QUARTERLY TECHNICAL REPORT 82-A

on

Earthquake Monitoring of Eastern Washington and Northern Oregon

January 1 through March 31, 1982

Geophysics Program

University of Washington

Seattle, Washington

PREPARED FOR THE U.S. DEPARTMENT OF ENERGY
UNDER CONTRACT NO. EY-76-S-06-2225
TASK AGREEMENT NO. 39

and

THE U.S. NUCLEAR REGULATORY AGENCY
UNDER CONTRACT NO. NRC-04-81-177

and

WASHINGTON PUBLIC POWER SUPPLY SYSTEM
CONTRACT NO. C-10976

Operations

Operation of the eastern Washington seismic network continued in mainly a stable mode in the first quarter of 1982. Stations CBW, PLN, TBM, PAT, and DYH continued to have significant amounts of down time. However, other problems were corrected during the quarter. BDG was moved about 900 feet, resulting in about a factor of four improvement in the signal/noise ratio. High-frequency noise had been a severe problem for some time owing to some new microwave antennae near the station. Crystal filters were installed on the receivers at MDW and WA2, resulting in elimination of the interference problem for MDW and considerable improvement for WA2. It is likely that we will have to change the WA2 radio frequency to completely clean up the problem. DYH was returned to operation during the quarter, and problems at CBW and PLN were fixed in April when the station sites melted out enough to allow access to the instruments.

An experimental system using an S13 seismometer and a new, low-noise Sprengnether amp/VCO was installed at GBL in early February. The system components were calibrated before installation, and a calibration circuit allows a three-point curve to be calculated on a daily basis. The VCO has proven quite stable, and the main problem at present is finding a way to improve the environmental protection of the seismometer. A similar system will be installed at ETT early this summer, while MDW and WA2 will receive S13 seismometers with no change to the telemetry system. The advantage of the S13 over the customary L4-C is its relative ease of calibration, owing to its lower mechanical damping. It is also a much more stable seismometer and its spurious resonant modes are at much higher frequencies, essentially outside the range of seismological interest.

The USGS-maintained network in northern Oregon continued to degrade during the quarter, with the result that by April over half the stations were out and many others were obviously malfunctioning. University of Washington-maintained

stations in the area operated reasonably well and provided at least a minimal coverage, along with the USGS stations that continued to operate. Expansion of the UW net in Oregon continued in April with installation of a station in the west hills area of Portland.

Data

There were 141 events processed by the network in the Eastern Washington - Northern Oregon region. Of these 42 were known or suspected blasts and 99 were earthquakes. 28 of these were hand picked from film records because they were missed for one reason or another by the on-line computer system. This activity is about normal as compared to the previous several reporting periods. Table I is the event catalog for this quarter and figures 1-4 show the epicenters for earthquakes separate from blasts in the two areas of interest.

There was on reported felt earthquake this quarter. A magnitude 2.0 earthquake on March 3 was reported barely felt by a few people near Chalatchie in southwest Washington. The largest event of the quarter occurred in the Goat Rocks aftershock area on January 23 (M = 3.0). Other areas of interest include two small swarms east and west of the Entiat- Waterville area and continued activity at Entiat. The central Pasco basin was unusually quiet during this quarter with only a few events just north of the Saddle Mountains and a couple in the Rattlesnake-Horse Heaven Hills area. There were only about half a dozen events located in Oregon this quarter, possibly partly because of the number of station outages in this area.

In early April, some changes have been noted in the overall seismicity patterns as compared to the previous several months. Increased numbers of events are being recorded in both the Lake Chelan and Wooded Island areas. While neither the number nor the magnitude of the events have been very significant as yet, it is possible that they may be the beginning of swarm-type activity such as has occurred

on several previous occasions at Wooded Island. The details of this activity will be included in the next quarterly report.

Downhole Seismometer Program

The three component downhole seismometer has been deployed in DC-3 for the entire quarter, and has been recording continuously. Data from the underground station is currently being processed in the Geophysics Program. A velocity/attenuation model for the DC-3 local is being compiled as a part of the downhole program. Data for the model comes from the 1979 crosshole experiment, the Seismograph Service Corp. check shot survey, geophysical well data, and from the Basalt Data Base at the Univ. of Washington. The model incorporates both the intrinsic properties of the basalts as well as the effects of fractures and alteration materials.

C A T A L O G

Jan 1982

DAY	TIME	SEC	LAT	LON	DEPTH	MAG	NS/NP	RMS	Q	MODEL	TYPE
2	9: 2	69.17	46 32.49	121 23.90	7.84	1.9	34/36	0.27	BC	C1	
4	8:43	52.13	47 14.53	120 38.41	0.89	2.7	42/44	0.30	BC	C1	
4	20:50	52.48	46 56.73	119 27.82	2.27	1.4	9/11	0.14	AC	E1	
4	21:17	53.73	47 39.44	120 7.14	0.64	0.6	6/10	0.18	BC	N1	
4	22:44	37.87	47 52.75	118 5.96	0.04*	2.1	13/15	0.40	CC	N1	X
6	18:50	42.93	46 31.63	121 20.80	0.08*	0.9	5/06	0.11	CD	C1	
7	4: 7	38.37	46 31.89	121 27.31	10.12	0.9	12/14	0.38	CB	C1	
7	5: 0	10.62	46 54.42	120 40.34	0.05*	1.3	5/05	0.39	DD	C1	H
7	6:46	37.54	46 32.08	120 2.72	15.51	1.3	8/14	0.27	BC	E1	H
9	12:17	16.52	46 6.12	122 24.99	17.26	0.3	22/31	0.23	BB	S1	
9	20:14	33.02	47 57.40	119 46.97	4.09	1.0	4/05	0.15	BD	N1	H
9	21:21	40.69	46 26.06	122 28.06	17.90	1.1	18/29	0.14	AA	S1	
10	0:13	34.56	47 42.20	120 6.08	0.70	1.0	3/05	0.09	BD	N1	H
10	11:43	14.14	46 29.25	122 27.80	19.82	1.1	18/24	0.13	AA	S1	
10	21:15	36.75	46 32.70	121 25.48	6.90	0.9	16/17	0.33	BC	C1	
10	23:17	6.73	46 17.24	119 46.13	7.25	1.3	4/04	0.03	AD	E1	H
10	23:29	3.41	45 45.23	119 28.21	0.07*	1.1	4/04	0.09	AD	E1	H
11	8:30	14.79	45 55.15	122 25.48	11.53	1.3	28/33	0.21	BB	S1	
11	21:28	26.26	47 53.67	118 5.78	0.10*	1.7	7/09	0.35	DD	N1	X
12	22:12	57.31	47 52.53	118 7.11	0.07*	1.8	12/13	0.45	BC	N1	X
13	0:50	49.03	47 33.33	120 27.80	15.18	0.6	4/07	0.38	CD	N1	H
13	9:13	33.90	46 5.90	119 11.95	6.11	1.2	7/07	0.15	AD	E1	H
18	19:30	39.21	46 17.91	122 43.42	0.95	1.1	4/05	0.25	DD	S1	H
21	15:24	50.41	46 14.65	118 55.27	0.08*	1.4	11/11	0.22	CC	E1	
22	17:11	60.64	46 57.11	119 27.73	3.51	1.3	7/09	0.10	AC	E1	
23	15:31	37.55	46 33.24	121 24.61	4.25*	3.0	46/46	0.18	AC	C1	
24	20: 4	62.09	47 43.47	119 53.23	21.48	0.9	9/10	0.16	AB	N1	
25	17: 9	63.44	46 31.25	121 24.27	4.30*	0.9	9/10	0.12	AC	C1	
26	22:48	46.02	46 13.95	122 20.59	0.72	0.4	13/15	0.13	AA	S1	X
27	3:47	-0.84	47 44.41	120 15.23	0.58#	0.8	4/07	0.65	DD	N1	H
28	3:24	25.54	47 1.22	120 38.96	0.03*	1.2	8/09	0.17	CC	C1	P
29	1:31	38.22	46 14.57	118 54.62	0.05*	1.5	15/17	0.36	BC	E1	X
29	1:39	46.92	46 32.32	121 25.06	5.72	0.8	9/09	0.10	AC	C1	
29	1:52	53.37	46 32.05	121 25.10	8.47	1.1	11/13	0.25	BC	C1	
29	2: 8	49.88	46 29.57	122 23.56	18.71	0.7	6/08	0.07	AC	S1	
29	22:51	61.62	46 31.44	121 24.14	0.05*	2.1	30/32	0.28	BC	C1	
29	23:47	52.71	46 30.99	121 23.35	0.07*	0.8	6/08	0.35	CC	C1	
30	0: 4	46.84	44 21.03	122 33.77	0.03*	1.6	6/06	0.13	CD	C1	
30	0:18	39.50	46 31.37	121 24.68	5.97	1.1	11/13	0.29	BC	C1	
30	3: 2	8.97	47 30.78	120 37.12	7.68	1.0	9/12	0.61	CC	N1	H
30	4:45	19.05	46 30.86	121 27.55	19.36	0.9	5/07	0.25	BD	C1	
30	6:33	9.97	46 22.21	120 43.57	5.67	1.2	6/06	0.05	AD	C1	H
30	23:17	64.51	46 31.64	121 25.85	7.22	1.4	12/14	0.33	BC	C1	
31	5:17	26.71	46 31.29	121 25.34	7.81	0.5	8/10	0.25	BD	C1	
31	17:30	18.86	47 31.52	120 38.91	0.35#	1.2	12/14	0.20	BC	N1	
31	23:37	51.81	46 32.20	121 25.44	7.06*	0.9	8/09	0.20	BC	C1	

Feb 1982

DAY	TIME	SEC	LAT	LON	DEPTH	MAG	NS/NP	RMS	Q	MODEL	TYPE
2	0:29	54.67	47 52.34	118 6.86	0.06*	1.5	14/15	0.54	BC	N1	X
2	16:59	60.55	47 43.28	120 7.69	0.06*	1.3	9/11	0.36	BC	N1	
3	0:49	49.12	47 30.72	119 16.49	0.04*	1.6	17/17	0.24	CC	N1	X
3	9:37	43.73	47 4.23	120 59.66	0.05#	2.5	35/36	0.19	BC	C1	
3	14:45	1.30	45 0.65	121 18.00	1.41	1.1	8/09	0.23	BC	C1	
3	23:25	63.99	46 17.75	122 21.00	12.41	0.3	9/12	0.07	AB	S1	
4	10:39	0.73	46 0.76	118 23.58	1.88	1.6	6/10	0.75	DD	E1	H
5	2:50	33.40	47 39.80	120 10.46	5.24	0.9	6/10	0.21	BC	N1	
5	15:15	59.92	46 14.81	118 55.49	0.06*	1.6	17/20	0.25	BC	E1	X
8	1:24	28.11	47 31.39	120 36.90	10.01	0.9	6/09	0.18	AD	C1	H
8	21:10	30.24	46 14.36	118 55.62	0.10*	1.3	12/13	0.27	BC	E1	X
9	11:53	41.18	46 59.60	120 24.69	0.04*	1.1	4/06	0.18	BD	C1	H
9	17:25	50.08	46 52.73	119 30.78	1.23	0.8	5/05	0.08	AD	E1	
9	19:21	28.04	46 52.24	119 30.96	0.33	0.7	6/08	0.26	BC	E1	
10	0:30	21.78	47 52.52	118 7.09	0.04*	2.0	14/15	0.76	BC	N1	X
10	2:58	9.81	47 7.11	121 4.02	1.86*	1.1	5/06	0.35	DD	C1	H
10	20:56	30.28	46 10.83	122 19.38	10.97	0.7	14/23	0.14	AA	S1	
12	19:54	38.39	46 49.05	120 40.24	0.89	1.2	6/06	0.34	CC	C1	P
13	0:28	58.15	47 30.61	119 17.61	5.00	1.5	8/08	0.08	AC	N1	
13	4:41	27.97	46 15.19	118 56.26	0.04*	1.4	16/18	0.41	BC	E1	X
17	1:56	19.86	47 30.70	119 17.08	0.68	1.5	8/08	0.08	AC	N1	
17	15:27	21.97	47 40.67	119 35.57	0.65	1.0	4/06	0.43	CD	N1	H
17	21:14	51.13	46 49.72	120 41.94	0.06*	1.3	8/08	0.32	CC	E1	P
17	23: 5	71.58	46 13.72	122 20.67	0.53	0.7	17/20	0.14	AA	S1	X
18	0:34	21.65	47 52.39	118 6.79	0.05*	2.0	9/10	0.29	BC	N1	X
18	2:12	23.28	45 56.50	118 11.41	0.07*	1.8	4/06	0.37	DD	E1	H
18	3:27	46.65	47 40.04	119 44.45	0.84$	2.8	23/26	0.45	CC	N1	
18	3:53	65.77	47 39.37	119 44.07	0.74	1.0	6/10	0.20	BC	N1	
18	4:28	39.30	47 39.23	119 44.31	3.36	1.1	8/12	0.21	CC	N1	
18	4:54	56.38	47 38.66	119 44.75	6.55	1.1	4/07	0.13	BD	N1	
18	12:47	29.11	46 52.83	120 47.09	12.07*	2.4	29/30	0.25	BB	C1	
18	13:23	5.31	47 40.51	119 41.14	0.75	0.9	5/07	0.59	CD	N1	H
18	13:55	11.94	47 39.21	119 44.47	0.65	1.5	11/15	0.16	BC	N1	
19	0:15	52.19	47 30.75	119 17.23	0.05*	1.6	14/14	0.41	CC	N1	X
19	6:22	23.74	46 14.81	118 56.21	0.03*	1.1	7/07	0.10	BD	E1	X
19	11:33	22.76	47 31.00	120 34.08	5.84	1.1	7/11	0.32	BD	N1	H
19	11:55	24.87	47 31.14	120 33.79	3.96	1.0	8/09	0.21	BD	N1	H
19	19: 4	42.99	45 21.14	121 43.78	5.58	2.1	11/12	0.21	AB	C1	
19	22:55	29.66	46 13.67	122 21.54	1.27	0.2	8/11	0.08	AD	S1	X
19	23:32	57.76	46 31.54	121 24.44	3.02	2.1	32/36	0.25	BC	C1	
20	0:59	18.76	46 46.90	118 7.49	0.03*	2.1	23/23	0.74	CD	N1	P
20	8:52	14.16	48 5.87	119 45.01	0.55	0.9	4/05	0.21	CD	N1	H
20	12: 5	9.04	48 5.85	119 46.38	0.78	1.3	4/08	0.20	BD	N1	H
20	17:42	57.13	46 14.73	122 32.18	1.03*	0.7	8/11	0.14	AC	S1	X
23	14:54	33.71	46 58.48	121 13.98	1.52	1.1	8/09	0.19	BC	C1	
24	2:14	54.34	47 30.18	119 17.32	0.05*	1.5	14/16	0.40	BC	N1	X
25	20:47	45.86	46 13.56	122 21.23	1.64	-0.4	11/13	0.11	AC	S1	X
26	18:53	14.75	46 20.68	122 32.09	0.04*	0.7	11/13	0.17	BC	S1	X

Feb 1982

DAY	TIME	SEC	LAT	LON	DEPTH	MAG	NS/NP	RMS	Q	MODEL	TYPE
26	23:44	24.84	45 39.93	121 59.37	10.04	0.9	11/15	0.20	BC	C1	
28	19: 4	52.89	47 39.29	120 16.54	0.04*	1.1	10/11	0.34	CB	N1	

Mar 1982

DAY	TIME	SEC	LAT	LON	DEPTH	MAG	NS/NP	RMS	Q	MODEL	TYPE
1	0:46	61.82	47 3.86	121 0.37	12.35$	2.7	46/58	0.56	CD	C1	
1	16:31	50.89	46 6.80	122 29.95	13.13	-0.3	12/17	0.17	AC	S1	
2	0:42	53.24	46 25.35	121 34.71	4.06	1.9	13/18	0.14	AD	C1	
2	6:41	16.41	46 14.38	118 56.46	0.41	0.9	12/13	0.14	AC	E1	X
2	21:10	56.43	46 10.72	122 19.05	10.79	-0.4	10/15	0.10	AB	S1	
2	22:55	26.59	46 53.17	120 47.61	9.99	2.1	23/24	0.24	BB	C1	
3	1:21	28.52	47 30.97	119 17.09	0.08*	1.7	15/16	0.22	BC	N1	X
3	4:42	14.72	46 14.74	118 55.61	0.06*	1.1	8/09	0.16	BD	E1	X
3	5:26	68.16	45 56.26	122 25.70	10.85	2.0	31/36	0.21	BB	S1	F
4	21:39	48.69	47 43.56	120 16.61	0.04*	2.4	22/23	0.56	CB	N1	
4	21:46	45.70	46 19.70	122 29.39	0.06*	0.4	12/12	0.14	AC	S1	X
4	22:31	0.66	47 52.63	118 7.01	0.09*	1.9	10/10	0.40	CC	N1	X
6	1:54	32.94	47 30.94	119 17.30	0.06*	1.4	12/12	0.63	CC	N1	X
6	23:53	14.95	46 53.29	120 47.43	9.51	1.2	5/08	0.36	AD	C1	H
7	14:38	52.45	46 32.31	121 23.98	6.83	0.9	5/07	0.16	BD	C1	
7	15:29	73.32	46 32.52	121 25.91	12.10	0.9	7/09	0.25	BC	C1	
7	15:32	25.32	46 32.12	121 28.11	17.89	0.8	4/06	0.11	BD	C1	
8	1:23	34.87	46 32.51	121 24.05	6.83	1.2	9/11	0.25	BC	C1	
8	21: 8	19.03	46 10.56	122 19.35	12.16	0.	13/17	0.10	AA	S1	
9	13:21	64.33	46 26.43	122 18.88	15.09	0.6	18/24	0.21	BA	S1	
10	0:23	24.07	47 39.55	118 55.59	0.50	1.7	4/06	0.59	CD	N1	H
10	2:20	69.23	47 30.76	119 16.81	0.09*	1.6	11/11	0.20	AC	N1	X
10	6:59	40.95	48 46.36	120 17.74	11.63	1.1	4/05	0.25	BD	N1	H
10	22:39	28.65	45 58.54	123 5.48	9.22	1.3	13/13	0.12	AC	P1	
11	1:36	56.83	47 30.49	119 17.79	0.54	1.6	7/07	0.05	AC	N1	X
11	21:17	7.31	46 5.07	119 43.92	0.06*	1.6	6/08	0.59	DD	E1	H
14	3:21	47.09	46 24.40	122 22.16	18.85	0.9	13/16	0.18	AA	S1	
14	11: 8	18.74	46 20.94	122 25.21	8.94	0.4	10/16	0.15	AA	S1	
15	18:43	60.12	46 13.74	122 20.79	1.53	0.2	9/11	0.09	AC	S1	X
15	23:34	12.92	46 17.97	122 21.80	0.83	0.8	10/11	0.14	AB	S1	X
16	1:56	54.46	45 38.61	121 13.44	9.98	1.1	11/11	0.37	BC	C1	
16	21:49	13.25	46 18.06	119 49.26	0.04*	1.7	9/10	0.14	BD	E1	X
17	15: 1	64.76	46 27.78	122 23.45	18.13	0.4	9/14	0.14	AA	S1	
17	23:54	45.01	47 25.68	119 12.64	8.29*	1.4	4/05	0.25	DD	N1	H
18	23:54	45.68	47 30.28	119 16.88	0.10*	1.1	7/07	0.61	CC	N1	X
19	2:35	60.05	45 51.77	122 15.07	8.17	2.6	35/41	0.25	BC	C1	
19	23: 9	52.76	47 30.53	119 16.91	0.10*	1.1	12/13	0.34	BC	N1	X
23	0:29	6.66	47 52.22	118 6.15	0.04*	1.6	15/15	0.71	CC	N1	X
23	23:54	68.23	46 19.02	119 46.57	0.08*	1.7	14/17	0.35	BC	E1	
28	10:31	42.22	46 27.43	121 40.21	0.10*	1.0	9/09	0.17	CC	C1	
28	23:37	47.17	47 40.49	120 6.85	0.08*	2.3	19/21	0.39	BC	N1	
29	19: 4	71.36	46 13.70	122 20.54	1.46	0.4	15/18	0.13	AA	S1	X
29	20:46	63.62	46 13.72	122 20.90	0.76*	-0.5	7/10	0.18	AC	S1	X
30	0:27	43.45	47 52.74	118 7.31	0.05*	1.4	10/10	0.47	BC	N1	X
30	18:43	73.42	46 13.78	122 20.38	0.55	-0.3	10/14	0.14	AB	S1	X

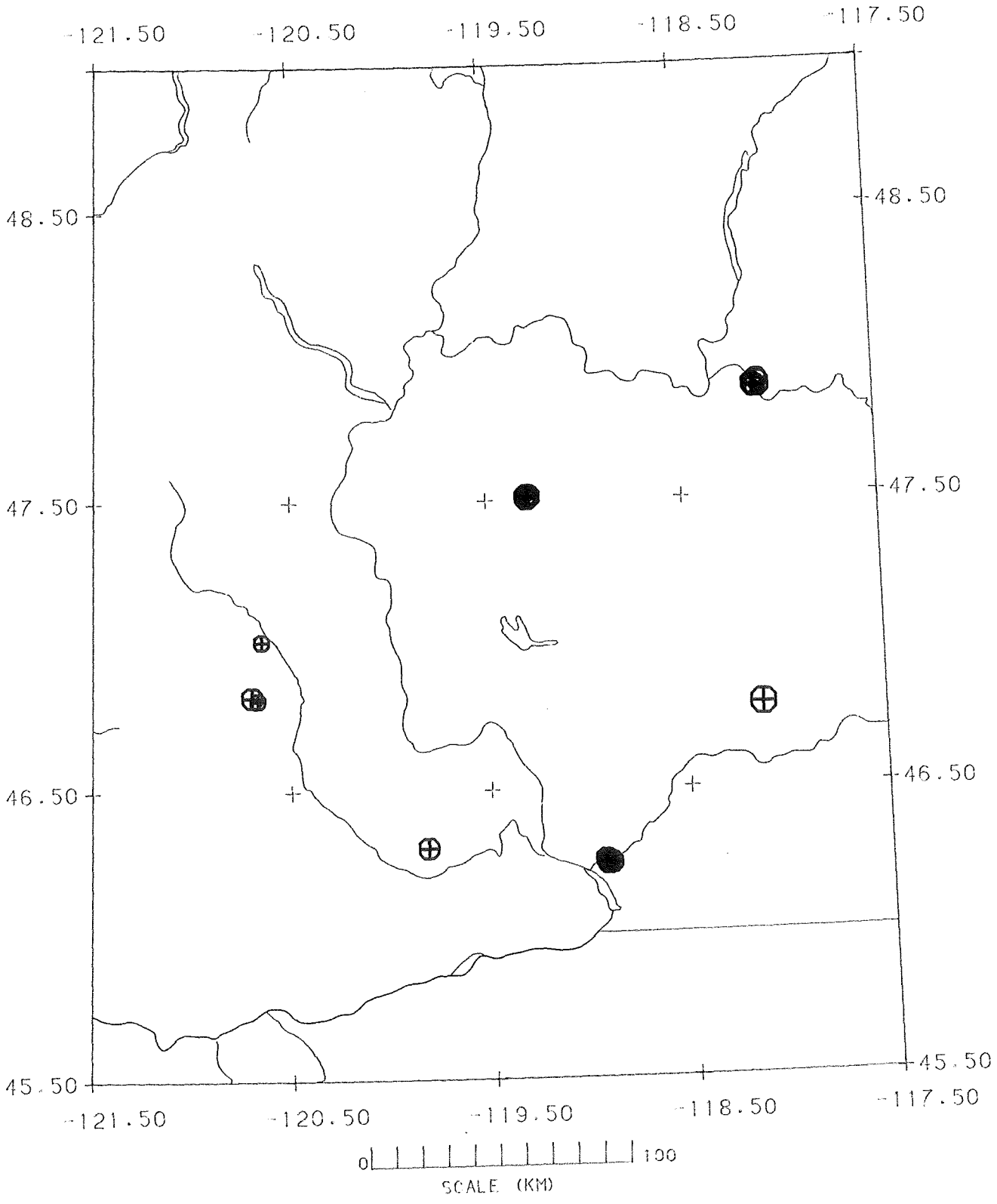

Fig. 1: Eastern Washington known and probable explosions

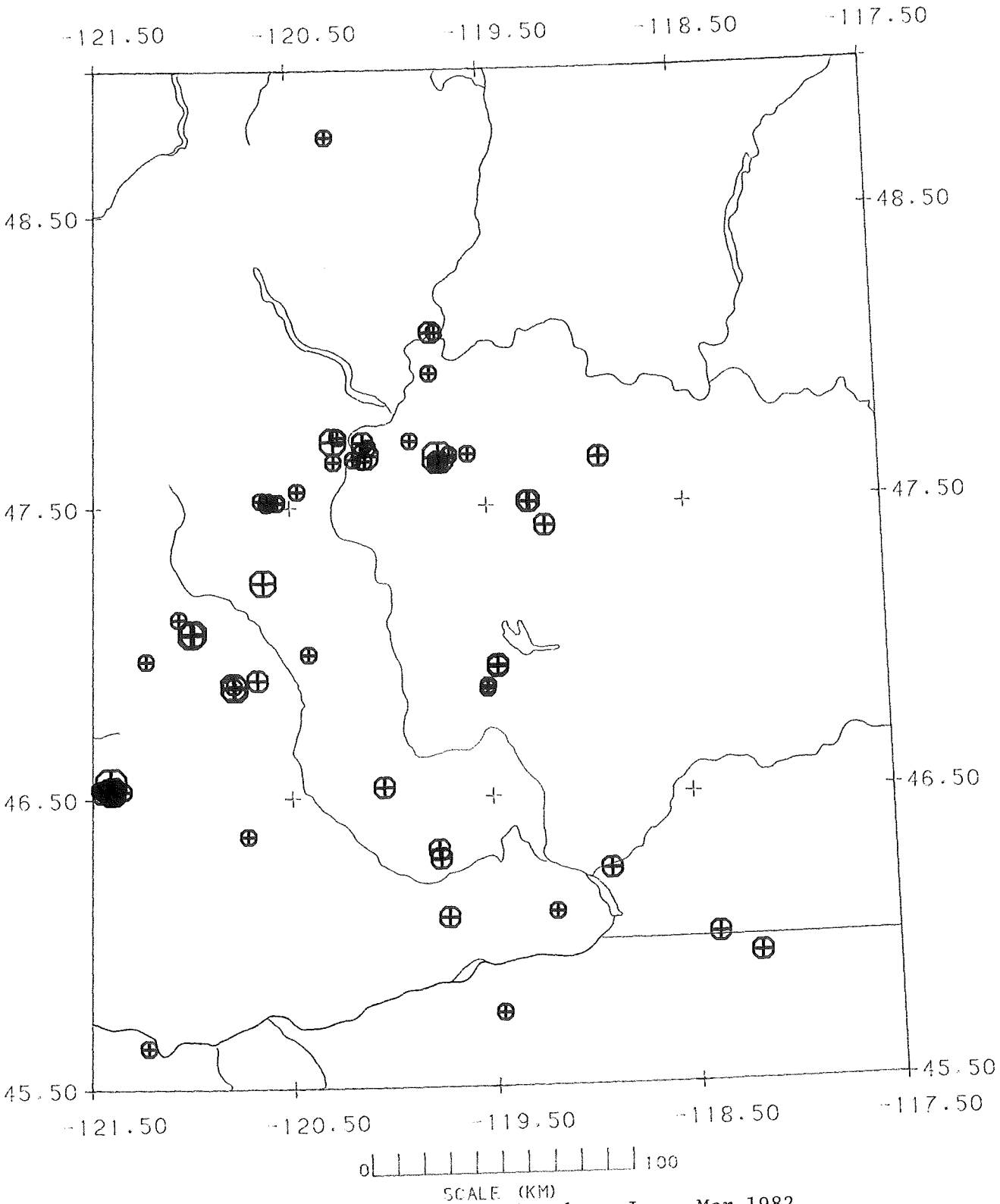

Fig.2: Eastern Washington Earthquakes, Jan - Mar 1982

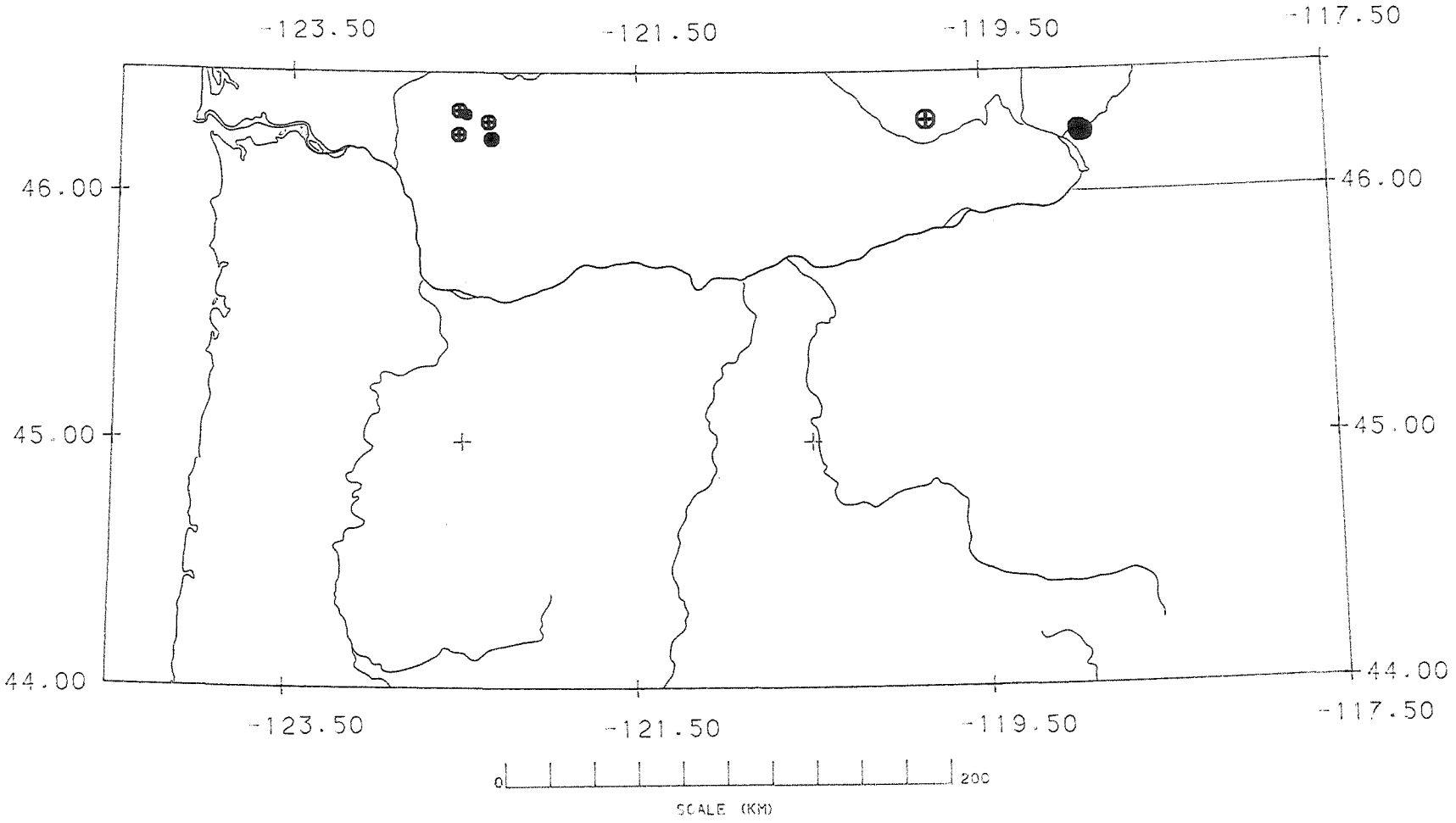

Fig. 3: Southern Washington - Northern Oregon known and probable explosions

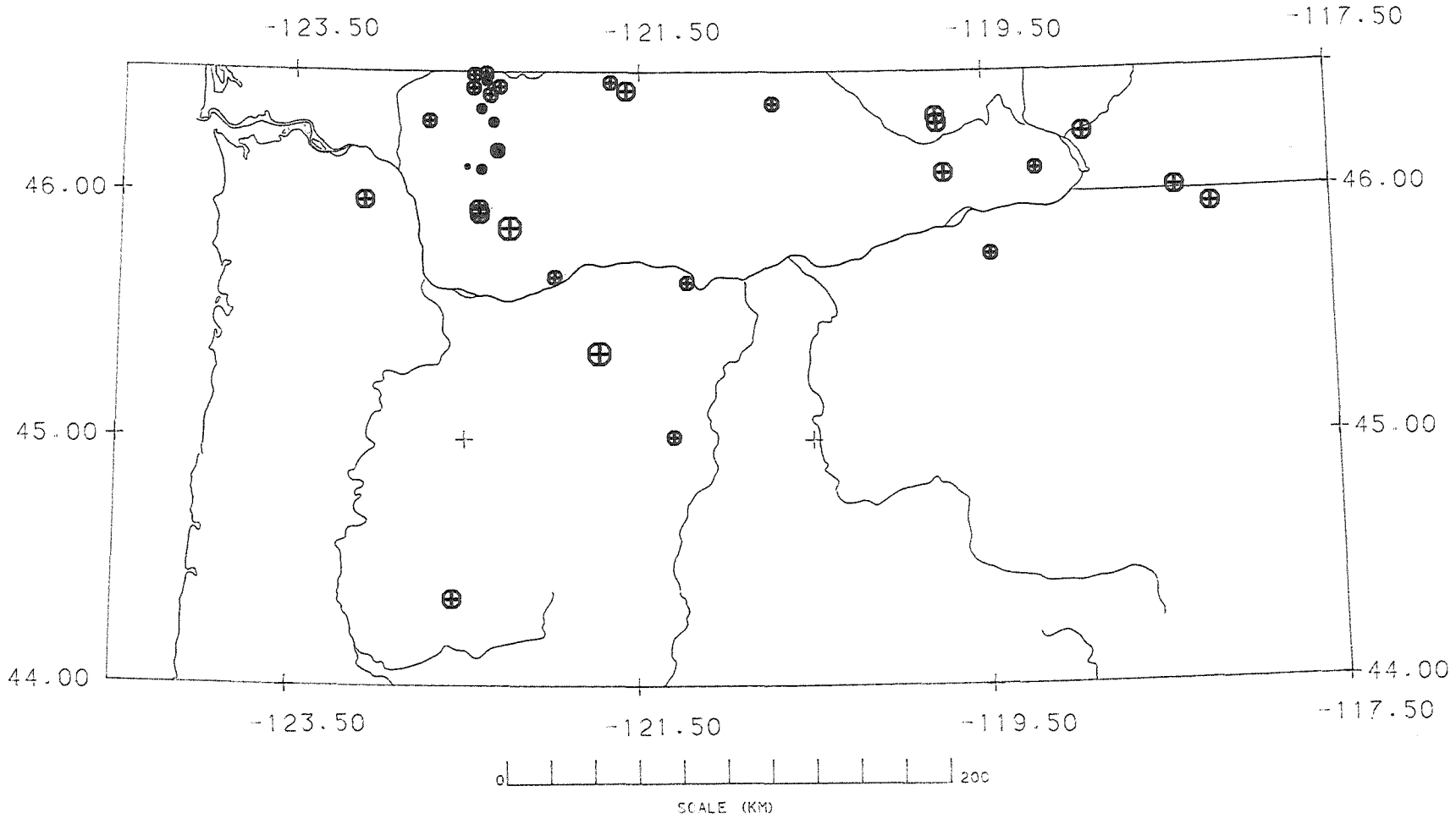

Fig. 4: Southern Washington - Northern Oregon Earthquakes Jan - Mar 1982