	43.84	47 25.16	121 48.82	17.21	1.2	7/12	0.24	CC	P2	
29	8:19	54.40	48 17.28	122 40.19	20.40	0.6	3/06	0.05	BD	P2	
30	19: 2	28.73	46 37.10	122 29.40	0.14	1.1	4/07	0.65	DD	P2	

September 1979

DAY	TIME	SEC	LAT	LON	DEPTH	MAG	NS/NP	RMS	Q	MODEL	TYPE
4	3:45	53.99	47 37.18	121 44.26	14.88	1.6	13/24	0.21	BC	P2	
5	3:49	19.33	47 31.46	122 0.06	3.99	2.1	18/27	0.23	BC	P2	F

524

APPENDIX 1 - Continued

September 1979 - Continued

DAY	TIME	SEC	LAT	LON	DEPTH	MAG	NS/NP	RMS	Q	MODEL	TYPE
5	6:47	3.74	47 31.31	122 0.18	2.93	1.4	10/17	0.20	BC	P2	
5	22:44	24.04	46 27.81	121 40.87	0.20	1.7	10/17	0.22	BD	P2	
6	6:42	1.84	47 31.48	121 59.41	0.16	1.6	9/15	0.13	AC	P2	
6	8:15	34.17	47 31.71	122 0.20	1.58	1.9	12/20	0.21	BC	P2	
6	9:11	9.45	47 31.48	121 59.56	4.67	1.2	6/11	0.19	CC	P2	
6	11:20	26.80	47 31.08	122 1.35	15.83	0.7	5/09	0.37	CC	P2	
8	13: 3	54.82	47 26.66	122 47.18	1.85	2.0	8/07	0.14	BC	P2	
9	6:10	18.21	46 30.00	122 19.45	0.12	1.9	9/13	0.18	BD	P2	
10	18:15	33.22	48 37.56	122 57.90	14.80	1.4	5/09	0.22	BD	P2	
10	20:20	17.48	48 47.72	121 45.99	0.11	1.7	7/12	0.38	DD	P2	
11	14:55	14.09	47 48.54	122 50.09	48.81	2.1	11/19	0.26	BA	P2	
13	21:59	14.69	47 34.67	121 59.69	0.82	1.6	6/10	0.40	CC	P2	
16	7:44	22.72	47 26.85	122 48.16	0.22	1.5	9/16	0.21	BC	P2	
20	11: 1	53.71	47 25.58	121 49.71	18.54	0.9	5/08	0.10	CD	P2	
20	13:41	11.96	46 30.25	122 20.38	20.43	1.6	13/22	0.20	BB	P2	
23	2: 0	28.14	46 21.89	122 12.48	3.87	1.1	7/11	0.12	BC	P2	
23	18:22	59.12	48 3.12	121 51.23	16.49	1.0	5/10	0.07	AD	P2	
29	9:27	5.90	47 56.03	122 25.11	24.59	2.1	14/15	0.21	BB	P2	
30	1:30	36.22	47 45.22	122 23.27	19.43	1.1	7/11	0.20	BB	P2	

October 1979

DAY	TIME	SEC	LAT	LON	DEPTH	MAG	NS/NP	RMS	Q	MODEL	TYPE
2	0:54	37.65	47 25.96	122 44.90	37.01	0.9	6/09	0.16	BC	P2	
5	6:37	35.48	47 35.89	123 15.29	46.60	2.1	19/22	0.21	BC	P2	
5	10:29	33.48	47 25.37	122 43.07	24.72	0.7	5/10	0.24	BB	P2	
5	16:38	28.28	47 45.14	122 34.14	17.89	1.0	6/12	0.21	BC	P2	
9	15:53	43.84	48 23.45	123 13.30	17.87	1.4	7/13	0.18	BD	P2	
10	11:54	23.90	47 36.10	122 44.94	23.57	1.5	13/21	0.17	BB	P2	
10	20:10	36.29	47 46.01	122 31.13	52.80	1.5	12/20	0.20	BA	P2	
12	17:15	58.94	47 47.10	122 48.01	17.76	1.3	7/14	0.17	BC	P2	
13	10:42	9.29	46 13.88	122 4.98	5.95	1.5	8/15	0.27	BD	P2	
15	12:40	53.87	47 28.72	123 27.84	32.74	0.9	8/14	0.28	BC	P2	
16	10:17	16.16	46 55.33	121 57.12	5.58	0.9	6/11	0.18	BD	P2	
17	6:45	40.07	46 26.10	122 23.70	18.47	1.5	11/17	0.20	BB	P2	
18	8:43	17.63	47 23.56	122 4.69	5.73	0.9	6/08	0.13	BC	P2	
18	8:49	19.12	47 24.18	122 3.81	6.17	0.9	6/09	0.14	AC	P2	
18	19:16	32.58	47 24.07	122 3.30	6.12	0.9	5/09	0.28	BC	P2	
18	23: 8	10.42	48 25.62	121 42.29	12.39	2.5	18/15	0.24	CD	P2	
20	1:22	20.41	48 19.48	122 12.54	15.95	1.2	5/07	0.15	BD	P2	
20	6:15	51.48	47 15.45	122 26.05	13.69	1.0	9/18	0.16	BB	P2	
24	16: 1	33.00	48 23.92	123 26.32	0.15	1.6	7/12	0.34	CD	P2	
25	18:16	28.29	47 26.25	121 51.18	16.32	1.3	6/10	0.09	BD	P2	
25	22:32	40.30	47 19.92	122 20.74	8.32	1.4	11/13	0.23	BC	P2	
26	21:20	38.54	47 48.94	121 47.25	0.14	0.8	4/07	0.32	CC	P2	
27	18:56	31.20	46 36.16	122 22.59	0.18	1.3	7/10	0.23	BB	P2	
30	0:32	16.15	48 2.16	122 19.50	29.72	2.4	18/19	0.15	AA	P2	
30	14: 0	4.64	48 1.65	122 12.03	20.70	0.6	4/08	0.12	AC	P2	
31	20:47	48.92	47 3.13	122 13.99	0.18	1.4	6/09	0.28	BA	P2	

APPENDIX 1 - Continued

November 1979

DAY	TIME	SEC	LAT	LON	DEPTH	MAG	NS/NP	RMS	Q	MODEL	TYPE
1	16: 6	14.89	46 49.61	121 53.42	3.64	1.4	6/11	0.23	BD	P2	
2	15:22	10.61	48 30.98	121 56.89	0.04	1.8	5/07	0.18	CD	P2	
3	2: 6	9.89	46 56.23	121 57.44	9.91	2.6	17/18	0.22	BC	P2	
8	14:16	42.04	46 50.83	121 55.48	0.15	1.5	8/12	0.33	CC	P2	
8	15:41	11.62	47 56.50	122 34.51	41.90	1.6	9/15	0.27	BD	P2	
8	21:55	60.52	46 43.50	122 25.18	0.38	1.5	7/12	0.36	CC	P2	
9	8:24	54.98	47 33.67	122 30.28	0.78	1.6	11/21	0.30	CC	P2	
9	9:58	19.53	47 46.31	122 34.37	17.50	1.4	6/12	0.22	BB	P2	
9	16: 2	9.51	48 52.42	124 38.67	41.99	4.1	19/14	0.23	CD	P2	F
9	17:32	53.49	47 15.39	124 2.17	0.22	1.2	4/08	0.30	CD	P2	
9	20:43	16.04	47 30.23	121 59.95	0.46	1.0	6/10	0.52	DC	P2	
10	12:50	17.14	47 31.37	121 47.46	17.18	1.2	9/14	0.21	BC	P2	
10	16: 6	59.37	47 28.90	122 42.12	23.23	1.1	6/09	0.26	BC	P2	
10	23:55	26.19	48 0.35	122 14.65	20.34	2.0	13/20	0.15	BB	P2	
11	11:22	33.68	47 50.23	121 53.32	8.51	1.5	9/16	0.15	AB	P2	
11	14:50	12.63	47 30.17	122 18.51	22.61	1.2	9/15	0.17	BB	P2	
11	15: 2	25.94	47 28.65	122 17.66	15.31	0.9	7/13	0.38	CC	P2	
12	19:36	10.91	47 18.03	122 21.28	57.16	1.6	11/20	0.24	BA	P2	
13	12:34	37.08	48 6.55	122 41.66	0.16	1.1	4/08	0.19	BC	P2	
14	8:22	44.02	46 9.70	122 11.87	0.15	2.0	6/08	0.28	CD	P2	
14	8:57	27.79	46 59.09	122 7.24	16.33	1.2	6/11	0.15	BC	P2	
15	16:12	47.23	49 14.12	122 19.25	11.72	3.4	21/24	0.33	CD	P2	F
16	8:14	25.03	47 50.80	122 25.41	12.33	1.0	4/08	0.19	CC	P2	
16	14:32	2.27	48 41.58	121 46.29	0.19	1.4	5/07	0.14	BD	P2	
17	16:44	25.68	47 16.10	122 16.60	16.96	1.5	6/11	0.19	BB	P2	
18	4:37	26.20	48 32.94	122 26.60	14.97	0.9	4/07	0.07	BD	P2	
19	20:31	28.75	46 59.39	122 8.01	13.57	1.3	7/13	0.17	BC	P2	
21	2: 1	41.87	48 1.92	122 12.75	25.94	1.0	5/10	0.25	BC	P2	
21	3:35	47.97	47 39.07	122 3.91	15.65	1.5	11/18	0.25	BB	P2	
23	19:19	33.09	47 26.02	121 47.82	18.69	0.9	5/09	0.11	CC	P2	
23	23:39	49.11	48 30.39	122 41.01	23.79	1.4	6/09	0.23	BD	P2	
24	15:57	19.70	46 36.34	122 44.27	27.48	1.7	8/14	0.35	CC	P2	
26	6:14	48.49	48 33.07	122 22.35	0.08	1.3	5/08	0.18	CD	P2	
26	23:18	27.34	48 32.95	122 23.77	17.07	3.8	20/20	0.21	BB	P2	F
26	23:23	38.67	48 34.03	122 24.03	16.09	1.3	4/08	0.11	AD	P2	
26	23:27	12.00	48 32.28	122 24.54	14.97	2.4	17/17	0.24	BC	P2	
27	2:12	42.31	48 38.10	122 23.10	16.11	1.6	5/09	0.16	BD	P2	
27	2:13	47.38	48 33.06	122 23.80	14.88	3.5	20/20	0.21	BB	P2	F
27	2:23	27.93	48 32.80	122 24.68	18.63	1.6	8/14	0.17	BD	P2	
27	2:31	15.25	48 34.74	122 24.03	13.80	1.7	8/15	0.23	BD	P2	
27	3:53	19.46	48 34.44	122 21.50	2.48	1.1	4/07	0.08	CD	P2	
27	5: 8	50.74	48 34.09	122 22.31	0.15	1.5	5/08	0.27	CD	P2	
27	10:49	30.90	48 35.90	122 23.86	7.95	1.5	5/07	0.46	CD	P2	
28	3: 8	22.13	48 25.49	122 51.87	52.31	2.5	14/17	0.24	BA	P2	
28	3:35	29.09	48 35.73	122 25.76	12.43	1.4	5/08	0.30	CD	P2	
28	15:49	18.90	48 32.07	122 23.92	16.75	2.1	15/20	0.26	BB	P2	

APPENDIX 1 - Continued

December 1979

DAY	TIME	SEC	LAT	LON	DEPTH	MAG	NS/NP	RMS	Q	MODEL	TYPE
1	20:20	42.57	47 38.38	121 51.52	21.94	1.1	8/14	0.12	AC	P2	
2	2:12	28.20	47 42.79	122 7.90	11.37	1.3	8/13	0.15	BB	P2	
2	20:12	38.90	46 54.09	121 56.23	7.10	0.9	5/09	0.10	BC	P2	
2	20:35	39.50	46 11.46	122 8.88	3.50	1.1	5/09	0.16	BD	P2	
4	12: 8	32.42	48 34.01	122 25.18	21.13	2.2	13/19	0.20	BD	P2	
7	11:26	2.68	47 32.31	122 28.82	17.81	0.9	7/12	0.18	BB	P2	
8	0:26	50.75	47 46.95	122 9.96	19.24	1.4	6/11	0.39	CC	P2	
9	8:59	21.47	47 12.17	122 19.50	2.98	1.1	4/08	0.29	BC	P2	
10	5:40	7.46	46 39.28	120 36.76	0.90	2.9	28/28	0.46	CC	P2	F
10	20:25	49.42	47 25.83	121 48.75	19.36	2.2	15/20	0.14	AC	P2	
14	23:29	25.67	47 37.00	121 58.10	18.47	2.1	9/11	0.09	AC	P2	
15	7:51	32.66	47 16.56	121 25.00	0.77	2.2	12/15	0.17	BD	P2	
15	17:58	17.41	47 37.87	121 51.84	20.96	1.3	9/15	0.10	AC	P2	
16	10:27	18.82	47 26.21	123 3.32	20.10	0.7	4/08	0.09	AB	P2	
16	15:37	37.07	48 33.85	122 23.90	21.04	1.7	10/19	0.21	BD	P2	
17	10:36	34.32	47 31.12	122 34.96	20.07	1.1	7/13	0.12	AA	P2	
19	11: 8	47.19	47 22.22	122 19.66	25.66	0.6	7/14	0.18	BB	P2	
20	8:25	51.58	46 42.76	121 6.58	4.95	1.5	4/08	0.18	CD	P2	
21	8:23	40.20	47 36.69	122 36.66	22.54	0.7	5/10	0.24	BB	P2	
21	22: 1	41.47	45 58.18	122 41.66	5.43	2.6	14/14	0.31	DD	P2	
22	14:22	49.63	47 32.26	122 34.77	25.09	1.0	9/18	0.18	BB	P2	
22	22:19	22.86	47 24.78	122 42.16	20.85	0.4	7/12	0.18	BB	P2	
23	1:23	17.78	47 24.99	122 3.01	4.06	1.7	10/19	0.42	CC	P2	
23	3:13	28.96	47 44.16	122 15.39	13.56	1.1	8/16	0.31	CB	P2	
25	15:20	5.17	48 10.70	122 48.46	19.00	1.5	12/21	0.29	BC	P2	
25	16:18	8.73	46 21.00	122 18.73	12.76	1.1	4/08	0.05	AC	P2	
25	17:30	48.52	46 20.98	122 14.69	20.83	1.3	4/07	0.55	DC	P2	
27	7: 3	27.70	47 44.33	121 54.42	7.49	1.5	7/13	0.13	AB	P2	
29	15:39	13.93	47 45.34	121 58.02	11.61	1.3	4/06	0.25	BD	P2	P
30	16:54	59.25	48 17.59	122 39.69	32.97	1.8	12/16	0.13	AD	P2	