QUARTERLY NETWORK REPORT 2004-C

on

Seismicity of Washington and Oregon

July 1 through September 30, 2004

Pacific Northwest Seismograph Network

Dept. of Earth and Space Sciences

Box 351310

University of Washington

Seattle, Washington 98195-1310

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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INTRODUCTION

This is the third quarterly report of 2004 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 catalog is available on-line, both through our web-site and through the ANSS 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 will be included only in the 4th quarter report. Lists of currently operating stations are available on-line through web page http://www.pnsn.org/OPS/stations.html.

NETWORK OPERATIONS

Table 1 gives approximate periods of time when individual stations were inoperable or when new stations were installed. 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.

2004 Mt. St. Helens sequence data processing

Beginning on September 23, 2004 seismic activity significantly increased beneath Mt. St. Helens generating a much larger volume of event data than is typical. It became apparent within the first two days that routine processing methods would be insufficient to keep up with data flow (approximately 40,000 events were detected between Sept. 23 and Oct. 1). It should be noted that the seismic analyst, Amy Wright, had begun her maternity leave the week prior. It had been agreed that graduate student Guy Medema would do the daily processing in her absence with help from Tony Qamar and other PNSN affiliated graduate students. The volume of data combined with the absence of the primary analyst created the challenges described here.

Volume and Space - An 8 Gb file system on the main earthquake processing computer scossa, **/wormdata2**, had been used as the initial location for unprocessed events. As activity increased, data accumulation reached a rate of ~0.5 Gb/hour, rendering this disk space insufficient. A 30Gb file system, **/scossahuge** was designated as the initial location for new triggers. Because of processing complications described in later sections, data files could not be reduced (squashed) fast enough to keep this new space from filling up as well, despite around the clock efforts by faculty, staff and students. An attempt was made on 10/1 to hang an external drive onto an external computer, grasso, without success. Beginning on 10/4, we began sending data via ftp to IRIS where the data were written to DLT tapes as an emergency measure. On 10/10, a 250Gb disk was installed on a Linux machine, hozomeen, as directory **/wd3** and designated as a storage and processing site for MSH data, ending the need for transfer to IRIS. Initially, data were moved by hand from **/scossahuge** to **/wd3** for processing and then this process was automated. Data were copied to **/wd3** automatically then removed by hand from **/scossahuge** when it was confirmed that copying was successful for a given time-block of triggers. Finally, a new server, tremito was installed on 10/21. The file system **/twd1** became the primary data storage and processing location. Additionally, net backup tapes began filling up at nearly one (5 Gb) per day.

Processing - Several factors affected routine analysis including volume of data, multiple events in each trigger and non-MSH events buried in MSH triggers. The primary goals considered in all processing procedures were to maintain the integrity of new data and to provide current information regarding seismic activity. Mount St. Helens activity included many subsets of similar events, and not all triggers needed to be analyzed to provide a representative sample of earthquake activity.

Multiple events –During this period, nearly all triggers contained multiple MSH events (there was an earthquake about every 18 seconds) that would ordinarily be separated manually and processed individually. This was done during the first two days of activity but was abandoned in the routine processing because the time required to separate events was prohibitive, and codas often extended into subsequent events

Non-MSH events – Mount St. Helens earthquakes interfered with the processing of ordinary earthquakes occurring elsewhere. Because Mt. St. Helens earthquakes occurred every 18 seconds on average, most small earthquakes were buried within Mt. St. Helens triggers. It was therefore necessary to carefully examine each trigger to look for non-MSH events. This also proved to be more time-consuming than was practical with the staff available. However, data files could not be squashed until any non-MSH events were located and manually separated.

Preliminary processing - To provide current seismicity information, keep all significant data and prevent overfilling disk space, a preliminary processing scheme was developed and modified as necessary.

1) Individual analysts were assigned 4-hour blocks of triggers. As seismicity decreased, this was extended to 6 then 12-hour blocks.
2) Pickfiles were tagged to denote the status and initial fate of the triggers as follows:
   'b' trigger contains non-MSH event. Will be moved to **/stor/seis/P/YYMM**
   'x' trigger contains no useful data and is marked for deletion
   'g' Small/moderate MSH events only. A subset of channels on or near the mountain will be saved. All others will be squashed.
   'a' Only strong-motion stations are to be squashed. This tag was used for either very large MSH events that recorded on distant stations, or events that have not been examined for small non-MSH events.
3) After moving 'b' and 'x' events, some of the well-recorded 'a' and 'g' events were located and tagged with the usual 's'. Only a few (1-5) events per hour were located. The rest were saved for future analysis.
4) All pick and data files were moved to semi-permanent storage (IRIS, **/wd3 or /twd1** file systems) in **/<filesystem>/REVIEW/B_STOR/DYYMM$DD**
5) Links to located events were placed in **/<filesystem>/REVIEW/A_QUICK_PIK/LOC/LYYMM**
6) Summary files for each processing session were created in **/<filesystem>/REVIEW/A_QUICK_PIK/Summaries**

Update and sendevent - The scripts 'update' and 'sendevent' were problematic. These scripts update our earthquake data-base and web pages and send earthquake information to other institutions. Both scripts were written to look only in /stor/seis/P/YYMM for new events. Both scripts were eventually modified to look also in new directories where Mount St. Helens events were processed. 'Sendevent' was temporarily decommissioned and then modified to prevent large numbers of MSH events from being broadcast to the world. Duplicate listings in the yearly summary file, loc.04, were an issue resulting primarily from some confusion caused by multiple people processing data amid ever-changing procedures. Clean-ups were conducted to remove any duplicate event listings.

Strong Motion Instrumentation Update

Several of the Duwamish Valley stations were completed this quarter. Station GTWN, in the Georgetown Playfied, was installed on August 8. This station was a replacement of a USGS Urban Ground Motion Studies station. GTWN uses wireless telemetry to Cleveland High School, in the Seattle School District. GTWN has a Guralp CMG-5TD accelerograph.

Two of the new Duwamish stations are located within 200 m of locations of liquefaction features that occurred during the 2001 Nisqually earthquake: stations BSFP and SSS. Station BSFP is located at the Boeing Fire Station at Boeing Field. This station has a Guralp CMG-5TD accelerograph. Station SSS is located at Seattle School District's John Stanford Center, located at 4th Ave S and S Lander Street. A surface reference station, SSS2, was installed at John Stanford Center in September. SSS2 has a K2 with an internal Episensor. Steve Palmer, of Washington State Department of Natural Resources, coordinated the drilling of 3 boreholes in the parking lot of the John Stanford Center. An array of subsurface accelerometers will be placed in these boreholes, with depths varying between 40 and 175 feet. Kinemetrics Shallow Borehole Episensors will be installed at depth and will be digitized by a Kinemetrics K2.

Station PSNS, located at the Puget Sound Naval Shipyard in Bremerton was completed on September 14. The previous instrument, a Terra Technology IDS-24, had failed and it was replaced with a Guralp CMG-5TD accelerograph.

Green River Community College purchased and installed an education-grade vertical component broadband seismograph. Amy Lindemuth of the PNSN assisted with the seismograph installation. The instrument is a Guralp EDU-V. An early prototype of the EDU-V was installed by Amy Lindemuth at PNSN station PNLK in Issaquah and the data has been available on the PNSN Webicorders. Data from Green River College is being collected at the UW under the station designation of GRCC.

Computer Processing and Analysis Update

Our main operational computers continue to operate with no change from the previous quarter. The processes that create the Webicorder web pages were initiated on grasso in anticipation of moving all webicorder processes off of scossa.

CREST Instrumentation Update

The EarthScope USArray transportable seismic station D03A was installed at Wishkah Valley School on September 17th, 2004. This first Pacific Northwest USArray station includes a Streckeisen STS-2 broadband seismometer, Kinemetrics Quanterra Q330 seismic data acquisition system, and Kinemetrics Baler recording instrument. On September 22 the strong motion Kinemetric EpiSensor ES-T from the temporary WISH CREST station was removed and installed in the D03A vault. The temporary WISH station continues to operate with a Guralp CMG40T broadband seismometer. The USArray equipment will be removed after the completion of the 18-24 month deployment at which point the rest of the original CREST RWW station will be installed permanently at this site. The USArray installation was headed by Robert Busby of IRIS and assisted by Lynn Simmons, PNSN and Mike Flannigan. Wishkah Valley School provided a great deal of support, in particular, staff members Don Hay and Craig Gallington. The event was covered by both Seattle TV news KING5 reporter Glen Farley and Grays Harbor "The Daily World" writer Paula Horton.

Use of PNSN Data

The IRIS Data Management Center reports 414 requests for PNSN trace data this quarter. More than 367,000 traces were requested.

TABLE 1 - Station outages and installations

Station	Outage Dates	Comment
ALKI	08/02/04-End	No timing; needs GPS
ALST	06/02/04-07/30/04	Bad GPS antenna
BEVT	06/07/04-07/01/04	No communications
BHW	03/14/04-End	Very noisy
BRO	02/04/03-07/01/04	Dead; changed seismometer
BSFP	07/08/04	Installed
BSFP	07/08/04-08/16/04	No communications
BULL	05/21/04-End	Intermittent
EDM	08/12/04	Replaced seismometer & VCO
EGRN	07/26/04-08/27/04	Intermittent
ERW	06/17/04-07/30/04	No communications
EYES	06/26/04-End	No communications, possible firewall issue
GHW	07/20/04-08/05/04	Dead
GNW	07/28/04-08/28/04	Very noisy
GPW	03/16/04-End	Dead
GRCC	09/21/04	Installed
GTWN	08/19/04	Installed
IRO	05/28/04-07/15/04	Dead; water in VCO
JCW	09/16/04-End	Dead; construction at site
JORV	08/18/04-09/26/04	Dead; broken K2
SSS1	09/27/04	Installed
SSS22	09/27/04	Installed
KEEL	08/18/04-End	No communications
KICC	09/13/04-09/28/04	No communications; replaced MSS
KNEL	08/12/04	Installed; replaced KNJH
KNEL	08/12/04-End	No communications; firewall config.
KNJH	07/07/04-End	Removed due to bldg being demolished
LTY	08/16/04-End	Dead horizontal components
MBKE	07/20/04-08/04/04	No communications; firewall issues
MCW	08/31/04-End	Dead
MEGW	04/01/03-08/02/04	Bad timing

TABLE 1 - Station outages and installations

Station	Outage Dates	Comment
MPL	01/01/04-08/19/04	Bad timing; removed for repair 4/16/04
NLO	08/20/04-End	Dead; aircells died
OBH	01/31/02-End	Temp. removed for logging
OOW	12/21/03-08/03/04	Off at night, okay during daytime
OSD	12/21/03-08/03/04	Intermittent because of OOW
OSR	01/06/04-End	VCO may be off-frequency
PGO	09/21/03-07/09/04	Dead; station was rebuilt
PGW	10/08/03-End	Dead
PSNS	04/23/04-09/13/04	No comm.; removed for repair 6/30/04
PSNS	09/13/04-End	Bad timing; needs GPS
RCM	01/27/04-09/03/04	Dead; new antenna cable & antenna
RCM	09/08/04-09/11/04	Dead; rangers stopped station due to interference
RCS	06/22/04-08/11/04	Dead
RVC	12/05/03-End	Noisy
SBES	06/30/04-08/20/04	No communications
SEA.HH?	12/05/03-End	Disconnected for renovation
SEAS	07/09/04-09/10/04	Intermittent; K2 resetting itself
SGAR	08/09/04-End	Removed
SMW	06/20/03-End	Intermittent
SOPS	08/27/02-End	K2 flash problem
SP2	04/23/04-End	No telemetry
SSO	08/28/04-End	Intermittent
SWES	08/09/04-End	Removed
TAKO	07/01/03-08/10/04	Bad timing
TBPA	09/01/04-End	Intermittent; bad N component
TRW	07/14/02-08/11/04	Fire damage repaired, not seismic
WIFE	09/14/04	Installed
WPW	05/02/04-End	Intermittent
YEL	08/28/04	Replaced seismometer

EARTHQUAKE DATA - 2004-C

There were 2,077 events digitally recorded and processed at the University of Washington between July 1 and September 30, 2004. Locations in Washington, Oregon, or southernmost British Columbia were determined for 1,433 of these events; 1,321 were classified as earthquakes and 112 as known or suspected blasts. The remaining 644 processed events include teleseisms (155 events), regional events outside the PNSN (104), and unlocated events within the PNSN. During this quarter, an eruption at Mount St. Helens began with vigorous seismic activity on September 23 that quickly overwhelmed our processing capabilities. 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, five events generated ShakeMaps. ShakeMap (**http://www.pnsn.org/shake/index.html**) shows a map of instrumentally measured shaking using data from accelerometers in the network. Peak ground acceleration (PGA) values on the map are modeled from recorded accelerometer data, known local geology, and distance to the epicenter. Another data product "CIIM" maps (**http://pasadena.wr.usgs.gov/shake/pnw/**) convert "felt" reports sent by the general public (via Internet) into numeric intensity values. The CIIM map shows 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 3a. Seismographs located near Mt. St. Helens.

Figure 3b. 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 2004

DATE-(UTC)-TIME	LAT(N)	LON(W)	DEP	MAG	COMMENTS	CIIM	Shake Map
yy/mm/dd hh:mm:ss	deg.	deg.	km				
04/07/05 05:42:09	42.06	120.23	8.7	3.2	16.7 km SSE of Lakeview, OR		
04/07/12 16:45:00	44.33	124.48	29.2	4.9	48.4 km SW of Newport, OR	✔	✔
04/07/22 20:26:26	42.09	120.24	1.1	4.3	14.3 km SE of Lakeview, OR	✔	
04/07/26 06:40:46	47.17	123.83	12.4	3.5	22.7 km N of Aberdeen, WA	✔	✔
04/08/16 21:05:53	46.67	121.47	0.3	4.0	17.5 km N of Goat Rocks, WA	✔	✔
04/08/19 06:06:03	44.66	124.30	27.9	4.7	19.9 km W of Newport, OR	✔	✔
04/08/21 19:43:33	47.15	123.89	15.5	3.2	21.1 km NNW of Aberdeen, WA		✔
04/08/31 16:58:00	46.72	121.88	7.4	2.2	17.2 km SW of Mt Rainier, WA		
04/09/24 07:10:04	48.15	123.05	7.2	3.1	28.9 km E of Port Angeles, WA	✔	

OREGON

During the third quarter of 2004, a total of 164 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 earthquakes in Oregon were two felt earthquakes, M 4.9 and 4.7, in distinctly different but close-together locations offshore of Newport Oregon. There were four felt earthquakes in Oregon this quarter; the two near Newport, and two others as part of an earthquake swarm that began last quarter near Lakeview. Nine small earthquakes were recorded in the Mount Hood area, and 3 in the vicinity of Three Sisters.

Newport, Oregon Offshore Earthquakes: Two felt earthquakes larger than magnitude 4.0 in distinctly different but close-together locations occurred offshore of Newport Oregon.

The first Newport earthquake, a M 4.9 event on July 12, occurred about 50 km SW of Newport. It was preceded by a magnitude 2.9 foreshock about 4 minutes earlier, and followed by 11 aftershocks in the magnitude 1.5-3.3 range occurring over the next month. Earlier small (most smaller than magnitude 2.9) events nearby included one or two events per year in 2004, 2003, and 2001, and 1994, and three events in 1996.

The second Newport earthquake, M 4.7 on August 19, occurred 25 km west of Newport and was followed by three aftershocks in the M 2.0-2.5 range. Earlier small (none larger than magnitude 2.9) events nearby included 3 earlier in 2004, 3 in 2003, and one or two events in 2000, 1998, 1996, 1995 and three in 1992 (this may be a spatially distinct group).

Both Newport mainshocks were located deeper than 25 km, and this estimate appears to be robust and in agreement with depths estimated independently by Doug Dreger and David Dolenc of U.C. Berkeley using moment-tensor inversion. The Berkeley group used Green's functions derived from California earthquakes, and the velocity model used by the PNSN is inaccurate in this region. Therefore, there is almost certainly some error in both PNSN and Berkeley depth determinations. The crustal structure in the area of these earthquakes is fairly well studied, lying close to where line P8 of ocean-bottom seismometers were deployed in 1996 during a wide-angle refraction and reflection experiment (Gerdon, M., Trehu, A.M., Flueh, E.R., and D. Klaeschen, 2000, *The continental margin off Oregon from seismic investigations*, Tectonophysics 329, pp. 79-97. The source area of the earthquakes appears to be within or just beneath the subducting oceanic plate. Gerdon et al. (2000) place the top of the subducting plate at around 20 km in this area, and the bottom at somewhere around 25 km.

The July 12 event had a strike-slip focal mechanism, with planes striking N81E and N9W The Aug. 19 event had a thrust mechanism, with best-fit fault planes striking N28E or N 24W. Both mechanisms were determined by Dreger & Dolenc at U.C. Berkeley using moment tensor inversion and agree with PNSN first-motion focal mechanisms. Given the depths of the events, which appear to place them below the subduction interface, the hazard implications of the Aug. 19 thrust focal mechanism are unclear.

Jordan Valley, Oregon Swarm: An earthquake swarm active last quarter of Jordan Valley (close to 117 degrees W, 43 degrees N; on the Oregon-Idaho Border about 100 km south-southwest of Boise, Idaho) quieted down this quarter. Only one small earthquake was recorded (in August) by the Southwest Idaho seismic network, operated by Jim Zollweg of Boise State

University. The UW net did not trigger on it, and neither of the 2 UW stations installed in eastern Oregon at the end of last quarter was operating properly at the time.

Lakeview, Oregon Swarm: The swarm near Lakeview, near the California Border, may have begun as early as June 4, when a magnitude 2.5 earthquake was located, apparently about 20 km north of the main cluster. However, it was not noticed until many events began occurring on June 25. During the last week of June, over thirty earthquakes, three of them magnitude 3.0 or larger, were located between 41.6-42.4 N latitude and 120.0-120.7 W longitude, including a magnitude 4.4 earthquake felt earthquake on June 30. This quarter, 109 earthquakes were located in the swarm area, including 5 magnitude 3.0 or larger. The largest event was a felt event on July 22, magnitude 4.3 at a depth of about 1 km. Swarm activity decreased through August and September.

Lakeview is a town of about 2,500 residents, and has unreinforced masonry buildings in an area where seismicity is historically infrequent. Few seismic stations are nearby, and the area is between the Pacific Northwest and California networks. Therefore, the PNSN and California Integrated Seismic Network **(http://www.cisn.org/**) are exchanging data for these events. Each organization analyzes the earthquakes independently. Based on Berkeley moment tensor solutions, the USGS assigned Mw 4.7 to the June 30 main shock and Mw 4.6 to the July 22 event. Both caused minor structural damage at Lakeview. These earthquakes and a Mw 4.1 event 6/27/04 all had normal faulting solutions consistent with motion on fault planes parallel to the Goose Lake Fault, which is the western boundary fault of the Warner Mountains. Additional information can be found in special web PNSN pages:
http://www.pnsn.org/NEWS/PRESS_RELEASES/LAKEVIEW_2004.html

Three 3-component broadband digital seismographs were deployed 17-18 July by the Southwest Idaho seismic network, operated by Jim Zollweg of Boise State University. At least one continues in operation, but all will be removed in early November. Three MEQ-800s were operated by BSU 15-19 July and four were operated 5-7 August. At least 15,000 events were recorded in the first three weeks of operation, with event rates as high as 2,000 per day. The data is being analyzed at BSU. Analysis is very incomplete, but preliminary results confirm that most of the events are beneath the Warner Mountains at depths of 4-8 km. Locations from the PNSN, without data from the temporary array, are usually biased 2-3 km to the SSE. Better location estimates for the entire swarm will result when the data from the temporary stations are used to establish station corrections for the stations recorded at UW.

WESTERN WASHINGTON SEISMICITY

During the second quarter of 2004, 1,052 earthquakes were located between 45.5 degrees and 49.5 degrees north latitude and between 121.0 degrees and 125.3 degrees west longitude. Five earthquakes were felt this quarter in western Washington. Details are in Table 2.

The largest felt earthquake in western Washington was a magnitude 4.0 event on July 18 (UTC), located about 57 km north of Goat Rocks at a very shallow depth (less than 1 km). It was followed by half-a-dozen small aftershocks (none larger than magnitude 2.2) over the next week or so. The deepest earthquake in western Washington this quarter was a magnitude 1.3 event at 90 km depth located about 15 km southeast of Bend, WA on August 4 (UTC).

From July 9-24,, an “Episodic Tremor and Slip” (ETS) event was recorded in north-western Washington and southwestern British Columbia. Three small research arrays that the UW’s Steve Malone and Wendy McCausland had deployed in northwestern Washington and on Vancouver Island in anticipation of this tremor recorded the event and then were removed in late July and early August. Additional info is available at:
http://www.pnsn.org/NEWS/PRESS_RELEASES/TREMOR.html

WASHINGTON CASCADE VOLCANOES

Mount St. Helens

Mount St. Helens began an eruptive episode with a vigorous sequence of seismic activity starting on September 23. Activity accelerated through the end of the quarter, culminating in early October in several phreatic explosions and half-hour to hour-long periods of harmonic tremor. The tremor and explosions interrupted and temporarily calmed extremely high rates of magnitude 3+ seismicity. Because of the high rates of seismicity, only a representative sample (less than 10%) of Mount St. Helens events was located. Figure 3a shows seismograph stations operating in September and early October. Station SEP on the old dome was destroyed in the Oct. 1 eruption. An accelerometer, BLIS, was installed on the newly uplifting area just south of the old dome in early October to provide data from the crater. Figure 3b shows located volcano-tectonic earthquakes near Mount St. Helens. Low frequency (L) and avalanche or rockfall events (S) are not shown.

This quarter, 780 earthquakes (the catalog is NOT COMPLETE and Mount St. Helens earthquakes on and after September 23 are NOT listed in Table 3) were located at Mount St. Helens in the area shown in Fig. 5. All well-located earthquakes were at depths of 1.5 km or less, and tightly clustered within the crater. Of the located earthquakes this quarter, 493 were magnitude 0.0 or larger and 14 were deeper than 4 km. Multiple volcano tectonic earthquakes of magnitude 3.0 and larger were occurring by September 30 at Mount St. Helens. Thirty-six type "S" or "L" events were located at Mount St. Helens this quarter, and an additional 310 "L" or "S" events too small to locate were recorded.

Because the eruption began at the very end of the third quarter and continued into October, a more complete analysis of sequence will be provided in the next quarterly report.

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 although 70 "L" or "S" events were recorded, but were too small to locate reliably. Type L and S events are not shown in Fig. 4.

A total of 51 tectonic events (20 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 on August 31; a magnitude 2.2 event at a depth of about 7 km located about 17 km southwest of the summit. This quarter, 29 tectonic earthquakes 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 12 (7 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 second quarter of 2004, 91 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 2.9 event on August 28th. It occurred at a near-surface depth and was located about 31 km west-northwest of Okanogan.

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**.

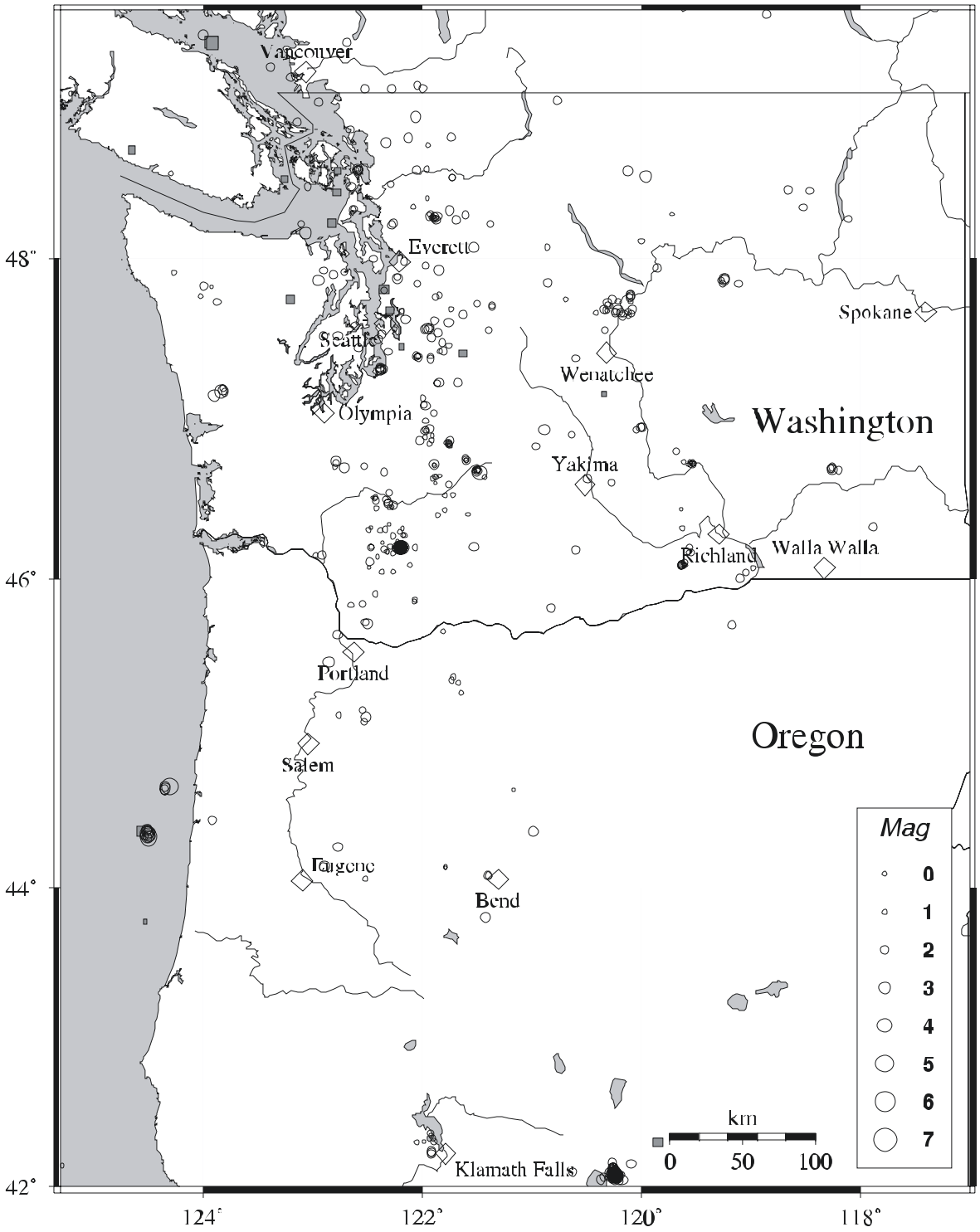

Figure 1 Earthquakes with magnitude greater than or equal to 0.0 (Mc>=0.0). Unfilled diamonds represent cities. Quakes shallower than 30 km are indicated by circles, and deeper quakes by filled squares.

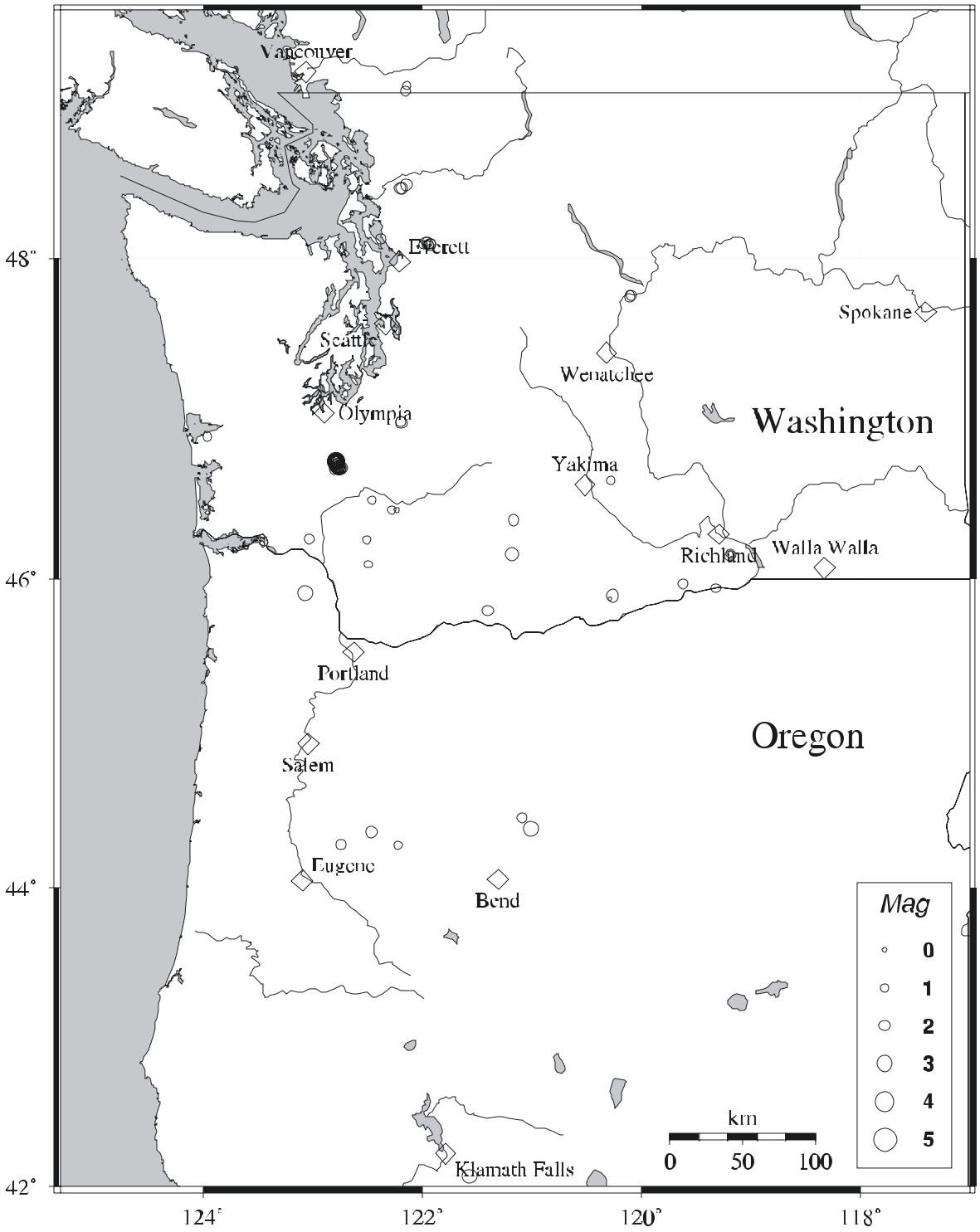

Figure 2. Blasts and probable blasts. Unfilled diamonds represent cities.

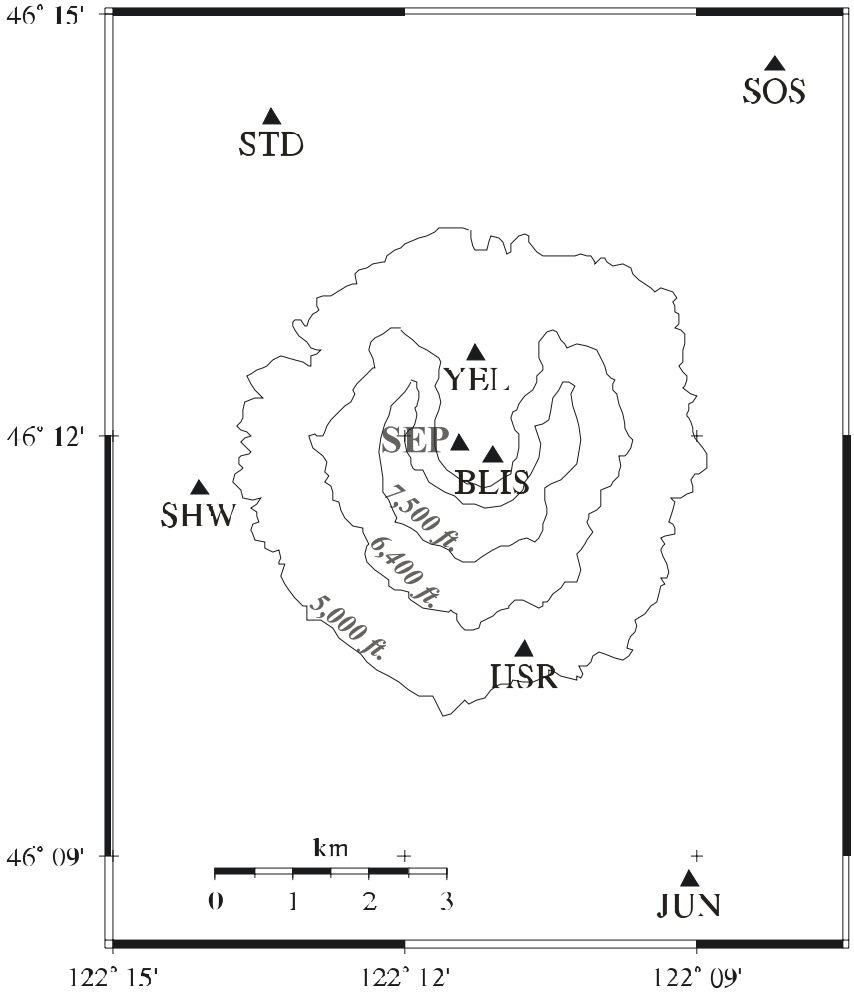

Figure 3 a Seismograph stations near Mt. St. Helens,

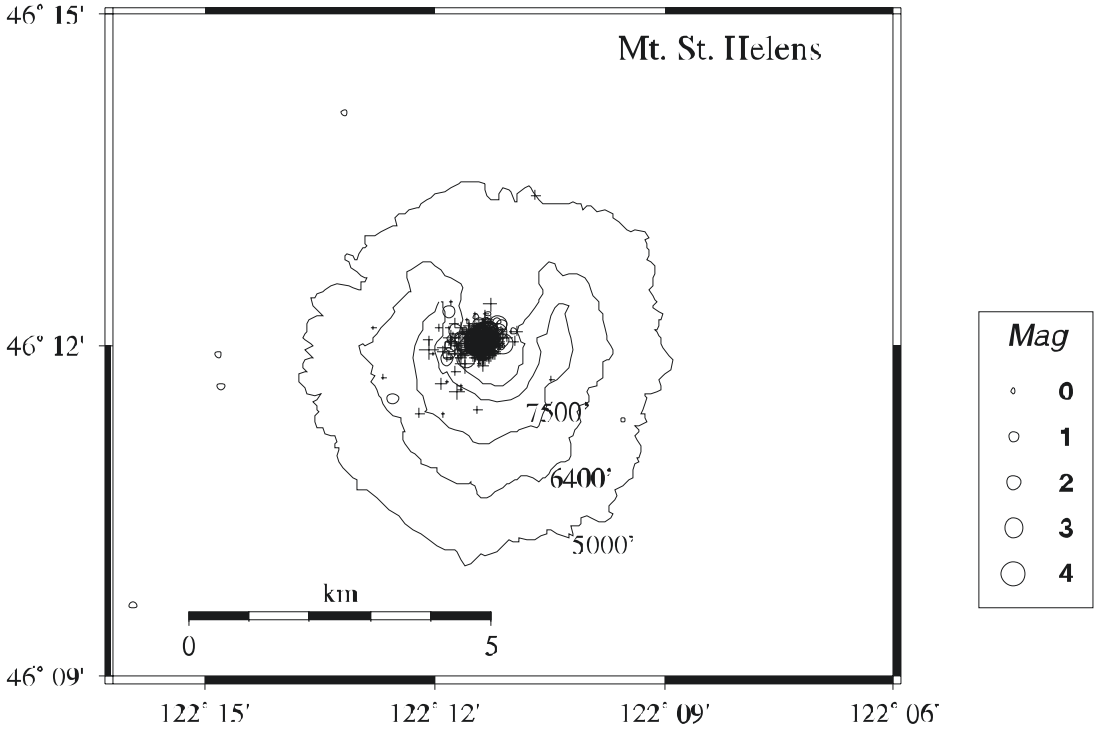

Figure 3 b Earthquakes at Mt. St. Helens, M>0.0.

Plus' symbols indicate depth less than 1 km. Circles indicate depth greater than 1 km. Elevation contours shown in feet

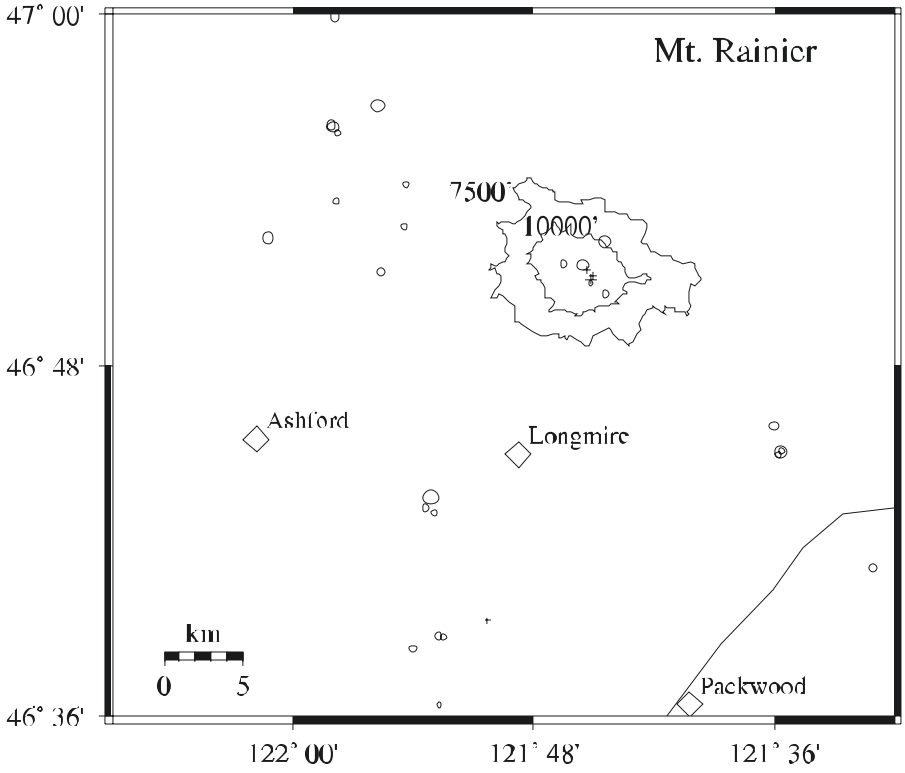

Figure 4. Earthquakes at Mt. Rainier, M>0.0.

EARTHQUAKE CATALOG, 2004-C

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, 2004-C
Within the area 42-49.5 degrees north latitude and 117-125.3 degrees west longitude

Jul-04											
DAY	TIME	LAT	LON	DEPTH	M	NS/NP	GAP	RMS	Q	MOD	TYP
2	02:32.6	42 04.08	120 14.70	7.51	2.8	13/014	121	0.53	DC	K3	
2	02:03.0	42 04.90	120 14.66	4.88	2.1	15/016	120	0.30	CC	K3	
2	16:15.1	42 05.80	120 14.32	4.89$	2.0	10/012	149	0.27	BC	K3	
3	31:13.0	47 36.37	121 45.11	14.36	2.1	25/025	93	0.18	BB	P3	
4	25:28.9	42 04.54	120 14.96	2.47	2.2	12/013	119	0.20	BC	K3	
4	45:07.8	42 05.24	120 15.09	11.27$	2.0	12/013	149	0.55	DC	K3	
4	15:17.2	42 17.99	119 50.67	40.31	2.0	8/008	308	0.73	DD	K3	
4	57:39.7	42 05.38	120 15.35	5.02$	2.1	10/011	149	0.40	CC	K3	
5	17:36.3	42 05.47	120 14.59	4.20$	2.2	11/012	149	0.19	BC	K3	
5	42:09.6	42 03.99	120 14.10	8.70	3.2	18/018	124	0.77	DC	K3	F
6	01:22.9	42 03.41	120 13.23	14.41*	2.6	16/017	129	0.46	CB	K3	
6	47:03.0	42 03.99	120 14.34	8.25	2.4	14/017	123	0.47	CC	K3	
7	10:43.6	42 05.77	120 13.62	6.18*	2.0	8/009	149	0.11	AC	K3	
7	10:38.8	42 04.66	120 16.10	1.62	2.8	14/015	114	0.50	DC	K3	
9	27:18.8	42 03.54	120 14.19	11.13	2.7	12/013	125	0.56	DB	K3	
10	34:56.8	47 55.83	121 50.90	15.90	2.2	29/030	73	0.26	BA	P3	
12	41:18.9	44 20.69	124 29.33	29.55$	2.9	14/014	247	0.24	BD	O0	
12	45:00.8	44 20.02	124 29.32	29.20	4.9	22/022	247	0.24	BD	O0	F
13	26:31.2	44 22.00	124 29.32	28.20$	2.7	12/013	273	0.29	CD	O0	
13	56:11.6	44 21.58	124 30.56	29.43	3.3	18/018	214	0.44	CD	O0	
13	54:34.6	42 04.90	120 14.81	4.25	3.3	13/014	119	0.18	BC	K3	
13	00:37.2	44 22.84	124 30.49	26.21	2.2	7/008	302	0.18	BD	O0	
13	23:04.2	42 04.77	120 14.79	1.65*	2.1	9/010	139	0.19	BC	K3	
13	43:29.8	42 03.73	120 14.12	10.88	2.2	11/012	147	0.21	BC	K3	
14	44:04.8	48 26.26	122 38.95	22.76	2.1	22/022	58	0.32	CA	P3	
14	44:38.2	44 19.83	124 30.39	0.03*	2.3	11/011	272	0.41	CD	O0	
15	58:43.2	42 05.35	120 14.37	11.64	2.0	6/006	155	0.07	AD	K3	
19	14:24.5	44 22.22	124 30.09	26.35	2.8	13/014	289	0.27	BD	O0	
19	32:39.2	47 52.83	122 13.43	24.10	2.2	26/029	51	0.15	BA	P3	
19	47:19.9	42 04.31	120 14.32	0.02*	2.0	8/008	141	0.28	BD	K3	
19	39:45.9	42 04.25	120 15.15	0.02*	2.6	10/010	140	0.24	BD	K3	
20	36:35.5	42 04.92	120 15.15	1.77	2.5	11/011	139	0.26	CD	K3	
20	58:48.4	44 20.28	124 29.55	23.70	2.5	12/013	271	0.25	BD	O0	
21	31:21.9	42 04.27	120 14.38	6.47	2.8	14/014	122	0.22	BC	K3	
22	01:07.5	42 05.58	120 14.77	2.19$	2.1	10/010	140	0.30	DD	K3	
22	55:13.3	42 04.50	120 14.62	2.43$	2.1	12/012	140	0.35	DD	K3	
22	40:10.8	42 04.74	120 14.27	6.17	3.1	18/018	121	0.24	BC	K3	
22	47:38.3	42 05.24	120 13.99	5.23	2.2	10/010	140	0.29	BD	K3	
22	21:51.8	42 04.86	120 13.37	1.39$	2.2	10/010	140	0.34	DD	K3	
22	15:47.2	42 05.67	120 14.77	0.04*	2.0	9/009	140	0.20	BD	K3	
22	26:27.0	42 05.43	120 14.40	1.10	4.3	15/015	120	0.13	AC	K3	F
22	34:35.0	42 07.21	120 15.72	1.71	2.2	10/010	142	0.22	BD	K3	
22	40:26.0	42 06.73	120 15.74	22.97	2.4	9/009	158	0.25	CD	K3	
22	42:49.7	42 06.15	120 14.32	1.29$	2.2	12/012	140	0.31	CD	K3	
22	03:27.6	42 09.58	120 15.82	19.42	2.1	5/005	162	0.42	CD	K3	

TABLE 3: EARTHQUAKE CATALOG, 2004-C
Within the area 42-49.5 degrees north latitude and 117-125.3 degrees west longitude

22	16:46.8	42 05.93	120 13.95	10.14	2.0	10/010	150	0.11	AD	K3	
22	18:13.4	42 05.99	120 15.16	5.75	2.2	10/011	140	0.21	BD	K3	
23	01:39.6	42 06.12	120 15.31	1.86*	2.0	9/010	140	0.24	BD	K3	
23	25:49.4	42 07.12	120 15.46	17.63	2.5	13/014	142	0.34	CD	K3	
23	46:14.4	42 07.19	120 15.37	4.49$	2.6	12/012	142	0.27	CD	K3	
23	43:57.8	42 04.86	120 14.92	6.19	2.7	14/015	140	0.61	DD	K3	
23	06:26.9	42 05.93	120 14.72	5.30	2.9	14/016	117	0.26	BC	K3	
24	35:43.7	42 05.54	120 14.64	8.43	2.1	12/013	118	0.22	BC	K3	
24	08:38.4	42 04.31	120 14.77	11.66$	2.2	14/015	120	0.43	CB	K3	
25	34:44.3	42 05.85	120 13.79	4.37*	2.1	13/014	140	0.26	BC	K3	
26	56:05.7	47 18.99	122 22.38	24.23	2.0	36/037	67	0.09	AA	P3	
26	40:46.8	47 10.78	123 50.00	12.42	3.5	42/042	160	0.33	CC	P3	F
26	22:19.8	47 11.25	123 48.99	0.02*	2.2	18/018	156	0.20	BC	P3	
27	28:03.9	47 31.49	122 45.80	10.77	2.0	9/012	139	0.24	BC	P3	
27	35:18.6	44 08.49	122 53.37	5.98	2.3	21/023	78	0.25	BC	O0	
27	28:26.7	44 20.73	124 28.87	25.36	2.3	16/017	271	0.26	BD	O0	
28	24:39.2	47 18.67	122 22.66	26.58	2.1	57/059	35	0.17	BA	P3	
28	10:04.7	42 05.89	120 15.26	0.99$	2.1	10/011	140	0.29	DC	K3	
30	56:16.4	42 04.21	120 14.72	5.10	2.3	12/013	138	0.25	BC	K3	
31	53:56.6	42 04.47	120 14.25	1.45	2.2	8/009	154	0.11	AC	K3	
Aug-04											
DAY	**TIME**	**LAT**	**LON**	**DEPTH**	**M**	**NS/NP**	**GAP**	**RMS**	**Q**	**MOD**	**TYP**
2	27:31.7	42 03.70	120 15.86	0.03*	2.0	8/009	255	0.21	BD	K3	
3	22:53.0	49 18.50	123 54.93	69.85	3.1	24/027	257	0.32	CD	P3	
3	32:44.2	49 18.08	123 54.79	71.43	3.0	26/026	257	0.37	CD	P3	
4	40:41.8	47 51.92	122 56.54	16.03#	2.5	35/038	65	0.33	CA	P3	
5	18:00.9	49 20.86	123 59.69	23.84	2.2	14/014	262	0.41	CD	P3	
6	44:46.6	42 04.67	120 14.89	1.82#	2.1	11/012	139	0.23	BC	K3	
9	23:50.0	47 34.02	121 56.41	1.13*	2.0	33/038	41	0.17	BB	P3	
9	33:57.4	47 34.14	121 56.85	2.37	2.3	42/047	41	0.28	BB	P3	
11	28:16.4	47 52.57	119 14.29	0.35*	2.0	15/016	163	0.17	BC	N3	
11	50:34.5	42 04.74	120 14.34	3.61	2.1	11/012	139	0.17	BC	K3	
12	16:27.2	48 04.06	121 31.78	4.10	2.3	35/038	88	0.48	CC	C3	
14	04:58.4	47 52.05	119 14.37	0.04*	2.3	12/013	161	0.13	AC	N3	
15	01:51.1	42 05.87	120 14.96	1.55$	2.2	13/014	140	0.25	DC	K3	
15	09:10.3	42 04.63	120 15.24	2.11*	2.1	8/009	257	0.28	BD	K3	
16	05:53.8	46 40.36	121 28.34	0.27*	4.0	98/098	37	0.40	CB	C3	F
17	22:32.2	47 37.80	122 08.99	24.15	2.0	24/026	64	0.14	AA	P3	
17	25:42.1	42 02.66	120 10.29	7.84	2.3	8/009	151	0.27	BC	K3	
17	28:24.2	45 28.14	122 50.78	26.27	2.6	49/049	41	0.26	BA	O0	
18	36:52.6	46 41.52	118 15.49	9.53$	2.4	29/034	205	0.36	CD	E3	
19	06:03.6	44 39.87	124 18.01	27.92	4.7	22/028	212	0.30	BD	O0	F
19	26:00.5	44 38.77	124 20.79	24.55	2.0	11/011	267	0.40	CD	O0	
19	54:10.9	44 39.10	124 20.44	24.93	2.5	13/013	267	0.22	BD	O0	
20	29:19.5	47 48.53	122 20.86	31.14	2.1	26/029	43	0.47	CA	P3	
21	43:33.6	47 09.44	123 53.62	15.50	3.2	28/028	157	0.75	DC	P3	F
22	27:52.9	42 03.98	120 13.65	5.94	2.0	10/011	138	0.20	BC	K3	
23	04:44.6	44 40.09	124 20.69	23.61	2.3	9/009	267	0.27	CD	O0	
23	50:12.1	48 32.69	122 35.02	14.97	2.4	32/034	77	0.32	CB	P3	
23	27:06.9	48 32.25	122 35.07	17.78*	2.0	23/024	75	0.29	BB	P3	
23	02:42.3	46 41.17	121 29.94	7.61	2.2	39/042	64	0.24	BA	C3	
28	38:16.8	42 04.70	120 15.66	1.38	2.3	13/014	116	0.25	BC	K3	

TABLE 3: EARTHQUAKE CATALOG, 2004-C
Within the area 42-49.5 degrees north latitude and 117-125.3 degrees west longitude

28	36:04.7	47 19.27	122 22.40	27.74	2.0	42/046	67	0.21	BA	P3	
28	15:18.8	48 30.01	119 57.20	0.03*	2.9	20/020	103	0.30	CD	N3	
28	19:46.8	42 05.73	120 14.59	1.30	2.1	11/012	149	0.23	BC	K3	
31	58:00.7	46 43.50	121 53.11	7.43	2.2	44/050	35	0.12	AA	C3	F
Sep-04											
DAY	**TIME**	**LAT**	**LON**	**DEPTH**	**M**	**NS/NP**	**GAP**	**RMS**	**Q**	**MOD**	**TYP**
1	12:31.5	42 03.21	120 13.40	12.37$	2.0	12/013	137	0.55	DC	K3	
2	46:23.2	42 04.66	120 13.22	11.87$	3.0	15/016	148	0.41	CC	K3	
3	50:39.1	47 14.04	121 50.40	15.23	2.0	37/045	78	0.15	AA	P3	
4	50:45.6	42 03.25	120 14.25	11.91$	2.6	17/018	125	0.51	DB	K3	
6	33:45.6	42 05.05	120 15.40	1.84$	2.2	11/012	139	0.30	CC	K3	
10	06:07.1	48 51.61	122 03.30	0.35	2.2	14/016	137	0.39	CC	P3	
12	42:57.0	45 38.67	122 46.08	20.24	2.1	36/040	63	0.14	AB	C3	
16	45:55.6	42 04.54	120 15.03	1.27	2.2	14/018	119	0.23	BC	K3	
17	30:03.4	46 56.48	120 52.86	4.82*	2.3	33/034	54	0.27	BC	C3	
17	40:37.1	47 40.99	120 12.58	3.89	2.4	17/019	56	0.31	CC	N3	
18	05:54.3	42 04.17	120 14.57	7.88*	2.4	15/017	138	0.22	BC	K3	
20	51:00.1	45 43.14	122 29.89	15.46	2.4	41/043	62	0.14	AA	C3	
20	20:44.3	45 06.77	122 30.43	0.04*	2.2	18/018	99	0.22	BC	O0	
22	30:56.8	42 03.69	120 14.30	10.31	2.1	13/016	138	0.33	CC	K3	
23	06:15.3	46 42.29	122 42.32	0.02*	2.2	8/010	85	0.29	BA	P3	
24	10:04.2	48 09.39	123 03.58	7.23*	3.1	40/040	126	0.46	CB	P3	F
28	32:43.3	46 44.75	122 46.88	0.03*	2.6	32/032	84	0.16	BC	P3	

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 and related hazards. Our program offers lectures, classes, lab tours, workshops, and 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.

Audio Library, Phone

With the onset of Mt. St. Helens activity the Seismology Lab was flooded with hundreds of calls. UW Computing and Communications donated a bank of 6 digital telephones and a nearby conference room was converted to a call center. Student staff and graduate students assisted PNSN Staff with answering phones and replying to messages. The Seismology Lab responded to ~75 calls from the general public, ~25 calls from Emergency Managers and government agencies, and over 150 calls from the Media. In addition, the PNSN audio library system received 300 calls this quarter. The audio library provides several recordings. We have resumed regular updating of the audio library 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 available information.

Internet outreach:

www.pnsn.org

As earthquake activity at Mt. St. Helens took a sudden upswing on Sept.23,we immediately initiated a page to archive webicorder and spectrograph records for the sequence, and a special "press release" page to connect users to CVO, the Forest Service, PNSN Mt. St. Helens seismicity pages, and other useful sites. As our ability to process the data was rapidly overwhelmed, and attention from the public increased, we faced several challenges in disseminating information through our website.

First, our automatic locations for Mount St. Helens earthquakes generally overestimated the magnitude and substantially mis-located many events. Therefore, a decision was made to stop posting automatic locations for Mt. St. Helens events to http://www.pnsn.org/recenteqs/latest.htm, and all preliminary unreviewed locations were removed through the

QDDS system. Secondly, we were unable to keep up with processing the high rate of seismicity. Thirdly, the scripts that normally send processed locations to "recenteqs" pages stopped working because the large volume of Mt. St. Helens data could not be processed in our regular working directories. We placed a disclaimer on the "recenteqs" pages to notify users that Mount St. Helens locations were incomplete, and by the second week of October the distribution scripts were repaired. Unfortunately, this was not quite seamless, and we recieved many inquiries from people who were puzzled by the disappearance of the preliminary events from our web site, or disturbed by the lack of updating to the local and national "recenteqs" sites.

On the afternoon of Sunday September 26, a "Notice of Volcanic Unrest" was issued jointly by the PNSN and the Cascades Volcano Observatory and posted to the U.S.G.S. Earthquake Program webpage. Attention from local and national media was quickly followed by hundreds of thousands of visits from the general public to the PNSN web pages. By Monday Sept. 27th the UW Dept. of Earth and Space Sciences webserver became totally congested. The USGS earthquake program was able to mirror the PNSN/CVO Mt. St. Helens Volcanic Advisories on their Akami-supported website, making that one page widely accessible, and arrangements were made to move the entire PNSN site and the www.pnsn.org domain name to a central, high capacity, University of Washington server.

The move, implemented on September 28 went relatively smoothly, although differences in the server set-ups caused some pages to become dysfunctional. Most of those problems were fixed by early the Sept. 29th and we continued to repair lower-traffic links as additional problems were noticed. The campus server was able to handle the extremely high volumes of traffic that occurred as seismic activity intensified in late September and early October. By Oct 5th the combined total of traffic on the two servers equaled between 25 and 30 million "hits". Several "hits" may be required for some pages to display as each graphic is counted as a separated "hit". The UW Department of Computing and Communications, which facilitated our greatly improved server capacity and network bandwidth, estimates that over 10 million “pages” of information were accessed.

PNSN staff also replied to about 250 e-mail messages from the public seeking information on a variety of topics via the seis_info@ess.washington.edu email address. Questions related to Mt. St. Helens Activity accounted for 125 of these in the last week of September. Routine questions are typically responded to within a day; complex or sensitive questions are routed to the appropriate staff person for a more in-depth response. Requests may include assistance with hazard assessments and legal issues, consultations with government agencies, and support for engineering issues related to strong motion data.

CISN Display servers are receiving PNSN recent earthquake data and now provide links to our ShakeMaps, automatically generated following significant earthquakes. The CISN Display beta version was distributed for testing to select users who provide feedback to PNSN staff. Anticipation of the release of version 1 of the CISN Display is growing in our region and, depending on demand, new servers may be required to augment those in Pasadena and Berkeley to ensure data delivery in 2005. PNSN staff will also face demands for development of additional data layers of interest to clients within Washington and Oregon. This product will first supplement and later replace the CUBE based RACE (Rapid Alert for Cascadia Earthquakes) systems currently deployed.

K-20 Education Outreach

Green River Community College purchased and installed an education-grade vertical component broadband seismograph. See Operations section for details.

PNSN and USGS staff gave 3 Seismology Lab tours and presentations for K-20 students and teachers, serving about 60 students this quarter. The PNSN also maintains an email list-service and distributed monthly newsletters to over 50 local K-20 educators and subscribers interested in earth-sciences education.

Educational Resources Web Page: http://www.pnsn.org/EDHOME/index.html.

Media Relations:

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). Early this quarter the PNSN and DOGAMI responded to requests for information and interviews following the July 22nd felt event of the ongoing Lakeview sequence. DOGAMI serves as a PNSN information Center for Oregon, PNSN staff consults frequently with DOGAMI concerning Oregon earthquake activity and media inquiries are referred to them for additional information.

With the declaration of "Volcanic Unrest" (Alert Level One) at Mount St. Helens on Sunday September 26th, the intense Media interest in the earthquake swarm that began September 23rd escalated dramatically. Graduate students and PNSN staff worked to ramp up our analysis and processing capabilities while providing information to all 5 Seattle-region TV stations, plus radio and print media. PNSN PIO Bill Steele was in St. Louis and analyst Amy Wright was on maternity leave, further reducing staff available to cope with the demand. Steele canceled his engagements and returned on the 28th. The Seismology Lab remained open from early morning to late evening for the next two weeks.

On Sept. 29, after reviewing with CVO scientists the seismic activity that had accelerated significantly overnight, a decision was made to move to Alert Level 2. UW Computing and Communications, who had already rescued our overburdened web servers, responded to the still escalating information demands by providing a phone bank of 5 digital telephone stations, added two new phone lines to our emergency communications system, and installed fiber optic cable into the Seismology Lab for direct fiber links for television media. All this was accomplished in a day without charge to the PNSN.

In the weeks that followed, PNSN faculty, staff, and students held hundreds of interviews with regional, national and international media providers. National news programs served included ABC News Nightline, CNN, MSNBC, Fox News, and NBC Nightly News. Early morning science conferences with CVO were of critical importance for the sharing of data, discussion of interpretations, and development of "talking points" for use in interviews. Despite our geographical separation, USGS Scientists at CVO, National Forest Service personnel at the Joint Information Center near Vancouver and PNSN staff (with assistance from our colleagues in the USGS Seattle Field Office at UW) provided consistent information to the Media.

Bill Steele participated in making a Global Net Productions 30-minute video "Living with Risk" commissioned for the National Earthquake Conference in St. Louis Mo. Locales in the video included the PNSN Seismology Lab and the Boeing Fire and Rescue Dispatch center at Boeing Field. Boeing managers described how they used products such as ShakeMap and the CISN Display.

Meetings, Presentations and Visitors:

This quarter PNSN staff made presentations to the Sammamish Rotary Club, a State Department sponsored group of International Scholars, and for the annual conference of the Evergreen Safety Council, at Seahawks Stadium. TBS Television's Public Affairs Show interviewed Bill Steele on Earthquake Hazards and preparedness for a special 30 minute show. Bill Steele represented Steve Malone at the PNW Region at the ANSS National Implementation Committee Meeting on September 26th and 27th in St. Louis and at the National Earthquake Conference that followed.