

QUARTERLY TECHNICAL REPORT 81-C

on

Earthquake Monitoring of Eastern Washington and Northern Oregon

July 1 through September 30, 1981

Geophysics Program

University of Washington

Seattle, Washington

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and

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Operations

Operations of the 37-station Eastern Washington network continued normally throughout the quarter, although somewhat more down time than usual was experienced in September due to problems at two sites. Average up time at other sites actually improved, owing chiefly to the Stanwyck Corporation's field technician, Mr. Don Hartshorn, whose improved familiarity with the sites and equipment is gradually leading to much more reliable operation. Major problems have occurred at Chelan Butte, where the transmitter to the phone drop has been causing interference on several local commercial operations. As a result, the transmitter has been turned off several times. Five stations in the South Lake Chelan area use this transmitter, so down time has been significant for these sites. We have negotiated use of a private phone line into the town of Chelan as a solution; this line should be installed in mid to late October.

The Table Mountain receiver at Ellensburg has caused numerous problems and has been removed for repairs. No spare radio pair was available, so the Table Mountain station has been inoperative pending reinstallation of the receiver.

Some effort has been expended resetting phone line input levels due to major changes in the characteristics of one Hanford line in late July. All subcarriers on the line suddenly became too hot by 9 to 18db, causing severe crosstalking and overall increased background noise on the traces recorded at the UW. Inquiries to the phone company produced denials that the characteristics of the lines had been changed in spite of the evidence that such was the case. Under such circumstances, it was felt that the best solution was to turn down the subcarriers at the individual sites. Many of these had been going on the line nearly at the output limits of the VCO's, (about 3-4 volts), so it is evident that the phone company had actually cleaned up some high attenuation portions of the lines.

Some progress was made on the new UW network in northern Oregon, which is

mainly supported by NRC. One station (VNM-Nicolai Mountain) was installed in late September. Siting and permitting work is complete for the eastern portion. The phone line for the eastern stations was installed in late July. We have been negotiating with PGE to get three of their stations in the Arlington area recorded on-line with the rest of the network. The remaining Oregon stations should be installed in late November and early December.

In late September, a working version of an on-line P-picker was installed at the UW. Our analysis routines are being revised to permit evaluation of the efficiency of the P-picker. We hope that a sufficient sample of events will be recorded in the last quarter of 1981 to permit a detailed critique.

Data

The area of interest for this report has been expanded from that covered in previous reports. Part of our operations is now supported by the NRC which is particularly interested in the southern Washington - northern Oregon area. We have, therefore, combined reports to DOE, WPPSS, and the NRC and cover the seismicity of eastern Washington as well as the southern Washington and northern Oregon regions. This expanded area includes all of eastern Washington east of longitude 121.5W and the area south of latitude 46.5N excluding the immediate Mount St. Helens area. The seismicity for these areas are plotted in figures 1-4, with known and suspected explosions on separate maps.

There are 178 seismic events plotted on these maps; 30 of them are explosions and 148 are earthquakes. The explosions mostly fall in known quarry locations in eastern Washington. The explosions plotted in southern Washington and northern Oregon have not been verified yet since we are just now gaining experience in quarry location. There are at least two clusters of plotted earthquakes in southern Washington which may be explosions. Their seismograms do not look characteristic of explosions but their time of day and tight spacial clustering is suspicious.

The active earthquake areas were similar to last quarter with the exception of 6 events in the central Pasco Basin. Three of these were quite small and shallow while the others were about 17km deep. One of these, on Sept # was a magnitude # event and was well enough recorded to obtain a poorly constrained fault plane solution. The solution is consistent with a roughly east-west striking fault plane dipping either 45 degrees north or south with reverse motion, which is similar to most other mechanisms determined for eastern Washington. Aftershocks of the Goat Rocks earthquake continued where the largest event of the quarter occurred on Aug 6 (M=2.8). The activity in the south Lake Chelan region was typical of previous periods, where the only felt event of the quarter occurred on July 22 (M=2.6).

A great deal of effort has gone into revising our earthquake location program during the past two months. We are now fairly satisfied with it and have begun using it for the routine processing. There are still a few tests we need to put it through but it appears to do a much better job resolving the details of shallow events than the previous version. The results listed in the catalog in this report have, for the most part, been processed with this new routine. A complete description of the code and its options will be available in the near future.

In the following earthquake catalog there are several symbols which have special meaning. Following the depth of an earthquake a * means the depth has been fixed; a \$ means that a convergent solution was not obtained with the depth free and it may be greatly in error; a # means that the depth was fixed but still no convergent solution was obtained and the epicenter may be greatly in error. Under the "TYPE" column the symbols have the following meaning: X means a known explosion; a P means a probable explosion usually based on signal character; and a F means the event was reported to have been felt.

CATALOG July - Sept. 1981

July 1981											
DAY	TIME	SEC	LAT	LON	DEPTH	MAG	NS/NP	RMS	Q	MODEL	TYPE
1	1:49	50.21	46 31.09	121 23.78	4.44	1.5	18/20	0.23	AC	C1	
1	7:13	25.77	47 34.42	120 19.53	4.74	1.0	7/09	0.08	AC	N1	
1	23:33	3.43	47 37.62	120 1.82	4.47	0.9	5/05	0.01	AD	N1	X
2	4:22	65.87	46 32.23	121 22.65	6.31	0.6	7/10	0.20	BD	C1	
2	12:46	59.76	46 31.91	121 24.63	3.81	2.3	30/33	0.22	BC	C1	
2	12:54	19.97	46 31.96	121 24.71	5.84	1.2	11/13	0.29	BC	C1	
2	13: 9	35.81	46 32.69	121 25.05	7.41	1.0	10/12	0.30	BB	C1	
2	19:59	64.27	46 32.41	121 24.70	0.04*	2.4	39/39	0.19	CC	C1	
2	20:47	66.24	46 32.12	121 23.11	7.87\$	0.7	6/08	0.29	BD	C1	
2	20:58	41.88	46 32.69	121 25.25	5.21	2.2	25/27	0.28	BC	C1	
2	21:39	33.19	46 31.62	121 24.40	5.53	1.3	18/21	0.38	BC	C1	
2	23:10	32.36	46 32.74	121 24.51	2.49*	0.1	16/16	0.17	AC	C1	
2	23:10	33.63	46 31.21	121 25.33	5.26	1.7	20/21	0.33	BC	C1	
2	23:45	65.49	46 32.91	121 25.24	7.73	0.8	11/13	0.23	BB	C1	
3	2:41	35.01	46 31.72	121 24.11	4.71\$	1.4	15/17	0.26	BC	C1	
3	8:34	8.43	46 32.21	121 23.81	3.68	0.7	9/11	0.28	BC	C1	
3	8:34	13.08	46 32.40	121 24.73	4.38	2.4	39/41	0.22	BC	C1	
3	8:50	33.72	46 32.61	121 24.33	7.19	1.1	11/14	0.23	BC	C1	
3	14:45	25.63	47 42.48	120 18.93	0.82	1.2	14/18	0.15	AC	N1	
3	22: 1	64.91	46 31.78	121 20.92	6.79	0.5	4/06	0.16	BD	C1	
4	1:36	65.43	46 32.35	121 23.58	8.32	0.4	4/07	0.26	CD	C1	
4	3:36	51.33	46 32.01	121 21.78	8.02	0.4	4/05	0.34	DD	C1	
4	7:51	42.40	46 50.76	119 20.21	0.10*	1.0	7/09	0.08	AB	E1	
5	20:53	59.59	47 31.35	120 38.73	2.64	1.6	12/12	0.22	BC	N1	
6	13:29	38.67	46 31.40	121 24.22	4.24	2.0	31/34	0.23	BC	C1	
6	23: 0	17.26	44 54.61	122 9.08	12.36	1.7	11/15	0.41	BC	C1	
7	18: 6	45.33	47 38.22	120 1.83	0.04*	2.2	18/18	0.37	CB	N1	
7	20:33	57.41	46 24.36	119 10.68	0.05*	1.6	15/15	0.21	BB	E1	
8	1:58	43.99	46 26.11	121 32.54	0.04*	0.9	10/10	0.20	CC	C1	P
8	7:37	25.62	47 31.21	120 38.03	0.06*	1.6	21/24	0.47	BC	N1	
8	7:41	16.89	47 31.21	120 37.98	0.06*	1.4	17/20	0.29	BC	N1	
9	3:15	28.25	46 31.31	121 22.21	0.07*	0.5	5/08	0.33	DD	C1	
9	6: 6	35.10	46 31.22	121 21.91	1.02	0.6	5/08	0.33	CD	C1	
10	2:41	63.07	46 17.43	118 28.61	0.04*	2.6	16/16	0.43	CC	E1	
10	14:57	41.55	47 38.69	120 7.69	0.32	0.1	5/09	0.08	AD	N1	
12	16: 8	65.94	46 31.89	121 21.29	7.88	0.4	4/06	0.11	BD	C1	
12	19:59	29.06	46 31.86	121 22.02	7.46	0.5	4/07	0.21	BD	C1	
13	8:56	29.32	46 33.06	119 39.39	16.93	0.	5/06	0.29	DD	E1	
13	9: 0	48.47	46 30.67	120 8.89	7.95	0.	4/04	0.88	AD	E1	
15	17:21	28.90	45 18.53	121 27.69	0.03*	2.3	8/09	0.34	DD	C1	P
15	23:27	29.24	47 50.32	118 10.62	0.09*	1.7	5/06	0.42	DD	E1	X
16	12:12	39.39	45 39.30	121 58.26	9.73	1.1	13/14	0.16	AC	C1	
18	3:47	38.44	46 31.98	121 23.69	7.11\$	0.6	5/08	0.21	BD	C1	
18	13:35	33.00	46 19.17	121 35.76	10.07	2.0	6/06	0.75	DC	C1	
19	21:47	18.06	47 32.56	120 37.98	8.29	0.8	11/12	0.23	BC	N1	
20	23:44	46.43	46 25.01	122 24.89	12.78	0.9	21/35	0.14	AB	S1	

July 1981

DAY	TIME	SEC	LAT	LON	DEPTH	MAG	NS/NP	RMS	Q	MODEL	TYPE
21	19:21	3.47	47 53.18	117 55.58	0.08*	1.6	12/12	0.47	DD	N1	
21	22: 4	11.53	46 31.57	121 23.07	6.62	0.5	7/10	0.35	BD	C1	
21	22:10	52.77	45 55.24	122 8.81	9.81	2.5	59/68	0.17	BB	S1	
21	23:18	17.69	45 54.76	122 7.99	6.87	1.1	20/27	0.13	AC	S1	
22	6: 5	50.62	47 46.57	120 16.21	3.59	2.5	30/30	0.42	BC	N1	F
22	7: 1	43.70	47 37.39	120 16.72	6.09	0.6	5/07	0.05	AD	N1	
23	4:42	58.15	46 31.78	121 24.54	2.65#	1.1	18/21	0.38	BC	C1	
23	21:56	46.04	46 52.24	119 26.92	2.76	1.0	6/10	0.12	AC	E1	
23	22:12	53.32	46 16.53	121 55.85	0.10*	0.9	13/13	0.14	AC	S1	P
24	0:39	26.01	46 22.65	122 30.84	0.10*	1.0	14/15	0.16	BB	S1	P
24	17:58	13.57	47 41.02	120 19.90	0.57	1.2	5/09	0.12	AD	N1	
25	1:46	39.91	46 16.53	122 27.46	15.97	0.5	13/23	0.15	AB	S1	
25	2:22	22.89	46 31.47	121 24.20	3.11	1.4	17/18	0.18	BC	C1	
25	2:31	22.61	46 30.88	121 21.03	5.39	0.6	4/06	0.01	AD	C1	
25	21:15	46.22	45 55.71	122 10.08	0.10*	1.1	15/17	0.20	BC	S1	
27	11:13	35.50	46 32.19	121 24.93	7.28	0.9	6/08	0.17	BC	C1	
28	17: 8	22.17	45 53.91	119 40.17	0.07*	2.4	18/19	0.47	CD	E1	P
29	20:26	35.19	47 50.53	118 7.57	0.91	1.9	16/19	0.85	CD	N1	X
30	15:38	56.97	47 39.70	120 10.03	0.10*	2.3	27/28	0.42	BB	N1	
31	2:50	19.18	46 32.92	121 26.62	10.82	1.2	8/11	0.20	BB	C1	

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DAY	TIME	SEC	LAT	LON	DEPTH	MAG	NS/NP	RMS	Q	MODEL	TYPE
1	5:52	10.24	46 8.97	119 25.70	12.24	0.1	9/14	0.17	AB	E1	
1	15:19	13.96	46 32.62	121 26.96	9.54	1.5	12/13	0.33	BB	C1	
3	1:31	16.39	46 30.77	121 24.05	4.99	1.1	8/10	0.19	BC	C1	
4	1:13	7.21	46 6.94	122 41.05	9.34	0.1	16/22	0.20	BC	P1	
4	22:34	17.50	46 36.96	121 18.49	12.10	1.3	34/36	0.33	CB	C1	
5	18:13	23.13	46 31.32	121 22.53	5.17	0.9	5/07	0.08	AD	C1	
6	12:32	28.67	46 29.26	121 21.26	0.08*	2.8	46/49	0.29	BC	C1	
6	13: 6	21.63	46 29.04	121 21.26	6.48	1.2	9/12	0.19	BC	C1	
7	16: 9	6.29	46 15.00	118 50.91	0.07*	1.1	10/11	0.33	CD	E1	X
7	16:33	58.17	46 8.31	119 26.63	5.80\$	0.9	7/09	0.53	DD	E1	
7	21:44	37.29	45 35.44	121 34.76	6.93	1.8	11/11	0.25	BB	C1	P
7	22: 2	38.49	46 31.56	119 34.35	17.04	1.5	19/26	0.49	CA	E1	
8	13:18	11.29	46 31.31	121 21.01	6.79	0.8	4/05	0.02	AD	C1	
9	0: 0	50.44	47 40.03	120 3.66	5.07	1.1	6/09	0.08	AC	N1	
9	15:25	27.08	47 43.54	120 7.02	5.38	0.4	7/12	0.14	AC	N1	
11	1:38	44.07	45 35.39	119 31.25	0.04*	2.3	12/12	0.49	CC	E1	P
11	5:43	64.28	45 2.27	122 22.20	16.78	1.0	8/11	0.26	BB	C1	
11	12: 5	44.82	46 32.06	121 21.58	8.34	0.6	6/08	0.17	BD	C1	
11	23:19	49.20	46 30.98	121 21.36	5.00*	0.5	4/06	0.07	BD	C1	
11	23:30	38.16	47 50.35	118 1.65	2.27	1.4	9/10	0.31	BD	N1	X
12	20:45	57.97	45 14.39	121 23.58	7.02	1.0	5/05	0.01	AD	C1	
13	17:17	59.64	45 14.22	121 24.35	0.03*	1.8	9/11	0.40	CD	C1	P
13	17:20	19.06	46 31.49	121 25.33	5.05	1.5	16/19	0.19	BC	C1	
14	16:36	59.33	47 6.72	121 20.45	8.96	0.8	13/19	0.23	BB	C1	
15	2:21	64.33	46 31.26	121 25.17	5.70	1.1	10/12	0.20	BC	C1	
16	12:43	47.63	46 15.71	122 41.55	48.47	-0.5	5/05	0.99	DD	S1	
17	23:21	36.94	45 19.21	121 16.84	0.04*	1.7	5/06	0.70	DD	C1	
18	0: 1	36.15	46 25.63	121 36.65	2.41	2.3	33/34	0.20	BC	C1	

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DAY	TIME	SEC	LAT	LON	DEPTH	MAG	NS/NP	RMS	Q	MODEL	TYPE
18	6:50	10.57	45 41.67	122 48.21	22.00	0.8	22/28	0.20	BD	P1	
18	17:47	12.12	45 32.48	122 6.26	27.46	1.1	8/08	0.73	DB	C1	P
18	23: 9	48.41	46 20.17	121 59.85	0.13	0.5	14/18	0.13	AC	S1	P
18	23:31	-0.14	47 57.88	117 59.53	0.08*	1.9	9/10	0.25	DD	N1	X
18	23:59	37.42	46 16.11	121 39.64	0.08*	1.1	13/14	0.22	CC	C1	P
19	18: 6	27.98	47 55.08	119 50.09	0.67*	1.1	12/13	0.56	CC	N1	
19	22:36	15.58	45 37.98	119 32.00	0.04*	1.8	19/20	0.39	CC	E1	
20	19:38	18.43	46 31.62	121 22.70	6.44	0.8	5/07	0.13	BD	C1	
20	23:32	-2.08	47 51.21	118 4.75	0.03*	1.8	9/10	0.65	DD	N1	X
21	18: 0	16.62	46 36.89	119 53.08	0.70\$	0.1	4/05	2.73	DD	E1	
21	20:53	13.04	45 25.19	122 3.30	1.13	1.0	5/08	0.46	DD	C1	
23	9:41	16.83	47 44.74	120 4.33	0.51\$	1.5	20/28	0.54	CB	N1	
23	19:44	47.27	46 32.07	121 24.29	6.96	0.8	9/11	0.20	BC	C1	
24	5:37	31.83	46 29.10	119 37.85	1.27	0.5	7/10	0.20	BC	E1	
24	15: 2	57.31	46 32.36	121 24.40	0.05*	0.9	9/09	0.15	CC	C1	
24	15: 2	58.47	46 31.86	121 24.22	0.04*	1.7	21/22	0.18	BC	C1	
24	16:31	68.46	46 28.18	119 39.19	1.35	0.2	4/05	0.16	BD	E1	
24	16:37	31.24	46 28.30	119 39.03	0.39	0.2	6/07	0.19	BC	E1	
25	7:10	25.69	47 32.25	120 37.87	7.51	0.6	14/16	0.22	BC	N1	
25	22:15	22.33	46 14.71	121 37.21	14.45	1.1	6/09	0.20	CD	C1	P
26	6: 8	45.18	46 30.90	121 22.91	4.92	0.6	5/07	0.05	AD	C1	
26	14:20	10.24	46 31.98	121 24.42	6.97	2.0	24/26	0.24	BC	C1	
26	14:48	47.24	46 31.82	121 23.97	5.91	1.3	14/16	0.32	BC	C1	
26	16:30	67.51	45 25.27	121 59.56	3.83	0.8	8/09	0.20	AC	C1	
26	18: 4	24.70	45 39.29	121 17.15	1.08	1.4	3/04	0.16	AD	C1	
26	18:21	22.92	46 32.06	121 24.51	7.99	0.7	7/09	0.17	BC	C1	
27	1:54	29.34	46 18.06	118 26.96	5.83	1.2	10/11	0.28	BD	E1	
27	5:52	66.69	46 51.57	119 16.55	4.90	0.8	5/08	0.19	CD	E1	
27	20:28	43.67	46 26.92	120 53.39	22.00	0.	5/05	0.87	DD	P1	
28	4:58	57.08	46 31.36	121 20.25	6.35	0.3	5/07	0.18	BD	C1	
28	16:32	48.32	46 9.10	122 27.35	0.06*	0.1	9/10	0.14	AB	S1	
28	17:57	54.63	45 48.12	121 33.47	37.14	0.9	5/08	0.47	DD	C1	
30	21:43	59.40	47 44.91	120 17.82	4.82	0.1	4/07	0.05	AD	N1	
31	21:33	1.46	46 13.93	118 46.47	0.01#	0.8	4/04	2.12	AD	E1	P
31	23:14	-3.79	45 22.82	119 39.93	0.10*	2.1	14/14	0.31	CD	E1	P

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DAY	TIME	SEC	LAT	LON	DEPTH	MAG	NS/NP	RMS	Q	MODEL	TYPE
1	9:32	46.96	46 7.80	122 30.48	0.10*	0.	8/08	1.27	DD	S1	
1	13:32	63.82	48 11.53	119 53.43	0.07*	2.4	21/21	0.61	BC	N1	
2	1:21	46.98	46 31.47	121 23.68	2.28	1.0	9/10	0.15	AC	C1	
2	20: 9	34.23	46 14.70	118 50.76	0.04*	1.1	7/07	0.22	CD	E1	X
2	21: 3	34.04	46 49.97	119 21.15	0.50	2.0	24/25	0.38	BA	E1	
3	22:35	27.92	45 13.40	121 11.35	0.06*	1.6	7/07	0.23	CD	C1	
4	15: 6	49.35	45 33.70	121 30.89	0.09*	0.	20/20	0.77	DC	C1	P
4	19:26	70.13	46 16.31	121 38.99	0.07*	1.3	15/16	0.24	CC	C1	P
4	22:47	23.82	45 14.62	119 38.36	21.70	1.6	6/08	0.18	BD	E1	
4	22:47	33.55	45 57.64	122 26.82	0.05*	1.6	12/14	0.15	AC	S1	P
5	19:38	56.15	45 18.50	122 23.75	11.24	1.2	6/08	0.08	AD	C1	
8	10:43	20.37	46 31.84	121 24.22	1.01	0.3	5/07	0.14	BD	C1	
8	23:51	59.77	45 44.86	122 32.63	8.74\$	1.4	23/25	0.22	CC	P1	

Sept 1981											
DAY	TIME	SEC	LAT	LON	DEPTH	MAG	NS/NP	RMS	Q	MODEL	TYPE
9	15:11	28.98	45 49.32	122 6.11	5.30	1.1	17/18	0.10	AC	S1	
10	0: 6	52.29	46 31.42	121 24.48	3.88	2.0	35/41	0.23	BC	C1	
10	2:10	15.00	46 31.76	121 25.54	8.15#	0.5	5/07	0.17	BD	C1	
10	6:45	56.42	46 30.91	121 24.48	3.88	1.6	13/15	0.39	BC	C1	
10	8:33	53.09	46 31.69	121 24.58	0.09*	2.4	42/43	0.23	BC	C1	
10	12:37	50.29	46 20.83	119 42.10	5.04	1.1	11/12	0.11	AB	E1	
10	17:31	62.09	46 50.39	119 23.43	0.04*	0.2	5/05	0.07	BD	E1	P
10	23: 0	2.12	45 0.83	122 2.97	18.71	1.6	5/06	0.12	BD	C1	
12	5:35	36.14	46 31.40	121 24.70	2.55	1.2	15/17	0.20	BC	C1	
12	7:18	24.72	46 31.93	121 23.45	5.56	0.5	7/09	0.20	BC	C1	
12	22:13	39.60	46 32.83	121 24.20	8.31	0.9	6/08	0.13	BC	E1	
14	10: 6	55.38	45 20.82	121 28.72	6.26	0.	6/06	1.89	DD	S1	
15	18:55	-15.94	49 45.14	120 0.77	0.07*	0.	10/10	1.57	DD	P1	P
17	6:22	-3.40	48 40.05	120 8.39	0.05*	1.8	11/14	0.94	CD	N1	
17	11:41	38.14	46 48.07	119 23.82	0.10*	1.1	7/09	0.09	AB	E1	
20	3:59	16.36	46 31.21	121 22.38	6.66	0.7	5/08	0.20	BD	C1	
20	8:35	52.24	46 31.38	121 24.28	7.01	0.9	11/15	0.16	BC	C1	
20	12:23	64.80	46 9.07	119 26.56	10.83	2.2	18/23	0.20	AB	E1	
20	12:47	39.12	46 8.74	119 26.63	7.72\$	1.8	17/23	0.20	AB	E1	
20	13:24	73.76	46 30.10	121 22.64	3.72	1.0	12/14	0.15	AC	C1	
21	21:23	60.56	46 20.81	121 52.58	0.55	1.2	17/20	0.13	AC	S1	P
22	21:58	21.84	46 8.92	119 26.38	9.40	1.2	8/11	0.15	AB	E1	
23	0:11	25.10	45 44.73	122 31.43	14.36	0.7	19/20	0.12	AC	S1	
23	8:14	15.57	47 42.39	120 18.69	0.19	-0.1	4/04	0.80	AD	N1	
23	16:28	39.37	46 31.67	119 41.62	17.44	2.3	26/31	0.50	BA	E1	
23	22:15	38.24	46 12.40	119 23.61	12.13	-0.1	4/07	0.40	CD	E1	
24	18:25	12.34	46 32.26	119 42.43	14.29	0.3	5/06	0.17	BD	E1	
25	2:51	25.95	46 38.97	119 38.31	4.35	0.2	6/09	0.10	AC	E1	
28	0:54	22.23	46 58.09	119 38.90	0.09*	2.6	25/27	0.30	AC	E1	
28	11:47	47.98	46 8.68	119 27.25	5.58	1.4	13/16	0.24	BC	E1	
28	17:59	51.28	46 31.84	121 24.20	6.87	1.2	12/14	0.22	BC	C1	
28	21:15	29.21	45 47.35	118 2.14	0.21	2.0	12/14	0.40	BD	E1	
28	22:56	20.53	46 7.30	121 39.57	3.32	1.5	9/10	0.27	BD	C1	
28	23:38	8.52	47 52.65	118 7.07	0.05*	1.8	13/14	0.55	CC	N1	X
29	5:40	-3.98	45 0.98	117 25.89	0.08#	1.7	11/11	0.15	CD	E1	
30	22:55	66.32	46 13.65	121 42.60	3.44	1.3	22/22	0.14	AC	C1	P

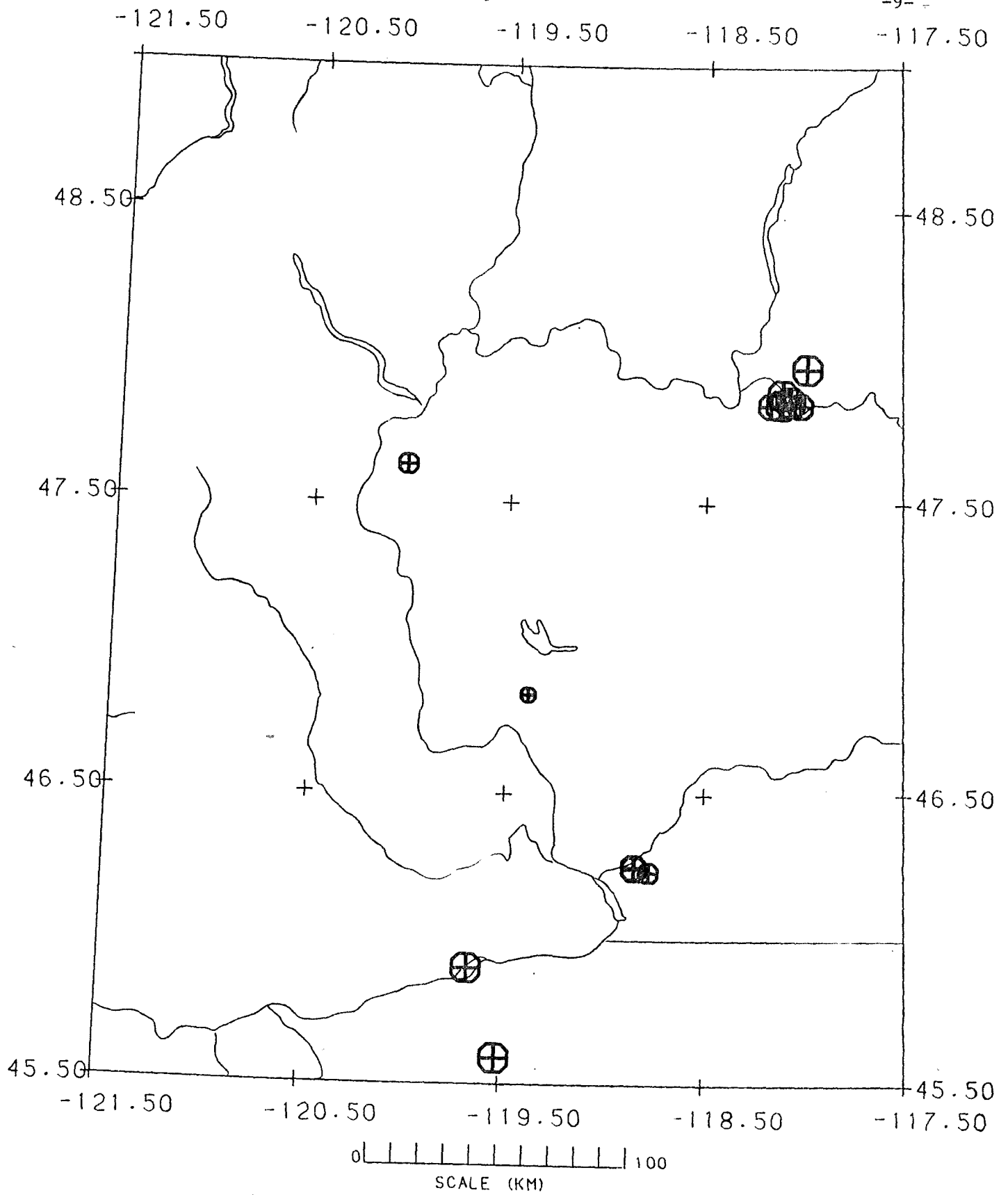


Fig. 1 Eastern Washington known and probable explosions

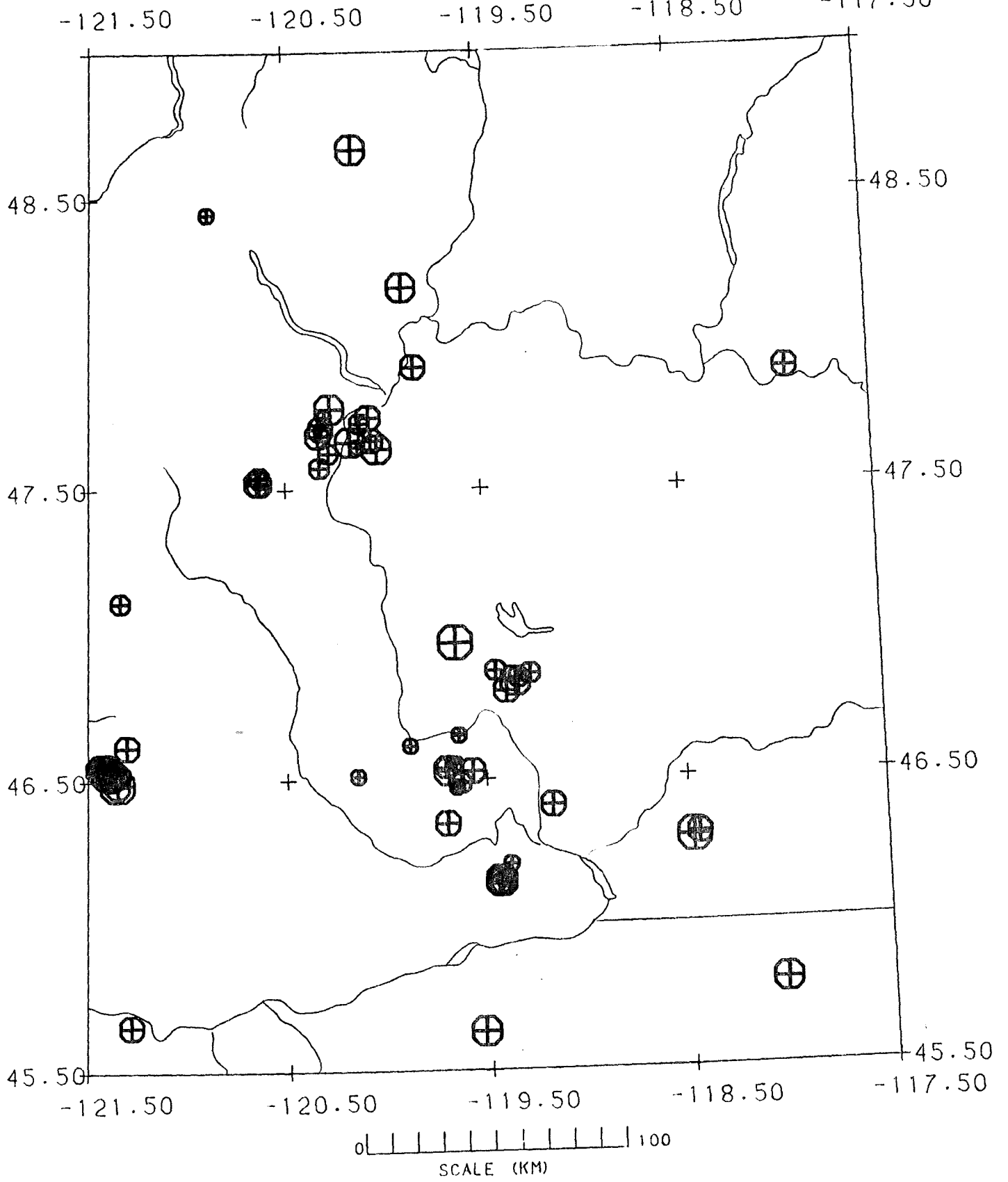


Fig. 2 Eastern Washington Earthquakes, July-Sept 1981

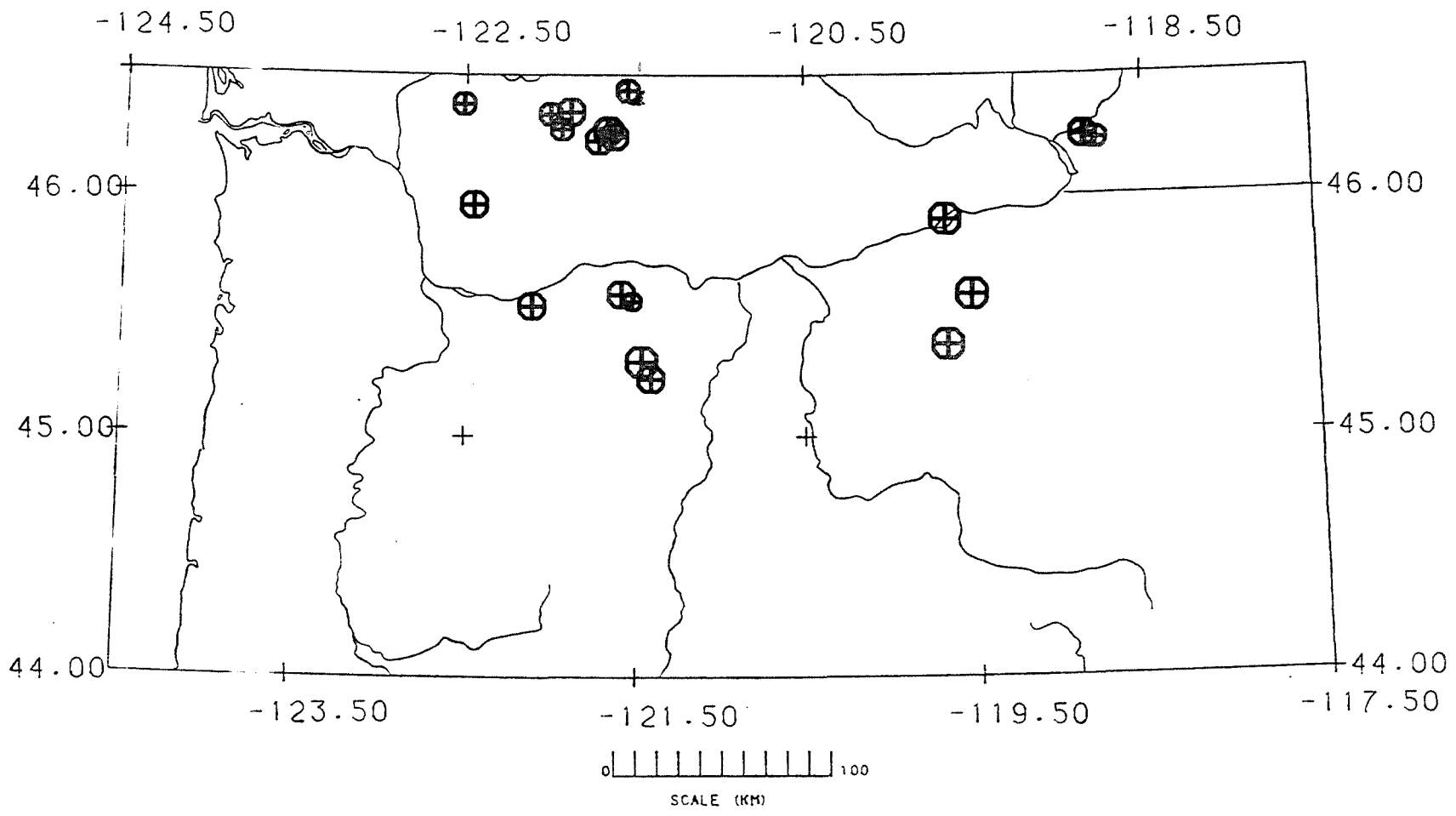


Fig. 3 Southern Washington - Northern Oregon known and probable explosions

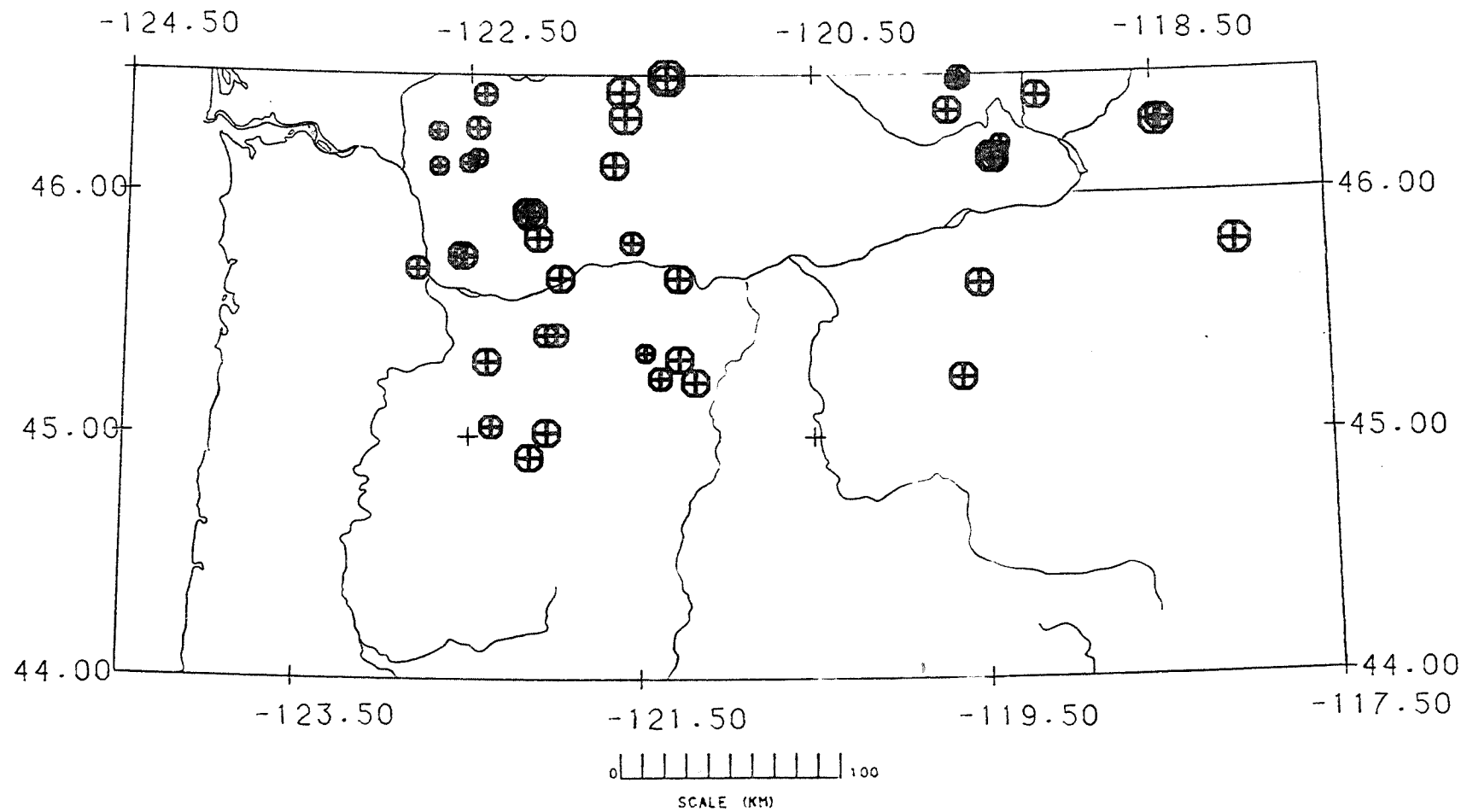


Fig. 4 Southern Washington - Northern Oregon Earthquakes, July-Sept 1981