

QUARTERLY TECHNICAL REPORT 83-A

on

Seismicity of the Washington and Northern Oregon Cascades

January 1 through March 31, 1983

Geophysics Program

University of Washington

Seattle, Washington

This report is prepared as a preliminary description of the seismic activity in the Cascade Mountains of Washington and Northern Oregon. Information contained in this report should be considered preliminary, and not cited for publication. Seismic network operations in and around the Cascade Range are supported by the following contracts:

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## INTRODUCTION

This is the first quarterly report from the University of Washington Geophysics Program covering seismicity in the Cascade mountains of Washington and northern Oregon. Quarterly reports have been produced since 1975 covering the seismicity of eastern Washington, and annual catalogs have been produced since 1969 covering the seismicity of western Washington. This report covers network operations, seismicity of the area, and a brief discussion of any unusual events or findings. These reports are to be considered preliminary, and are not a substitute for detailed technical reports, a regional catalog, or technical papers. Findings mentioned in these quarterly reports should not be cited for publication.

The area covered by this report is a narrow north-south strip extending from the Canadian border at  $49^{\circ}$  N to Three Sisters volcano, Oregon at  $44^{\circ}$  N. The longitude of this strip varies from  $120.5^{\circ}$  to  $122^{\circ}$  W for the northern half and from  $121^{\circ}$  to  $122.5^{\circ}$  W for the southern half. Figure 1 shows the major geographical features of this area and the seismograph stations currently in operation. Additional stations located off this map are routinely used for locating earthquakes within this area.

## Operations

The seismograph stations operating in the Cascades are supported by several federal agencies. Currently, most stations in Northern Oregon are not operating due to financial cut backs. The telemetry costs for the 16 USGS stations in this area exceed our current budget. Alternate telemetry routes are being developed and operations of these stations may resume later this summer.

First-quarter operation of stations in and adjacent to the Cascade Range was disappointing. Only in the Mt. St. Helens - Mt. Rainier region were almost all

network stations operational for most of the quarter. At least one station remained operational on or near each of the more-recently-active stratovolcanoes (Baker, Rainier, St. Helens, and Hood).

In the North Cascades, MBW on the west flank of Mt. Baker remained in reliable operation throughout the winter. The Skagit Valley stations remain nonoperational pending completion of an agreement to telemeter their data via microwave. WTP, a station on the east side of the North Cascades, was closed in March; several other stations in the southern Lake Chelan area experienced intermittent or prolonged outages.

Nearly all stations in the Mt. Rainier area remained operational. A new station (RVC) was installed on 15 January at Voight Creek, just west of Mt. Rainier National Park. All but one station in the Mt. St. Helens area continued in full operation. The station on Mt. Adams was only intermittently operating. Between St. Helens and the Columbia River, RED was out for the entire quarter, and GLD was closed in March. AUG, near Bingen, remained in operation but is a noisy site.

South of the Columbia River, only TDH (just south of Hood), VGB (east of the Cascades), and VGT (on the western side of the Range) operated continuously; although VFP (east of Hood) was occasionally up for short intervals.

#### **Data**

There were 278 events in the Cascades processed by the network in the first quarter of 1983. Of these, 21 were known or suspected blasts, and 257 were earthquakes. Eleven of the earthquakes were handpicked from film records, because they did not trigger the online system. 163 of the earthquakes occurred in the Mt. St. Helens area. Table 1 is the event catalog for this quarter; figure 2 shows the earthquakes in the northern and southern Cascades excluding

Mount St. Helens (MSH); and figure 3 shows earthquakes in the MSH area. Blasts and probable blasts are not plotted.

During the first quarter of 1983, three felt events occurred in the Cascades. The first occurred 30 kilometers northwest of Mt. Rainier on January 24 and was felt in Carbonado. This magnitude 3.0 earthquake was the largest earthquake to occur in the Cascades during the quarter. The second felt event, a  $M=2.7$  near Mt. Hood in northern Oregon on February 23, was felt at Timberline Lodge on Mt. Hood. The last felt event ( $M=2.9$ ) occurred on March 3 and was felt in Fall City.

The seismic activity in the northern Cascades this quarter was predominately on the west flank of the range. Few earthquakes occurred under the crest of the Cascades. This distribution is typical of seismicity occurring in this region for the preceding decade.

Two concentrations of activity are evident in the southern Cascades, the activity in the Elk Lake aftershock zone and the MSH area. Forty earthquakes with magnitudes less than 2.0 occurred in the aftershock region of the 1981 Elk Lake ( $M = 5.5$ ) earthquake.

Details of activity at MSH are covered in the Mount St. Helens monthly seismic reports. To summarize briefly, an eruption began between 4 February and 7 February. Seismic activity indicated that the extrusion continued through approximately 23 February. The seismic activity then returned to near background levels. In early March, both the seismicity and reported deformation rates suggested another eruption was due within the month, however, activity declined toward the end of the month and no new eruption had begun by the end of the quarter.

The apparent lack of seismic activity in the Oregon Cascades is due to the large number of station outages in that region rather than a real decrease in seismicity.

Table 1 is a catalog of the located events between January 1, 1983 and March 31, 1983. The locations reported in this catalog have been determined using a location routine obtained from Dr. Bob Herrmann at St. Louis University and extensively modified and tested here at the University of Washington. Azimuthal weighting is used and obviously bad readings are automatically thrown out. There is a special depth adjustment algorithm for events with poorly controlled shallow depths.

Most of the columns in the catalog are self explanatory. Times are in coordinated universal time (PST + 8hr). The \* sometimes following the depth means that the depth has been fixed. \$ and # mean that the maximum number of iterations has been exceeded without meeting convergence tests and both this and the depth have been fixed. Events flagged with these symbols may be very poorly located even if the quality factors are good. NS/NP is the number of stations and the number of phases used in the location determination. The *types* listed in the catalog are as follows:

X-Known explosion

P-Probable explosion (based on seismogram character)

F-Earthquake reported to have been felt

L-Low frequency earthquake

H-Hand picked event from film records

CATALOG

Jan 1983											
DAY	TIME	SEC	LAT	LON	DEPTH	MAG	NS/NP	RMS	Q	MODEL	TYPE
2	13:30	55.87	47 25.17	121 44.37	18.78	1.3	7/08	0.18	BC	P1	
5	11:37	71.57	46 31.13	121 24.94	4.28\$	1.6	8/09	0.16	BC	C1	
8	17:49	8.15	46 45.00	121 51.10	6.81	0.6	5/08	0.20	BD	C1	
10	22:12	18.71	46 52.00	121 44.81	0.97#	0.7	6/08	0.29	CD	C1	
10	22:12	25.94	46 51.78	121 44.11	0.89\$	1.8	20/23	0.32	CB	C1	
11	18:0	23.03	46 50.56	121 45.30	0.04*	1.0	14/20	0.30	BC	C1	
12	18:18	44.16	46 46.09	121 36.11	5.66	1.4	11/14	0.17	BB	C1	
13	15:29	31.12	46 39.63	121 47.36	2.88	1.5	9/14	0.20	BC	C1	
13	18:29	40.62	47 44.03	121 51.09	19.26	2.2	13/17	0.39	BB	P1	
15	17:25	36.39	46 45.72	121 36.07	7.29	0.7	6/10	0.12	AC	C1	
16	0:16	53.75	46 57.51	121 51.61	0.87	1.3	16/18	0.28	BB	C1	
17	22:24	59.60	47 35.59	121 44.29	8.22	1.1	8/10	0.17	BC	P1	
17	22:54	60.18	46 32.23	121 46.24	5.85	2.0	33/39	0.24	BC	C1	
20	22:15	32.85	46 37.20	121 44.81	12.85	1.0	11/16	0.14	AB	C1	
20	23:19	12.30	47 54.76	121 51.41	1.84*	1.1	6/08	0.21	BC	P1	P
22	1:52	39.35	46 40.03	121 52.64	6.14	1.1	11/17	0.14	AB	C1	
22	23:42	10.92	47 50.15	121 49.12	13.94#	1.6	4/06	0.12	DD	P1	H
23	6:18	13.04	47 4.93	121 49.09	1.26	1.0	9/11	0.24	BC	C1	
24	13:31	52.80	47 4.39	121 58.46	5.44	3.0	39/41	0.30	BC	C1	F
25	17:58	4.42	46 49.77	120 51.14	9.06	1.8	9/13	0.26	BD	C1	
30	12:40	16.34	47 24.47	121 43.32	9.12	1.9	8/09	0.22	BB	P1	
30	17:17	39.76	46 31.20	121 23.58	4.37*	1.9	18/20	0.25	BC	C1	
30	20:1	28.29	47 33.10	121 45.19	16.47	1.6	7/08	0.20	BB	P1	
31	22:56	36.56	48 2.15	121 54.37	2.60	2.2	8/11	0.22	BC	P1	P

Feb 1983											
DAY	TIME	SEC	LAT	LON	DEPTH	MAG	NS/NP	RMS	Q	MODEL	TYPE
1	1:10	24.54	48 7.25	121 38.61	8.54	1.9	8/10	0.25	BC	P1	
1	6:10	28.59	48 6.39	121 40.86	10.09	0.7	4/06	0.36	CD	P1	
2	15:5	54.82	47 3.97	121 53.80	0.06#	2.0	14/18	0.43	CC	C1	
4	23:2	39.01	47 33.56	121 41.43	3.64	1.1	10/12	0.29	BC	P1	
5	19:59	57.77	47 31.69	120 37.46	7.84	1.4	6/12	0.27	AC	N1	H
7	8:58	17.00	47 4.51	121 0.48	3.72	2.4	40/44	0.28	BC	C1	
7	9:4	56.10	47 3.77	121 1.53	0.09*	1.6	9/09	0.19	CC	C1	
10	5:9	22.17	47 33.24	121 46.94	19.10	1.9	11/13	0.17	BB	P1	
10	5:28	35.04	47 32.99	121 43.24	17.37	1.3	4/06	0.17	DD	P1	H
11	11:9	61.49	47 58.54	121 33.01	5.30\$	1.7	9/11	0.38	CC	P1	
12	17:1	30.02	47 7.20	121 49.45	14.26	1.9	19/24	0.37	BB	P1	
14	20:59	49.65	46 38.78	121 55.58	7.73	0.6	7/09	0.07	AB	C1	
14	21:41	24.73	47 9.62	121 55.34	4.79	2.4	18/20	0.56	EC	P1	X
18	21:49	43.67	47 19.07	121 58.45	8.01	1.0	6/06	0.14	CD	C1	
20	21:48	15.35	48 5.63	121 53.19	0.56	1.7	4/07	0.10	AD	P1	H
23	8:34	33.11	47 59.31	121 56.36	12.82	2.0	10/13	0.25	BB	P1	
23	12:21	15.23	47 59.41	121 56.61	14.78	2.1	13/17	0.25	BB	P1	
26	14:14	31.74	47 28.02	121 44.75	18.21	1.6	10/12	0.23	BB	P1	
27	22:48	54.32	47 55.52	121 45.45	6.27	2.2	21/24	0.24	EC	P1	

Feb 1983

DAY	TIME	SEC	LAT	LON	DEPTH	MAG	NS/NP	RMS	Q	MODEL	TYPE
28	4:23	44.44	47 32.62	120 39.85	6.58	1.6	11/17	0.30	BC	N1	

Mar 1983

DAY	TIME	SEC	LAT	LON	DEPTH	MAG	NS/NP	RMS	Q	MODEL	TYPE
1	10:15	24.08	48 19.00	121 56.77	5.84	1.5	4/05	0.11	CD	P1	H
2	19:54	47.43	47 9.08	121 53.49	8.44	1.9	10/14	0.21	BB	P1	P
3	5:58	58.01	47 31.54	120 38.73	0.32\$	1.8	15/17	0.19	CC	N1	
3	15:37	60.16	47 34.29	121 55.92	6.54	2.9	35/37	0.35	BC	P1	F
3	19: 3	43.47	47 49.55	121 57.88	5.03	1.8	4/05	0.01	AD	P1	P
4	5:34	41.65	47 58.56	121 33.46	5.71\$	1.9	8/11	0.28	BC	P1	
5	22:58	23.99	47 43.12	121 25.31	4.20	1.9	14/16	0.37	BC	P1	
7	0:16	45.98	47 55.30	121 50.38	14.74	1.6	7/11	0.49	CB	P1	
7	17:43	18.90	47 49.48	121 58.10	6.20	1.7	6/09	0.08	AC	P1	P
9	17:10	16.30	47 28.98	121 47.79	22.57	1.8	10/12	0.26	BB	P1	
10	8: 4	45.81	47 38.39	121 54.38	13.78	2.0	7/12	0.23	BB	P1	H
10	22:39	9.53	47 49.34	121 58.11	6.46	2.1	5/06	0.19	BD	P1	P
11	12:29	53.23	48 5.28	121 39.41	10.05	2.0	6/07	0.11	AC	P1	
11	12:45	47.06	47 28.30	121 49.51	20.19	2.0	12/14	0.33	BA	P1	
11	23:37	53.54	47 5.03	121 48.28	0.05*	2.2	10/10	0.17	CC	C1	P
12	17:17	32.54	47 28.51	121 50.47	21.02	1.9	9/10	0.43	CB	P1	
14	1:59	55.99	46 51.15	121 45.87	1.00\$	1.1	11/15	0.32	BC	C1	
14	23:24	38.19	47 28.10	121 51.08	4.75	0.7	8/09	0.18	AC	P1	P
18	0:10	16.57	47 50.04	121 57.63	6.67	1.9	7/09	0.13	BB	P1	P
19	23: 3	22.50	47 49.73	121 57.66	6.88	2.0	5/07	0.14	BD	P1	P
20	5:16	61.47	47 8.85	121 6.29	6.25	1.2	8/12	0.29	BC	C1	
22	21:46	22.44	47 7.87	121 56.90	5.59	2.1	16/17	0.26	BC	P1	P
24	0:54	51.81	47 26.20	121 44.09	7.92	1.8	6/09	0.23	BC	P1	H
24	1:24	58.84	47 26.00	121 44.26	8.51	1.8	5/09	0.28	BD	P1	H
25	8:40	9.96	47 40.99	121 56.63	10.08	2.1	6/06	0.07	AC	P1	H
25	17:58	58.91	47 26.45	121 55.97	7.58	0.8	7/09	0.17	BB	P1	P
25	22:39	21.97	47 49.21	121 57.98	4.82	2.3	11/13	0.37	BB	P1	P
26	15: 4	23.71	46 57.79	121 57.89	5.91	1.7	18/22	0.17	AA	C1	
28	20:52	40.05	46 52.53	121 56.05	8.18	1.4	10/13	0.12	AB	C1	
28	23:35	17.67	47 28.03	121 51.92	3.78	2.0	17/17	0.31	BA	P1	P
29	2:12	15.72	47 42.39	121 28.01	6.94	1.4	5/08	0.30	BD	P1	H
31	3:40	2.58	47 39.35	121 56.97	69.90	1.6	9/15	0.26	BB	P1	H

Jan 1983

DAY	TIME	SEC	LAT	LON	DEPTH	MAG	NS/NP	RMS	Q	MODEL	TYPE
1	2:24	67.98	46 12.13	122 11.55	0.04*	0.3	6/06	0.08	CC	S1	
1	2:38	8.67	46 12.32	122 11.85	0.10*	1.3	7/07	0.15	CB	S1	L
1	2:38	68.23	46 12.12	122 11.28	0.08*	0.3	6/06	0.11	CC	S1	
1	2:39	49.24	46 11.96	122 11.13	0.32	0.9	9/09	0.07	AB	S1	
1	2:43	27.12	46 11.93	122 11.45	0.71	0.7	9/09	0.09	AB	S1	
1	2:45	18.65	46 12.27	122 11.53	0.69	0.9	8/08	0.14	AB	S1	
2	4:29	41.39	46 12.70	122 12.42	0.06#	1.8	6/06	0.61	DC	S1	L
2	4:32	40.33	46 12.09	122 11.29	1.49	0.9	10/10	0.11	AB	S1	
2	10: 5	22.47	46 12.28	122 11.36	1.44	1.5	14/15	0.12	AA	S1	
2	20:10	19.09	46 11.87	122 11.32	2.41	1.0	8/08	0.16	BB	S1	
3	8:28	63.68	46 12.17	122 11.40	1.34	1.0	5/05	0.08	BD	S1	
4	8:15	53.19	46 11.95	122 11.24	1.06	0.9	8/08	0.16	AB	S1	

Jan 1983											
DAY	TIME	SEC	LAT	LON	DEPTH	MAG	NS/NP	RMS	Q	MODEL	TYPE
4	20:57	34.41	46 22.44	122 13.20	0.06*	0.8	8/10	0.08	AB	S1	
5	0:46	71.04	46 12.78	122 11.48	1.63	0.6	6/06	0.10	BD	S1	
5	0:53	71.46	46 11.96	122 11.38	0.58	1.1	6/06	0.10	BC	S1	
5	5: 5	46.17	46 12.70	122 11.25	0.45	0.9	9/09	0.12	AA	S1	
6	2:27	47.74	46 12.35	122 11.20	0.51	0.6	8/08	0.07	AA	S1	
6	6:22	52.99	46 12.07	122 11.51	0.03*	1.5	7/07	0.25	CB	S1	
6	6:23	25.32	46 12.50	122 11.46	0.04*	0.6	5/05	0.15	CD	S1	
7	22: 4	14.46	46 14.30	122 6.59	9.64	0.5	9/15	0.11	AB	S1	
9	16:40	69.98	46 12.23	122 11.42	0.77	0.7	9/10	0.10	AB	S1	
9	21: 4	73.48	46 12.06	122 11.46	0.09*	1.5	7/07	0.08	BB	S1	L
10	15:37	57.26	46 21.08	122 14.12	6.19	0.5	10/18	0.15	AC	S1	
11	4:47	71.34	46 12.43	122 11.43	0.09*	0.7	8/08	0.10	BA	S1	
11	11:49	70.80	46 12.19	122 11.60	0.74	0.8	6/06	0.12	BC	S1	
13	16:59	40.76	46 20.99	122 14.34	6.16	0.5	14/22	0.12	AB	S1	
13	18:18	38.93	46 21.06	122 14.53	6.50	1.1	20/27	0.12	AB	S1	
13	20:52	63.51	46 22.51	122 14.91	8.76	0.4	12/18	0.11	AB	S1	
13	23:17	20.02	46 11.99	122 11.56	0.20	0.9	7/07	0.16	BB	S1	
14	3:26	49.00	46 12.15	122 11.30	0.93	1.1	11/11	0.14	AA	S1	
14	4:32	63.73	46 12.08	122 10.72	5.55	0.6	9/11	0.09	AB	S1	
14	20:37	18.80	46 22.71	122 13.16	0.10*	0.5	16/18	0.13	AB	S1	P
15	7:52	65.67	46 12.13	122 11.57	1.43	1.0	11/11	0.16	BB	S1	
15	10:28	64.14	46 12.33	122 11.64	1.06*	0.7	7/07	0.14	BC	S1	
15	11:28	18.85	46 12.21	122 11.42	1.54	1.0	11/11	0.10	AB	S1	
15	11:28	39.04	46 11.76	122 11.47	0.29*	0.1	8/08	0.12	BB	S1	
15	12:12	62.23	46 12.49	122 11.82	0.06*	0.6	7/07	0.14	BB	S1	
15	17:59	31.89	46 12.26	122 11.42	1.43*	0.9	8/09	0.12	AB	S1	
15	22:45	17.39	46 11.95	122 11.24	0.73*	0.9	11/12	0.18	AB	S1	
16	6:49	62.73	46 25.78	122 20.94	16.99	0.6	15/20	0.19	BB	S1	
16	21: 3	68.51	46 12.34	122 11.68	0.10*	2.3	6/06	0.16	CC	S1	L
17	4:47	33.38	46 11.91	122 11.51	0.38	0.7	8/08	0.13	AB	S1	
17	6:10	43.88	46 5.82	122 9.30	8.03	0.4	13/18	0.18	BB	S1	
17	14: 2	74.73	46 12.27	122 11.28	0.68	0.9	8/08	0.10	AB	S1	
17	15:10	37.66	46 11.72	122 11.40	0.08*	0.5	7/08	0.18	CB	S1	
18	3: 6	25.09	46 12.52	122 11.16	0.09#	1.1	7/07	0.23	CB	S1	L
18	10:13	57.17	46 20.20	122 14.52	6.43	1.9	24/32	0.17	AB	S1	
18	15:21	68.62	46 12.20	122 11.38	0.61	0.9	6/06	0.08	AC	S1	
18	16:48	39.27	46 11.90	122 11.43	0.22*	0.6	7/07	0.22	BB	S1	
18	16:56	56.68	46 12.07	122 11.22	0.45	0.7	8/09	0.11	AB	S1	
18	17:25	42.29	46 12.12	122 11.68	0.83	0.7	9/09	0.17	BB	S1	
18	17:30	5.32	46 11.90	122 11.14	0.31	1.1	7/07	0.08	AB	S1	
19	6:17	60.09	46 11.75	122 11.91	2.38	0.7	7/09	0.18	BB	S1	
19	8:38	61.47	46 12.27	122 11.13	2.02	0.8	10/15	0.07	AB	S1	
19	9: 2	27.39	46 12.34	122 11.37	5.23	0.5	12/15	0.16	AB	S1	
19	12:49	58.08	46 12.00	122 11.51	0.82*	0.5	8/10	0.11	AB	S1	
19	13: 9	73.00	46 12.01	122 11.62	0.90	0.8	8/10	0.11	AB	S1	
19	14:19	45.17	46 12.13	122 11.15	0.85	1.0	11/12	0.09	AB	S1	
19	18:11	21.81	46 21.42	122 16.49	5.56	1.1	19/23	0.23	BB	S1	X
19	20: 5	55.51	46 12.14	122 11.41	0.70	0.9	9/13	0.14	AB	S1	
19	22:45	45.07	46 12.02	122 11.18	2.24	-0.1	7/10	0.15	BB	S1	
20	0:52	68.35	43 12.23	122 11.22	0.05*	0.4	7/08	0.19	CB	S1	
20	1:55	63.79	46 12.28	122 11.96	0.68	0.6	8/08	0.25	EB	S1	



Jan 1983

DAY	TIME	SEC	LAT	LON	DEPTH	MAG	NS/NP	RMS	Q	MODEL	TYPE
22	4:48	19.18	46 11.68	122 11.28	0.10*	0.8	8/09	0.20	CB	S1	
22	4:48	38.67	46 12.08	122 10.61	1.52	1.0	11/15	0.15	BA	S1	
22	8: 9	55.26	46 12.38	122 11.54	0.07*	0.8	6/06	0.12	CC	S1	
22	20:27	32.63	46 11.95	122 11.19	0.25	1.0	8/09	0.06	AB	S1	
22	22:15	66.73	46 11.95	122 11.32	0.09*	0.9	7/07	0.09	BB	S1	
22	22:45	74.87	46 11.94	122 11.42	0.06*	1.2	8/08	0.08	BB	S1	
23	12:54	26.44	46 12.24	122 11.82	0.06*	0.9	6/06	0.18	CC	S1	
24	17:48	30.53	46 12.68	122 11.56	2.00	0.7	6/07	0.15	BC	S1	
25	15:42	19.88	46 24.08	122 19.00	0.88	1.3	22/26	0.19	BC	S1	
26	17:57	24.29	46 12.28	122 11.75	4.32	0.1	6/09	0.14	AC	S1	
28	3: 5	44.89	46 11.71	122 11.67	0.24*	1.0	8/08	0.09	AB	S1	
28	9:38	60.01	46 11.94	122 11.45	0.20	0.9	8/08	0.07	AB	S1	
29	1:20	48.23	46 12.08	122 11.55	0.76	1.1	7/07	0.17	AB	S1	
29	8:10	62.77	46 20.22	122 14.11	8.27	0.4	10/16	0.06	AB	S1	
29	20:53	28.88	46 17.75	122 19.22	11.11	1.3	20/27	0.12	AA	S1	
31	15:11	72.82	46 12.04	122 11.43	0.09*	1.0	8/08	0.07	BB	S1	

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DAY	TIME	SEC	LAT	LON	DEPTH	MAG	NS/NP	RMS	Q	MODEL	TYPE
1	6:49	42.66	46 17.38	122 13.12	6.22	-0.3	12/18	0.09	AB	S1	
1	17:45	73.46	46 12.43	122 11.61	0.08*	0.9	7/08	0.09	BB	S1	
1	20: 1	53.12	46 11.87	122 10.94	0.08*	0.6	5/05	0.04	BD	S1	
1	22: 3	64.44	46 12.07	122 11.63	1.57	1.0	12/15	0.11	AA	S1	
1	22:10	66.83	46 11.86	122 11.39	1.12	0.4	9/13	0.15	AB	S1	
1	22:13	43.64	46 12.40	122 11.33	1.39	0.6	6/07	0.16	BC	S1	
2	7: 7	48.03	46 11.98	122 11.44	0.43	2.8	11/11	0.16	AA	S1	
2	14:54	58.43	46 12.04	122 11.32	0.07*	1.1	7/07	0.07	BB	S1	
2	20:41	35.89	46 21.40	122 14.97	8.71	0.2	10/17	0.13	AB	S1	
2	22: 0	54.91	46 12.01	122 11.29	0.26*	1.2	7/07	0.07	BB	S1	
3	2:14	57.25	46 11.87	122 11.31	0.06*	0.6	7/08	0.10	BB	S1	
3	7: 4	69.78	46 11.97	122 11.33	0.22	0.4	6/08	0.09	AC	S1	
3	7: 7	91.81	46 12.10	122 10.85	0.87*	0.1	6/06	0.06	AC	S1	
3	7:28	28.94	46 12.16	122 11.48	0.78	0.4	6/07	0.07	AC	S1	
3	7:32	22.93	46 12.00	122 10.88	3.75	-0.6	5/05	0.06	BD	S1	
3	11: 8	33.18	46 11.98	122 11.31	0.83	1.7	15/15	0.14	AA	S1	L
3	23: 9	29.42	46 12.05	122 11.14	1.49	1.0	7/08	0.14	BB	S1	
3	23:43	57.39	46 12.03	122 11.42	0.28	0.5	8/09	0.12	AB	S1	
4	4:58	29.68	46 12.00	122 11.26	1.28	0.9	7/07	0.11	AB	S1	
4	6:16	51.50	46 11.25	122 12.31	2.20	2.3	14/16	0.42	CA	S1	
4	7:38	74.07	46 12.05	122 11.28	2.23	0.5	10/11	0.08	AB	S1	
4	8:36	59.50	46 11.92	122 11.20	0.31	1.2	8/08	0.09	AB	S1	
4	8:54	68.17	46 12.12	122 11.09	0.43	0.6	8/08	0.12	AB	S1	
4	9:54	50.46	46 12.09	122 11.05	0.76	1.3	11/11	0.09	AB	S1	
4	13: 8	27.54	46 12.48	122 11.38	0.51	0.7	8/09	0.10	AB	S1	
4	14:39	76.75	46 12.08	122 11.11	1.21	0.6	13/15	0.05	AA	S1	
4	18:49	25.45	46 12.21	122 11.35	0.83	0.9	13/15	0.21	AA	S1	
5	6:34	16.98	46 12.12	122 11.65	0.29*	0.8	6/08	0.19	CC	S1	
8	0:46	35.59	46 22.67	122 15.08	9.17	1.2	25/35	0.19	AB	S1	
8	15:34	18.70	46 11.93	122 11.21	2.07	1.1	6/03	0.02	AC	S1	L
10	22:28	15.82	46 6.39	122 24.20	7.86#	0.6	17/22	0.25	EC	S1	
14	2:51	20.20	46 29.31	121 47.24	14.22	0.9	8/13	0.09	AE	C1	

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DAY	TIME	SEC	LAT	LON	DEPTH	MAG	NS/NP	RMS	Q	MODEL	TYPE
16	4:17	72.50	46 11.75	122 11.32	0.08*	1.0	13/14	0.24	BA	S1	
18	23:12	41.19	46 22.11	122 14.85	6.79	0.1	10/17	0.14	AC	S1	
21	11:25	15.51	46 22.17	122 14.76	7.61	1.9	26/35	0.14	AB	S1	
22	22: 6	22.78	46 4.95	122 28.89	0.09*	1.1	18/19	0.19	BD	S1	X
23	5:39	45.02	45 21.98	121 42.08	4.68	2.7	25/27	0.32	BC	C1	F
23	11:19	37.52	46 21.43	122 15.19	11.55	0.8	15/20	0.11	AB	S1	
24	15:22	23.51	46 12.95	122 11.13	0.08*	1.3	7/07	0.24	CB	S1	
27	22:46	28.93	46 12.08	122 11.40	0.08*	0.7	7/08	0.04	AB	S1	
27	23:40	51.91	46 12.66	122 11.15	2.28	0.7	7/08	0.16	BB	S1	
28	13:38	13.96	46 15.09	122 29.51	1.21	0.9	16/24	0.22	BC	S1	
28	22:24	42.01	46 12.75	122 11.35	0.03#	1.9	6/08	0.23	CC	S1	L

Mar 1983

DAY	TIME	SEC	LAT	LON	DEPTH	MAG	NS/NP	RMS	Q	MODEL	TYPE
1	4: 7	38.34	46 11.26	122 11.17	0.75\$	1.2	7/07	0.23	BB	S1	L
1	5:35	62.13	46 14.67	122 7.53	8.87	0.6	20/28	0.16	AB	S1	
1	14:25	68.14	46 21.28	122 15.10	5.72	0.3	15/21	0.11	AB	S1	
1	15: 6	33.36	46 11.98	122 11.12	0.48	1.6	8/08	0.08	AB	S1	L
1	21:45	17.58	46 12.43	122 11.98	0.08*	0.5	7/07	0.32	CB	S1	
2	0:48	18.57	46 5.18	122 28.57	0.08*	1.5	22/24	0.21	BB	S1	P
2	4:37	28.82	46 12.27	122 11.21	2.10	0.9	10/10	0.11	AB	S1	
2	8: 1	32.74	46 11.68	122 11.44	0.07*	0.6	7/09	0.14	CB	S1	
3	5:58	48.88	46 13.10	122 11.75	0.07*	2.1	5/05	0.09	CD	S1	L
3	12:51	28.30	46 12.77	122 11.66	0.09*	1.0	6/08	0.23	CC	S1	L
3	22:23	24.17	46 12.00	122 10.94	1.90	1.6	6/08	0.15	AC	S1	L
4	3:47	43.92	46 12.14	122 11.84	0.49\$	1.0	7/07	0.27	CB	S1	L
4	4:47	19.50	46 12.12	122 11.58	0.04*	0.8	12/12	0.21	BB	S1	
4	15:45	64.65	46 11.95	122 11.28	1.26	1.5	19/21	0.18	AA	S1	
4	19:56	76.38	46 11.38	122 12.07	1.42	1.6	10/10	0.13	AC	S1	L
4	21:21	35.54	46 12.40	122 11.67	0.08*	1.2	8/08	0.22	CA	S1	L
4	23: 7	31.94	46 22.64	122 13.00	0.10*	0.2	17/19	0.25	BB	S1	P
5	0:26	43.35	46 13.41	122 11.42	0.05#	0.9	5/05	0.36	DD	S1	L
5	10:22	42.99	46 12.23	122 11.21	0.26*	1.3	7/07	0.18	CB	S1	L
5	12:11	67.42	46 12.44	122 11.20	0.07#	1.9	7/07	0.35	CB	S1	L
5	16:22	22.08	46 11.94	122 11.16	0.10*	0.7	7/07	0.18	BB	S1	L
5	17:25	27.25	46 12.44	122 11.39	0.07*	1.5	6/06	0.12	CC	S1	L
5	19:17	64.63	46 12.33	122 11.70	0.08*	0.9	7/07	0.12	BB	S1	L
5	19:26	48.14	46 14.16	122 6.50	10.37	0.8	21/32	0.18	AA	S1	
5	20:15	35.31	46 12.26	122 11.64	0.97*	1.3	8/08	0.16	BB	S1	L
5	20:30	41.69	46 14.19	122 6.44	10.40	0.5	21/32	0.17	BA	S1	
5	23:42	61.25	46 12.48	122 11.32	0.10#	-0.5	5/05	0.11	BD	S1	
5	23:51	54.66	46 12.38	122 11.13	0.04*	1.5	8/08	0.11	BA	S1	L
6	6:31	65.29	46 12.46	122 11.79	0.40	0.8	6/06	0.09	AC	S1	L
6	6:35	35.22	46 14.59	122 6.25	9.35	-0.2	13/17	0.14	AB	S1	
6	9:11	25.53	46 12.56	122 11.88	0.21*	0.7	5/05	0.12	CD	S1	L
6	10: 0	68.65	46 12.58	122 11.75	1.41	1.2	6/08	0.13	ED	S1	L
6	10:56	53.77	46 12.17	122 11.50	0.08*	0.8	8/08	0.07	BB	S1	
6	10:58	25.15	46 12.10	122 11.19	2.32	1.3	6/08	0.20	EC	S1	L
6	11:20	73.17	46 12.40	122 11.21	0.09*	0.5	6/06	0.24	CC	S1	L
6	11:24	23.59	46 12.22	122 11.93	1.08#	0.7	6/06	0.15	CC	S1	L
6	12:39	41.51	46 11.75	122 11.53	0.04*	1.5	7/07	0.24	CB	S1	L

Mar 1983

DAY	TIME	SEC	LAT	LON	DEPTH	MAG	NS/NP	RMS	Q	MODEL	TYPE
8	18:13	27.41	46 12.23	122 11.46	0.33*	0.9	7/07	0.50	DB	S1	L
8	20:12	20.60	46 12.69	122 11.28	0.07*	0.9	7/07	0.14	BB	S1	L
6	20:41	47.64	46 24.19	122 17.23	14.98	0.8	14/16	0.19	AA	S1	
6	21:13	17.94	46 12.36	122 11.68	0.04#	0.6	5/05	0.34	DD	S1	L
6	21:23	30.01	46 11.40	122 10.93	0.59\$	0.7	6/08	0.34	CC	S1	L
7	1: 4	55.47	46 11.95	122 11.16	0.69	1.1	9/09	0.15	AB	S1	L
7	21:22	52.49	46 12.18	122 11.34	1.80	0.5	8/08	0.08	AB	S1	L
7	23:20	45.50	46 12.10	122 11.20	0.39	1.0	9/09	0.11	AB	S1	L
8	1:11	67.71	46 12.42	122 11.17	0.16*	1.1	6/08	0.10	BC	S1	L
8	1:50	53.31	46 12.60	122 11.43	1.22	1.6	8/08	0.08	AC	S1	
8	4:57	27.95	46 11.74	122 10.92	2.10	1.4	9/09	0.15	AB	S1	
8	9:25	71.37	46 14.27	122 6.24	10.29	0.9	23/34	0.17	BA	S1	
8	10:49	41.18	46 12.05	122 12.49	0.36	0.9	7/07	0.20	BB	S1	L
8	14:52	63.13	46 12.48	122 11.75	0.03*	1.5	6/08	0.24	CC	S1	L
8	18:19	37.67	46 12.91	122 5.11	0.02#	1.3	6/08	1.61	DD	S1	L
8	18:42	65.40	46 11.63	122 11.18	0.82#	1.3	9/09	0.25	BB	S1	
8	23:57	40.17	46 12.86	122 11.28	0.05#	0.9	5/05	0.17	CD	S1	L
9	13:31	21.15	46 20.75	122 14.70	10.87	1.1	23/29	0.13	AA	S1	
10	7:39	21.85	46 11.45	122 11.33	0.05*	2.1	17/17	0.27	BA	S1	L
10	17:31	33.32	46 12.88	121 35.96	0.08*	1.6	10/10	0.25	CC	C1	L
11	6:33	37.95	46 12.13	122 11.73	0.39	1.0	8/08	0.18	AB	S1	L
11	7:53	8.33	46 11.51	122 11.40	0.43	1.1	8/08	0.20	BB	S1	L
12	1:32	1.78	46 12.35	122 11.36	0.08*	1.4	7/07	0.11	BB	S1	L
13	0:44	40.00	46 20.95	122 23.97	7.65	0.1	11/16	0.14	AC	S1	
13	3:38	50.31	46 12.31	122 11.40	1.56	0.9	13/13	0.10	AE	S1	
14	9: 9	52.81	46 18.78	122 14.38	8.41	0.5	18/24	0.14	AA	S1	
14	14:43	34.47	46 25.34	122 22.06	15.99	0.4	13/19	0.15	BA	C1	
15	18:41	49.38	46 20.10	122 13.82	6.03	1.6	22/29	0.20	BB	S1	
15	22:18	61.87	46 12.88	122 12.16	0.07#	1.4	6/08	0.15	CC	S1	L
18	17:36	34.26	46 21.57	122 14.44	7.63	1.5	24/32	0.15	AB	S1	
19	8:32	18.23	46 12.36	122 11.14	1.51	1.2	10/10	0.08	AA	S1	
19	19:51	16.43	46 20.97	122 23.93	8.50	0.2	9/14	0.07	AB	S1	
20	7:57	38.63	46 12.51	122 11.82	0.03*	0.9	5/05	0.21	CD	S1	
20	13:47	66.06	46 6.18	122 6.20	9.26	2.0	31/37	0.23	BA	S1	
24	16:51	62.30	46 22.00	122 14.85	8.60	0.3	13/21	0.10	AB	S1	
25	4:22	45.40	46 19.69	122 14.27	9.21	0.	10/14	0.11	AB	S1	
25	7:45	29.05	46 11.36	122 11.73	0.43*	-0.1	8/09	0.16	EB	S1	
25	11:35	35.50	46 12.07	122 11.12	0.50	0.4	7/07	0.09	AB	S1	
25	12:22	34.04	46 12.12	122 11.36	0.22*	0.5	8/08	0.21	EB	S1	
25	20:29	45.00	46 21.32	122 15.09	5.14	-0.1	9/14	0.07	AE	S1	
25	23:30	29.89	46 0.57	122 7.82	1.78	0.5	15/17	0.13	AB	S1	P
26	10:14	17.50	46 12.21	122 11.57	0.05*	0.4	8/08	0.08	BB	S1	
26	18: 5	38.23	46 12.28	122 11.62	0.03*	0.5	6/08	0.16	CC	S1	
26	18:51	49.00	46 12.43	122 11.55	0.06#	1.2	7/07	0.25	CC	S1	L
29	8:51	20.39	46 12.01	122 11.41	1.75	1.5	7/07	0.10	AB	S1	L
29	12:16	43.65	46 21.09	122 24.01	6.59	0.1	12/16	0.15	AC	S1	
31	11:41	29.01	46 12.21	122 11.42	1.83	0.8	9/09	0.11	AB	S1	

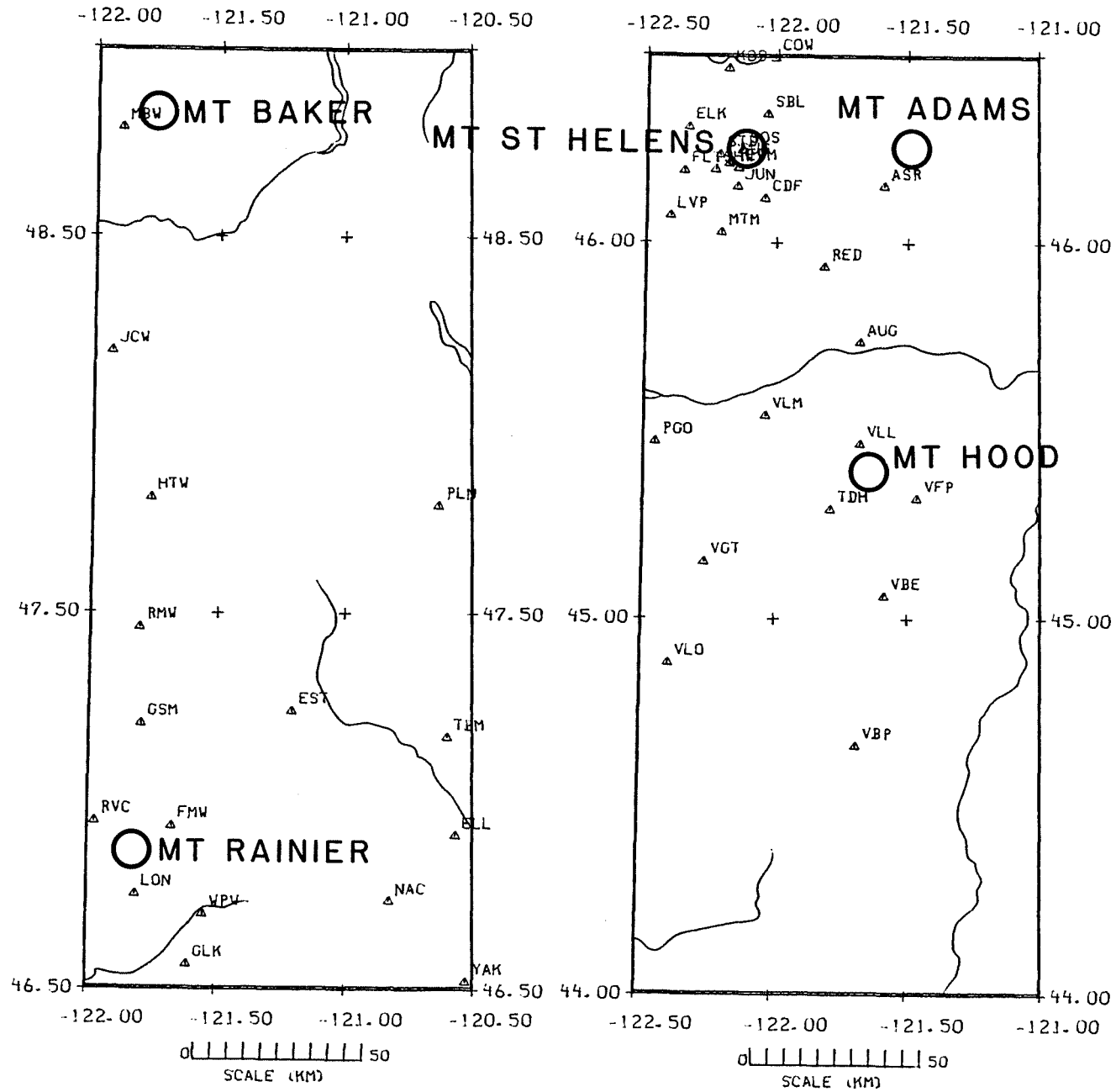


Figure 1. Seismograph stations operating in the Cascade Range, Washington.

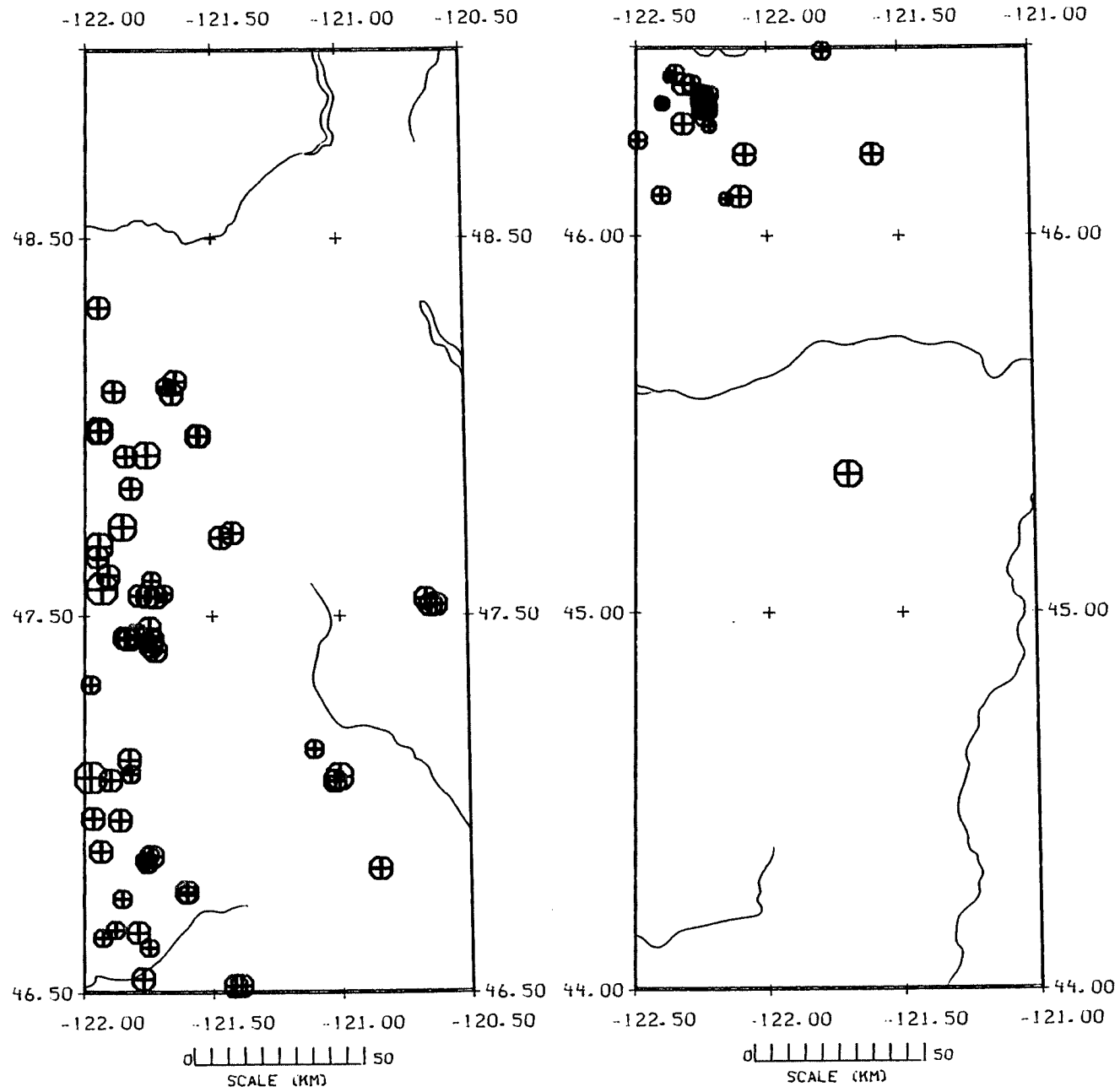


Figure 2. Earthquakes in northern and southern Cascades excluding Mt. St. Helens area, January 1 through March 31, 1983.

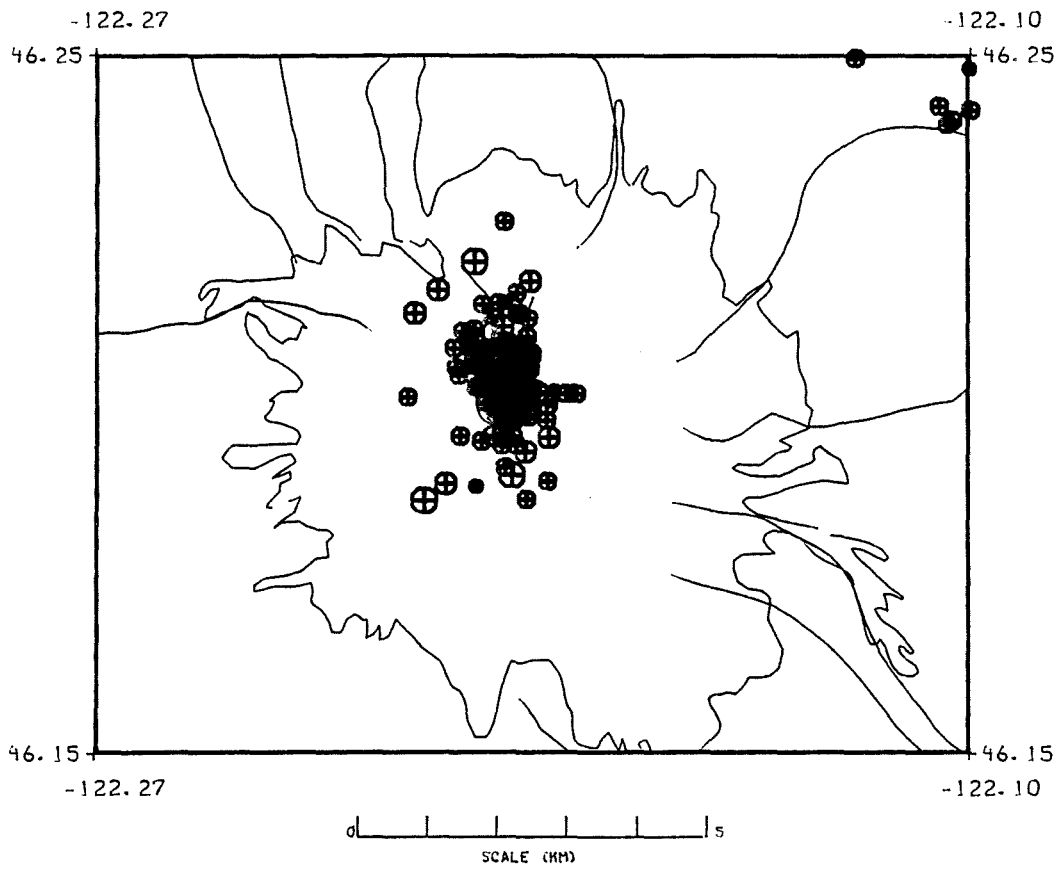


Figure 3. Earthquakes in Mt. St. Helens area, January 1 through March 31, 1983.