QUARTERLY NETWORK REPORT 2005-D

on

Seismicity of Washington and Oregon

October 1 through December 31, 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

INTRODUCTION **1**
NETWORK OPERATIONS **1**
Mt. St. Helens eruption, 2004-2005 2
- MSH Equipment; destruction and replacement 3

Strong Motion Instrumentation Update 3
CREST Instrumentation Update 3
Computer Hardware Update 3
Use of PNSN Data 3
PNSN PERSONNEL CHANGES **3**
PNSN P.I.Tony Qamar (1943-2005) fatally injured 3
John Vidale – Incoming Director of the PNSN to replace Steve Malone, retiring 4
Other Personnel Changes 4
EARTHQUAKE DATA – 2005-D **4**
OREGON 5
WESTERN WASHINGTON SEISMICITY 5
WASHINGTON CASCADE VOLCANOES 5
Mount St. Helens 5
Mount Rainier 6
EASTERN WASHINGTON SEISMICITY 6
OTHER SOURCES OF EARTHQUAKE INFORMATION **6**
EARTHQUAKE CATALOG, 2005-D **10**
OUTREACH ACTIVITIES **13**
Audio Library, Phone 13
Internet outreach 13
Washington State Support 13
Information Products 13
K-20 Education Outreach 13
Media Relations 13
Meetings, Presentations and Visitors 14

FIGURES
Figure 1 Earthquakes with magnitude greater than or equal to 0.0 (Mc>=0.0). 7
Figure 2. Blasts and probable blasts. Unfilled diamonds represent cities. 8
Figure 3. Selected Earthquake at Mt. St. Helens; (Mc>=0.0) 9
Figure 4. Earthquakes at Mt. Rainier; (Mc>=0.0) 9

TABLES
TABLE 1 Station outages and installations 1
TABLE 2 Felt Earthquakes 5
TABLE 3 Earthquake Catalog 10

INTRODUCTION

This is the fourth 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. In these reports we provide information about network operations, our educational and outreach activities, and seismicity of the region including special coverage (figures, counts, listings, etc.) of earthquake swarms, aftershock sequences, or unusual events or findings.

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. These tables were included in Appendix 1 of the 2005C Quarterly Report. 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.

NETWORK OPERATIONS

Lists of currently operating stations are available on-line through web page http://www.pnsn.org/OPS/stations.html. We currently receive data from 289 stations in our network area. There are 215 stations in Washington and 64 in Oregon. These stations provide short-period data from 174 stations, strong motion data from 110 stations, and broadband data from 45 stations. The PNSN also receives data from 40 stations operated by other seismic networks.

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
ALKI	11/07/05-11/14/05	No communications
ALVY	07/20/05-10/06/05	No communications
BEVT	05/20/05-End	Removed for repair
BHW	10/04/05-12/14/05	Dead; installed new seismometer & seismometer cable
BKC	11/19/05-End	Dead
BLT	10/21/05	Installed
CDF	11/03/05-11/22/05	Dead
COLT	06/23/05-End	Removed for repair
CSO	12/15/05	Removed
ELK	12/26/05-End	Dead
ERW	07/25/05-End	Intermittent communications
GHW	05/04/05-12/09/05	Int. due to low solar exposure; converted site to air cell/solar site
GL2	10/21/04-End	Dead
GLK	09/29/05-End	Intermittent
GPW	03/16/04-09/28/05	Dead
GRCC	08/12/05-10/10/05	Removed for repair
GTWN	06/01/05-End	No communications; telemetry being moved for bldg. renovation
HAO	11/10/05	Removed
HOLY	10/01/05-10/26/05	No communications
JBO	10/15/04-End	Noisy
JRO	11/04/05-12/13/05	No communications (Coldwater VSAT down)
KDK	11/04/05-11/16/05	No communications
KEEL	05/30/05-End	Dead
KFAL	06/15/05-End	Dead
KICC	03/04/05-End	Bad timing

TABLE 1 - Station outages and installations

Station	Outage Dates	Comment
KICC	12/14/05-End	No communications
KIMB	12/14/05-12/23/05	No communications
KMO	12/29/05-End	Dead
KNEL	10/26/05-12/30/05	No communications
KOS	11/24/05-End	Dead
LANE	07/20/05-10/06/05	No communications
LTY	09/07/05-End	Intermittent communications
LYNC	12/17/05-12/29/05	No communications
MBKE	06/07/05-End	Dead, communications?
MIBL	11/17/05	Installed (St. Helens)
MOON	11/27/05-End	Intermittent
MRIN	10/18/05-End	Dead
MTM	12/12/05-End	Dead
NED	11/04/05-End	Dead
OBC	10/27/05-End	Dead
OBH	01/31/02-End	Temp. removed for logging
OOW	12/15/05-End	Dead
OSD	12/15/05-End	Dead because of OOW
PAT2	10/21/05	Installed
PERL	10/04/05-End	Dead
PGW	10/08/03-09/21/05	Dead; removed, site abandoned
RBO	11/09/05	Removed
RCM	12/26/05-End	Dead
RCS	12/29/05-End	Dead
RER	12/19/05-End	Noisy
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	11/04/05-12/1305	No communications (Coldwater VSAT down)
SEP	11/04/05-12/13/05	No communications (Coldwater VSAT down)
SFER	09/01/04-End	Short period dead; needs removal
SOPS	08/27/02-End	K2 flash-memory problem
SOS	12/15/05-End	Dead
SP2	09/28/05-10/26/05	No communications
SSS1	03/05/05-End	One of 3 downhole 3-D sensors dead
STD (BB)	11/04/05-12/13/05	No communications (Coldwater VSAT down)
STD (SP)	12/15/05-End	Dead
SUG	10/02/05-10/18/05	Dead aircells
TAKO	12/25/05-End	No communications
TKCO	09/22/05-11/16/05	No communications
TOLO	12/24/05-End	No communications
TTW	12/01/05-End	Removed; strong motion sensor moved to USArray site for 2 years
UWFH	05/01/05-End	Short period problems; needs removal
VGB	09/23/04-End	Intermittent; usually very noisy
VVHS	06/30/05-12/27/05	No communications
WWHS	08/03/05-End	Bad timing

Mt. St. Helens eruption, 2004-2005

The dome-building eruption of Mount St. Helens that began on September 23, 2004 continues. This quarter, a slight change was made in the procedure for selecting events at Mt. St. Helens to be located. Previously, triggering was desensitized so that only the largest events at Mt. St. Helens caused data files to be automatically generated. Continuous trace data from Mt. St. Helens stations were manually reviewed and trace-data files cut from the continuous data for selected events. Beginning in December, the triggering threshold for automatically recording Mt. St. Helens earthquakes was lowered slightly, webicorders

were reviewed to identify events to be manually retrieved from the continuous data stream, and the continuous data were fully reviewed only for one hour of every six.

- **MSH Equipment; destruction and replacement**

Aircells died at station SUG causing no data to be collected from October 2-18, 2005. Station NED died for good on November 4, 2005. That same day, the feed from the Coldwater VSAT was lost. That was the source for signals from stations NED, SEND, SEP, STD (broadband), and JRO. The VSAT was down until December 13, 2005. On November 17, 2005, station SEND was moved to the old station BLIS location and was named MIBL.

Strong Motion Instrumentation Update

There were no new strong motion installations this quarter.

Station SSS1, the deepest of three downhole seismometer packages installed in Oct. 2004 at the John Stanford Center in Seattle, ceased operation in March of 2005. This quarter, a 5' X 5' square was cut in the parking apron to access the borehole wellhead. On their first visit, Eric Flood and Tom Yelin did some spade work to excavate the wellhead after the concrete slab was removed. On a second visit, they attempted to pull a cable through the conduit to the wellhead. The cable was binding somewhere in the conduit and they were unable to free it. Arrangements were made to bring in a driller in January 2006 to attempt to clear out the bentonite-cement grout that had been used to backfill the borehole after the sensor was installed. Replacement of the faulty sensor will delay reinstallation of the unit until sometime in mid 2006.

CREST Instrumentation Update

The EarthScope USArray transportable seismic station C05A was installed at the South Fork Tolt Reservoir on December 1, 2005. This Pacific Northwest USArray station includes a Streckeisen STS-2 broadband seismometer, Kinemetrics Quanterra Q330 seismic data acquisition system, and Kinemetrics Baler recording instrument. On December 1, 2005, the strong motion CREST station, TTW, was removed and the Kinemetric EpiSensor ES-T from this station was installed in the C05A vault. The USArray equipment will be removed after the completion of the 18-24 month deployment, at which point the rest of the original CREST TTW station will be installed permanently in the new C05A vault. The USArray installation was headed by Robert Busby of IRIS and assisted by Lynn Simmons of the PNSN. Seattle Public Utilities provided a great deal of support, in particular, staff members Bill Steenberg, Ted Victa, Teresa Hallauer, and Steve Monsey.

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.

Use of PNSN Data

The IRIS Data Management Center reports 1,162 requests for PNSN trace-data this quarter. More than 16,200,000 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.

PNSN PERSONNEL CHANGES

PNSN P.I.Tony Qamar (1943-2005) fatally injured

Tony Qamar, co-PI of the PNSN, was 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. As a co-Principal Investigator for the Pacific Northwest Seismograph Network, Dr. Qamar was involved with almost every aspect of network operations and research, from field work to detailed studies of both tectonic and volcanic earthquakes. He also served as the Washington State Seismologist providing information and consulting to state government and civil authorities on earthquake hazards. His seismic investigations included studies of seismicity of the region, and earthquake hazards. He helped to develop an early version of a web based survey technique for felt earthquakes. He studied the seismicity of Cascade volcanoes and also the seismic signals related to glacier motion. He was instrumental in developing seismic processing and mapping software and managed the calibration and instrument response database for the network.

Dr. Qamar was an early leader in doing geodetic measurements in Washington using GPS technology. In cooperation with the Pacific Geoscience Centre in Canada he installed one of the early GPS "tracking" instruments at Neah Bay that detected the slow eastward movement of the west coast due to subduction of the oceanic plate under Washington. Additional

collaboration with scientists at Central Washington University and others resulted in the establishment of the "Pacific Northwest Geodetic Array" (PANGA).

Recently, Dr. Qamar was a major contributor to the seismic study of renewed activity at Mount St. Helens. His interest in volcanoes began in the spring of 1980, prior to the major eruption on May 18, 1980, when he and several colleagues camped on the slopes of Mount St. Helens and operated portable seismic stations and to make simultaneous visual and thermal observations of surface activity. More recently, he closely tracked the recent Mount St. Helens activity; contributing significant new data processing procedures and visual display techniques. His contributions included thoughtful insight both into the details of seismograms and the big picture of how volcanoes work. He was a regular participant in group discussions within the PNSN lab and in frequent conference calls and meetings with the staff of the Cascade Volcano Observatory (CVO).

The Department of Earth and Space Sciences sponsored a memorial for Tony Qamar at 7 PM Oct. 11 at the University of Washington. Over three hundred and fifty friends and family from the local area and across the country gathered to celebrate Tony's life and provide each other with support in the face of this devastating loss. Dr. Daniel Johnson of the University of Puget Sound was killed in the same accident, and hundreds attended his memorial service, held at the University of Puget Sound at noon on October 10th. Web pages with biographical information, photographs, and friends' remembrances may be found at:

http://www.pnsn.org/NEWS/PRESS_RELEASES/TONY_QAMAR.html
and
http://www.pnsn.org/NEWS/PRESS_RELEASES/DAN_JOHNSON.html

Tony's passing is mourned by the PNSN and the Dept. of Earth and Space Sciences, by the broader seismological community, and by colleagues and friends at the many other organizations he was involved with professionally and personally. His scientific curiosity and love of nature and the outdoors were combined in a particularly pleasant way with his friendliness, sense of humor and enjoyment of cooking. Tony's presence, knowledge, and sociability are missed.

John Vidale – Incoming Director of the PNSN to replace Steve Malone, retiring

Dr. John Vidale has accepted a position as Director of the PNSN. Dr. Vidale is expected to arrive at the UW in summer of 2006. Dr. Stephen D. Malone is planning to retire from the PNSN once Dr. Vidale settles in, but will continue to work with the PNSN part-time, concentrating on volcano seismicity problems.

Other Personnel Changes

Technician Robert Leslie resigned. Jon Connolly and Eric Flood, both former student helpers who had graduated recently, were hired temporarily to assist with field operations. Tom Yelin of the USGS is taking a more active role in the PNSN, including assuming occasional responsibility for emergency response duties. The PNSN has initiated a job search for a Network Manager to oversee day-to-day network operations, including field work, data-acquisition hardware and software, data analysis, and response to significant events.

EARTHQUAKE DATA – 2005-D

Between October 1 and December 31, 2005, 1,098 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 that began in late September 2004. Of the processed events, locations in Washington, Oregon, or southernmost British Columbia were determined for 832 of these events; 741 were classified as earthquakes and 91 as known or suspected blasts. The remaining processed events include teleseisms (125 events), regional events outside the PNSN (53), 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 4th 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
05/11/23 20:53:15	48.85	122.13	0.0	4.0	6.6 km ENE of Deming, WA	✓	✓
05/12/15 10:26:02	47.72	117.76	0.1	2.4	27.0 km WNW of Spokane, WA (Mission & N Division)		
05/12/27 05:46:07	47.76	121.82	12.4	2.3	12.4 km ENE of Duvall, WA	✓	

OREGON

During the fourth quarter of 2005, 26 (none larger than magnitude 2.2) earthquakes were located in Oregon between 42.0 degrees and 45.5 degrees north latitude, and between 117 degrees and 125 degrees west longitude.

WESTERN WASHINGTON SEISMICITY

During the fourth quarter of 2005, 624 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. Two earthquakes were felt this quarter in western Washington.

The largest earthquake in western Washington this quarter was a magnitude 4.0 event on November 23 (UTC), located about 6 km east-north-east of Deming at a depth of less than 1 km. The deepest earthquake in western Washington this quarter was a magnitude 0.8 event at about 74 km depth located about 8 km SW of Bend, WA on November 14 (UTC).

WASHINGTON CASCADE VOLCANOES

Mount St. Helens

At Mount St. Helens, seismicity associated with the dome building eruption continue. During the 4th quarter of 2005, seismicity increased; event counts at HSR more than doubled compared to the 3rd quarter. However, due to the smaller magnitudes of 4th quarter events, the emergent nature of the seismic signals, and loss of a key crater station (NED), the number of located earthquakes declined from last quarter. Some changes in the procedure for selecting Mount St. Helens quakes to be located were also made during the 4th quarter (see this report's section on Network Operations). Located events at Mount St. Helens are only a representative sample of the seismicity.

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, 404 earthquakes were located in the area shown in Fig. 3 using conventional manual processing procedures (including 342 earthquakes between magnitude 1.0 and 2.9, and 3 slightly larger events with magnitudes between 3.0 and 3.4).

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 in 2005, reviewed 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
4th quarter 2005 - 30,315 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). No events flagged "L" or "S" were located at Mount Rainier this quarter, though 32 "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 37 tectonic events (25 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 1.2 event on October 18 (UTC), located about 3 km north-northeast of the summit of Mt. Rainier at less than 1 km depth. This quarter, 18 tectonic earthquakes (12 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 15 (11 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 fourth quarter of 2005, 88 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 earthquake recorded in eastern Washington this quarter was a magnitude 2.5 event on November 10 (UTC), located about 14 km west-southwest of Prosser at about 11km depth. This quarter's seismicity included a swarm of about 20 small (none larger than magnitude 2.0) shallow earthquakes (none deeper than 2 km) located near Wahluke, about 28 km west-southwest of Othello, during the month of December.

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

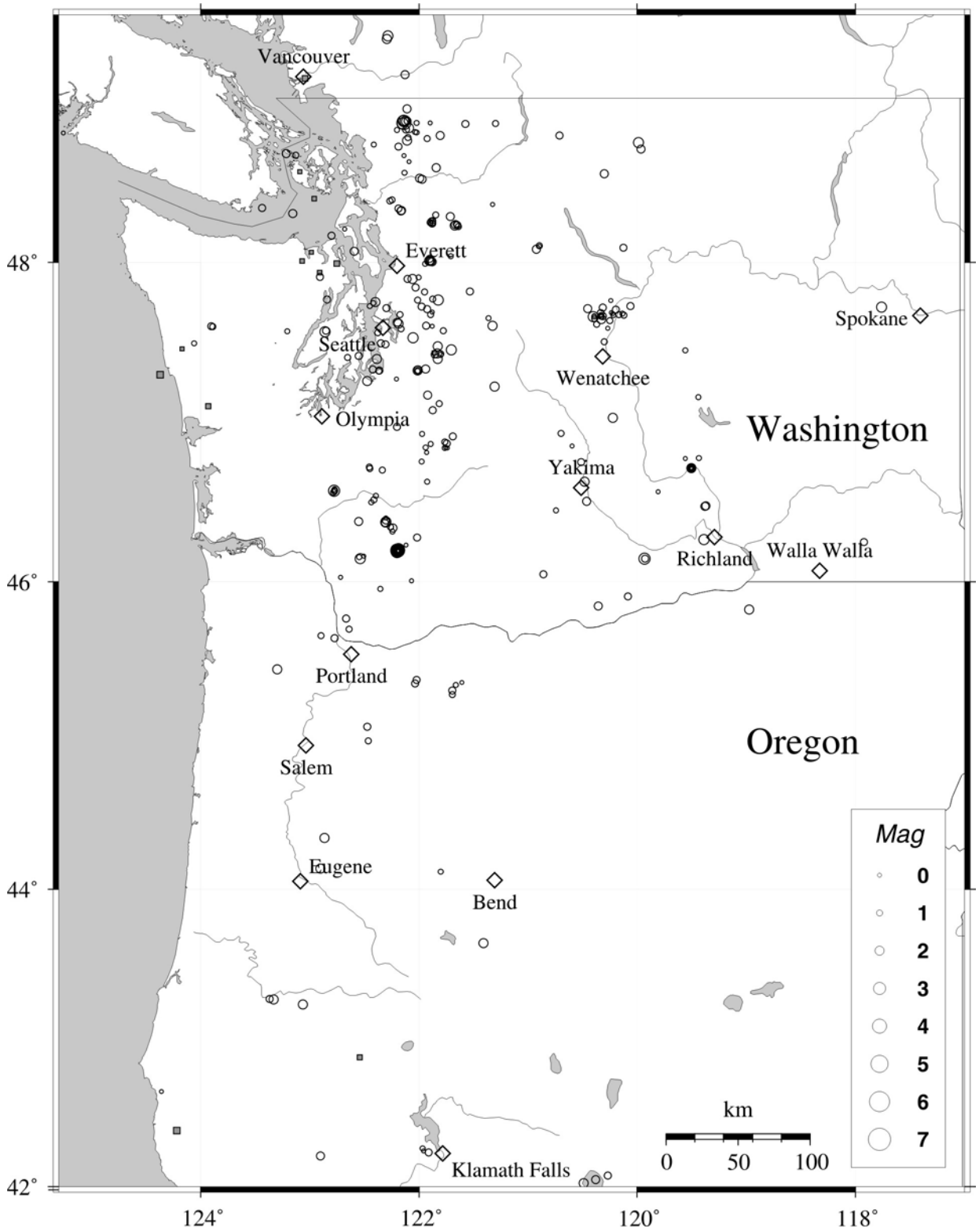

Figure 1 Earthquakes with magnitude greater than or equal to 0.0 (Mc>=0.0).

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

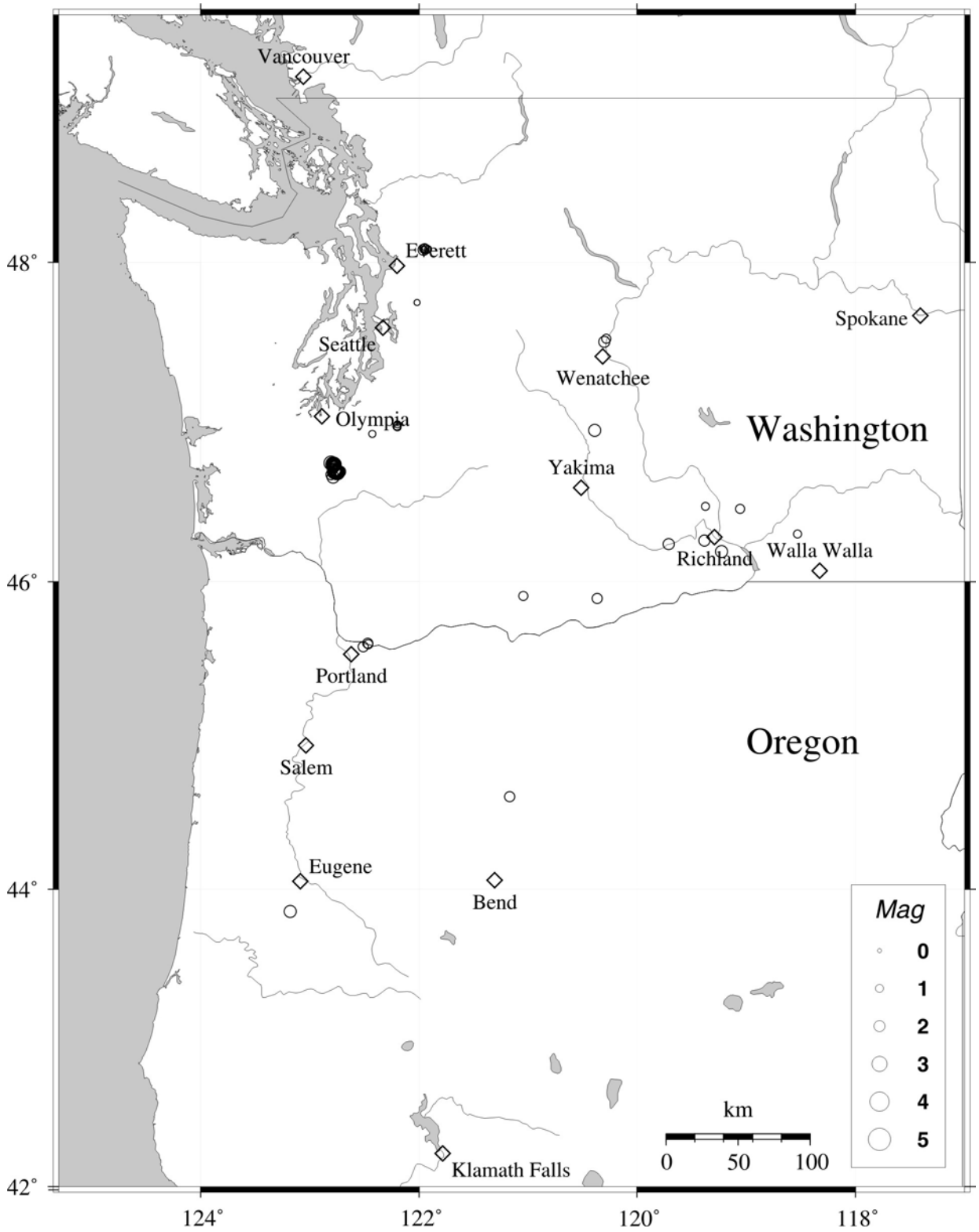

Figure 2. Blasts and probable blasts. Unfilled diamonds represent cities.

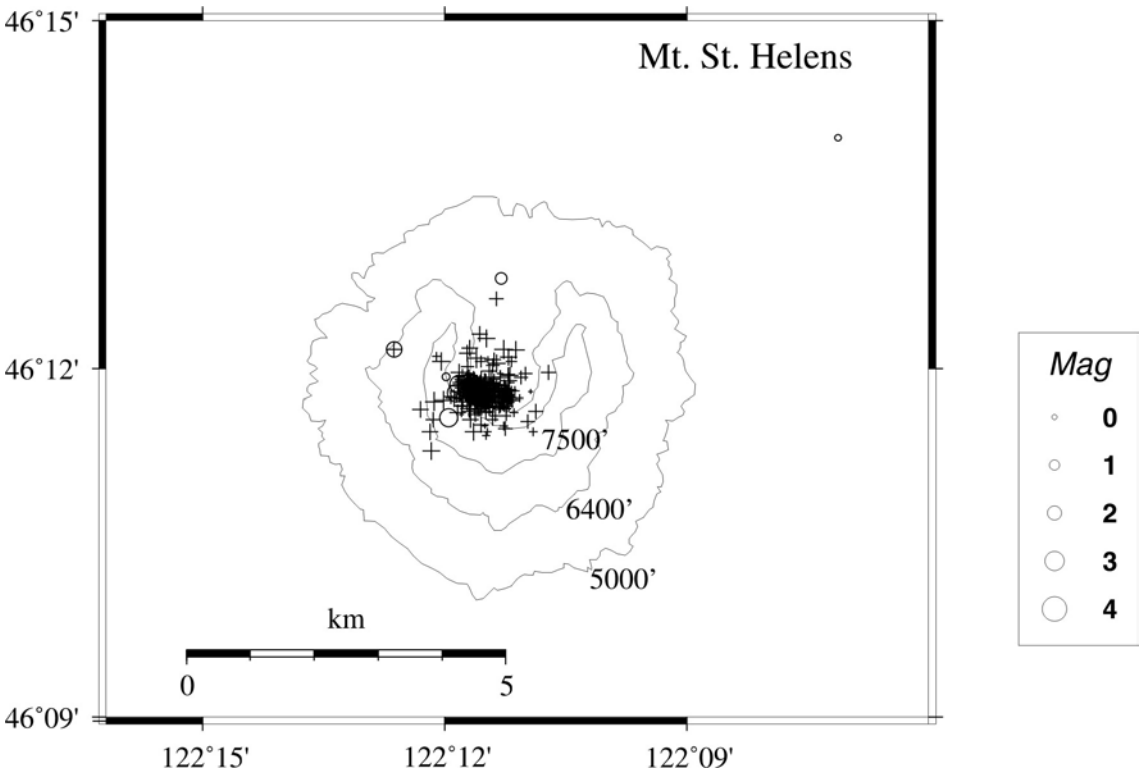

Figure 3. Selected Earthquake at Mt. St. Helens; (Mc>=0.0)
Events elected by the analyst for location are small fraction of the number of events recorded during the quarter.
Plus symbols indicate depth less than 1 km. Circles indicate depth greater than 1 km. Elevation contours shown in feet.

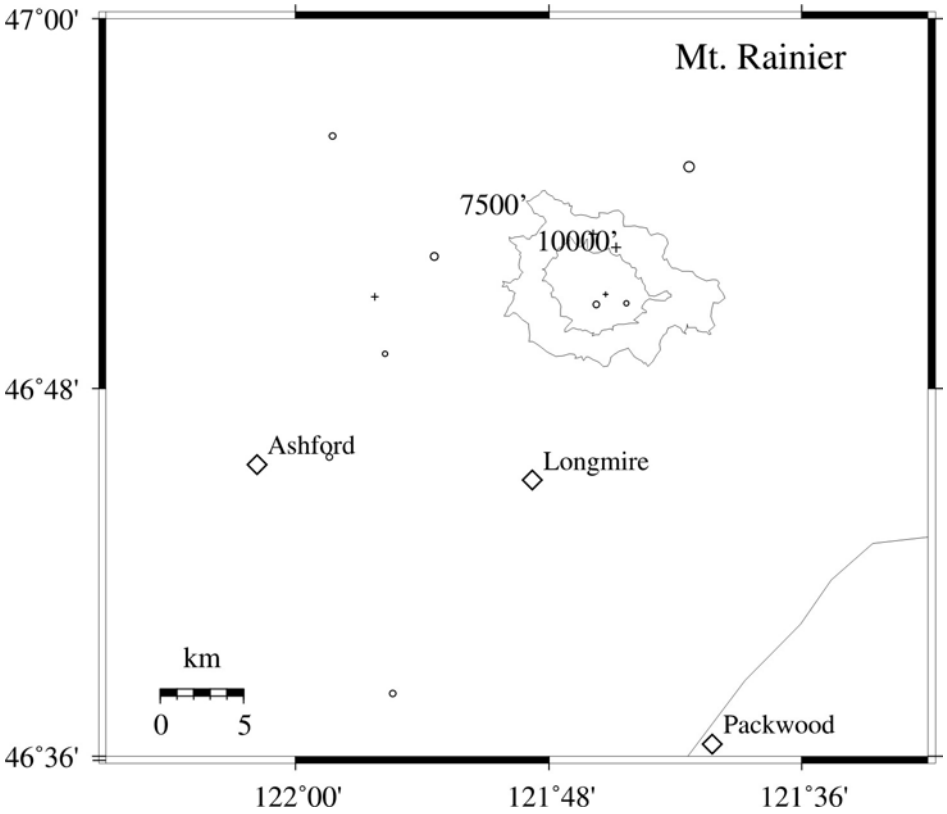

Figure 4. Earthquakes at Mt. Rainier; (Mc>=0.0)

EARTHQUAKE CATALOG, 2005-D

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-D

Oct-05

DAY	TIME	LAT	LON	DEPTH	M	NS/NP	GAP	RMS	Q	MOD	TYP
1	7:52	46 11.84	122 11.49	0.91	2.5	15/015	66	0.06	AA	S4	
1	11:54	46 11.67	122 11.40	0.05*	2.7	16/016	66	0.19	BA	S4	
2	1:14	46 11.84	122 11.84	0.58	2.8	14/014	108	0.12	AB	S4	
2	7:01	46 11.68	122 11.43	0.73	2.2	21/025	67	0.11	AA	S4	
2	17:40	46 11.97	122 11.45	0.92	2.1	11/012	90	0.22	BA	S4	
2	20:02	46 11.58	122 11.94	1.22	2.6	11/011	82	0.13	AA	S4	
3	1:06	46 11.77	122 11.43	0.03*	2.5	13/013	102	0.22	BB	S4	
3	12:55	46 11.46	122 11.64	0.89	2.7	15/015	121	0.18	BB	S4	
3	13:30	46 11.71	122 11.43	0.93	2.2	10/010	119	0.15	BB	S4	
3	22:41	46 11.87	122 11.67	0.02*	2.5	14/014	103	0.29	BB	S4	
4	3:08	46 11.87	122 11.64	0.68	2.7	13/013	102	0.07	AB	S4	
4	4:31	46 11.91	122 11.30	0.29	2.1	12/012	93	0.08	AB	S4	
4	6:48	46 12.17	122 11.27	0.35	3.0	16/016	62	0.20	BA	S4	
4	12:47	46 11.77	122 11.28	0.02*	2.0	15/015	98	0.11	AB	S4	
4	22:18	46 11.81	122 11.36	0.72	2.9	27/027	43	0.11	AA	S4	
5	13:06	46 11.49	122 11.25	0.79*	2.1	7/007	145	0.21	BC	S4	
5	15:33	46 11.74	122 11.52	0.63	2.4	13/013	106	0.05	AB	S4	
5	20:37	46 11.90	122 11.20	0.03*	2.5	13/013	87	0.13	AA	S4	
6	3:49	46 11.81	122 11.20	0.03*	2.1	7/007	97	0.11	AB	S4	
6	8:00	46 11.81	122 11.39	0.13	2.7	12/012	99	0.08	AB	S4	
6	14:05	46 11.75	122 11.69	0.02*	2.9	15/015	72	0.15	BA	S4	
6	17:20	46 11.81	122 11.36	0.02*	2.2	12/012	99	0.14	AB	S4	
6	23:45	46 11.69	122 11.54	0.03*	2.1	12/012	108	0.13	AB	S4	
7	9:28	46 12.17	122 11.68	0.03*	2.5	10/010	99	0.27	BB	S4	
7	14:31	46 11.97	122 11.81	0.63	2.6	13/013	101	0.11	AB	S4	
7	16:42	46 11.78	122 11.28	0.04*	2.5	10/010	98	0.26	BB	S4	
7	22:02	46 11.55	122 10.96	0.04*	2.1	9/009	279	0.13	AD	S4	
8	1:41	46 11.56	122 11.67	0.91	2.5	13/013	76	0.15	BA	S4	
8	2:23	46 11.96	122 11.00	0.79	2.0	9/009	139	0.19	BC	S4	
8	9:11	46 11.56	122 12.13	0.5	2.2	5/005	128	0.05	AD	S4	
8	10:49	46 11.94	122 11.19	0.05*	2.6	14/014	83	0.16	BA	S4	
8	11:32	46 12.10	122 11.21	0.64	2.6	15/015	61	0.14	AA	S4	
8	16:00	46 11.94	122 11.21	0.02*	2.0	7/007	138	0.07	AC	S4	
8	19:24	46 11.84	122 11.54	0.31	2.0	13/013	102	0.13	AB	S4	
9	5:07	46 11.78	122 11.86	1.07	2.5	13/013	111	0.09	AB	S4	
9	14:09	46 11.77	122 11.34	0.04*	2.5	15/015	100	0.15	AB	S4	
9	21:56	46 11.72	122 12.00	0.67	2.8	14/014	79	0.07	AA	S4	
10	5:34	46 11.80	122 11.23	0.09	2.1	13/013	96	0.10	AB	S4	
10	6:22	46 11.84	122 11.67	0.4	2.1	10/010	112	0.19	BB	S4	
10	7:24	46 11.64	122 10.87	0.02*	2.2	7/007	128	0.21	BB	S4	
10	11:38	46 11.72	122 11.51	0.55	2.2	12/012	106	0.13	AB	S4	
11	1:29	46 11.84	122 11.60	0.42	2.0	15/015	103	0.10	AB	S4	
11	7:41	46 11.84	122 11.58	0.61	2.0	16/016	102	0.09	AB	S4	
11	8:56	46 11.74	122 11.77	0.62	2.8	14/014	111	0.10	AB	S4	

TABLE 3 - EARTHQUAKE CATALOG, 2005-D											
11	11:27	46 11.82	122 11.64	0.51	2.0	17/017	104	0.09	AB	S4	
11	12:30	46 11.84	122 11.34	0.48	2.0	14/014	97	0.08	AB	S4	
11	14:45	46 11.65	122 12.30	0.17	2.5	14/014	128	0.30	BB	S4	
11	19:52	47 27.59	121 42.17	17.5	2.3	40/041	56	0.14	AA	P3	
11	23:32	46 11.90	122 11.68	1.07	2.2	12/012	69	0.04	AA	S4	
12	2:12	46 11.81	122 11.54	0.62	2.1	17/017	67	0.11	AA	S4	
12	4:11	46 11.75	122 11.48	0.68	2.0	16/016	104	0.08	AB	S4	
12	8:15	46 11.85	122 11.81	1.11	2.6	15/015	73	0.09	AA	S4	
12	8:29	46 11.88	122 11.48	0.67	2.2	15/015	98	0.08	AB	S4	
12	12:23	46 11.84	122 11.67	0.34	2.0	12/012	105	0.09	AB	S4	
12	13:41	46 11.91	122 11.62	0.7	2.1	12/012	100	0.07	AB	S4	
12	15:45	46 11.78	122 11.52	0.48	2.2	15/015	103	0.08	AB	S4	
13	3:48	46 12.26	122 11.47	0.02*	2.8	8/008	86	0.24	BA	S4	
13	10:47	46 11.77	122 11.66	0.04*	2.4	14/014	108	0.12	AB	S4	
14	18:56	46 11.69	122 11.52	0.14	2.6	12/012	69	0.13	AA	S4	
15	16:16	46 11.71	122 11.59	0.7	2.5	14/014	108	0.10	AB	S4	
15	19:21	46 11.81	122 11.32	0.04*	2.0	14/014	98	0.13	AB	S4	
15	22:20	46 34.60	122 46.60	24.38	2.5	53/053	41	0.24	BA	P3	
18	4:47	46 12.06	122 12.04	0.26	2.9	16/016	73	0.05	AA	S4	
18	19:32	49 22.47	122 16.94	5.30$	2.3	14/016	270	0.34	CD	P3	
19	22:06	46 11.78	122 11.54	0.49	2.5	16/016	104	0.13	AB	S4	
22	6:52	46 11.80	122 11.60	0.03*	2.6	13/013	105	0.11	AB	S4	
25	5:51	46 11.80	122 11.81	0.58	2.3	14/014	109	0.08	AB	S4	
25	5:51	48 51.67	122 07.67	1.27*	2.3	21/021	111	0.48	CC	P3	
26	3:05	46 11.84	122 11.46	0.15*	2.6	18/018	77	0.13	AA	S4	
27	1:34	46 12.04	122 11.34	0.02*	2.7	10/010	96	0.16	BB	S4	
28	0:15	46 11.62	122 11.84	0.48	2.4	14/014	119	0.08	AB	S4	
28	12:49	46 11.68	122 11.40	0.31	2.1	14/014	105	0.11	AB	S4	
29	16:13	46 11.71	122 11.72	0.34	2.7	17/017	73	0.08	AA	S4	
30	13:35	46 11.80	122 11.54	0.32	2.3	14/014	103	0.10	AB	S4	
31	13:17	47 34.31	122 51.54	21.72	2.4	62/062	60	0.22	BA	P3	
31	13:56	46 11.68	122 11.79	0.21	2.3	15/015	114	0.13	AB	S4	
Nov-05											
DAY	**TIME**	**LAT**	**LON**	**DEPTH**	**M**	**NS/NP**	**GAP**	**RMS**	**Q**	**MOD**	**TYP**
2	13:50	46 12.09	122 11.60	0.04*	3.1	15/015	65	0.15	BA	S4	
6	17:24	46 11.77	122 11.66	0.69	2.9	14/014	71	0.09	AA	S4	
7	12:50	47 15.95	122 28.40	12.05	2.1	46/047	38	0.19	BA	P3	
9	4:43	49 21.41	122 17.70	6.73$	2.1	17/018	285	0.36	CD	P3	
10	12:45	46 08.77	119 55.85	10.53*	2.5	22/022	114	0.10	AB	E3	
11	18:26	46 11.75	122 11.40	0.69	2.8	16/016	55	0.11	AA	S4	
14	7:26	46 11.77	122 11.41	0.13	2.6	15/015	65	0.11	AA	S4	
14	21:05	45 26.26	123 17.88	20.13	2.1	29/030	90	0.25	BB	O0	
15	6:55	46 11.77	122 11.34	0.72	2.7	15/015	63	0.10	AA	S4	
16	16:12	46 11.82	122 11.62	0.35	2.5	10/010	104	0.10	AB	S4	
18	17:41	46 11.52	122 11.54	0.04*	2.3	9/009	117	0.08	AB	S4	
20	7:41	46 12.13	122 11.72	0.05*	2.5	4/004	153	0.10	AD	S4	
22	6:06	46 11.78	122 11.33	0.03*	2.5	15/015	99	0.14	AB	S4	
23	13:07	46 11.84	122 11.42	0.03*	2.3	14/014	98	0.15	AB	S4	
23	20:53	48 51.22	122 08.28	0.03*	4.0	30/031	106	0.42	CC	P3	F
24	9:11	46 11.77	122 11.54	0.05*	2.4	14/014	105	0.13	AB	S4	
25	11:08	46 11.91	122 11.41	0.03*	2.3	12/012	96	0.12	AB	S4	
25	15:57	47 39.90	120 24.12	0.64	2.4	22/022	54	0.17	BB	N3	
26	9:11	46 11.75	122 11.45	0.12	3.0	13/013	66	0.11	AA	S4	

TABLE 3 - EARTHQUAKE CATALOG, 2005-D											
27	2:37	46 11.72	122 11.15	0.04*	2.1	7/008	100	0.17	BB	S4	
28	1:57	46 11.81	122 11.47	0.11	2.6	11/011	83	0.09	AA	S4	
28	16:52	47 26.23	121 50.01	20.75	2.0	23/024	67	0.20	BA	P3	
Dec-05											
DAY	**TIME**	**LAT**	**LON**	**DEPTH**	**M**	**NS/NP**	**GAP**	**RMS**	**Q**	**MOD**	**TYP**
1	6:33	46 11.68	122 11.45	0.11*	2.1	11/011	106	0.17	BB	S4	
1	20:46	46 11.78	122 11.61	0.28	2.1	10/010	106	0.13	AB	S4	
3	7:19	46 08.74	122 32.22	16.58	2.3	38/038	35	0.13	AA	C3	
4	2:57	46 11.65	122 11.69	0.7	2.7	16/016	114	0.15	AB	S4	
4	5:01	46 43.21	119 30.28	0.04*	2.0	20/020	67	0.12	AB	E3	
4	22:51	48 52.02	122 08.61	0.73	2.3	16/017	229	0.44	CD	P3	
5	12:41	46 11.71	122 11.68	0.10*	2.4	12/012	111	0.13	AB	S4	
5	21:05	44 08.12	122 54.08	8.52	2.0	13/014	100	0.11	BC	O0	
5	21:13	46 16.05	119 23.25	0.03*	2.3	15/015	209	0.21	BD	E3	
5	21:58	48 13.69	121 40.35	8.76	2.1	18/019	74	0.25	BC	C3	
6	3:43	46 12.59	122 11.35	0.36	2.1	6/007	212	0.13	BD	S4	
6	16:22	46 11.75	122 11.87	0.59	2.6	13/013	114	0.12	AB	S4	
8	6:40	46 11.29	122 12.16	0.05*	2.8	13/013	134	0.62	DB	S4	
8	11:38	46 22.74	122 18.02	16.76	2.3	46/047	45	0.18	BA	S4	
9	14:12	48 50.83	122 09.08	1.94*	2.6	17/017	106	0.18	BC	P3	
9	16:46	46 11.80	122 11.34	0.04*	2.8	13/013	98	0.12	AB	S4	
11	12:19	46 11.64	122 11.67	0.67	2.4	12/012	115	0.12	AB	S4	
12	20:20	46 11.46	122 12.18	0.05*	2.5	9/009	131	0.29	BB	S4	
14	2:19	46 12.03	122 11.40	0.02*	2.0	7/007	129	0.05	AB	S4	
14	14:02	47 32.04	122 03.11	17.80*	2.3	47/050	37	0.21	BA	P3	
15	1:26	46 11.71	122 12.12	0.02*	2.9	11/011	120	0.12	AB	S4	
15	10:26	47 43.56	117 45.73	0.05*	2.4	9/009	292	0.41	CD	N3	F
15	13:05	48 43.90	119 59.25	0.03*	2.4	16/016	146	0.30	CD	N3	
16	2:20	45 49.21	118 58.30	14.27*	2.0	18/018	155	0.23	BC	E3	
18	0:35	46 11.61	122 11.61	0.02*	2.1	11/011	114	0.13	AB	S4	
18	5:09	47 24.16	122 23.00	20.81	2.0	23/024	43	0.13	AA	P3	
19	11:46	46 11.72	122 11.46	0.03*	2.8	13/013	108	0.13	AB	S4	
19	20:04	47 36.54	121 19.37	4.81#	2.1	30/032	40	0.39	CC	C3	
22	13:57	46 12.16	122 11.12	0.21	2.7	14/015	105	0.23	BB	S4	
24	1:46	46 11.64	122 11.48	0.04#	2.4	7/007	141	0.48	CC	S4	
24	14:04	46 11.77	122 11.28	0.02#	2.1	13/013	98	0.12	AB	S4	
26	3:47	46 11.77	122 11.28	0.05*	2.8	13/013	98	0.20	BB	S4	
26	14:55	46 11.80	122 11.59	1.24	2.0	10/010	104	0.06	AB	S4	
27	5:46	47 46.14	121 49.47	12.42	2.3	43/044	30	0.23	BA	P3	F
27	18:55	46 12.30	122 11.56	0.02*	2.3	10/010	88	0.15	AA	S4	
28	7:25	46 11.97	122 10.70	0.02#	2.2	11/011	91	0.42	CB	S4	
29	8:42	48 51.79	122 08.45	1.27	2.5	22/022	107	0.50	CC	P3	
30	12:14	46 12.17	122 12.63	1	2.3	9/009	98	0.30	BB	S4	
30	23:23	46 11.85	122 11.61	0.1	2.8	15/015	103	0.12	AB	S4	
31	7:34	47 19.86	122 00.63	18.75	2.0	30/030	33	0.21	BA	P3	

OUTREACH ACTIVITIES

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**. The following is a partial list of activities this quarter.

Audio Library, Phone

The Seismology Lab responded to over 100 calls from the general public, Emergency Managers and government agencies, and another 50 calls from the media. In addition, the PNSN audio library system received 240 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

PNSN staff replied to over 150 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.

Washington State Support

The University Board of Regents submitted a supplemental budget request for ~$400,000 for support of information product development and infrastructure hardening of the PNSN. Governor Christine Gregoire included this request in her budget submission to the Legislature. Steve Malone and have testified before legislative committees and we are hopeful budget will be approved.

Information Products

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.

Two CIIM maps were generated for felt events this quarter. The widest felt event was a very shallow, magnitude 4 earthquake on 11/23/05 located 17 miles ENE of Bellingham, Washington. Over 100 people filed felt reports. A ShakeMap was also generated for this event.

K-20 Education Outreach

PNSN and USGS staff gave 6 Seismology Lab tours and presentations for K-12 students and teachers, serving about 115 students this quarter, and one college level tour for 15. A lecture at Northwest Indian College, presented by Ruth Ludwin, was broadcast to distance-learning classes at several other Puget Sound locations.

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).

Bill Steele provided a briefing about regional earthquake hazards for the management of Belo Corporation that owns King 5 TV and Cable Network News and radio stations. Belo is reviewing its business continuity plans and mitigation activities with the goal of remaining on air following a large earthquake near Seattle.

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 once or twice a week to share data and interpretations, plan field activities and develop "talking points" for use in interviews when needed.

Meetings, Presentations and Visitors

- Bill Steele spoke at a CREW held a seminar October 19, 2005 called: How will we Respond and Recover from a "Katrina/Rita" Scale event? Video of the presentations is now available from this link: http://depts.washington.edu/mspci/directory_fall05.html
- Bill Steele represented Steve Malone and the PNSN at a CUSVO (Consortium of U.S. Volcano Observatories) meeting on November 8th in Salt Lake City.
- PNSN incoming Director John Vidale and Bill Steele attended an Oregon Seismic Monitoring Workshop sponsored by DOGAMI and the ANSS NW (PNSN).
- Bill Steele gave a workshop on Pacific Northwest Earthquake Hazards for the Pacific Policy Foundation.
- Ruth Ludwin gave presentations to the Pacific Northwest Historian's Guild and to a regional MENSA gathering; both in Seattle.
- Steve Malone presented a paper on Mount St. Helens at a special session at the annual meeting of the Geological Society of America in Salt Lake City, Utah
- Steve Malone participated in the yearly meeting of the Regional Coordinators of the ANSS in Memphis, TN.
- Steve Malone, Bill Steele and Robert Winglee (chair of the UW's Dept. of Earth and Space Sciences) attended a hearing of the Washington State Legislature on emergency preparedness. Malone gave a presentation on the role of the PNSN in emergency response and hazard mitigation.
- Steve Malone gave a presentation on the operations of the PNSN to the ANSS Steering Committee for the USGS in Denver, CO
- Steve Malone attended the annual meeting of the AGU in San Francisco, CA