QUARTERLY NETWORK REPORT 2005-C

on

Seismicity of Washington and Oregon

July 1 through September 30, 2005

Pacific Northwest Seismograph Network

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This report is prepared as a preliminary description of the seismic activity in Washington State and Oregon. Information contained in this report should be considered preliminary and not cited for publication without checking directly with network staff. The views and conclusions contained in this document should not be interpreted as necessarily representing the official policies, either express or implied, of the U.S. Government**.**

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TABLE OF CONTENTS

FIGURES

TABLES

APPENDIX 1, PNSN Quarterly Report 2005-C – Station Maps and Locations

INTRODUCTION

This is the third quarterly report of 2005 from the Pacific Northwest Seismograph Network (PNSN), at the University of Washington Dept. of Earth and Space Sciences, covering seismicity of Washington and western Oregon.

Comprehensive quarterlies have been produced by the PNSN since the beginning of 1984. Prior to that, we published quarterly reports for western Washington in 1983 and for eastern Washington from 1975 to 1983. Annual technical reports covering seismicity in Washington since 1969 are available from the U.W. Dept. of Earth and Space Sciences. The complete PNSN earthquake catalog is available on-line, both through our web-site and through the ANSS earthquake catalog. In these reports we provide special coverage (figures, counts, listings, etc.) of earthquake swarms, aftershock sequences, etc.

This quarterly report discusses network operations, seismicity of the region, unusual events or findings, and our educational and outreach activities. This report is preliminary, and subject to revision. The PNSN routinely records signals from selected stations in adjoining networks. This improves our ability to locate earthquakes at the edges of our network. However, our earthquake locations may be revised if new data become available. Findings mentioned in these quarterly reports should not be cited for publication.

Prior to 2004, each quarterly included station tables and maps. Beginning in 2004, station tables and maps appear in the quarterly report only once a year. The 2005C Quarterly Report includes these tables and maps in Appendix. \

NETWORK OPERATIONS

Lists of currently operating stations are available on-line through web page http://www.pnsn.org/OPS/stations.html. Table 1 gives approximate periods of time when individual stations were inoperable. Data for Table 1 are compiled from weekly plots of network-wide teleseismic arrivals and automated and manual digital and analog signal checks, plus records of maintenance and repair visits.

TABLE 1 - Station outages and installations

Station	Outage Dates	Comment
ACES	08/03/05-End	Bad timing
ALCT	08/16/05-End	Removed for repair
ALVY	07/20/05-End	No communications
BEVT	05/20/05-End	Removed for repair
BULL	03/28/05-07/29/05	Dead
COLT	06/02/05-End	Removed for repair
EARN	08/29/05-09/09/05	No communications
ERW	07/25/05-09/19/05	No communications
GL2	10/21/04-End	Dead
GPW	03/16/04-End	Dead
GRCC	06/06/05-08/12/05	No communications
GRCC	08/12/05-End	Removed for repair
GTWN	06/01/05-End	No communications; telemetry being moved for bldg. renovation
HOLY	07/13/05-09/09/05	No communications; firewall changed
HTW	08/30/05-09/07/05	Dead air cells
HUO	08/21/05-09/20/05	Dead
JBO	10/15/04-End	Noisy
KDK	07/06/05-07/26/05	No communications
KEEL	05/30/05-End	Dead
KFAL	06/15/05	Replaced sensor
KICC	03/04/05-End	Bad timing
LANE	07/20/05-End	No communications
LEOT	08/24/05-09/01/05	No communications
LNO	06/07/05-08/06/05	Dead; subcarrier problem
LTY	09/07/05-End	Intermittent
MBKE	06/07/05-End	Dead; possible K2 problem
MIDE	07/18/05	Destroyed by St. Helens rockfall
OBH	01/31/02-End	Temp. removed for logging
PGW	10/08/03-End	Dead
PNLK	08/26/05-09/02/05	No communications

TABLE 1 - Station outages and installations

Station	Outage Dates	Comment
RAFT	07/28/05	Installed—Mount St. Helens
RCS	06/11/05-07/07/05	Dead; replaced seismometer and cable
RHAZ	06/26/05-08/08/05	Dead
RHAZ	08/08/05-08/11/05	Removed for repair
SBES	05/18/05-End	Short period noisy
SCC	08/03/05-End	Bad timing
SEA.HH?	12/05/03-End	Disconnected for renovation
SEND	07/01/05	Installed—Mount St. Helens
SFER	09/01/04-End	Short period dead; needs removal
SMNR	06/23/05-08/18/05	Temp. removed for work on the bldg.
SMW	06/20/03-05/27/05	Intermittent; equalization problem
SOPS	08/27/02-End	K2 flash-memory problem
SOS	09/14/05	Replaced seismometer
SSS1	03/05/05-End	One of 3 downhole 3-D sensors removed for repair
UWFH	05/01/05-End	Short period problems; needs removal
VGB	09/23/04-End	Intermittent; usually very noisy
VVHS	06/30/05-End	No communications
WWHS	08/03/05-End	Bad timing

Mt. St. Helens eruption, 2004-2005

Beginning on September 23, 2004 a series of small earthquakes at Mount St. Helens signaled the beginning of the first dome-building eruption at the volcano since 1986. The small earthquakes soon escalated into the most vigorous seismic activity at Mount St. Helens since the catastrophic eruption of 1980. Continuous seismic data from short-period stations near Mt. St. Helens are archived at the PNSN and streamed to the IRIS BUD archive. New procedures were implemented to rapidly handle the large volume of data so the PNSN and Cascade Volcanoes Observatory could assess the significance of the rapidly changing seismicity. For details, see the 2004-D, 2005-A and 2005-B quarterly reports.

- ***MSH Equipment; destruction and replacement*** **-** Station MIDE was destroyed during a large rockfall and magnitude 3.2 earthquake on July 18. New stations SEND and RAFT were installed on July 1 and July 28, respectively. All were done by the staff of CVO. Major service of many Mt. St. Helens stations was done during this quarter because of good weather and helicopter support provided by CVO. Under separate funding, 40 portable "Texan" high-frequency seismometers were installed for 3 days in August at 100m spacing along a line going from the dome 4 kilometers north. Around the same time, five other three-component stations were installed high on the flanks of the mountain for a three-week period.

PNSN Personnel changes

George Thomas left the PNSN at the end of September to begin a new job as a research scientist with the Land Surface Hydrology Research Group in the Civil and Environmental Engineering department at the University of Washington. We will miss him and all his expertise but wish him luck and happiness in his new job.

Our co-Principal Investigator, Tony Qamar, was fatally injured in a logging truck accident on October 4, 2005 while driving with Dan Johnson, of the University of Puget Sound, to the Olympic Peninsula to retrieve a GPS instrument. This is a terrible loss personally and professionally for everyone associated with the PNSN. A section devoted to Tony will be included in the report for the 4th quarter of 2005.

As the cycle of life goes on, congratulations to Karl Hagel, our electronics technician, who welcomed a baby boy, Giancarlo Martin Hagel, into the world on September 30, 2005.

Strong Motion Instrumentation Update

There were no new strong motion installations this quarter. However, the implementation of a maintenance program for the ANSS strong motion instruments was started with 2001 and 2002 instruments this year. This program includes changing batteries, upgrading flash cards and firmware.

At station SSS1, the deepest of three downhole seismometer package located at the John Stanford Center in Seattle and installed in Oct. 2004, ceased operation in March of 2005. The logistics of retrieving and replacing a downhole instrument are considerable. The USGS and the UW are currently preparing to remove the failed instrument. Repairs and a subsequent lengthy tests of the repaired unit will likely delay reinstallation of the unit until sometime in early to mid 2006.

Computer Hardware Update

Scossa continues to be our main data collection computer, and *tremito* provides additional computational power for manual processing of earthquake data and acts as a fileserver for all the other networked computers in the group. A second Windows computer was configured to act as a backup to our main digitizing computer. Tests continue into the 4th quarter.

Use of PNSN Data

The IRIS Data Management Center reports 1,103 requests for PNSN trace-data this quarter. Nearly 9,800,000 traces were requested. The number of traces requested remains at an elevated level compared to a "typical" quarter prior to the current eruption of Mount St. Helens.

EARTHQUAKE DATA – 2005-C

Between July 1 and September 30, 2005, 1,754 events were digitally recorded and processed at the University of Washington. Tens of thousands of additional unlocated events occurred at Mount St. Helens associated with the dome-building eruption which began in late September 2004. Of the processed events, locations in Washington, Oregon, or southernmost British Columbia were determined for 1,277 of these events; 1,171 were classified as earthquakes and 106 as known or suspected blasts. The remaining processed events include teleseisms (163 events), regional events outside the PNSN (102), and unlocated events within the PNSN, mostly at Mt. St. Helens. Due to the extremely large number of events, only a representative sample of Mount St. Helens seismicity was located. Other unlocated events within the PNSN normally include surficial events on Mt. St. Helens and Mt. Rainier, very small earthquakes, and blasts. Frequent mining blasts occur near Centralia, Washington and we routinely locate them.

Table 2 lists earthquakes reported to have been felt during this quarter. Events with ShakeMaps or Community Internet Intensity Maps (CIIM) are indicated. This quarter, one event generated a ShakeMap. Four events produced "CIIM" maps (**http://pasadena.wr.usgs.gov/shake/pnw/**), which convert "felt" reports sent by the general public (via Internet) into numeric intensity values. CIIM maps show the average intensity by zip code.

Table 3 is this quarter's catalog of earthquakes M 2.0 or greater, located within the network - between 42-49.5 degrees north latitude and 117-125.3 degrees west longitude.

Figure 1. Earthquakes with magnitude greater than or equal to 0.0 (M_c >=0).

Figure 2. Blasts and probable blasts (M_c >=0).

Figure 3. Earthquakes located near Mt. St. Helens (M_c >=0).

Figure 4. Earthquakes located near Mt. Rainier (M_c >=0).

TABLE 2 - Felt Earthquakes during the 3rd Quarter of 2005

DATE-(UTC)-TIME	LAT(N)	LON(W)	DEP	MAG	COMMENTS		Shake
yy/mm/dd hh:mm:ss	deg.	deg.	km	Ml		CIIM	Map
					No felt earthquakes this quarter		

OREGON

During the third quarter of 2005, 40 earthquakes were located in Oregon between 42.0 degrees and 45.5 degrees north latitude, and between 117 degrees and 125 degrees west longitude. The most notable earthquake in Oregon this quarter was a M 2.7 quake at about 13 km depth located near Adel, OR on August 16 (UTC).

WESTERN WASHINGTON SEISMICITY

During the first quarter of 2005, 1,088 earthquakes were located between 45.5 degrees and 49.5 degrees north latitude and between 121.0 degrees and 125.3 degrees west longitude. Most western Washington seismicity this quarter was in the Mount St. Helens area, see discussion below. No earthquakes were felt this quarter in western Washington.

Excluding Mt. St. Helens, the largest earthquake in western Washington this quarter was a magnitude 2.9 event on Sept. 13 (UTC), located about 23 km west-north-west of Poulsbo at a depth of about 49 km. The deepest earthquake in western Washington this quarter was a magnitude 0.7 event at about 97 km depth located about 13 km SSW of Skykomish, WA on September 28 (UTC).

Episodic Tremor and Slip event (ETS)

ETS was expected to occur sometime between August and October, 2005. It began on September 6, 2005 and ended by September 30, 2005. The tremor began in the Puget Sound area and moved north, terminating to the west of Port Alberni, B.C. Additional details are available at http://www.pnsn.org/NEWS/PRESS_RELEASES/TREMOR_05.html

WASHINGTON CASCADE VOLCANOES

Mount St. Helens

Mount St. Helens seismicity and dome building eruption continued through this quarter. The current eruptive episode began on September 23, 2004 with a vigorous sequence of seismic activity. The initial phase of the activity culminated Oct. 1-5, 2004 when several phreatic explosions and half-hour to hour-long periods of harmonic tremor interrupted and temporarily calmed extremely high rates of magnitude 3+ seismicity. Seismicity declined following Oct. 5, 2004 though frequent, but smaller earthquakes have continued through this quarter. Because of the high rates of seismicity, only a representative sample of Mount St. Helens events was located using conventional manual processing. Figure 3 shows located volcano-tectonic earthquakes near Mount St. Helens. Low frequency (L) and avalanche or rockfall events (S) are not shown. See the operations section for details on destruction, replacement and new instrument installation.

This quarter, 839 earthquakes were located in the area shown in Fig. 3 using conventional manual processing procedures (including 716 earthquakes between magnitude 1.0 and 2.9, and 31 slightly larger events with magnitudes between 3.0 and 3.4. Most of the larger events are associated with rockfalls off the new dome. Rockfalls expose glowing hot rocks in the core of the whaleback, and flashes of light continue to be recorded simultaneously with rockfall signals. Digitally enhanced nighttime volcano-cam images (http://www.luscombe-carter.com/mount_st_helens/index.html) show variations in the intensity of glow from the new dome. Earthquakes continue to occur with a somewhat regular inter-occurrence time which has varied slowly over days and weeks. This activity, called “drum-beat earthquakes” declined, and the count of events went down by a factor of 4 this quarter compared to last quarter.

All locatable earthquakes in the 2004/2005 sequence are relatively shallow. Only a few events have been located deeper that 2 km. Seismicity this quarter continued to be located on the boundary between the old and new domes near the vent that appeared in early October, 2004.

Seth Moran of CVO has provided improved counts of seismic events during the current eruptive sequence. These numbers represent automated counts at HSR, which is intermediate in distance between YEL and JUN (the stations used for count estimates given in previous quarters) . Helena Buurman, a summer intern at CVO reveiwed the data to assure uniformity and quality.

Earthquake counts at Mount St. Helens, quarterly break-down, provided by CVO.

4th quarter 2004 - 292,352 events

1st quarter 2005 - 123,502 events

2nd quarter 2005 - 49,811 events

3rd quarter 2005 - 12,085 events

Mount Rainier

The number of events in close proximity to the cone of Mt. Rainier varies over the course of the year, since the source of much of the shallow activity is presumably ice movement or avalanching at the surface, which is seasonal in nature. Events with very low frequency signals (1-3 Hz) believed to be icequakes are assigned type "L" in the catalog. Emergent, very long duration signals, probably due to rockfalls or avalanches, are assigned type "S" (see Key to Earthquake Catalog). One event flagged "L" or "S" was located at Mount Rainier this quarter and 100 "L" or "S" events were recorded, but were too small or too emergent to locate reliably. Type L and S events are not shown in Fig. 4.

A total of 46 tectonic events (22 of these were smaller than magnitude 0.0, and thus are not shown in Fig. 4) were located within the region shown in Fig. 4. The largest tectonic earthquake located near Mt. Rainier this quarter was a magnitude 1.8 event on July 2 (UTC), located about 15 km west of the summit of Mt. Rainier at about 6 km depth. This quarter, 21 tectonic earthquakes (13 of them smaller than magnitude 0.0 and thus not shown in Fig. 4)were located in the "Western Rainier Seismic Zone" (WRSZ), a north-south trending lineation of seismicity approximately 15 km west of the summit of Mt. Rainier (for counting purposes, the western zone is defined as 46.6-47.0 degrees north latitude and 121.83-122 west longitude). Within 5 km of the summit, there were 11 (5 of them smaller than magnitude 0.0 and thus not shown in Fig. 4) higher-frequency tectonic-style earthquakes and the remaining events were scattered around the cone of Rainier as shown in Fig. 4.

EASTERN WASHINGTON SEISMICITY

During the third quarter of 2005, 41 earthquakes were located in eastern Washington in the area between 45.5 - 49.5 degrees north latitude and 117 - 121 degrees west longitude. The largest earthquakes recorded in eastern Washington this quarter was were two magnitude 2.6 events. The first occurred on July 22 (UTC), and was located about 18 km north-northwest of Ellensburg at less than 1 km depth. The second was on Sept. 27 (UTC), and was located about 39 km east of Skykomish, WA at a depth of about 6 km.

OTHER SOURCES OF EARTHQUAKE INFORMATION

We provide automatic computer-generated alert messages about significant Washington and Oregon earthquakes by e-mail, FAX or via the pager-based RACE system to institutions needing such information, and we regularly exchange phase data via e-mail with other regional seismograph network operators.

Other regional agencies provide earthquake information. These include the Geological Survey of Canada (Pacific Geoscience Centre), Sidney, B.C. **http://www.pgc.nrcan.gc.ca/seismo/table.htm** and other regional networks in the United States **http://earthquake.usgs.gov/regional/** The US Geological Survey coordinates earthquake information nationally; **http://earthquake.usgs.gov**.

Complete catalog listings are available on-line through **http://www.pnsn.org/CATDAT/catalog.html** Key to earthquake catalog can be found in the last quarterly report of each year, or at:
http://www.pnsn.org/INFO_GENERAL/PNSN_QUARTERLY_EQ_CATALOG_KEY.htm

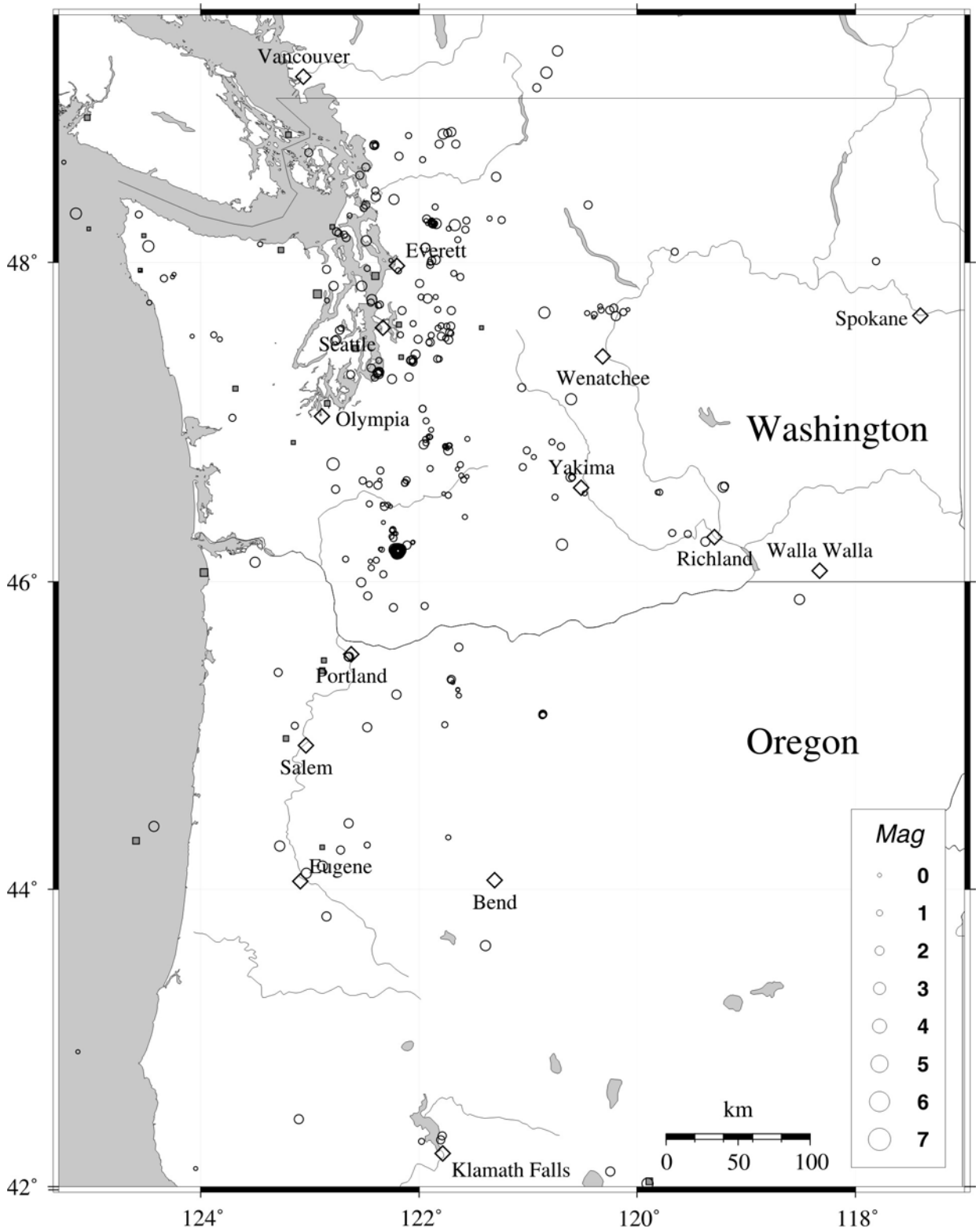

Figure 1 Earthquakes with magnitude greater than or equal to 0.0 (Mc>=0.0).

Unfilled diamonds represent cities. Quakes shallower than 30 km are indicated by circles, and deeper quakes by filled squares.

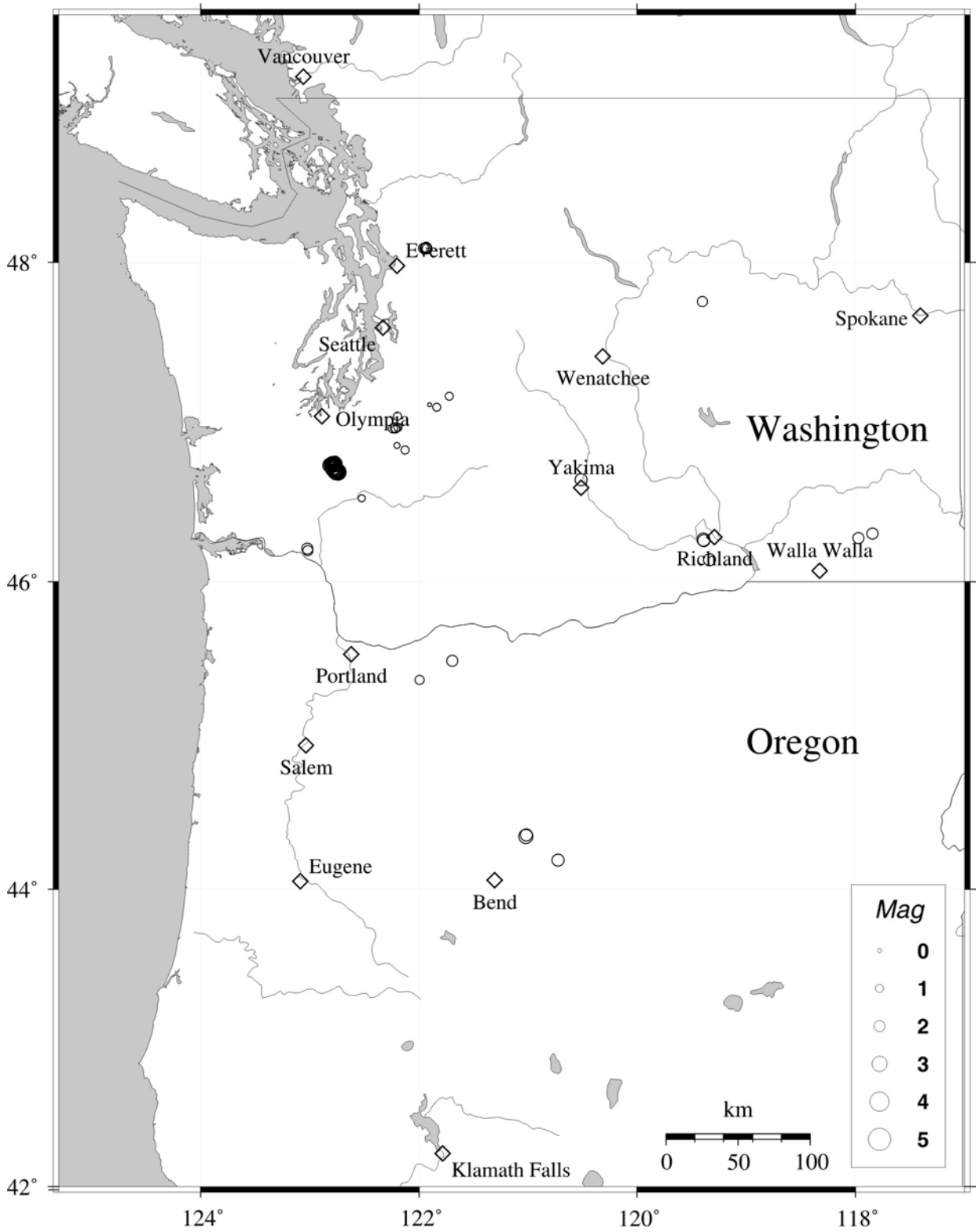

Figure 2. Blasts and probable blasts. Unfilled diamonds represent cities.

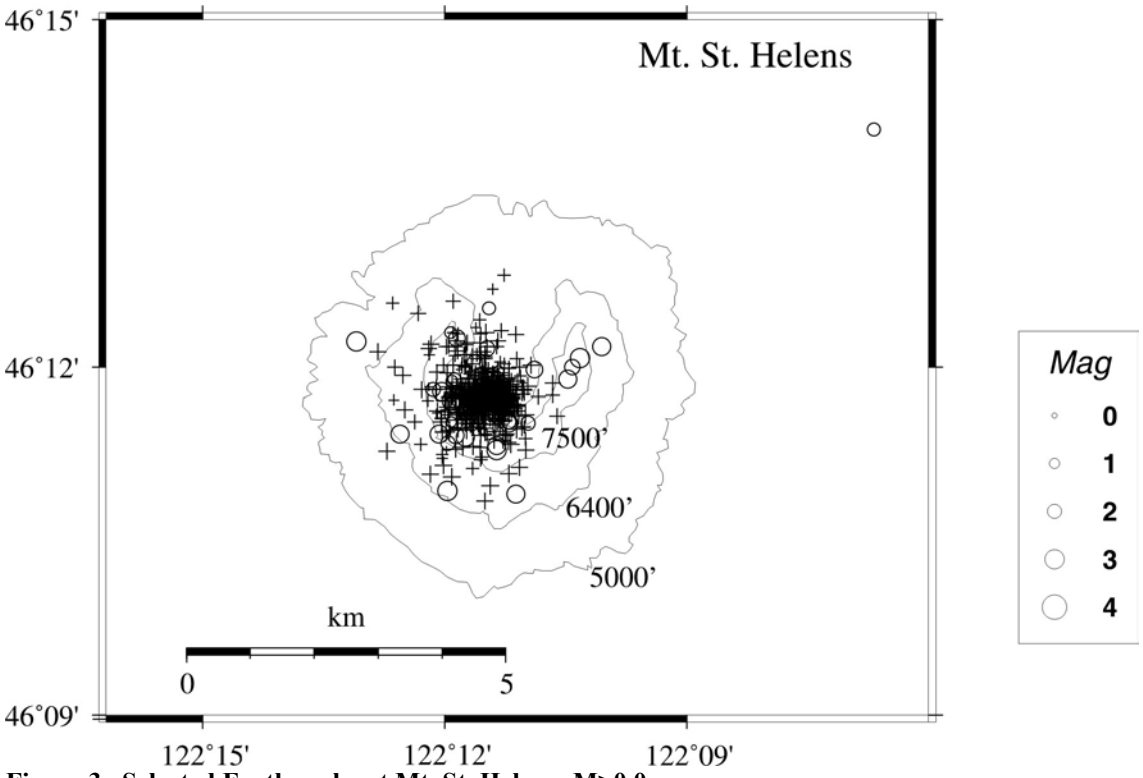

Figure 3. Selected Earthquake at Mt. St. Helens; M>0.0
Events elected by the analyst for location are small fraction of the number of events recorded during the quarter. Plus symbols indicate depth less than 1 km. Circles indicate depth greater than 1 km. Elevation contours shown in feet.

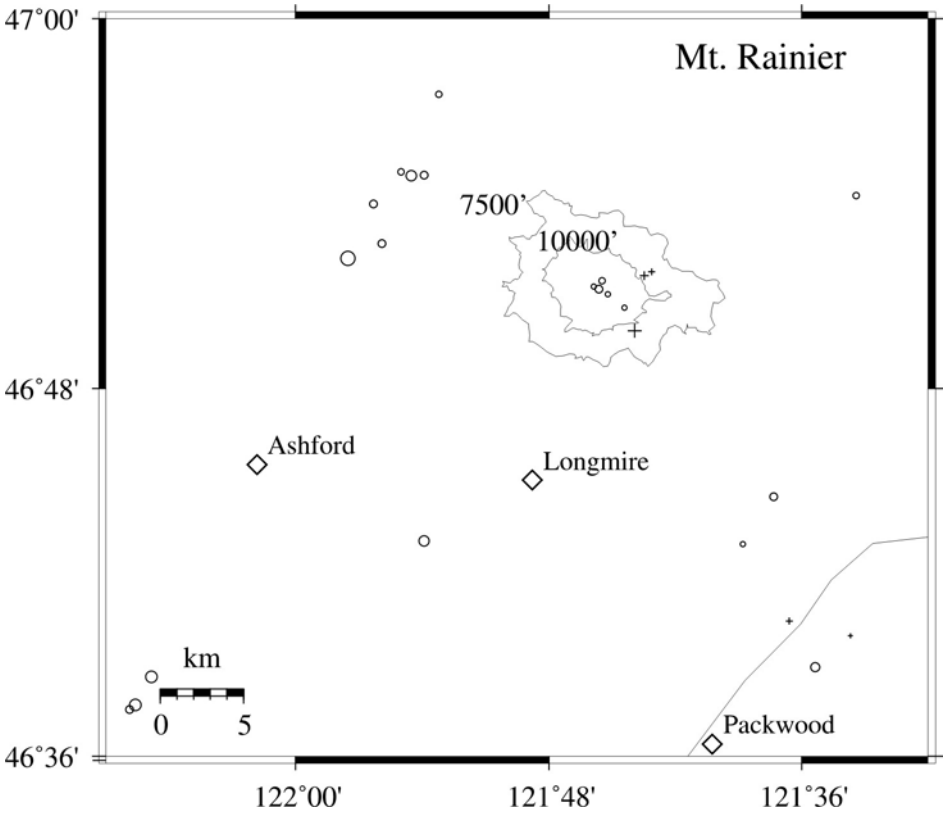

Figure 4. Earthquakes at Mt. Rainier; M>0.0

EARTHQUAKE CATALOG, 2005-C

This quarter's catalog lists earthquakes of magnitude 2.0 or larger, except at Mt. St. Helens, where only events of magnitude 3.0 or larger are shown. Complete catalog listings are available on-line through **http://www.pnsn.org/CATDAT/catalog.html**
Key to earthquake catalog can be found in the last quarterly report of each year, or at:
http://www.pnsn.org/INFO_GENERAL/PNSN_QUARTERLY_EQ_CATALOG_KEY.htm

TABLE 3 - EARTHQUAKE CATALOG, 2005-C

Jul-05

DAY	TIME	LAT	LON	DEPTH	M	NS/NP	GAP	RMS	Q	MOD	TYP
2	13:29:54	46 12.07	122 11.56	0.02*	3.1	12/012	104	0.17	BB	S4	
2	22:39:31	48 08.13	122 28.92	16.87	2.2	23/024	53	0.22	BA	P3	
3	0:53:31	47 51.35	122 31.32	26.43	2.4	29/032	56	0.19	BA	P3	
3	8:16:57	47 46.31	122 25.83	26.02	2.3	37/043	40	0.26	BA	P3	
9	11:16:19	47 55.09	122 23.90	32.96	2.2	46/052	44	0.23	BA	P3	
10	16:13:42	48 14.32	121 50.45	9.33	2.2	27/029	53	0.39	CA	P3	
13	1:31:39	46 35.99	119 12.75	19.98	2.4	34/037	73	0.21	BA	E3	
13	19:50:01	46 39.74	120 36.51	8.25*	2.1	25/025	88	0.17	BB	E3	
14	16:22:15	43 49.14	122 50.91	0.30	2.0	6/007	181	0.17	BD	O0	
15	12:22:01	46 11.77	122 11.35	0.37	3.1	32/032	43	0.18	BA	S4	
16	20:08:39	46 11.81	122 11.51	0.45	3.2	36/036	43	0.13	AA	S4	
19	3:54:53	46 11.77	122 11.46	0.02*	3.2	33/033	46	0.16	BA	S4	
20	5:19:57	46 11.78	122 11.52	0.02*	3.3	44/044	38	0.20	BA	S4	
21	10:00:04	46 11.75	122 11.49	0.22	3.1	34/034	43	0.16	BA	S4	
22	3:53:52	47 09.12	120 36.22	0.02*	2.6	22/022	71	0.28	BA	N3	
22	17:47:49	46 11.71	122 11.49	0.19	3.1	26/026	43	0.16	BA	S4	
23	9:38:19	46 11.78	122 11.51	0.23	3.2	28/028	46	0.17	BA	S4	
24	10:35:49	46 11.71	122 11.55	0.05*	3.3	35/036	43	0.27	BA	S4	
26	5:12:14	46 14.17	120 41.41	1.36	2.5	20/020	170	0.24	BC	C3	
27	10:15:22	49 17.07	120 43.93	0.02*	2.3	10/010	274	0.70	DD	C3	
27	20:41:57	48 23.18	122 13.60	14.10	2.3	23/024	72	0.34	CA	P3	
29	1:12:04	44 09.22	122 53.06	2.46$	2.3	23/024	57	0.91	DC	O0	
29	17:04:26	46 11.77	122 11.47	0.52	3.2	30/030	43	0.22	BA	S4	
30	1:29:19	46 11.65	122 11.23	0.05*	3.0	15/015	101	0.18	BB	S4	
30	12:31:36	46 11.54	122 11.28	0.02*	3.0	19/019	107	0.24	BB	S4	
31	6:09:58	46 11.46	122 11.10	0.02*	3.0	18/018	61	0.30	CA	S4	
31	9:34:39	46 11.80	122 11.39	0.69	3.3	29/029	43	0.11	AA	S4	

Aug-05

DAY	TIME	LAT	LON	DEPTH	M	NS/NP	GAP	RMS	Q	MOD	TYP
1	1:41:44	46 11.75	122 11.46	0.55	3.0	23/023	66	0.11	AA	S4	
1	5:36:57	47 31.39	122 45.34	21.34	2.0	27/029	98	0.13	AB	P3	
1	7:15:07	46 11.38	122 11.39	0.02*	3.0	16/016	115	0.27	BB	S4	
1	17:50:17	46 11.71	122 11.51	0.03*	3.0	23/023	68	0.13	AA	S4	
2	19:24:13	43 37.52	121 23.49	5.71	2.2	9/009	138	0.29	BC	O0	
8	16:22:13	48 17.99	125 08.67	19.06	2.6	18/019	284	0.44	CD	P3	
9	21:39:45	48 47.07	121 46.58	18.73	2.3	10/010	194	0.30	CD	C3	
10	18:34:59	46 11.67	122 11.33	0.03*	3.0	15/015	64	0.24	BA	S4	
11	1:06:19	44 06.44	123 01.79	0.03*	2.3	9/009	112	0.38	CB	O0	
12	0:10:58	46 11.68	122 11.54	0.05*	3.0	19/019	109	0.26	BB	S4	
13	1:10:07	46 11.62	122 11.34	0.03*	3.2	28/028	43	0.35	CA	S4	
13	17:41:13	44 24.80	124 25.72	28.06	2.2	10/011	254	0.19	BD	O0	
13	19:32:31	48 06.09	124 28.63	0.02*	2.5	17/018	171	0.51	DC	P3	
16	12:10:51	46 49.86	121 43.91	0.48*	2.0	5/005	193	0.24	BD	C3	L

16	13:31:22	42 02.14	119 53.41	42.88#	2.1	7/007	313	0.61	DD	K3	
Aug-05, cont.											
DAY	**TIME**	**LAT**	**LON**	**DEPTH**	**M**	**NS/NP**	**GAP**	**RMS**	**Q**	**MOD**	**TYP**
16	15:52:07	46 11.80	122 11.03	0.02#	3.4	28/028	47	0.54	DA	S4	
18	2:25:26	48 43.07	122 24.51	15.86*	2.1	21/025	83	0.34	CA	P3	
19	5:49:59	46 11.74	122 11.92	0.04*	3.1	23/023	44	0.17	BA	S4	
19	8:52:38	45 16.37	122 12.30	16.30	2.0	35/036	60	0.26	BA	O0	
22	3:55:41	46 11.65	122 11.36	0.04#	3.0	14/014	105	0.42	CB	S4	
22	13:34:30	48 01.07	121 50.79	12.81*	2.1	13/016	76	0.19	BB	P3	
22	19:10:18	45 53.09	118 30.61	1.74$	2.4	13/013	207	0.31	DD	E3	
23	10:07:29	46 12.07	122 10.31	1.31	3.0	14/014	118	0.31	CB	S4	
24	2:12:46	46 11.67	122 11.26	0.04*	3.1	16/016	62	0.24	BA	S4	
24	6:16:54	46 11.56	122 11.36	0.04*	3.0	16/016	109	0.23	BB	S4	
24	23:00:20	46 07.41	123 30.03	2.29	2.3	8/008	208	0.17	BD	P3	
25	0:44:18	46 03.43	123 58.33	36.47	2.5	29/030	197	0.28	BD	P3	
26	8:42:42	47 46.69	121 55.24	20.81	2.1	38/040	53	0.32	CA	P3	
26	22:34:39	48 13.75	121 40.37	9.25	2.5	25/026	74	0.30	BC	C3	
29	8:31:36	47 51.25	122 47.03	22.40	2.1	27/027	71	0.21	BA	P3	
29	18:35:13	48 05.50	121 56.36	0.02*	2.0	12/013	100	0.26	BC	P3	
Sep-05											
DAY	**TIME**	**LAT**	**LON**	**DEPTH**	**M**	**NS/NP**	**GAP**	**RMS**	**Q**	**MOD**	**TYP**
4	18:57:05	42 01.18	119 54.39	12.72	2.7	9/009	156	0.26	BC	K3	
7	2:14:31	46 11.81	122 12.10	0.02*	3.2	18/018	79	0.49	CA	S4	
7	20:48:56	49 09.36	120 49.90	0.04*	2.8	17/017	177	0.50	DD	C3	
13	5:14:24	47 48.40	122 55.83	49.03	2.9	80/082	45	0.26	BA	P3	
14	7:45:17	46 11.81	122 11.29	0.37	3.0	13/013	85	0.11	AA	S4	
15	2:43:13	44 17.21	123 16.56	1.58$	2.2	6/007	230	0.15	AD	O0	
17	20:39:30	46 11.71	122 11.36	0.10*	3.0	16/016	103	0.32	CB	S4	
20	10:16:09	45 03.64	122 28.41	18.31	2.0	33/034	74	0.33	CB	O0	
23	8:22:09	46 11.67	122 11.65	0.02*	3.0	13/013	73	0.44	CA	S4	
26	18:11:05	44 19.32	124 35.44	33.26	2.1	7/008	304	0.23	CD	O0	
27	15:36:17	46 11.98	122 11.51	0.03*	3.0	14/014	64	0.15	BA	S4	
27	22:46:17	47 41.55	120 50.92	5.76	2.6	25/025	50	0.29	BC	C3	

OUTREACH ACTIVITIES

The PNSN staff and faculty participate in an educational outreach program designed to better inform the public, educators, businesses, policy makers, government agencies, engineers, and the emergency management community about earthquake, volcano and related hazards. Our program offers lectures, classes, lab tours, workshops, consultations, and electronic and printed information products. Special attention is paid to the information needs of the media. We provide information directly to the public through information sheets, an audio library, email, and via the Internet at http://www.pnsn.org.

Tony Qamar, co-PI of the PNSN, and Dan Johnson were tragically killed on October 4th by a logging truck while driving to retrieve GPS instruments on the Olympic Peninsula. His loss has impacted all aspects of PNSN Operations and all who contribute to it. An anonymous tribute on Tony's office door reads:

"Seldom have the qualities of friendship, gentleness, and courage been so arraigned in one person. Your passing leaves a large void in our lives. You will live on in our memories and in our hearts. We will never forget you."

The following is a partial overview of the quarter's outreach activities, and does not include Tony's activities.

Audio Library, Phone

The Seismology Lab responded to over 200 calls from the general public, Emergency Managers and government agencies, and another 60 calls from the Media. In addition, the PNSN audio library system received 250 calls this quarter. The audio library provides several recordings. We have a regularly updated message concerning current seismic activity, and there

are also recordings describing seismic hazards in Washington and Oregon and earthquake prediction. Callers to the audio library have the option of being transferred to the Seismology Lab for additional information.

Internet outreach

In 2004 URL www.pnsn.org was moved to a University server when www.ess.washington.edu, the Dept. of Earth and Space Sciences (ESS) server, was overwhelmed with internet traffic due to the eruption of Mt. St. Helens in Sept. 2004. The Dec. 26th Sumatra & Andaman Islands earthquake and tsunami again caused overload of the ESS server. This year, the entire ESS site was improved by additional high-traffic, high-security servers operated by the University's Computer & Communications (C&C) unit, which provided dual separated web servers located in different UW locations to provide "fail-over" redundancy, each with Gigabit backbone access. The C&C machines use a round-robin-type dynamic network service (DNS) to balance load. The startup hardware cost for this system was $6000, and annual operations will cost about $3,000 a year which is being paid by the Dept. of Earth and Space Sciences, a welcome and useful contribution to PNSN operations. The authoritative "master" web server was upgraded in June. This ESS departmental computer supplies updates every 5 minutes to the C&C high capacity servers.

PNSN staff replied to over 300 e-mail messages from the public seeking information on a variety of topics via the ***seis_info@ess.washington.edu*** email address. Ruth Ludwin managed this service this quarter, typically responding to routine questions within a day. Complex or sensitive questions are routed to the appropriate staff person for a more in-depth response. Requests may include complex scientific inquiries, assistance with hazard assessments and legal issues, consultations with government agencies, and support for engineering issues related to strong motion data. Bill Steele and other staff members also respond to numerous requests for information via their own email accounts.

Information Products

California Integrated Seismic Network (CISN) display servers are receiving and displaying PNSN recent earthquake data and now provide links to the PNSN ShakeMaps, which are automatically generated following significant earthquakes. The CISN Display version 1 was released in December 2004 and distributed to 25 select users including lifeline operators, emergency managers, and large businesses. This product has replaced the CUBE based RACE (Rapid Alert for Cascadia Earthquakes) systems which have largely been removed. After initial registration and configuration, the administrative duties for maintaining these accounts have been light.

K-20 Education Outreach

PNSN and USGS staff gave 10 Seismology Lab tours and presentations for K-12 students and teachers, serving about 240 students this quarter, and one college level tour for 25. The PNSN maintains an email list-service of over 50 local K-20 educators and subscribers interested in earth-sciences education, and occasionally sends out messages on events of special interest.

Media Relations

The PNSN staff frequently provides interviews, research support, and referrals to radio, television, film, and print media. The PNSN organizes press conferences, contributes to TV and radio news programs and talk shows, and provides field opportunities linking reporters with working scientists. Staff members also assist news organizations, authors, television producers, and independent documentary makers to design accurate and informative stories and programs related to earthquake and volcano hazards. PNSN staff work to link reporters and producers developing stories with the appropriate research institutions, agencies, and scientists working in the areas to be covered by the piece. The PNSN coordinates the release of information and media relations with the USGS Western Region, the Cascades Volcano Observatory, and the Oregon Department of Geology and Mineral Industries (DOGAMI).

The Seattle Fault Scenario, first introduced on Feb. 28th 2005, was published in July resulting in renewed media interest in this product. PNSN staff participated in reports about the evolution of earthquake hazards assessments for Western Washington.

The episodic tremor and slip event began on 9/06/05 and ended 9/30/05 under northern Vancouver Island attracted a great deal of local and National attention when reports originating with the Canadian Geologic Survey suggested an increased probability during the slip of a Cascadia Subduction Zone earthquake. PNSN staff participated in dozens of interviews with TV, print, and radio media.

The ongoing eruption of Mount St. Helens (MSH) continued to stimulate media inquiries particularly when rock falls produced visible plumes. Throughout the quarter, PNSN scientists participated in morning science conferences with CVO three times a week to share data and interpretations, and develop "talking points" for use in interviews.

Meetings, Presentations and Visitors

Congratulations to Ruth Ludwin, who was appointed Affiliate Faculty in the University of Washington's Henry M. Jackson School of International Studies Canadian Studies Center for her investigations into Native American and First Nations traditions related to earthquakes, tsunamis, and landslides. This quarter, Ruth taught an NSF Chautauqua field course in late July titled "**Pacific Northwest Earthquakes: Evidence in Native Myth and Tradition**", and was first author on two recent articles on this subject that appeared in Seismological Research Letters: " **Pacific Northwest Earthquakes: Evidence in Native Myth and Tradition** ", by R. S. Ludwin, C. P. Thrush, K. James, D. Buerge, C. Jonientz-Trisler, J. Rasmussen, K. Troost, and A. de los Angeles, SRL, V. 76, No. 4, pp. 426-431. and "**Dating the 1700 Cascadia Earthquake - Great Coastal Earthquakes in Native Stories**", by R. S. Ludwin, R. Dennis, D. Carver, A. D. McMillan, R. Losey, J. Clague, C. Jonientz-Trisler, J. Bowechop, J. Wray, and K. James, SRL, V. 76, No. 2.

Ruth Ludwin provided presentations on "Earthquake hazards in Washington and Oregon" at Home Street Bank in Seattle, and to several groups of students and teachers from Northwest Indian College in Bellingham. Ruth also provided background and information on First Nations and Native American knowledge of geologic hazards to a Canadian filmmaker working on a production about the effects of a large earthquake on Vancouver, B.C., to a journalist working on an article about Geomythology for Science Magazine, and to staff members of the American Museum of Natural History for a display on tsunamis.

Bill Steele was re-elected to the Board of Trustees of CREW, the Cascadia Region Earthquake Workgroup, and gave an invited talk to the Justices of the Ninth Circuit Court at their annual meeting in Seattle August 31st. Mark Pierepiekarz, Senior Project Manager EQE International, and Bill Steele teamed up to offer a three-hour class on regional earthquake hazards and the potential impact of a Seattle Fault earthquake to the Seattle Chapter of the American Architectural Institute. Bill Steele also co-led a NSF Chautauqua class "**Volcano Monitoring at Mt. St. Helens**".

The University of Washington was chosen by the Federal Emergency Management Agency (FEMA) as the first university to participate in an upcoming Integrated Emergency Management Course (IEMC). The five-day disaster planning and response training event took place **August 8-12, 2005** at FEMA's National Emergency Training Center in Emmitsburg, Maryland. Bill Steele represented the PNSN at the training and assisted in the exercise development.

Steve Malone, PNSN Director gave a summary presentation of the state of the PNSN to the Scientific Earthquake Studies Advisory Committee (SESAC) at their annual meeting, held this year on September 27th in Seattle. Bill Steele organized an ESS-funded reception for SESAC participants following their meeting, and Steve Malone provided a tour of our facilities.

From Sep 18 until Oct 8, 2005, the PNSN hosted Roberto Scandone and Lisetta Giacomelle, two Italian volcanologists who are interested in the current activity at Mount St. Helens.

Due to a printing error last quarters report omitted the final page of this section. The missing portion of last quarter's Outreach Activities section is reprinted below.

From PNSN Quarterly Report 2005-B: Outreach Activities; Meetings, Presentations and Visitors

- A Northwest Science Writers Association meeting was hosted by the PNSN. Cynthia Gardner, Steve Malone, and Bill Steele spoke to the group about the eruption of Mt. St. Helens, and scientist-media relations.
- PNSN and UW management continued to work with State of Washington representatives to obtain State funding to meet State agency information needs.
- Bill Steele assisted the Cascadia Region Earthquake Workgroup with the development and roll out of the CREW Cascadia Earthquake Scenario at the State Partners in Preparedness Conference and with the submission of an Op-Ed article published by the Seattle Post Intelligencer.
- The PNSN participated in University-sponsored events including an Alumni Open House, the Arts and Sciences Celebration of Distinction program and poster session, and provided a lab tour while meeting with Regent and past Governor Dan Evans.
- Steve Malone provided the Presidential speech at the Seismological Society of America (SSA) Conference in Reno, NV.

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- **2005 –B: SSA presentations by PNSN faculty, staff and graduate students:**

  - **High-resolution 3D Travel-time Tomography Using Controlled Sources and Earthquakes: Application to the Seattle Basin and Vicinity** CROSSON, R. S.,
  - **The Origins of the Advanced National Seismic System** FILSON, J. R., ARABASZ, W. J., BENZ, H. M. and BULAND, R., GEE, L. S., MALONE, S. D., and OPPENHEIMER, D.
  - **Broadband Seismic Monitoring of Recent Activity at Mount Saint Helens, Washington** HORTON, S. P., BRACKMAN, T., WATSON, C., WITHERS, M., PATTERSON, G., and BODIN, P.,NORRIS, R.; MORAN, S., and QAMAR, T.
  - **The 2004-2005 Eruption of Mount Saint Helens: Possible Links between Seismicity and Physical Changes in the New Lava Dome** MORAN, S. C. and VALLANCE, J. W., QAMAR, A. I. and MALONE, S. D.
  - **Rapid Analysis of Earthquake Data during the 2004-2005 Dome-building Eruption of Mount Saint Helens** QAMAR, A. and MALONE, S. D., and MORAN, S.
  - **Azimuthal Patterns in High-frequency Energy Observed at Mount Saint Helens, Washington: Implications for Near-surface Structure** THELEN, W. A. and MALONE, S. D
  - **Pacific Northwest Seismograph Network (PNSN) as Part of ANSS** THOMAS, G., QAMAR, A., BARBEROPOULOU, A., LINDQUIST, P. C., and MALONE, S. D.
  - **Source Parameters of Microearthquakes at Mount St. Helens (USA)** TUSA, G. and GRESTA, S.; and MALONE, S. D.

- UWTV recorded a May 1, 2005 public lecture on Mt. St. Helens given by PNSN Director Stephen D. Malone. The lecture is scheduled for a half-dozen re-broadcasts on UWTV in the near future. Dr. Malone was also videotaped presenting a lecture on predicting earthquake and volcanic eruptions to the UW Program on the Environment and the UW Alumni Club . This lecture has been broadcast on a public-access channel.
- Steve Malone provided lectures on Mt. St. Helens during a visit to Italy at the INGV (National Institute of Geophysics and Volcanology) and the University of Pisa.
- The PNSN hosted many meeting this quarter including The Contingency Planners and Recovery Managers (CPARM), Seattle ShakeMap Workgroup, and the University of Washington Emergency Planning Group.
- Ruth Ludwin presented a poster and participated in a panel discussion at the NSF Tsunami Deposits Workshop hosted June 12-15 by the Dept. of Earth and Space Sciences. http://earthweb.ess.washington.edu/tsunami2/deposits/.
- Bill Steele gave a number of invited talks including the Oregon Telecommunications Associations Annual Conference in Bend Oregon. A talk for the Thoracic Oncology Conference, and the University Rotary Club.

APPENDIX 1, PNSN Quarterly Report 2005-C – Station Maps and Locations

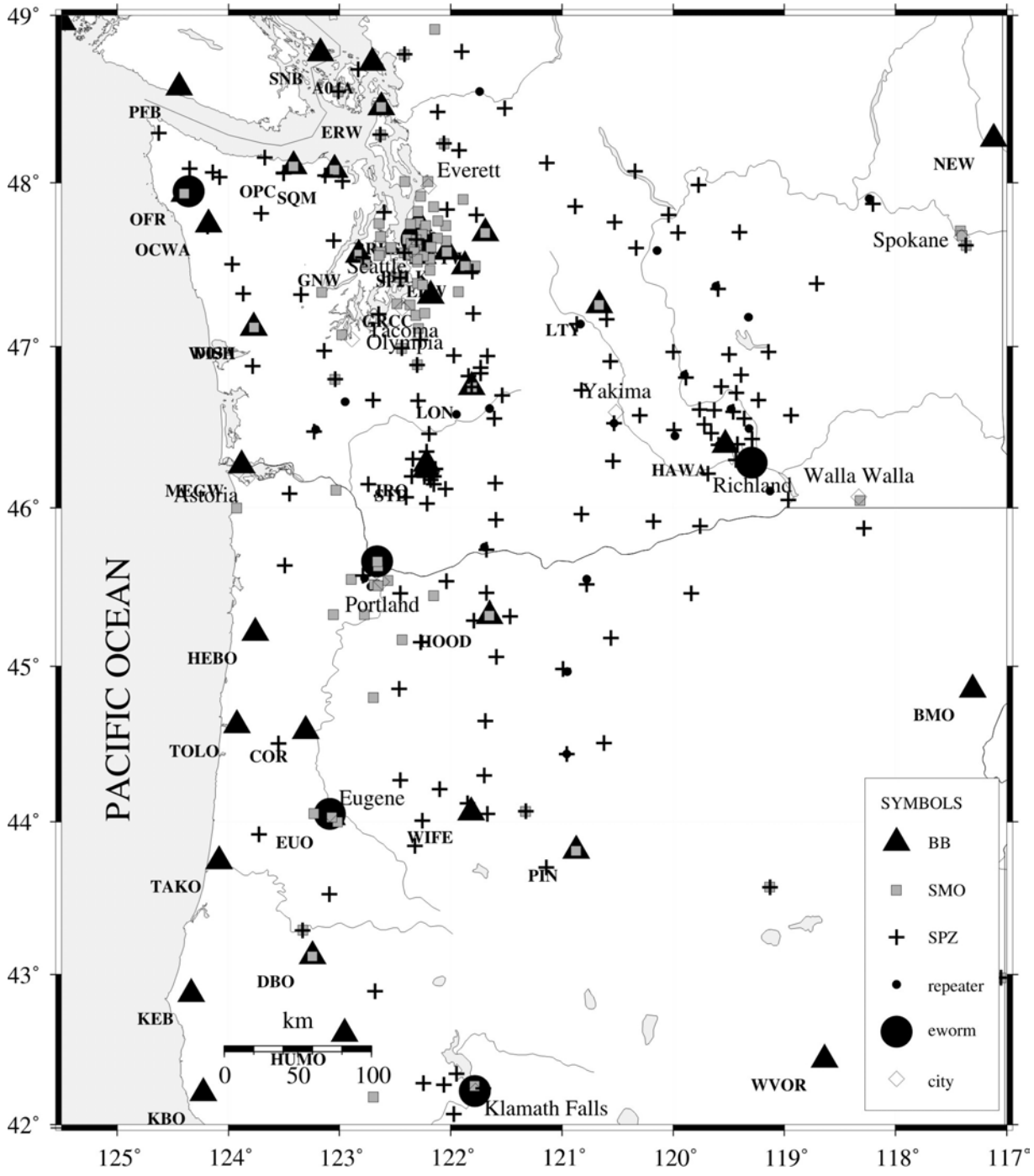

Figure 1 A. Seismograph Stations.

"BB" indicates broadband stations (Table 1B) "SMO" indicates strong motion stations (Table 1C), and "SPZ" indicates short-period stations (usually vertical component only) (Table 1A). "Repeater" designates a site with radio receivers and transmitter used in the transmission of seismic data to the UW via FM telemetry. "eworm" represents sites where a "mini-earthworm" system is running on a local computer to collect data for transfer to the UW via the internet.

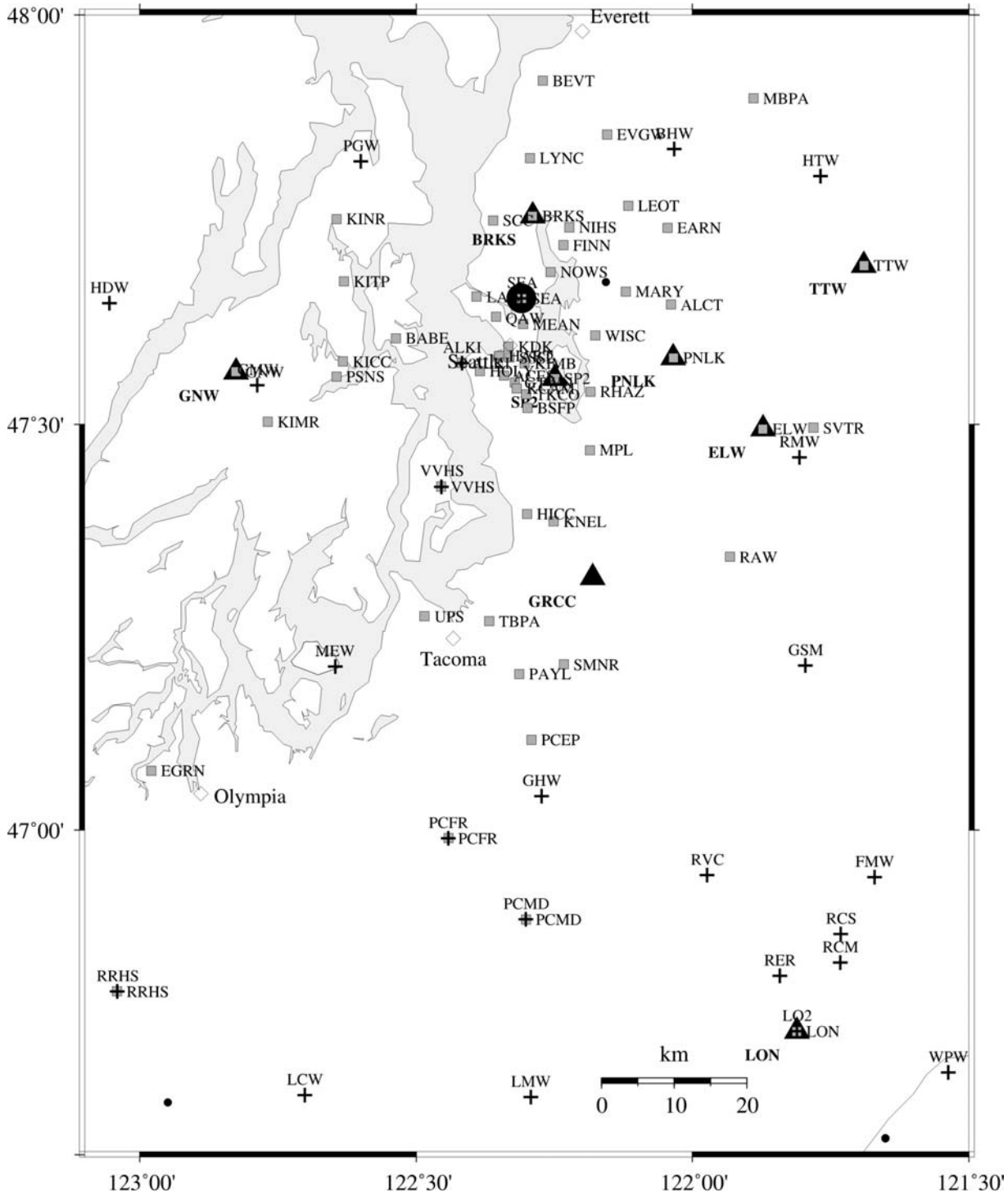

Figure 1 B. Puget Sound seismograph stations, detail of Fig. 1 A

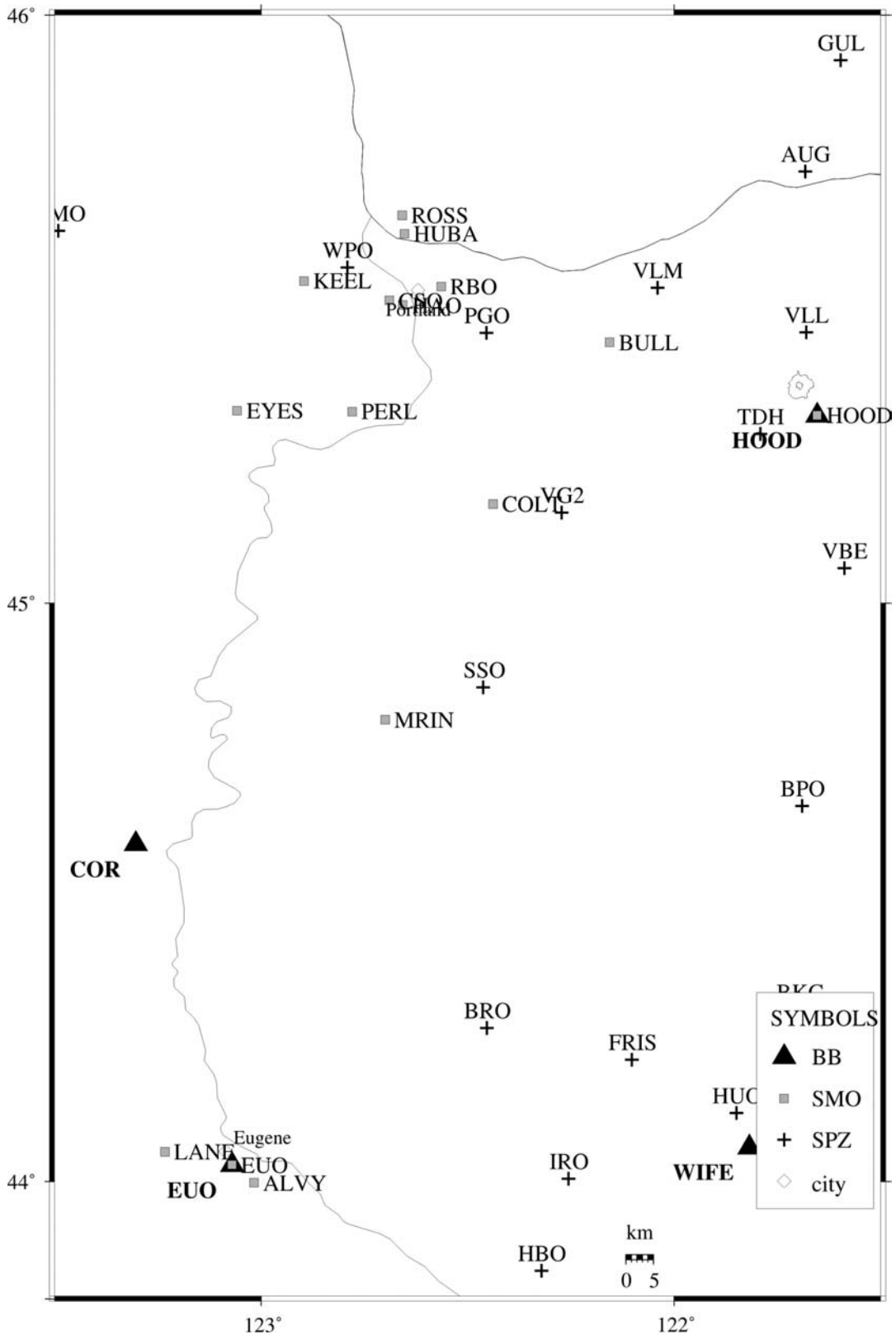

Figure 1 C. Willamette Valley seismograph stations, detail of Fig. 1 A

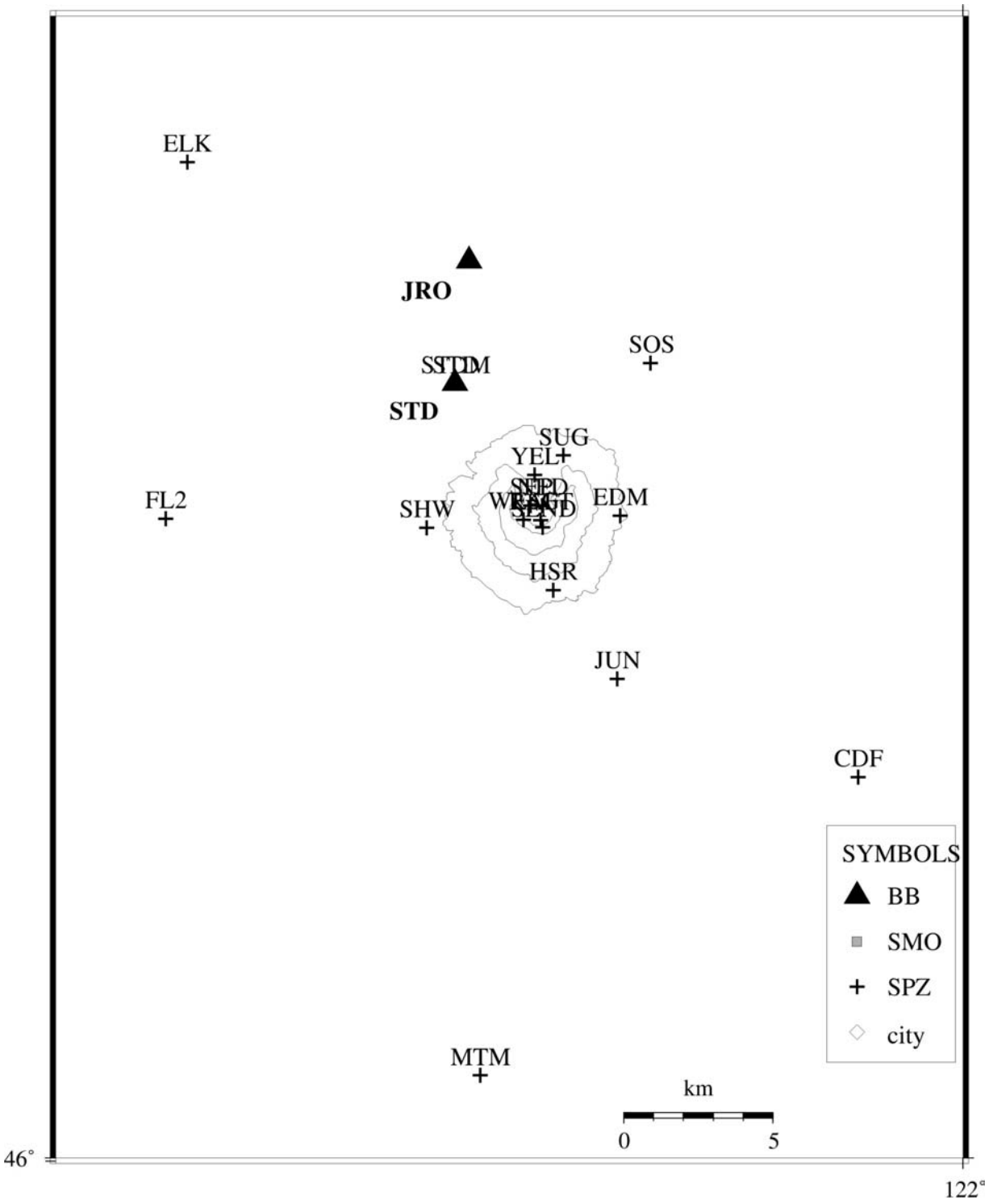

Figure 1 D. Mount St. Helens seismograph stations, detail of Fig. 1 A

Station Tables

Table 1A lists short-period, mostly vertical-component stations used in locating seismic events in Washington and Oregon. The first column in the table gives the 3-letter station designator, followed by a symbol designating the funding agency; stations marked by a percent sign (%) were supported by USGS joint operating agreement 04-HQ-AG-005. A plus (+) indicates support under Pacific Northwest National Laboratory, Battelle contract 259116-A-B3. Stations designated "#" are USGS-maintained stations recorded at the PNSN. Stations designated by letters are operated by other networks, and telemetered to the PNSN. "M" stations are received from the Montana Bureau of Mines and Geology, "C" stations from the Canadian Pacific Geoscience Center, "U" stations from the US Geological Survey (usually USNSN stations), "N" stations from the USGS Northern California Network, and "H" stations from the Hanford Reservation via the Pacific Northwest National Labs. "G" stations are contributed by other organizations, with some assistance from the PNSN. Other designations indicate support from other sources. Additional columns give station north latitude and west longitude (in degrees, minutes and seconds), station elevation in km, and comments indicating landmarks for which stations were named.

Table 1A – Short period stations

STA	F	LAT	LONG	EL	NAME
ALKI	%	47 34 31.0	122 24 58.9	0.001	Alki Wastewater Plant, ANSS-SMO
ASR	%	46 09 09.9	121 36 01.6	1.357	Mt. Adams - Stagman Ridge
ATES	%	48 14 10.9	122 03 33.0	0.062	Arlington Trafton ES ANSS-SMO
AUG	%	45 44 10.0	121 40 50.0	0.865	Augspurger Mtn
B001	E	48 02 34.1	123 07 56.2	0.23	Golbeck
B005	E	48 03 34.6	123 30 19.1	0.3	Golbeck Shore 1 NW
B006	E	48 03 31.7	123 30 08.3	0.3	Shore NE
B007	E	48 03 20.2	123 30 19.4	0.29	Shore
BBO	%	42 53 12.6	122 40 46.6	1.671	Butler Butte, OR
BEN	H	46 31 12.0	119 43 18.0	0.335	PNNL station
BEND	%	44 04 00.8	121 19 36.0	1.141	UO Bend Office, DOGAMI SMO
BHW	%	47 50 12.6	122 01 55.8	0.198	Bald Hill
BKC	%	44 17 57.9	121 41 45.6	1.208	Black Crater, OR
BLN	%	48 00 26.5	122 58 18.6	0.585	Blyn Mt.
BLT		45 54 54.5	120 10 33.0	0.659	Bickleton
BOW	%	46 28 30.0	123 13 41.0	0.87	Boistfort Mt.
BPO	%	44 39 06.9	121 41 19.2	1.957	Bald Peter, OR
BRO	%	44 16 02.5	122 27 07.1	1.341	Big Rock Lookout, OR
BRV	+	46 29 07.2	119 59 28.2	0.92	Black Rock Valley
BSMT	M	47 51 04.8	114 47 13.2	1.95	Bassoo Peak, MT
BUO	%	42 16 42.5	122 14 43.1	1.797	Burton Butte, OR
BURN		43 34 23.0	119 07 49.0	1.615	Burns, OR SMO
BVW	+	46 48 39.5	119 52 56.4	0.67	Beverly
CBS	+	47 48 17.4	120 02 30.0	1.067	Chelan Butte, South
CDF	%	46 07 01.4	122 02 42.1	0.756	Cedar Flats
CHMT	M	46 54 51.0	113 15 07.0	-	Chamberlain Mtn, MT
CMW	%	48 25 25.3	122 07 08.4	1.19	Cultus Mtns.
CPW	%	46 58 25.8	123 08 10.8	0.792	Capitol Peak
CRF	+	46 49 30.0	119 23 13.2	0.189	Corfu
DPW	+	47 52 14.3	118 12 10.2	0.892	Davenport
DY2	+	47 59 06.6	119 46 16.8	0.89	Dyer Hill 2
EDM	%	46 11 50.4	122 09 00.0	1.609	East Dome, Mt. St. Helens
ELK	%	46 18 20.0	122 20 27.0	1.27	Elk Rock
ELL	+	46 54 34.8	120 33 58.8	0.789	Ellensburg
EPH	+	47 21 22.8	119 35 45.6	0.661	Ephrata
ET3	+	46 34 38.4	118 56 15.0	0.286	Eltopia (replaces ET2)

Table 1A – Short period stations					
STA	**F**	**LAT**	**LONG**	**EL**	**NAME**
ETW	+	47 36 15.6	120 19 56.4	1.477	Entiat
FHE	+	46 57 06.9	119 29 49.0	0.455	Frenchman Hills East
FL2	%	46 11 47.0	122 21 01.0	1.378	Flat Top 2
FMW	%	46 56 29.6	121 40 11.3	1.859	Mt. Fremont
FRIS	%	44 12 44.0	122 06 01.8	1.642	Frissel Point, OR
GBB	H	46 36 31.8	119 37 40.2	0.185	PNNL Station
GBL	+	46 35 54.0	119 27 35.4	0.33	Gable Mountain
GHW	%	47 02 30.0	122 16 21.0	0.268	Garrison Hill
GL2	+	45 57 35.0	120 49 22.5	1	New Goldendale
GLK	%	46 33 27.6	121 36 34.3	1.305	Glacier Lake
GMO	%	44 26 20.8	120 57 22.3	1.689	Grizzly Mountain, OR
GMW	%	47 32 52.5	122 47 10.8	0.506	Gold Mt.
GPW	%	48 07 05.0	121 08 12.0	2.354	Glacier Peak
GSM	%	47 12 11.4	121 47 40.2	1.305	Grass Mt.
GUL	%	45 55 27.0	121 35 44.0	1.189	Guler Mt.
H2O	H	46 23 44.5	119 25 22.7	0.175	Water PNNL Station
HAM	%	42 04 08.3	121 58 16.0	1.999	Hamaker Mt., OR
HBO	%	43 50 39.5	122 19 11.9	1.615	Huckleberry Mt., OR
HDW	%	47 38 54.6	123 03 15.2	1.006	Hoodsport
HOG	%	42 14 32.7	121 42 20.5	1.887	Hogback Mtn., OR
HSO	%	43 31 33.0	123 05 24.0	1.02	Harness Mountain, OR
HSR	%	46 10 28.0	122 10 46.0	1.72	South Ridge, Mt. St. Helens
HTW	%	47 48 14.2	121 46 03.5	0.833	Haystack Lookout
HUO	%	44 07 10.9	121 50 53.5	2.037	Husband OR (UO)
IRO	%	44 00 19.0	122 15 15.4	1.642	Indian Ridge, OR
JBO	+	45 27 41.7	119 50 13.3	0.645	Jordan Butte, OR
JCW	%	48 11 43.8	121 55 34.4	0.792	Jim Creek
JORV	%	42 58 40.0	117 03 10.0	1.338	Jorden Valley, OR SMO
JUN	%	46 08 50.0	122 09 04.4	1.049	June Lake
KMO	%	45 38 07.8	123 29 22.2	0.975	Kings Mt., OR
KOS	%	46 27 46.7	122 11 41.3	0.61	Kosmos
KTR	N	41 54 31.2	123 22 35.4	1.378	CAL-NET
LAB	%	42 16 03.3	122 03 48.7	1.774	Little Aspen Butte, OR
LAM	N	41 36 35.2	122 37 32.1	1.769	CAL-NET
LAS	N	41 35 57.6	121 34 36.0	-	CAL-NET
LBC	N	40 50 12.3	121 20 59.8	-	CAL-NET
LCCM	M	45 50 16.8	111 52 40.8	1.669	Lewis and Clark Caverns, MT
LCW	%	46 40 14.4	122 42 02.8	0.396	Lucas Creek
LHE	N	41 37 42.6	122 13 49.8	-	CAL-NET
LMW	%	46 40 04.8	122 17 28.8	1.195	Ladd Mt.
LNO	+	45 52 18.6	118 17 06.6	0.771	Lincton Mt., OR
LO2	%	46 45 00.0	121 48 36.0	0.853	Longmire
LOC	+	46 43 01.2	119 25 51.0	0.21	Locke Island
LTI	N	41 10 34.0	121 29 19.6	-	CAL-NET
LVP	%	46 03 58.0	122 24 02.6	1.13	Lakeview Peak
MBW	%	48 47 02.4	121 53 58.8	1.676	Mt. Baker
MCMT	M	44 49 39.6	112 50 55.8	2.323	McKenzie Canyon, MT
MCW	%	48 40 45.1	122 49 52.9	0.693	Mt. Constitution
MDW	+	46 36 47.4	119 45 39.6	0.33	Midway
MEW	%	47 12 07.0	122 38 45.0	0.097	McNeil Island
MJ2	+	46 33 27.0	119 21 32.4	0.146	May Junction 2

Table 1A – Short period stations					
STA	**F**	**LAT**	**LONG**	**EL**	**NAME**
MOON	%	44 03 06.2	121 40 06.0	2.24	Moon Mt, OR
MOX	+	46 34 38.4	120 17 53.4	0.501	Moxie City
MPO	%	44 30 17.4	123 33 00.6	1.249	Mary's Peak, OR
MTM	%	46 01 31.8	122 12 42.0	1.121	Mt. Mitchell
NAC	+	46 43 59.4	120 49 25.2	0.728	Naches
NCO	%	43 42 14.4	121 08 18.0	1.908	Newberry Crater, OR
NED	#	46 12 01.5	122 11 03.4	2.06	NE part of old Dome, St. Helens
NEL	+	48 04 12.6	120 20 24.6	1.5	Nelson Butte
NLO	%	46 05 21.9	123 27 01.8	0.826	Nicolai Mt., OR
OBC	%	48 02 07.1	124 04 39.0	0.938	Olympics - Bonidu Creek
OBH	%	47 19 34.5	123 51 57.0	0.383	Olympics - Burnt Hill
OCP	%	48 17 53.0	124 37 25.9	0.487	Olympics - Cheeka Peak
OD2	+	47 23 15.6	118 42 34.8	0.553	Odessa site 2
ON2	%	46 52 50.8	123 46 51.8	0.257	Olympics - North River
OOW	%	47 44 03.6	124 11 10.2	0.561	Octopus West
OSD	%	47 48 59.2	123 42 13.7	2.008	Olympics - Snow Dome
OSR	%	47 30 20.3	123 57 42.0	0.815	Olympics Salmon Ridge
OT3	+	46 40 08.4	119 13 58.8	0.322	New Othello (replaces OT2 8/26
OTR	%	48 05 00.0	124 20 39.0	0.712	Olympics - Tyee Ridge
P403	E	48 03 43.9	124 08 32.0	0.31	Sandy Floe Quarry
PAT2	+	45 53 01.6	119 45 23.8	0.259	Paterson 2
PCFR	%	46 59 23.3	122 26 27.4	0.137	PC Firing Range ANSS-SMO
PCMD	%	46 53 20.9	122 18 00.9	0.239	PC Mountain Detachment ANSS-SMO
PGO	%	45 27 42.6	122 27 11.5	0.253	Gresham, OR
PGW	%	47 49 18.8	122 35 57.7	0.122	Port Gamble
PRO	+	46 12 45.6	119 41 08.4	0.553	Prosser
RAFT		46 11 45.1	122 11 06.4	2.132	Raft, St Helens crater station
RCM	%	46 50 08.9	121 43 54.4	3.085	Mt. Rainier, Camp Muir
RCS	%	46 52 15.6	121 43 52.0	2.877	Mt. Rainier, Camp Schurman
RED	H	46 17 51.0	119 26 15.6	0.33	Red Mountain PNNL Station
RER	%	46 49 09.2	121 50 27.3	1.756	Mt. Rainier, Emerald Ridge
RMW	%	47 27 35.0	121 48 19.2	1.024	Rattlesnake Mt. (West)
RNO	%	43 54 58.9	123 43 25.5	0.85	Roman Nose, OR
RPW	%	48 26 54.0	121 30 49.0	0.85	Rockport
RRHS	%	46 47 58.6	123 02 25.4	0.047	Rochester HS ANSS-SMO
RSW	+	46 23 40.2	119 35 28.8	1.045	Rattlesnake Mt. (East)
RVC	%	46 56 39.3	121 58 22.7	1	Mt. Rainier - Voight Creek
RVW	%	46 08 53.2	122 44 32.1	0.46	Rose Valley
SAW	+	47 42 06.0	119 24 01.8	0.701	St. Andrews
SBES	%	48 46 05.9	122 24 54.2	0.119	Silver Beach ES ANSS-SMO
SEA	%	47 39 15.8	122 18 29.3	0.03	UW, Seattle (Wood Anderson BB)
SEND		46 11 37.2	122 11 03.2	-	SEND, Mt. St. Helens (Dome station)
SEP	#	46 12 01.4	122 11 21.8	2.116	September lobe, Mt. St. Helens
SFER	%	47 37 10.4	117 21 55.7	0.715	Spokane Schools, Ferris High
SHW	%	46 11 37.1	122 14 06.5	1.425	Mt. St. Helens
SLF	%	47 45 38.6	120 31 41.5	1.75	Sugar Loaf
SMW	%	47 19 10.7	123 20 35.4	0.877	South Mtn.
SNI	H	46 27 50.4	119 39 35.1	0.323	Snively PNNL station
SOS	%	46 14 38.5	122 08 12.0	1.27	Source of Smith Creek
SSO	%	44 51 21.6	122 27 37.8	1.242	Sweet Springs, OR
STD	%	46 14 16.0	122 13 21.9	1.268	Studebaker Ridge

Table 1A – Short period stations					
STA	**F**	**LAT**	**LONG**	**EL**	**NAME**
STDM	%	46 14 16.0	122 13 21.9	1.268	Studebaker Ridge Microphone
STW	%	48 09 03.1	123 40 11.1	0.308	Striped Peak
SUG	%	46 12 56.6	122 10 30.2	1.859	Sugar Bowl, MSH
SVOH	%	48 17 21.8	122 37 54.8	0.022	Skagit Valley CC ANSS-SMO
TBM	+	47 10 12.0	120 35 52.8	1.006	Table Mt.
TDH	%	45 17 23.4	121 47 25.2	1.541	Tom,Dick,Harry Mt., OR
TDL	%	46 21 03.0	122 12 57.0	1.4	Tradedollar Lake
TRW	+	46 17 32.0	120 32 31.0	0.723	Toppenish Ridge
TWW	+	47 08 17.4	120 52 06.0	1.027	Teanaway
UMPQ	%	43 17 27.8	123 19 50.5	0.162	Umpqua Commun. College, DOGAMI
UWFH	%	48 32 46.0	123 00 43.0	0.01	UW Friday Harbor ANSS-SMO
VBE	%	45 03 37.2	121 35 12.6	1.544	Beaver Butte, OR
VCR	%	44 58 58.2	120 59 17.4	1.015	Criterion Ridge, OR
VDB	C	49 01 34.0	122 06 10.1	0.404	Canada
VFP	%	45 19 05.0	121 27 54.3	1.716	Flag Point, OR
VG2	%	45 09 20.0	122 16 15.0	0.823	Goat Mt., OR
VGB	+	45 30 56.4	120 46 39.0	0.729	Gordon Butte, OR
VIP	%	44 30 29.4	120 37 07.8	1.731	Ingram Pt., OR
VLL	%	45 27 48.0	121 40 45.0	1.195	Laurance Lk., OR
VLM	%	45 32 18.6	122 02 21.0	1.15	Little Larch, OR
VSP	%	42 20 30.0	121 57 00.0	1.539	Spence Mtn, OR
VT2	+	46 58 02.4	119 59 57.0	0.385	Vantage2
VTH	%	45 10 52.2	120 33 40.8	0.773	The Trough, OR
VVHS	%	47 25 25.1	122 27 13.1	0.095	Vashon HS ANSS-SMO
WA2	+	46 45 19.2	119 33 56.4	0.244	Wahluke Slope
WAT	+	47 41 55.2	119 57 14.4	0.821	Waterville
WESG		46 11 45.6	122 11 33.2	2.13	St. Helens Crater (west side glacier)
WIW	+	46 25 45.6	119 17 15.6	0.128	Wooded Island
WPO	%	45 34 24.0	122 47 22.4	0.334	West Portland, OR
WPW	%	46 41 55.7	121 32 10.1	1.28	White Pass
WRD	+	46 58 12.0	119 08 41.4	0.375	Warden
WRW	%	47 51 23.8	120 52 54.4	1.189	Wenatchee Ridge
YA2	+	46 31 36.0	120 31 48.0	0.652	Yakima
YEL	#	46 12 35.0	122 11 16.0	1.75	Yellow Rock, Mt. St. Helens
YPT	+	46 02 55.8	118 57 44.0	0.325	Yellepit

Table 1B lists broad-band stations used in locating seismic events in Washington and Oregon, and Table 1C lists strong-motion stations. The format for station locations is the same for all station tables, as described above.

Table 1B - Broadband Stations					
STA	**F**	**LAT**	**LONG**	**EL**	**NAME**
A04A	E	48 43 12.6	122 42 20.5	0.024	Lummi Island, WA
BMO		44 51 09.0	117 18 21.0	1.154	Blue Mountain Ob (USNSN) BB
BRKS	%	47 45 19.1	122 17 17.9	0.02	Brookside ANSS-SMO BB
COR	U	44 35 08.5	123 18 11.5	0.121	Corvallis, OR (USNSN) BB
D03A	E	47 06 58.3	123 46 11.0	0.049	Wishkah, WA
DBO	%	43 07 09.0	123 14 34.0	0.984	Dodson Butte, OR (UO CREST BB)
ELW	%	47 29 39.4	121 52 17.2	0.267	EchoLakeBPA BB-SMO-IDS20
ERW	%	48 27 14.4	122 37 30.2	0.389	Mt. Erie SMO-IDS24 BB
EUO	%	44 01 45.7	123 04 08.2	0.16	Eugene,OR U0 CREST BB SMO
GNW	%	47 33 51.8	122 49 31.0	0.165	Green Mt CREST BB SMO
GRCC	%	47 18 42.5	122 10 46.0	0.13	Green River CC BB
HAWA	U	46 23 32.3	119 31 57.2	0.367	Hanford Nike USNSN BB

Table 1B - Broadband Stations					
STA	**F**	**LAT**	**LONG**	**EL**	**NAME**
HEBO	%	45 12 49.2	123 45 15.0	0.875	Mt. Hebo, OR CREST BB SMO
HLID	U	43 33 45.0	114 24 49.3	1.772	Hailey, ID USNSN BB
HOOD	%	45 19 17.8	121 39 07.8	1.52	Mt Hood Meadows, OR CREST BB SMO
HUMO		42 36 25.6	122 57 24.1	0.555	Hull Mountain,OR BB from UCB
JRO		46 16 31.0	122 12 59.7	1.28	Johnston Ridge Observatory
KBO	N	42 12 45.0	124 13 33.3	1.008	Bosley Butte, OR CREST BB
KEB	N	42 52 20.0	124 20 03.0	0.818	Edson Butte, OR CREST BB
KRMB	N	41 31 22.6	123 54 28.7	1.265	CAL-NET Red Mtn, OR CREST BB
KSXB	N	41 49 49.4	123 52 36.8	-	CAL-NET Camp Six, OR CREST BB
LON	%	46 45 00.0	121 48 36.0	0.853	Longmire CREST BB LONLZ SMO
LTY	%	47 15 21.2	120 39 53.3	0.97	Liberty BB CREST SMO
MEGW	%	46 15 57.4	123 52 38.2	0.332	Megler, WA CREST BB SMO
MOD		41 54 08.9	120 18 10.6	1.555	Modoc Plateau, CA from UCB
NEW	U	48 15 50.0	117 07 13.0	0.76	Newport Observatory USNSN BB
OCWA	U	47 44 56.0	124 10 41.2	0.671	Octopus Mtn. USNSN BB
OFR	%	47 56 00.0	124 23 41.0	0.152	Olympics - Forest Resource Center
OPC	%	48 06 01.0	123 24 41.8	0.09	Olympic Penn College CREST BB
OZB	C	48 57 37.1	125 29 34.1	0.671	Canada BB
PFB	C	48 34 30.0	124 26 39.8	0.465	P.Renfrew, Canada BB
PIN	%	43 48 40.0	120 52 19.0	1.865	Pine Mt., OR (U0 CREST, BB, SMO)
PNLK	%	47 34 54.5	122 02 01.0	0.128	Pine Lake JH ANSS-SMO BB
PNT	C	49 18 57.6	119 36 57.6	0.55	Canada, BB
SNB	C	48 46 33.6	123 10 16.3	0.408	Canada BB
SP2	%	47 33 23.3	122 14 52.8	0.03	Seward Park, Seattle SMO-IDS24
SQM	%	48 04 39.0	123 02 44.0	0.03	Sequim, WA (CREST BB SMO)
STD	%	46 14 16.0	122 13 21.9	1.268	Studebaker Ridge
TAKO	%	43 44 36.6	124 04 52.5	0.046	Tahkenitch, OR CREST BB SMO
TOLO	%	44 37 19.3	123 55 16.6	0.021	Toledo BPA, OR CREST BB SMO
TTW	%	47 41 40.7	121 41 20.0	0.542	Tolt Res, WA CREST BB SMO
WIFE		44 03 35.4	121 48 58.7	1.955	Wife at 3-Sisters from CVO
WISH	%	47 07 01.8	123 46 11.6	0.045	Wishkah CREST BB SMO
WVOR	U	42 26 02.0	118 38 13.0	1.344	Wildhorse Valley, OR (USNSN BB)
YBH		41 43 55.3	122 42 37.4	1.06	Yreka, CA from UCB BB

Table 1C lists strong-motion, three-component stations operating in Washington and Oregon that provide data in real or near-real time to the PNSN. Several of these stations also have broad-band instruments, as noted.

The "SENSOR" field designates what type of seismic sensor is used:

A = Terra-Tech SSA-320 SLN triaxial accelerometer/Terra-Tech IDS24
A20 = Terra-Tech SSA-320 triaxial accelerometer/Terra-Tech IDS20 recording system
FBA23 = Kinemetrics FBA23 accelerometers and Reftek recording system
EPI = Kinemetrics Episensor accelerometers and Reftek recording system
BB = Guralp CMG-40T 3-D broadband velocity sensor
BB3 = Guralp CMG3T 3-D broadband velocity sensor
BBZ = Broad Band sensor, PMD 2024, vertical component only
K2 = Kinemetrics Episensor accelerometers and K2 recording system

The "TELEMETRY" field indicates the type of telemetry used to recover the data:

D = dial-up,
E = continuously telemetered via Internet from a remote EARTHWORM system
I = continuously telemetered via Internet
L = continuously telemetered via dedicated lease-line telephone lines
P = continuously telemetered via dedicated lease-line telephone lines using PPP protocol
M = continuously telemetered via BPA microwave
R = continuously telemetered via spread-spectrum radio

Table 1C - Strong-motion three-component stations

STA	F	LAT	LONG	EL	NAME	SENSOR	TEL.
ACES	%	47.55953	-122.341	0	Army Corps of Engineers Seattle	CMG5T	Internet
ALCT	%	47.64672	-122.039	0.055	Alcott Elementary	K2	Internet
ALKI	%	47.5751	-122.418	0.001	Alki	K2: L4	LL
ALST	%	46.10881	-123.034	0.198	Alston	A20	Earthworm + Microwave
ALVY	%	43.99796	-123.017	0.155	Alvey	K2	Earthworm + Microwave
ATES	%	48.23617	-122.06	0.062	Trafton Elementary	K2: L4	Internet
BABE	%	47.60565	-122.537	0.083	Blakely Elementary	K2	Internet
BEND	%	44.06673	-121.328	1.141	U of O Bend Field Office	K2: S13	Internet
BEVT	%	47.91982	-122.271	0.17	Boeing Plant Everett	K2	Internet
BRKS	%	47.75512	-122.29	0.02	Brookside Elementary	K2,BBZ	Internet
BSFP	%	47.52	-122.298	0.005	Boeing Fire Protection	CMG5T	Internet
BULL	*	45.44589	-122.156	0.222	Bull Run Dam	A	Internet
BURN	#	43.57293	-119.131	1.615	Burns Butte Radio Building	K2	Internet
COLT	%	45.17015	-122.438	0.213	Colton High School	CMG5T	Internet
CSEN	%	47.80106	-122.22	0.055	Crystal Springs Elementary	K2	Internet
CSO	#	45.51694	-122.69	0.036	Canyon	FBA23	Dial-up
DBO	%	43.11901	-123.244	0.984	Dodson Butte (CREST)	EPI,BB3	LL
EARN	%	47.74072	-122.045	0.159	East Ridge Elementary	K2	Internet
EGRN	%	47.07315	-122.979	0.057	Evergreen State College	K2	Internet
ELW	%	47.4941	-121.873	0.267	Echo Lake	A,BB	Dial-up + Microwave + T1
ERW	%	48.45383	-122.626	0.389	Mount Erie	A,BB	Dial-up + LL + Microwave
EUO	%	44.02921	-123.07	0.16	Eugene Golf Course (CREST)	EPI,BB	Earthworm + LL
EVCC	%	48.00732	-122.206	0.03	Everett Community College	K2	Internet
EVGW	%	47.85422	-122.155	0.122	Gateway Middle School	K2	Internet
EYES	%	45.32942	-123.058	0.061	Ewing Young Elementary	CMG5T	Internet
FINN	%	47.71932	-122.233	0.121	Finn Hill Junior High	K2	Internet
GNW	%	47.56422	-122.827	0.165	Green Mountain (CREST)	EPI,BB3	LL
GRCC	G	47.31162	-122.181	0.13	Green River Community College	EDU-V	Internet
GTWN	%	47.55116	-122.322	0.025	Georgetown Playfield	CMG5T	Intuicom Wireless + Internet
HAO	#	45.50919	-122.657	0.018	Harrison	FBA23	Dial-up
HART	%	47.58377	-122.35	0.002	Harbor Island	K2	Intuicom Wireless + Internet
HEBO	%	45.2135	-123.755	0.875	Mt. Hebo (CREST)	EPI,BB	Microwave + Earthworm
HICC	%	47.38994	-122.299	0.115	Highline Community College	K2	Internet
HOLY	%	47.56522	-122.385	0.106	Holy Rosary School	K2	Internet

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Table 1C - Strong-motion three-component stations							
STA	**F**	**LAT**	**LONG**	**EL**	**NAME**	**SENSOR**	**TEL.**
HOOD	%	45.32145	-121.653	1.52	Hood Meadows (CREST)	EPI,BB	LL + Internet
HUBA	%	45.63067	-122.653	0.023	Hudson's Bay High School	CMG5T	Internet
JORV	%	42.97766	-117.054	1.338	Jordan Valley High School	K2	Internet
KCAM	%	47.544	-122.319	0.005	King County Airport Maintenance	CMG5T	Internet
KDK	%	47.59502	-122.333	0.004	King Dome	K2	Internet
KEEL	%	45.55006	-122.896	0.067	Keeler	A20	Dial-up+Earthworm+Microwave
KFAL	%	42.25756	-121.786	1.326	Klamath Falls	CMG5T	Internet
KICC	%	47.577	-122.632	0.017	Kitsap County Central Commun.s	K2	Internet
KIMB	%	47.57462	-122.304	0.069	Kimball Elementary	K2	Internet
KIMR	%	47.50287	-122.768	0.123	Moderate Risk Waste Collection Fclty.	K2	Internet
KINR	%	47.75148	-122.644	0.008	North Road Shed	K2	Internet
KITP	%	47.67482	-122.631	0.076	Wastewater Treatment Plant	K2	Internet
KNEL	%	47.38052	-122.252	0.014	Kent Elementary School	K2	Internet
KNJH	%	47.38454	-122.23	0.014	Kent Junior High	K2	Internet
LANE	%	44.05165	-123.233	0.12	Lane	K2	Earthworm + Microwave
LAWT	%	47.65632	-122.391	0.05	Lawton Elementary	SLN-320	Internet
LEOT	%	47.76772	-122.117	0.115	Leota Junior High	K2	Internet
LON	%	46.74983	-121.811	0.853	Longmire Springs (CREST)	EPI,BB3	LL
LTY	%	47.25573	-120.666	0.97	Liberty Heights Mine (CREST)	EPI,BB3	LL + Earthworm
LYNC	%	47.82555	-122.294	0.019	Lynnwood City Hall	CMG5T	Internet
MARY	%	47.66252	-122.121	0.011	Marymoor Park	K2	Internet
MBKE	%	48.91707	-122.143	1.01	Kendall Elementary	K2	Internet
MBPA	%	47.89835	-121.89	0.186	Monroe	A20	Dial-up + Microwave + T1
MEAN	%	47.62252	-122.306	0.037	Meany Middle School	K2	Internet
MEGW	%	46.26577	-123.879	0.332	Megler (CREST)	EPI,BB	Microwave + Earthworm
MPL	%	47.46843	-122.186	0.122	Maple Valley	K2	Dial-up + Microwave + T1
MRIN	%	44.80023	-122.699	0.187	Marion	K2	Microwave + Earthworm
MURR	%	47.11982	-122.561	0.082	Camp Murray	K2: L4	none
NIHS	%	47.74126	-122.223	0.137	Inglemoore High School	K2	Internet
NOWS	%	47.68649	-122.257	0.002	NOAA Sand Point	A20	Internet
OFR	%	47.93313	-124.396	0.152	Olympic Natural Resources Cntr. (CRES	EPI,BB	Internet + Earthworm
OHC	%	47.3337	-123.159	0.006	Hood Canal Junior High	K2	Internet
OPC	%	48.10009	-123.413	0.09	Peninsula College (CREST)	EPI,BB	Internet
PAYL	%	47.1926	-122.314	0.009	Aylen Junior High	K2	Internet
PCEP	%	47.11142	-122.291	0.16	Puyallup East Sheriff Precinct	K2	Internet
PCFR	%	46.98962	-122.442	0.137	Roy Training Center	K2: S13	Internet
PCMD	%	46.88896	-122.301	0.239	Mountain Detachment	K2: L4	Internet
PERL	%	45.32818	-122.779	0.068	Pearl	K2	Microwave + Earthworm
PIN	%	43.81096	-120.873	1.865	Pine Mtn. (CREST)	EPI,BB3	Earthworm + LL
PNLK	%	47.58162	-122.035	0.128	Pine Lake Middle School	K2,EDU-V	Internet
PSNS	%	47.55871	-122.644	0.006	Puget Sound Naval Shipyard	CMG5TD	Internet
QAW	%	47.63157	-122.356	0.14	Queen Anne	A20	T1
RAW	%	47.33705	-121.933	0.208	Raver	A20	Microwave + T1
RBEN	%	47.43502	-122.187	0.152	Benson Hill Elementary	K2	Internet
RBO	#	45.54083	-122.564	0.158	Rocky Butte	FBA23	Dial-up
RHAZ	%	47.54002	-122.185	0.108	Hazelwood Elementary	K2	Internet
ROSS	%	45.66178	-122.658	0.061	Ross	A20	Earthworm
RRHS	%	46.79942	-123.042	0.047	Rochester High School	K2: L4	Internet
RWW	%	46.96473	-123.543	0.015	Ranney Well (CREST)	EPI,BB3	LL
SBES	%	48.76814	-122.416	0.119	Silver Beach Elementary School	K2: L4	Internet
SCC	%	47.74965	-122.361	0	Shoreline Community College	CMG5T	Internet
SEA	%	47.65421	-122.309	0.03	University of Washington	A20,PMD2023	LL
SEAS	%	45.99742	-123.926	0.005	Seaside	K2	Internet
SFER	%	47.61944	-117.367	0.715	Ferris High School	K2	Internet
SGAR	%	47.67705	-117.415	0.579	Garfield Elementary	K2	Internet
SHIP	%	47.65511	-122.322	0.005	WashDOT Lake Union Shop	CMG5T	Intuicom Wireless + Internet
SHLY	$	47.70844	-117.416	0.626	Spokane Temp	K2	None

Table 1C - Strong-motion three-component stations							
STA	**F**	**LAT**	**LONG**	**EL**	**NAME**	**SENSOR**	**TEL.**
SMNR	%	47.20442	-122.233	0.022	Sumner High School	K2	Internet
SNIO	$	47.67944	-117.405	0.584	Spokane NIOSH	K2	None
SOPS	$	47.728	-117.313	0.707	Orchard Prairie Elementary	K2	Internet
SOUA	%	42.18375	-122.695	0.634	Southern Oregon University Ashland	K2: L4	Internet
SP2	%	47.55629	-122.249	0.03	Seward Park	A,BB	LL
SQM	%	48.07731	-123.047	0.03	Sequim Battelle Properties (CREST)	EPI,BB	Internet+Spread Spectrum Radio
SSS1	%	47.5818	-122.331	0.005	John Stanford Center 1	K2	Internet
SSS2	%	47.5818	-122.331	0.005	John Stanford Center 2	K2	Internet
SVOH	%	48.2892	-122.633	0.022	Skagit Valley College Oak Harbor	K2: L4	Internet
SVTR	%	47.49576	-121.782	0.146	Two Rivers School	CMG5T	Internet
SWES	%	47.71407	-117.466	0.623	Westview Elementary	K2	Internet
SWID	%	48.00843	-122.413	0.062	South Whidbey Primary School	K2	Internet
TAKO	%	43.74334	-124.082	0.046	Tahkenitch (CREST)	EPI,BB	Earthworm
TBPA	%	47.25788	-122.368	0.002	Tacoma	A20	Microwave + T1 + Dial-up
TKCO	%	47.53668	-122.302	0.005	King County Airport	A20	Internet
TOLO	%	44.62187	-123.923	0.021	Toledo (CREST)	EPI,BB	Microwave + Earthworm
TTW	%	47.69445	-121.69	0.542	Tolt Reservoir (CREST)	EPI,BB3	Internet
UMPQ	%	43.29089	-123.332	0.162	Umpqua Community College	K2: L4	Internet
UPS	%	47.26376	-122.485	0.113	University of Puget Sound	K2	Internet
UWFH	%	48.54593	-123.013	0.01	Friday Harbor Laboratories	K2: L4	Internet
VVHS	%	47.42345	-122.455	0.095	Vashon High School	K2: L4	Internet
WISC	%	47.60872	-122.176	0.056	Wilburton Instructional Services Cntr.	K2	Internet
WISH	%	47.11698	-123.771	0.045	Wishkah School (CREST)	BB	Internet
WWHS	%	46.04527	-118.318	0.01	Walla Walla High School	CMG5T	Internet