QUARTERLY TECHNICAL REPORT 82-D

on

Earthquake Monitoring of Eastern Washington and Northern Oregon

October 1 through December 31,1982

Geophysics Program

University of Washington

Seattle, Washington

PREPARED FOR THE U.S. DEPARTMENT OF ENERGY
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and

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

Operations

Up-time for stations in eastern Washington was high during the quarter, reflecting an overall improvement in the quality of the sites and maintenance over the previous year. Nevertheless, several minor outages occurred. Many of these were due to failed batteries or problems with Emtel 6202 amp/vco systems. A more efficient power converter board was designed for the 6202's by James Ramey, and it should improve up-time by decreasing the frequency of battery failure. New amp/vco systems are either already received or on order for over a third of the eastern Washington stations. They should allow us to replace the 6202's that are in the worst shape.

As of November, the Volcanic Hazards Program discontinued maintenance responsibility for the USGS Northern Oregon network. Maintenance of these stations became the responsibility of the University of Washington although no new funds were received for this purpose. We had already planned to use existing telemetry links through Vancouver (Washington) and Augspurger Mountain to rearrange the network communications, but the late date at which this was authorized and the poor fall weather conspired to prevent finalizing the change over before spring. Very few stations are now operating in northern Oregon, and those are primarily the ones supported by NRC and DOE. The seismicity catalog for the quarter reflects the state of the network in an overall apparent decrease in activity in Oregon.

Additional S13 sites with low-noise VCO's were installed at MDW and WA2. MDW is extremely noisy, probably due to drilling activities within a few kilometers of the site.

Data

There were 87 events processed by the network in the Eastern Washington -

Northern Oregon region. Of these 30 were known or suspected blasts and 57 were earthquakes. Only 5 of these were hand picked from film records because they were missed by the on-line computer system. This activity is about half of the activity observed during the previous quarter; mainly due to a large decrease in activity in northern Oregon and the decline in the number of aftershocks at Goat Rocks. 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 one felt event in the report area during this quarter. A magnitude 2.7 earthquake was felt at Woodland, Washington in the southwest part of the state. In the central Pasco Basin, a small cluster of activity stands out northeast of the Saddle Mountains. The depths of earthquakes in this cluster were around 12 kilometers which is deeper than typical depths(0-5 km) of swarm events in this region. Focal mechanisms were done for three of the earthquakes in this cluster. Mechanisms show reverse faulting with a near horizontal compression axis oriented north-south, which is consistent with focal mechanisms determined for other events in this region. Details of the focal mechanisms will be discussed in the annual report. A second concentration of activity occurred south of Lake Chelan. Both these areas typically have clusters of activity. Only four earthquakes were located in northern Oregon; this low level of activity probably reflects the high percentage of down time for the northern Oregon stations.

Borehole Seismology

A downhole amplifier system is being developed which can be powered from the surface. This requires rewiring of the Geospace package and surface control unit, development of a low-noise, high-bandwidth, downhole amplifier circuit, and checking the temperature stability of the new circuit in an environmental chamber. Currently the downhole circuit is being prepared for printed circuit card manufacture. Deployment of the system is expected in early March.

CATALOG

Oct 1982

DAY	TIME	SEC	LAT	LON	DEPTH	MAG	NS/NP	RMS	Q	MODEL	TYPE
3	4:59	39.87	45 39.20	120 15.70	0.02*	1.4	3/05	0.30	DD	C1	H
4	20: 4	34.57	45 37.40	121 4.07	0.07*	1.7	19/19	0.26	CC	C1	P
5	20:29	38.73	45 53.48	122 48.27	4.92	2.0	22/23	0.21	BC	P1	X
5	20:35	46.35	45 38.56	119 27.03	0.04*	1.8	15/15	0.33	CC	E1	P
5	23:25	18.04	46 0.51	119 15.99	0.10*	2.1	18/18	0.46	CC	E1	X
6	15:16	27.46	47 42.30	120 6.11	2.15	1.8	4/07	0.04	BD	N1	
6	21:11	13.19	46 14.18	121 55.75	0.07*	1.2	7/10	0.11	AC	S1	
6	22:59	57.64	47 30.68	119 17.38	0.66	1.3	8/08	0.16	AC	N1	P
10	16:48	65.25	47 39.74	120 15.18	0.51	1.0	5/08	0.10	AD	N1	
11	19:43	45.97	45 29.29	121 32.73	5.09	1.5	5/05	0.16	BD	C1	
11	21:40	22.94	46 11.57	122 21.73	0.56	0.9	9/10	0.08	AC	S1	
11	23:46	42.58	46 6.33	121 58.02	2.19	1.9	24/24	0.18	AB	S1	P
12	1:30	21.53	46 0.03	119 16.86	0.05*	2.8	22/22	0.40	CC	E1	X
12	21:43	56.48	47 6.90	121 17.86	0.96$	2.6	35/36	0.30	BC	C1	
13	19:12	19.86	46 11.73	122 21.94	1.18*	0.7	8/08	0.08	AC	S1	P
14	8:53	39.95	47 42.94	120 10.89	0.41	2.4	26/29	0.42	BC	N1	
14	9:24	18.11	47 49.92	120 52.91	0.04*	2.2	23/23	0.31	CC	N1	
14	19:59	34.49	46 42.97	119 0.69	0.09*	1.6	15/15	0.27	CC	E1	P
15	2: 6	55.37	45 5.74	122 1.44	9.91	1.1	4/04	0.05	AD	C1	P
15	19:35	31.15	45 54.01	119 40.35	0.10*	2.4	21/21	0.32	CC	E1	P
15	19:40	33.01	46 0.71	122 51.61	7.74	1.9	20/20	0.22	BC	P1	P
16	1:31	15.83	47 31.49	120 38.26	1.49	2.1	31/34	0.30	BC	N1	
16	2:13	45.66	47 32.65	120 38.47	7.39	0.9	14/15	0.18	AC	N1	
16	14:25	55.07	47 39.73	120 17.17	0.68*	1.6	19/21	0.31	BA	N1	
18	20:43	31.15	47 55.10	120 2.73	0.08*	2.3	17/18	0.47	BC	N1	
19	7:32	39.02	46 10.90	120 26.35	15.29	2.7	35/35	0.24	BC	C1	
19	15:13	19.90	48 15.67	119 6.93	13.11	1.6	6/08	0.06	AD	N1	H
19	19:58	32.91	46 43.20	118 59.69	0.06*	0.9	15/15	0.41	CC	E1	
19	23:49	37.07	45 20.83	120 48.52	0.04*	2.2	6/08	0.57	DC	E1	P
20	22:35	14.05	46 12.48	121 54.15	0.82	1.9	22/23	0.16	AC	S1	P
21	21:45	45.85	46 15.58	121 37.86	1.64	1.7	10/10	0.12	AC	C1	P
22	0:27	51.44	47 44.56	121 19.90	0.52	1.8	11/12	0.25	BC	C1	P
22	22:41	44.65	45 13.32	121 48.52	0.77	1.7	5/05	0.16	CD	C1	P
23	0:32	16.41	45 1.48	121 54.00	0.05*	2.2	8/08	0.23	CD	C1	P
23	23: 9	24.46	46 53.04	119 28.18	10.66	1.3	15/20	0.24	BA	E1	
23	23:14	28.76	46 52.69	119 27.77	12.52	1.6	22/26	0.25	BA	E1	
23	23:14	61.60	46 52.72	119 28.09	12.42	0.6	10/14	0.26	BA	E1	
24	13:18	43.67	45 45.54	122 31.34	12.48	1.1	20/23	0.15	BC	P1	
24	19:21	22.64	46 52.85	119 28.59	12.23	1.3	13/17	0.29	BA	E1	
25	7: 9	68.73	47 43.89	119 27.97	0.07*	2.3	21/22	0.42	BB	N1	
28	0:36	5.66	44 52.62	120 31.69	0.06*	2.4	9/09	0.40	CD	E1	P
30	22:40	57.28	46 0.45	119 16.73	0.08*	2.7	23/23	0.29	CC	E1	X

Nov 1982

DAY	TIME	SEC	LAT	LON	DEPTH	MAG	NS/NP	RMS	Q	MODEL	TYPE
1	17:50	38.03	45 11.75	121 32.13	7.10	1.5	6/09	0.36	CC	C1	P

Nov 1982

DAY	TIME	SEC	LAT	LON	DEPTH	MAG	NS/NP	RMS	Q	MODEL	TYPE
2	2: 8	9.09	46 15.30	122 29.67	15.87	0.7	15/22	0.16	BB	S1	
2	22: 4	24.82	46 27.82	119 1.75	0.07*	1.3	21/21	0.28	AB	E1	P
3	0:51	33.77	45 45.28	122 32.50	9.58*	1.9	24/26	0.20	BC	P1	
3	20: 0	-3.45	46 42.27	119 2.01	1.77	1.2	4/07	0.10	AD	E1	H
4	10:29	55.32	46 9.82	122 24.80	10.82	0.6	14/19	0.16	AA	S1	
5	20:39	65.64	47 45.54	120 4.98	0.38$	1.9	16/18	0.45	CB	N1	
7	12:59	-5.73	46 53.87	121 5.22	3.79	1.5	5/06	0.16	AD	C1	H
8	0:23	61.12	46 52.53	119 27.80	12.80	2.3	29/37	0.32	BA	E1	
9	2:35	59.58	46 52.81	119 27.28	12.65	2.3	23/26	0.20	BA	E1	
9	13:54	53.17	46 53.06	119 28.41	12.69	0.9	8/12	0.15	BB	E1	
9	20:26	58.01	46 6.33	121 57.72	1.91	1.6	20/20	0.14	AB	S1	P
9	22:14	49.56	47 52.06	118 6.12	0.05*	2.1	16/17	0.69	BC	N1	P
10	0:16	25.46	46 52.29	119 28.56	12.67	0.8	8/12	0.12	AC	E1	
13	14:34	26.20	45 45.94	122 31.74	10.23	1.3	24/28	0.15	AC	P1	
16	0:10	55.88	47 40.58	120 23.07	0.61	0.7	6/09	0.25	BC	N1	
16	19:40	22.24	47 39.76	120 9.30	5.59	0.7	5/08	0.08	AD	N1	
18	19:53	38.40	46 21.52	122 36.13	3.02	0.4	5/06	0.24	CD	S1	P
20	1:50	53.89	47 41.86	120 11.88	0.98	1.4	10/15	0.17	AB	N1	
21	4:57	32.84	45 54.31	122 53.45	24.38	2.7	21/21	0.15	AD	P1	F
21	22:19	59.75	46 52.65	119 27.70	13.06	1.9	25/31	0.26	BA	E1	
23	1:23	65.86	46 24.16	121 37.54	19.66	1.4	13/16	0.43	CC	C1	
23	21:39	25.50	46 0.42	119 16.51	0.04*	3.2	26/26	0.42	CC	E1	X
24	4:36	32.28	47 1.26	120 55.40	4.77	2.1	25/28	0.24	BC	C1	
24	5:33	27.40	47 39.92	120 7.06	8.12	0.8	5/08	0.14	AD	N1	
24	18:44	53.20	46 18.73	122 38.85	7.40	1.0	11/13	0.26	BC	S1	

Dec 1982

DAY	TIME	SEC	LAT	LON	DEPTH	MAG	NS/NP	RMS	Q	MODEL	TYPE
2	20:32	17.24	45 53.32	119 42.16	0.06*	2.2	13/13	0.38	CA	E1	P
3	11:35	33.61	47 37.87	120 10.72	0.61	1.7	12/16	0.20	AB	N1	
4	19:17	55.19	46 9.91	122 37.95	10.28*	1.6	17/25	0.21	BC	P1	
4	20:52	32.51	46 51.26	119 41.47	0.06*	1.9	20/21	0.28	BB	E1	
5	11:14	52.72	47 58.00	120 32.71	14.05	1.1	10/14	0.29	BD	N1	
5	11:39	4.43	47 57.99	120 34.10	14.49	0.6	7/10	0.42	CD	N1	
5	17: 7	36.31	47 39.89	120 19.19	3.21	0.7	5/08	0.21	AD	N1	
7	21: 7	49.13	45 53.21	119 42.49	0.04*	2.4	16/17	0.50	CA	E1	P
9	5:30	21.17	47 37.32	120 10.59	0.61	1.0	5/09	0.39	BD	N1	
10	4: 7	51.70	45 41.49	122 44.00	15.83$	2.2	29/33	0.22	BA	P1	
12	7: 3	38.91	46 39.56	119 58.13	13.46	1.2	4/04	0.	AD	E1	H
12	18: 5	58.29	46 15.29	122 29.39	15.98	1.9	26/36	0.16	AA	S1	
14	19:48	11.47	47 12.29	120 55.14	0.09*	2.8	46/49	0.35	BC	C1	
20	4:20	29.01	46 31.79	121 24.42	3.18	2.7	50/51	0.26	BC	C1	
24	9:15	32.69	47 40.86	120 7.30	0.51*	2.1	14/19	0.35	CC	N1	
24	18:33	9.74	45 49.55	121 20.98	5.32#	1.3	6/06	0.17	BC	C1	P
28	9: 3	69.66	47 40.68	120 4.71	6.15	1.0	6/10	0.10	AC	N1	
29	21:18	22.02	47 13.52	121 12.94	5.58*	2.4	24/24	0.29	BA	C1	
29	22:39	38.06	46 9.44	119 11.13	0.04*	2.0	14/17	0.38	BC	E1	X

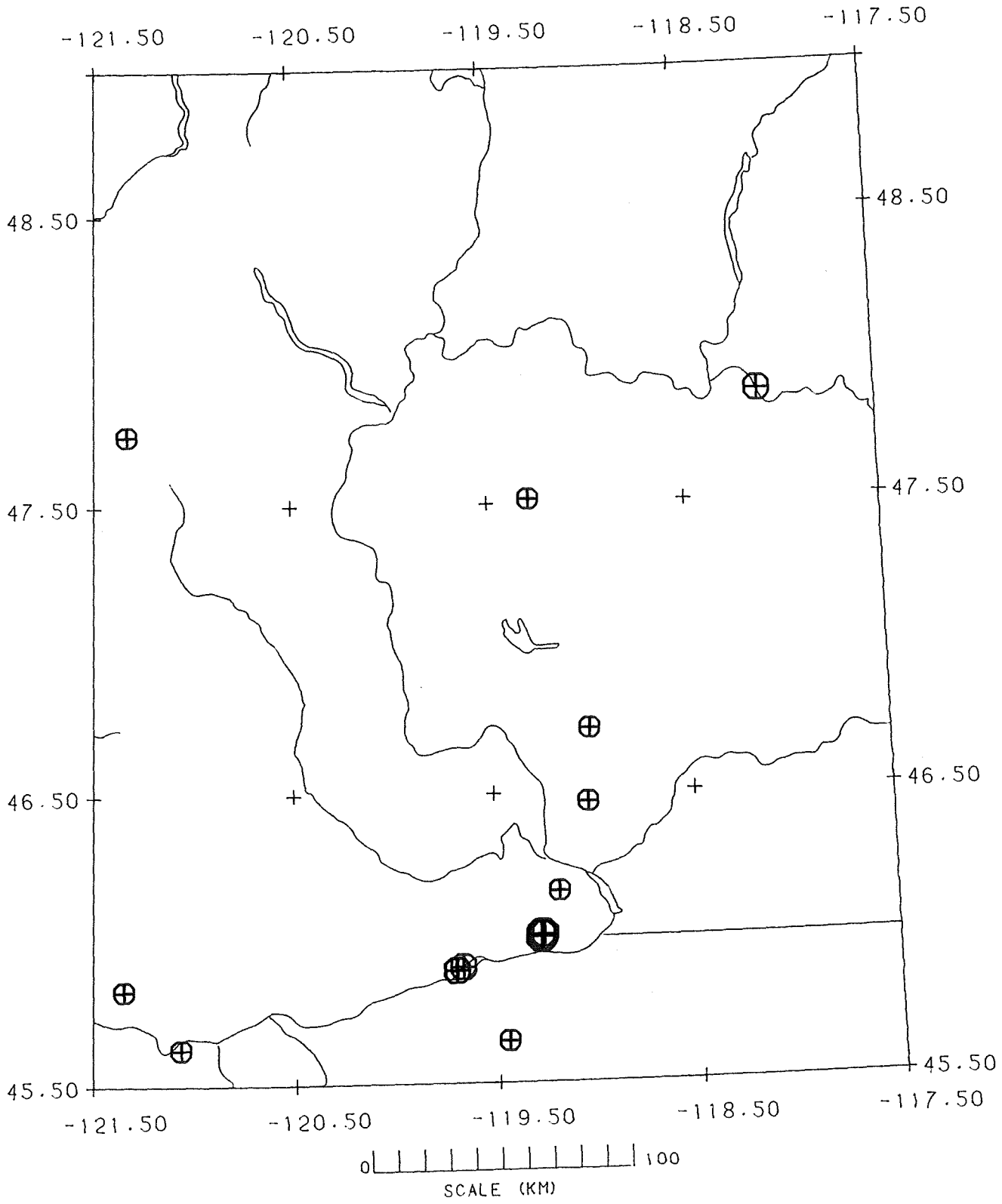

Figure 1. Eastern Washington known or probable explosions Oct-Dec 1982.

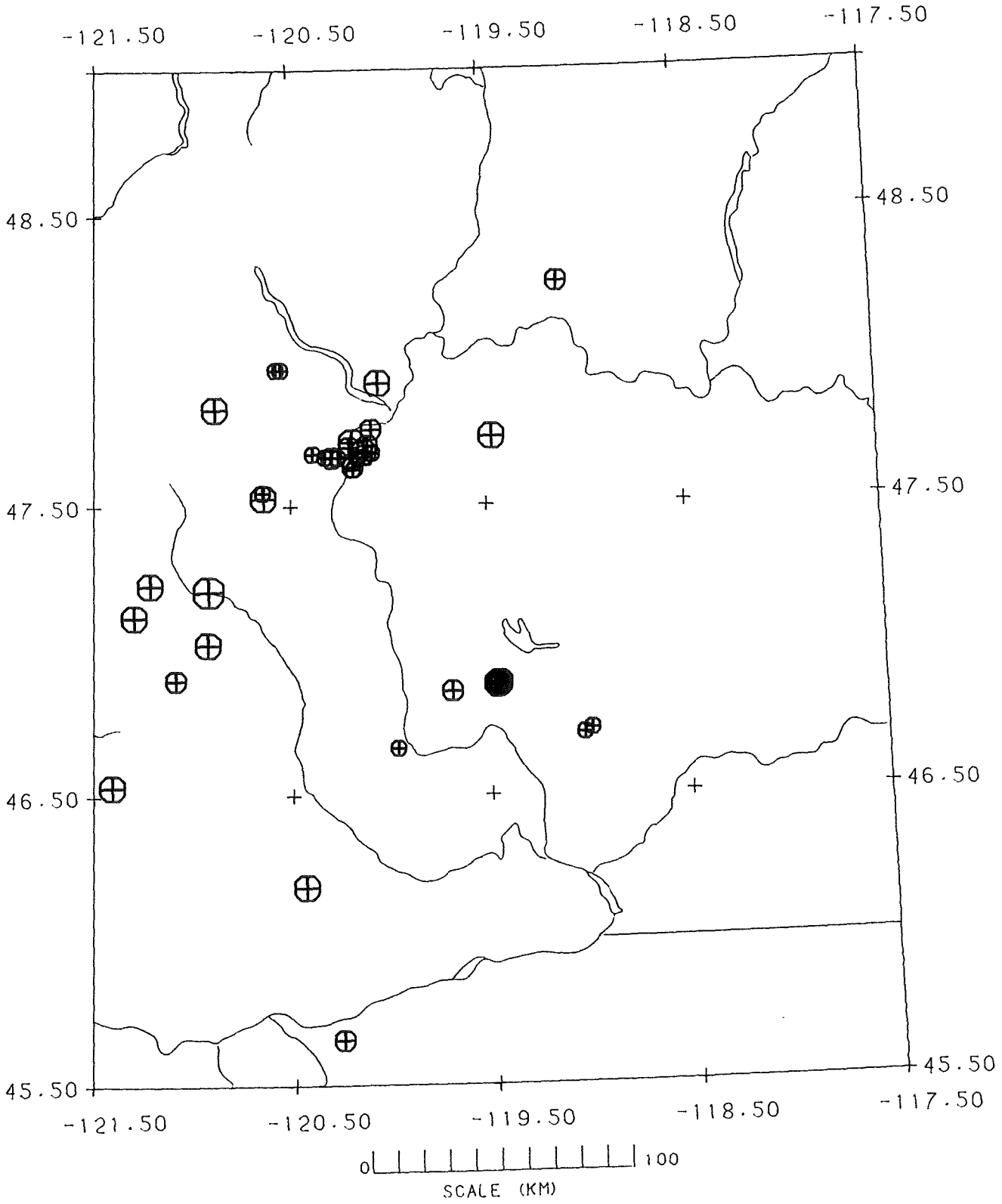

Figure 2. Eastern Washington earthquakes, Oct-Dec 1982.

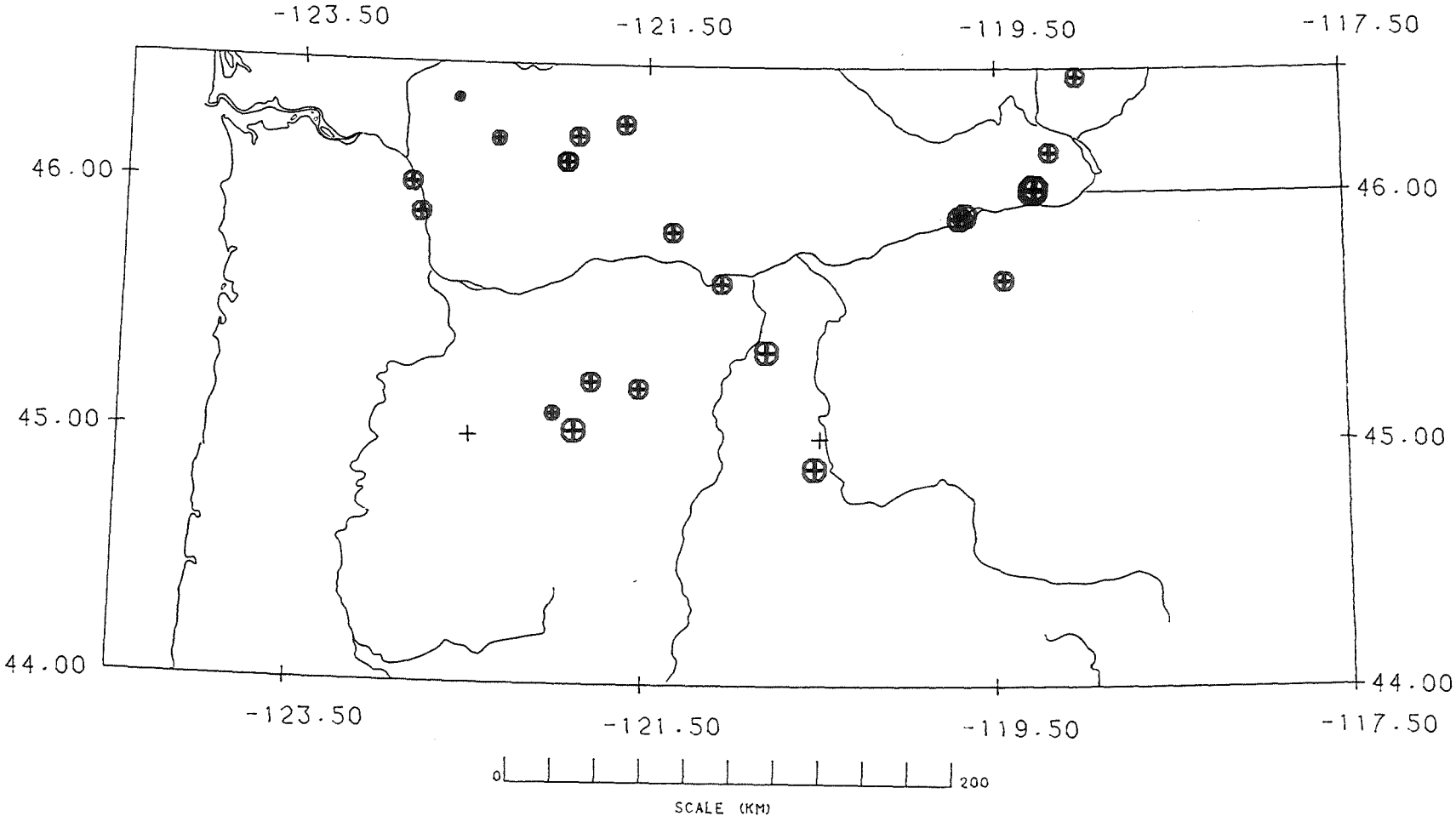

Figure 3. Southern Washington-Northern Oregon known and probable explosions.

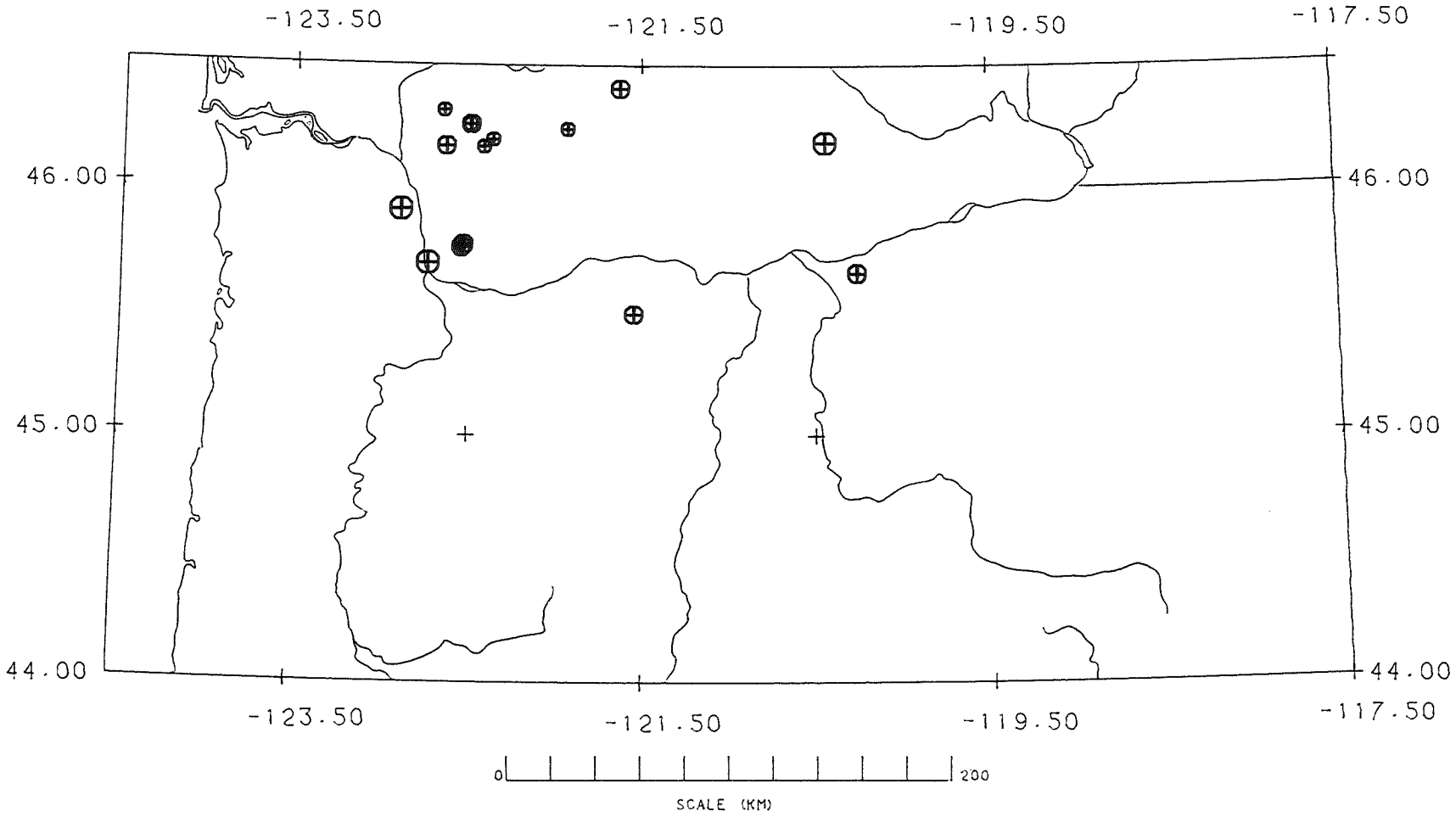

Figure 4. Southern Washington-Northern Oregon earthquakes Oct-Dec 1982