

QUARTERLY TECHNICAL REPORT 80-C and D

on

Earthquake Monitoring of the Hanford Region, Eastern Washington

July 1 through December 30, 1980

Geophysics Program

University of Washington

Seattle, Washington

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Introduction

The technical reports for the third and fourth quarters of 1980 are being combined in this one report, since only now do we have even a preliminary catalog for this period. There have been large and significant changes in the way the data are being handled and displayed; consequently this report should be considered an interim progress report. We are still only half way through these changes which are primarily due the new computer recording system which is impacting many aspects of our work. Besides the obvious reorganization in our seismogram reading techniques, and the location and plotting routines, there are institutional changes which should ultimately improve the quality and completeness of the data set. The routine analysis of all earthquakes in the northwest, both eastern and western Washington, will be done together in the future, and will result in a more uniform and complete catalog. The networks will still be funded individually; however the efficiency should be much improved by using some common staff. Much duplication of effort which was the result of independent network operations over the past five years will be avoided.

Operations

The seismic processing routine has returned to a semblance of normal after the onslaught of earthquakes associated with the Mount St. Helens eruptions. We still have not processed most of the data from the first half of this year, but have kept fairly up to date since July 1 of this year. The computer processing routines are nearly written and routine record analysis is progressing smoothly. A second Tectronix graphics terminal was delivered at the end of the year which has helped speed up the processing.

The field maintenance is being taken over by a separate subcontractor whose technician will be stationed in eastern Washington. This should improve our response to technical problems and allow for greater flexibility in adjusting the

network configuration to take advantage of research opportunities. This subcontract is in effect now and the technician is presently being trained to service our particular network. We also are about to hire a seismic network manager to take most of the everyday routine load off of the principle investigators such that they can spend more time on the scientific problems. Jim Zolweg from the Tennessee Earthquake network has been hired and will begin work overseeing most of the details of the network operations in March.

Data

A catalog of the located seismic events during the second half of 1980 follows. The form for this catalog is slightly different than that used in previous reports but the basic information is the same. The locations reported here should not be considered final since we are currently using a location routine which has several disadvantages. We expect to switch to a far better location routine in the near future at which time all events will be relocated. Most events will not be greatly effected, though depths may be strongly effected for some events. Combining and coordinating the analysis for both eastern and western Washington has caused several delays in getting a final catalog together. We anticipate that the new network manager will significantly speed up this process. The present catalog includes all located events in eastern Washington and the east flank of the Cascades from June 18 through December 20, 1980. These are all events east of about 121.5 west longitude detected and recorded on the online computer system with the exception of about two dozen known blasts which duplicate other blasts. Three different velocity models have been used for locating these events. The models are shown in table 1 and the next to last column in the catalog indicates which model was used for each event.

A preliminary map of eastern Washington shows all events located. This map does not distinguish between earthquakes and blasts nor indicate event magnitude

nor depth in anyway. We are presently developing programs to produce more useful graphical output. Of the 153 events plotted on this map, 65 are known or expected blasts. These are mostly concentrated in the Gable Mountain area, Ice Harbor Dam area, and the Midnight Mine area. Of the remaining 88 earthquakes the average number of events have occurred in the southern Lake Chelan area as well as the north flank of the Saddle Mountains.

The sensitivity of the online computer system has been tested by comparing the events it triggered on and recorded with those independently found by hand scanning the devecorder films. There were 18 events missed by the computer that were detected by the scanners; however, only 6 of these were recorded on enough stations to located and 3 of these occurred when the computer system was down. On the other hand there were 4 events which the computer detected but were missed by the scanners, usually because of problems with the film. We are fairly confident that the computer can, on the average, do about as well as a scanner at detecting events and produce far better quality data.

Other Studies

Our work on the fracture studies consisted of finalization of software for Geophysical well log analysis, program documentation, and fracture data analysis. Also, basic computer programs needed for digitizing, crossplotting, histogram generation, and log correlation have been completed and are running in production mode. These programs have been fully documented and are being chained together for use by any novice wishing some form of log analysis. The fracture data from the cores has now been cleaned up and secondary parameter calculations are now being computed. This data set has not proven to be self consistent, and substantial time has been spent on removing errors in the data catalog. This problem has been overcome, and formation permeability logs will shortly be generated for the depth zones we have data for.

Table 1. Eastern Washington Velocity Models

North East Model (NE1)

Velocity(km/sec)	Depth(km)
5.1	0.0
6.05	0.5
7.2	19.0
8.0	24.5

South East Model (SE1)

Velocity(km/sec)	Depth(km)
3.7	0.0
4.7	0.8
5.15	1.2
6.05	7.5
7.2	19.0
8.0	28.0

Cascades Model (CS1)

Velocity(km/sec)	Depth(km)
5.1	0.0
6.0	1.0
6.6	10.0
6.8	18.0
7.1	25.0
7.9	35.0

EASTERN WASHINGTON PRELIMINARY CATALOG JUNE 18 - DECEMBER 20 1980

June 1980

DAY	TIME	SEC	LAT	LON	DEPTH	MAG	NS/NP	RMS	Q	MODEL	TYPE
18	1:10	21.07	46-18.63	117-59.68	0.10	2.3	12/12	0.39	dd	SE1	
18	11:41	30.95	48-30.01	119-37.19	0.10	3.0	30/30	0.35	cd	NE1	
30	22:55	32.69	46-19.36	118-53.07	27.41	1.8	10/10	0.29	bb	SE1	

July 1980

DAY	TIME	SEC	LAT	LON	DEPTH	MAG	NS/NP	RMS	Q	MODEL	TYPE
2	3:52	13.03	46-52.40	118-10.93	0.10	1.5	9/09	0.61	dd	NE1	
2	18:19	0.90	47-51.85	118- 9.07	0.10	2.3	14/14	0.24	cd	NE1	X
3	8:21	42.25	46-39.78	118-51.56	3.01	2.1	10/12	0.28	bc	SE1	
4	23:17	58.44	47-49.80	119-54.18	6.26	-0.1	4/07	0.34	dd	NE1	
7	0:29	61.20	46-48.92	119-26.81	0.10	1.2	8/12	0.15	ab	SE1	
7	9:59	11.20	45-45.23	120-54.88	97.36	2.3	8/08	3.21	dd	CS1	
8	6:22	41.96	46-40.09	118-51.85	0.10	1.2	8/09	0.34	cc	SE1	
8	6:29	20.13	46-39.61	118-50.45	0.10	1.3	9/10	1.84	dc	SE1	
10	18:13	21.42	47-52.71	118- 7.85	0.10	1.7	8/08	0.15	cd	NE1	X
11	18:48	64.25	46-33.93	119-29.82	0.10	1.2	4/04	1.36	dd	SE1	X
11	19:30	24.30	46-33.36	119-24.73	0.10	1.2	6/07	0.18	bb	SE1	X
11	21:14	59.34	46-33.02	119-22.36	5.96	1.2	6/08	0.35	cb	SE1	X
12	19:37	52.72	46-30.97	119-25.12	1.04	0.6	4/04	0.59	dd	SE1	X
12	21:26	70.14	46-31.76	119-25.63	1.20	1.5	7/07	0.11	ab	SE1	X
12	23:32	18.48	46-31.20	119-25.64	1.20	0.9	5/05	0.10	ad	SE1	X
14	13: 0	11.07	46-53.53	120-39.56	12.59	1.5	10/12	0.11	ab	CS1	
14	16:50	40.84	46-31.97	119-22.98	1.20	0.9	5/06	0.39	cd	SE1	X
14	20: 2	23.97	46-32.93	119-23.79	1.20	1.2	6/06	0.05	ab	SE1	X

July 1980

DAY	TIME	SEC	LAT	LOX	DEPTH	MAG	NS/NP	RMS	Q	MODEL	TYPE
15	15:37	11.90	46-33.67	119-26.39	1.20	1.2	4/04	0.22	bd	SE1	X
15	16:44	70.56	46-32.71	119-27.68	1.20	1.1	6/06	0.24	bb	SE1	X
15	18:40	15.76	46-32.68	119-27.97	1.20	1.2	5/05	0.10	ad	SE1	X
15	22: 8	43.73	45-46.19	120-34.77	9.40	2.2	12/13	0.13	bd	CS1	
16	16:38	16.69	46-33.49	119-26.91	1.20	1.7	4/04	0.31	cd	SE1	X
16	23:37	26.50	47-51.75	118- 9.20	0.10	2.3	15/15	0.25	cd	NE1	X
17	22:56	40.10	47-51.40	118-14.39	0.10	0.	5/05	0.21	dd	NE1	X
18	16:38	42.13	46-32.28	119-25.97	1.20	1.2	7/07	0.28	bb	SE1	X
19	0:16	40.29	46-32.27	119-24.67	1.20	1.7	5/05	0.30	bd	SE1	X
19	4:34	23.00	47-27.76	120-10.05	0.10	1.5	7/09	0.37	cb	NE1	
21	15:53	16.87	46-35.03	119-21.08	1.20	1.5	6/07	0.30	cb	SE1	X
21	17:10	57.38	46-32.66	119-24.09	1.16	1.5	4/04	0.55	dd	SE1	X
22	18:49	30.82	46-32.70	119-24.78	1.21	1.7	5/05	0.07	ad	SE1	X
22	21:20	28.33	46-32.66	119-24.68	1.21	1.2	4/04	0.26	bd	SE1	X
23	15:55	46.74	46-32.76	119-25.29	1.21	1.7	4/04	0.51	dd	SE1	X
24	16:52	13.75	46-32.80	119-18.96	1.21	0.9	4/04	0.72	dd	SE1	X
24	17:14	16.05	46-17.20	119-32.58	0.10	2.3	10/10	0.19	cc	SE1	X
24	18:23	40.31	46-16.64	119-11.68	0.10	0.9	4/05	0.35	cd	SE1	
25	20:39	30.40	46-32.40	119-19.56	0.10	0.9	6/11	0.34	cc	SE1	X
26	15:56	28.26	46-31.37	119-24.06	0.10	1.5	8/09	0.27	bb	SE1	X
26	18:37	64.25	46-31.82	119-23.98	0.10	1.5	8/09	0.24	bb	SE1	X
26	20:40	27.78	46-32.76	119-24.69	0.40	1.2	5/05	0.14	ad	SE1	X

July 1980

DAY	TIME	SEC	LAT	LON	DEPTH	MAG	NS/NP	RMS	Q	MODEL	TYPE
27	15: 8	28.04	46-32.14	119-24.08	0.10	1.5	6/07	0.24	bb	SE1	X
27	16:10	24.81	46-33.31	119-26.08	0.10	1.5	5/06	0.37	cd	SE1	X
29	14:35	53.29	46-25.51	119- 1.79	1.38	1.1	12/12	0.13	ac	SE1	P

Aug 1980

DAY	TIME	SEC	LAT	LON	DEPTH	MAG	NS/NP	RMS	Q	MODEL	TYPE
4	16:52	56.43	47-41.12	120- 8.99	0.10	0.5	4/08	0.31	cd	NE1	
5	13:54	34.64	47-39.91	120- 2.73	0.10	1.9	15/19	0.14	ac	NE1	
5	15: 1	35.62	46-39.25	119-38.15	0.10	0.7	6/10	0.25	bc	SE1	
6	20:17	26.56	47-51.71	118-42.88	0.41	2.0	13/13	0.15	bc	NE1	P
7	20:51	34.42	45-49.19	120-32.30	0.10	1.9	10/17	0.46	dd	SE1	
7	22:13	42.40	46-39.06	119-37.97	0.10	0.5	6/11	0.26	bc	SE1	P
8	22:13	59.40	46-38.78	119-38.46	0.10	0.6	8/11	0.41	cb	SE1	
8	22:50	56.08	46-32.64	119-27.41	0.10	0.9	7/08	0.30	cb	SE1	P
11	18:57	37.57	46-55.09	119-36.29	0.10	0.3	4/06	0.12	cd	SE1	
12	22:25	31.21	46-31.45	119-24.31	3.37	1.2	4/05	0.46	cd	SE1	X
13	22:52	61.90	46-39.19	119-38.24	6.33	0.6	5/06	0.25	cd	SE1	
15	20: 8	56.62	46-31.68	119-28.05	0.10	1.2	6/07	0.26	cb	SE1	X
15	23:45	36.40	47-40.34	120- 3.86	0.10	0.3	4/07	0.13	bd	NE1	
20	3:38	31.20	48-46.81	118-42.24	0.10	2.2	12/20	0.75	dd	NE1	
22	3:12	63.60	46-24.40	121-17.16	0.10	2.3	24/35	0.29	bc	CS1	
23	6:37	61.25	46-55.49	119-18.25	0.10	1.1	7/12	0.30	cc	SE1	
23	10:34	58.20	46-52.23	119-35.80	0.10	0.7	6/07	0.41	cc	SE1	
24	10:30	1.14	47-41.95	121- 2.91	0.10	0.9	5/05	0.11	cd	CS1	
28	23:23	25.73	47-28.02	117-22.72	0.10	2.4	11/11	0.50	dd	NE1	P
29	2:42	53.57	47-40.08	120-11.21	5.42	0.4	4/08	0.16	bd	NE1	

Sept 1980

DAY	TIME	SEC	LAT	LON	DEPTH	MAG	NS/NP	RMS	Q	MODEL	TYPE
3	23:36	11.13	46-52.27	119-22.38	0.10	1.2	6/10	0.22	bc	SE1	
8	4:34	50.35	46-51.74	119-22.07	0.10	0.6	5/06	0.15	bd	SE1	
8	18:36	26.16	47- 7.35	118-47.57	12.09	1.9	11/15	0.25	bc	NE1	P
11	15:41	30.27	46-49.02	119-25.40	0.10	0.6	4/06	0.47	cd	SE1	
11	18:16	60.24	46-48.25	119-24.24	0.10	0.7	4/07	0.23	cd	SE1	
11	20:39	43.42	47-39.93	120- 6.37	0.10	1.2	7/12	0.29	bc	NE1	
12	21:29	40.46	46-48.16	119-24.11	0.10	0.7	6/09	0.13	ab	SE1	
14	12:23	28.64	47-40.93	120-12.01	0.10	0.9	6/11	0.13	ab	NE1	
15	22:37	49.67	47- 8.32	118-49.90	8.56	2.0	9/10	0.23	cc	NE1	P
18	20:33	49.16	47-40.28	120- 6.94	8.24	0.7	5/10	0.16	bd	NE1	
19	2:59	16.97	47-41.07	120- 6.66	7.94	0.5	5/10	0.10	ad	NE1	
22	22:55	50.03	47- 5.85	121-15.08	2.27	2.2	6/06	0.17	cc	CS1	
25	23:12	29.56	48- 3.25	118-42.29	0.10	1.8	8/09	0.19	bc	NE1	P
26	7:51	51.89	47-42.01	120-14.48	0.08	0.1	4/07	0.26	bd	NE1	
26	20:54	70.38	46-51.99	121-10.73	0.10	1.7	7/08	0.13	ac	CS1	
26	23:45	48.80	47-37.83	120-11.03	0.10	0.1	4/06	0.15	ad	NE1	
28	22:35	35.30	47-45.39	120-14.52	4.63	1.4	7/13	0.09	ac	NE1	
29	3:53	52.86	47-45.48	120-14.29	0.10	2.6	18/24	0.12	ac	NE1	F
29	4: 5	41.61	47-45.46	120-14.52	0.10	0.4	4/08	0.11	ad	NE1	
30	23:27	22.18	46-32.99	119-20.36	0.10	0.8	4/05	0.15	bd	SE1	P

Oct 1980

DAY	TIME	SEC	LAT	LON	DEPTH	MAG	NS/NP	RMS	Q	MODEL	TYPE
1	22:15	8.32	46-31.65	119-18.27	0.55	1.2	5/05	0.13	ad	SE1	

Oct 1980

DAY	TIME	SEC	LAT	LON	DEPTH	MAG	NS/NP	RMS	Q	MODEL	TYPE
7	22:36	32.15	47-19.30	119-49.60	0.10	2.2	24/24	0.20	cc	NE1	P
8	9:31	61.83	47-27.05	121-13.67	4.96	1.4	9/12	0.12	ac	CS1	
11	16:39	36.31	46-37.30	119-16.06	1.27	0.6	4/04	0.36	cd	SE1	
13	19:27	61.30	47-19.81	119-49.28	0.10	1.4	13/13	0.34	cc	NE1	P
17	22: 6	10.88	47-11.34	118-59.60	3.62	1.9	16/17	0.17	bc	NE1	P
18	23:39	66.58	47-40.38	120- 6.41	0.10	1.8	19/21	0.14	ac	NE1	
20	3:11	36.40	46-49.58	120-45.03	3.38	1.3	16/17	0.19	bc	CS1	
20	3:11	72.48	46-49.28	120-44.80	0.10	1.2	19/20	0.29	cc	CS1	
22	11:36	32.45	46-25.98	119-42.32	43.70	0.3	8/08	4.49	db	SE1	
23	0:21	40.94	46-31.47	119- 4.10	12.99	0.8	5/05	5.32	dd	SE1	
23	21:37	57.66	47-22.98	121-16.69	0.10	0.5	6/08	0.56	dc	CS1	
26	3:10	34.67	46-20.42	119-19.17	12.76	1.1	11/15	0.24	bb	SE1	
28	0:34	-3.20	46-30.75	117-40.24	0.10	1.8	10/15	0.59	dd	SE1	X
29	22:25	24.36	47-11.59	118-59.89	0.10	2.0	15/16	0.22	bc	NE1	

Nov 1980

DAY	TIME	SEC	LAT	LON	DEPTH	MAG	NS/NP	RMS	Q	MODEL	TYPE
1	8:34	41.53	48-18.37	121-15.60	8.04	1.7	6/08	0.20	cd	CS1	
1	12:36	67.57	46-27.65	119-43.32	18.90	1.5	19/23	0.12	ab	SE1	
3	23:47	15.41	48- 3.60	118-42.78	0.10	1.8	20/23	0.32	cc	NE1	P
5	18: 9	25.58	46-29.09	119- 8.49	27.37	0.6	5/05	0.33	dd	SE1	
5	21:31	55.26	46-54.90	119-26.83	38.23	0.7	4/04	0.58	dd	SE1	
7	0: 4	35.95	46-57.44	119-28.19	1.79	2.6	15/21	0.35	cc	SE1	
8	6:58	15.96	47-43.81	120- 5.52	0.10	0.3	6/11	0.20	bb	NE1	
9	2:36	17.29	47-42.12	120- 3.67	0.10	2.7	30/42	0.76	db	NE1	

Nov 1980

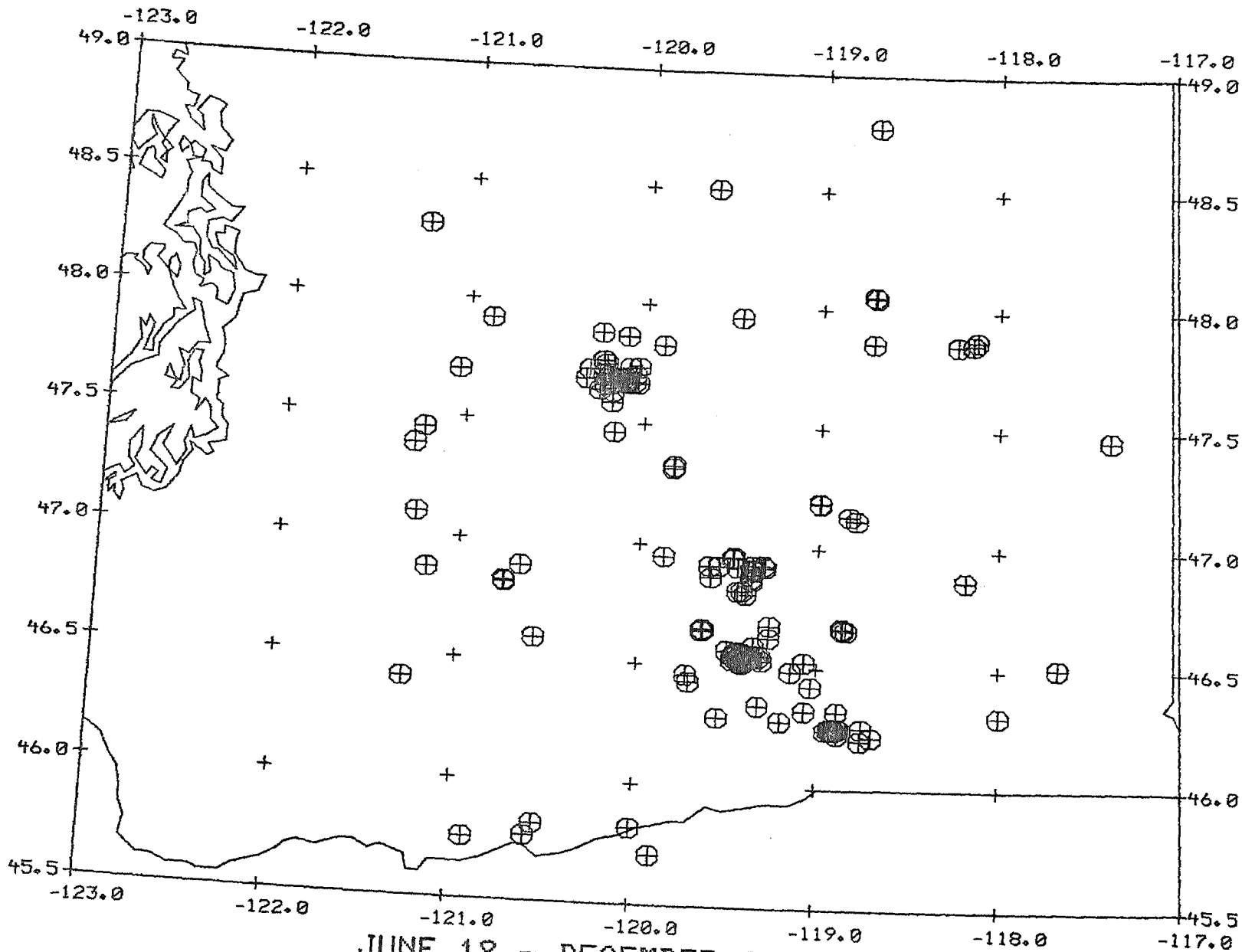
DAY	TIME	SEC	LAT	LON	DEPTH	MAG	NS/NP	RMS	Q	MODEL	TYPE
11	0:32	68.69	47-52.48	120-15.17	0.52	0.6	5/05	0.79	dd	NE1	
12	18: 0	31.42	47-40.85	120-20.23	0.52	0.3	5/07	0.34	cd	NE1	
17	7:25	47.63	46-35.52	120-34.23	17.17	1.5	21/24	0.21	bb	CS1	
18	15:54	28.57	47-38.17	120-15.53	3.43	1.7	12/17	0.22	bb	NE1	
18	23:38	23.63	46-40.36	119-15.89	10.08	0.8	4/05	1.48	dd	SE1	
19	21:35	23.82	46-57.09	119-28.56	0.08	3.3	39/46	0.34	cc	SE1	
20	5:37	31.57	47-43.25	120-19.14	5.77	0.5	6/10	0.11	ab	NE1	
23	0:51	43.62	47-43.96	120- 2.41	4.87	0.4	4/06	0.11	bd	NE1	
23	4:10	53.95	46-55.12	119-33.18	0.10	2.5	19/21	0.54	db	SE1	
24	5:33	32.13	47-57.44	119-27.74	13.85	1.2	5/09	0.12	ad	NE1	
30	2:29	60.98	47-51.75	120- 6.46	19.82	-0.2	4/05	0.74	dd	NE1	
30	3:14	30.13	45-42.27	119-53.57	0.10	1.4	10/10	0.18	cd	SE1	P

Dec 1980

DAY	TIME	SEC	LAT	LON	DEPTH	MAG	NS/NP	RMS	Q	MODEL	TYPE
2	10:12	68.24	47-35.05	120-11.19	0.10	0.	4/05	0.40	cd	NE1	
3	6:58	46.62	46-55.01	119-17.75	0.10	2.6	31/37	0.88	dc	SE1	
3	6:59	46.72	46-54.62	119-21.14	0.55	0.7	6/07	0.19	bc	SE1	
3	7: 1	36.48	46-55.39	119-21.96	0.10	1.0	10/11	0.27	bc	SE1	
3	23:46	22.85	47-40.94	120- 8.05	0.10	2.2	33/40	0.27	bc	NE1	
4	1:30	27.92	46-19.37	119- 3.71	0.10	1.2	5/05	0.49	cd	SE1	
4	12:59	39.70	46-54.39	119-21.11	0.10	1.0	6/08	0.16	bc	SE1	
5	5:58	66.59	46-54.22	119-21.71	0.10	0.5	5/06	0.44	cd	SE1	
5	20: 4	49.82	46-15.32	118-53.18	0.10	1.2	7/09	0.33	cd	SE1	P
6	19:19	23.51	46-14.75	118-55.29	0.10	2.1	8/09	0.29	bd	SE1	X
6	22:16	57.03	46-15.39	118-52.52	0.10	2.1	4/04	0.54	dd	SE1	X

Dec 1980

DAY	TIME	SEC	LAT	LON	DEPTH	MAG	NS/NP	RMS	Q	MODEL	TYPE
7	0:15	32.14	46-14.59	118-56.52	0.10	1.5	8/08	0.37	cc	SE1	X
7	9:32	11.58	47-55.17	120-52.68	0.10	0.8	7/08	0.28	cd	NE1	
8	21:33	43.54	46-15.12	118-54.29	0.10	1.1	10/10	0.43	cd	SE1	X
9	0:47	68.69	46-15.06	118-53.97	0.10	1.1	7/07	0.29	cd	SE1	X
9	17:15	13.92	46-15.01	118-54.26	0.10	0.9	5/05	0.33	cd	SE1	X
9	22:58	31.41	47-44.65	120-13.45	0.10	0.1	4/07	0.23	bd	NE1	
10	1:6	41.50	46-14.76	118-55.13	0.10	1.5	13/13	0.23	bc	SE1	X
10	14:17	10.81	46-15.13	118-55.01	0.10	1.2	9/09	0.14	bd	SE1	X
11	6:29	48.57	46-14.85	118-54.47	5.35	1.2	6/06	0.21	bd	SE1	X
12	3:50	40.73	46-13.65	118-52.86	0.10	1.5	7/08	0.20	cd	SE1	P
12	4:31	44.65	46-54.66	119-22.11	0.10	0.8	4/05	0.18	bd	SE1	
12	18:41	37.66	46-57.07	119-51.78	0.10	1.9	32/32	0.49	cb	SE1	
13	1:8	35.35	46-14.64	118-53.89	0.10	1.0	8/10	0.34	cd	SE1	X
13	18:5	43.21	46-15.04	118-52.35	6.99	0.9	6/06	0.16	bd	SE1	X
17	4:25	34.94	46-15.29	118-44.91	24.15	1.1	5/06	0.29	dd	SE1	X
17	9:11	36.67	46-15.33	118-52.84	0.10	1.2	6/06	0.18	cd	SE1	X
17	9:25	47.75	46-12.20	118-45.27	0.10	1.3	5/06	0.25	dd	SE1	P
17	18:39	27.93	46-13.18	118-41.65	0.10	1.4	6/07	0.23	dd	SE1	P
18	22:44	29.17	45-48.95	120-0.34	0.10	3.5	21/24	0.32	cb	CS1	
19	11:0	50.73	47-41.64	120-12.64	0.10	0.4	4/08	0.26	bd	NE1	
19	20:47	16.20	47-39.31	120-13.89	0.10	0.2	4/08	0.17	bd	NE1	



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EARTHQUAKES AND BLASTS