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QUARTERLY NETWORK REPORT 88-C

on

Seismicity of Washington and Northern Oregon

July 1 through September 30, 1988

Geophysics Program

University of Washington

Seattle, Washington

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INTRODUCTION

This is the third quarterly report of 1988 from the University of Washington Geophysics Program covering seismicity of all of Washington and northern Oregon. These comprehensive quarterlies have been produced since the beginning of 1984. Prior to that we published quarterlies for western Washington in 1983 and for eastern Washington from 1975 to 1983. Annual reports covering seismicity in Washington since 1969 are available from the U.W. Geophysics Program. In collaboration with the University of Washington, the State Department of Natural Resources (DNR) has published catalogs of earthquake activity in western Washington for the period 1970-1979. The DNR has published earthquake catalogs for the whole state for the period 1980-1986.

This quarterly report discusses network operations, seismicity of the region, and unusual events or findings. This report is preliminary, and subject to revision. Some earthquake locations may be revised if new data become available, such as P and S readings from Canadian seismic stations. Findings mentioned in these quarterly reports should not be cited for publication. Fig. 1 shows major geographical features in the state of Washington and northern Oregon and seismograph stations now in operation.

NETWORK OPERATIONS

Table 1 gives approximate periods of time when stations were inoperable. Data for Table 1 are compiled from weekly plots of network-wide teleseismic arrivals, plus records of maintenance and repair visits. Fig. 1 shows a map view of stations operating during the quarter.

There were few changes within the network this quarter, with most of the activity concentrating on routine maintenance. Five stations were removed in Eastern Washington as planned, and included stations CHO, RPK, WBW, WNS and HH2. They were removed between August 16 and August 19.

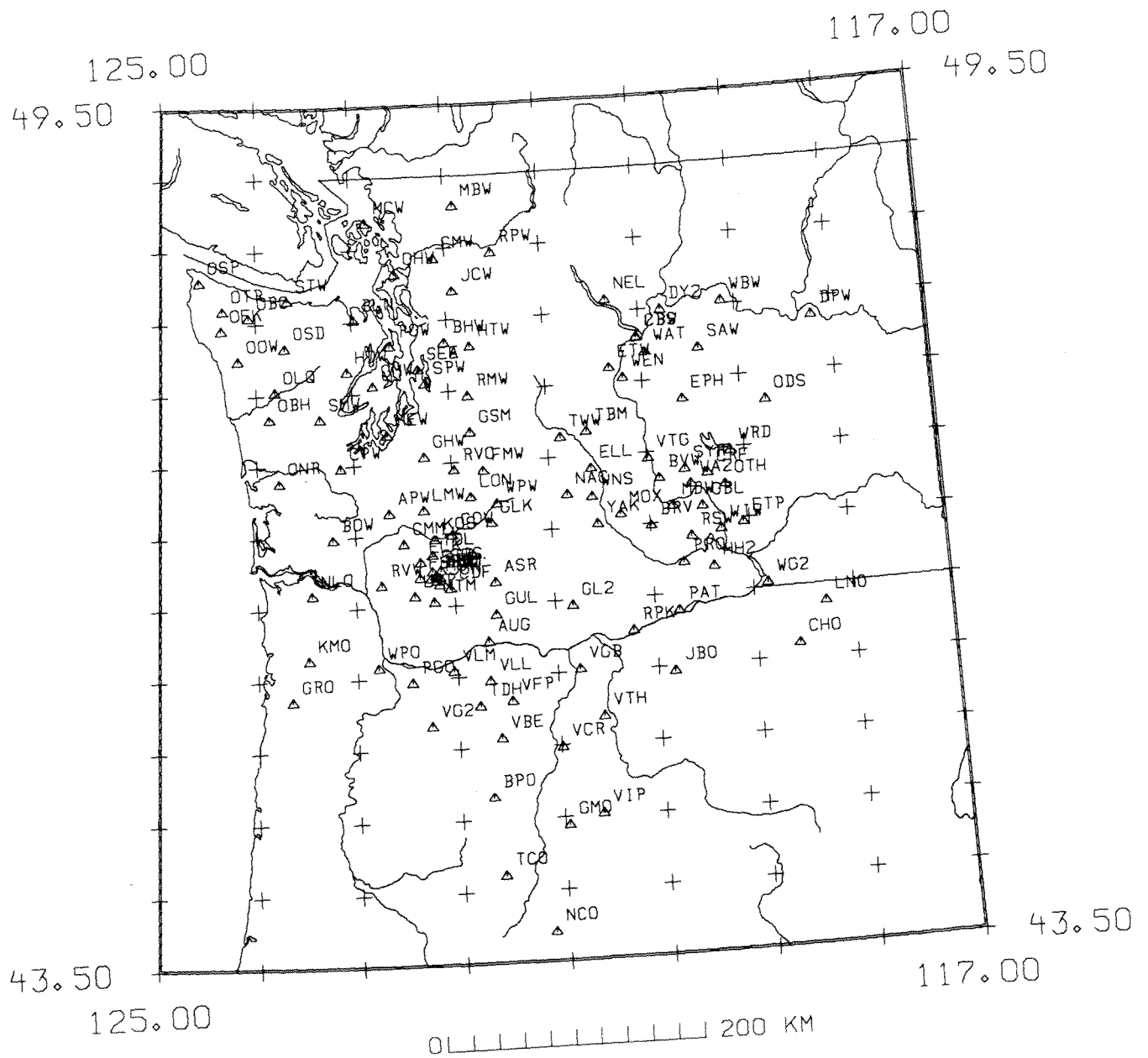


Figure 1. Seismograph stations operating during the 3rd quarter 1988.

EARTHQUAKE DATA

There were 703 events processed by the University of Washington digitally recording seismic network between July 1 and September 30, 1988. Locations were determined for 522 of these in Washington and Northern Oregon; 368 were classified as earthquakes and 154 as known or suspected blasts. The remaining 171 processed events include teleseisms (112 events), regional events outside the U. W. network (35), and unlocated events within the U. W. network. Unlocated events within the U.W. network include very small earthquakes and some known blasts. For example, only a few of the frequent mine blasts at Centralia are kept or located.

Table 3 is the catalog of earthquakes and blasts located within the network for this quarter. Fig. 4 shows all earthquakes with magnitude greater than or equal to 1.0 ($M_c \geq 1.0$) Fig. 5 shows blasts and probable blasts ($M_c \geq 0.$) Fig. 6 shows earthquakes located at Mount St. Helens ($M_c \geq 0$).

Western Washington and Oregon

311 earthquakes were located between 43.5° and 49.5° north latitude and between 121° and 125° west longitude during the third quarter of 1988. Most of these occurred at depths less than 30 km with, as usual, a small number of earthquakes in the Puget Sound lowland at depths greater than 30 km. The largest event during the quarter occurred on July 29, and was $M_c = 4.1$, at a depth of 11.8 km on the western flanks of Mount Rainier, Washington. It was felt widely around Mt. Rainier, in towns such as Carbonado, Eatonville, Orting, and Randall. This was followed one hour later by another event in the same area which had a $M_c = 3.8$ and was 10.8 km deep. Both hypocenters were located approximately 12 km west of Mount Rainier's summit. Nearly two weeks later, on August 12, a $M_c = 3.0$ earthquake with a similar location occurred. The July 29th earthquake is the largest earthquake to occur in the Mt. Rainier region since a $M_c = 4.7$ shock on April 20, 1974.

Mount Rainier seismicity is high compared to other stratovolcanos of the central Cascade region, which (with the exception of Mount St. Helens) are seismically quiet. Figure 1 shows all

earthquakes since 1969 in the Mount Rainier region. There is a north-south trend of seismicity just to the west of the mountain, as well as a cluster at the summit. Focal mechanism solutions for the three earthquakes in July and August of 1988 are very similar to solutions found for earthquakes in 1973 (Crosson and Frank, 1975) and 1974 (Crosson and Lin, 1975) in this region. Figure 2 also shows focal mechanism solutions for selected events larger than $M_c = 3.0$. For more specific reference to activity this quarter, Figure 3 has been added which is a summary of activity for the time period July 1 to September 30.

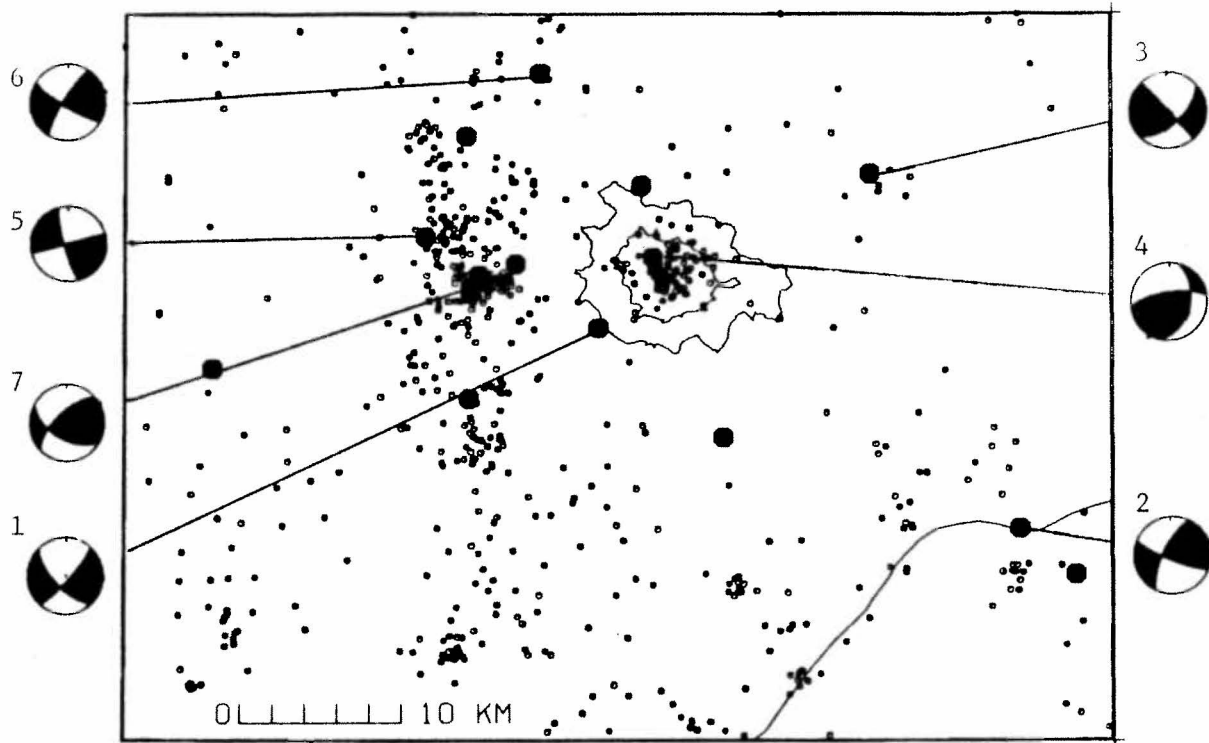


Figure 2. Earthquakes located in the vicinity of Mount Rainier from 1969 through August, 1988. The map includes the area from 121.4° to 122.2° west longitude and from 46.6° to 47° north latitude. The contours on the map represent the 7,500 ft. and 10,000 ft. contours of Mount Rainier. Two symbol sizes are used, the smaller for earthquakes with magnitude less than 3.0, and the larger for earthquakes greater than magnitude 3.0. Lower hemisphere, equal-area focal mechanisms derived from P-wave first motions are shown for larger earthquakes, and are numbered to correspond to the table below.

#	DATE	TIME	LAT	LON	DEPTH(KM)	MAG
1	73/07/18	21:58:06.01	46 49.54	121 49.03	6.94	3.9
2	74/04/20	03:00:09.38	46 42.95	121 28.54	5.55	4.7
3	75/04/18	04:57:56.62	46 54.68	121 35.83	5.05	3.9
4	76/11/11	05:28:28.43	46 51.86	121 46.38	0.56	3.1
5	85/01/01	19:15:00.80	46 52.57	121 57.39	11.31	3.1
6	85/12/27	19:12:00.81	46 58.02	121 51.91	7.02	3.0
7	88/07/29	04:59:47.27	46 51.27	121 54.82	11.83	4.1

Of the other felt events which occurred this quarter, one occurred on July 8 in the Robe Valley area between Granite Falls and Darrington. It had a $M_c = 3.2$, and occurred at a depth of less than 1 km. Another event that was reported felt occurred on July 14, and had a $M_c = 3.1$, and a focal depth of 3.4 km. It was felt in the area of Arlington, Wa. The remaining event felt in western Washington during the quarter occurred under Whidbey Island on September 8, had a $M_c = 2.8$, and a depth of 22.5 km. Felt reports were received from Oak Harbor, Wa.

The deepest earthquake during the quarter had a magnitude of 2.0 and was located at a depth of ~ 55 km beneath the coast of Oregon. While deep earthquakes are more commonly located north of 46° a couple earthquakes at depths similar to this one have previously been documented in Oregon.

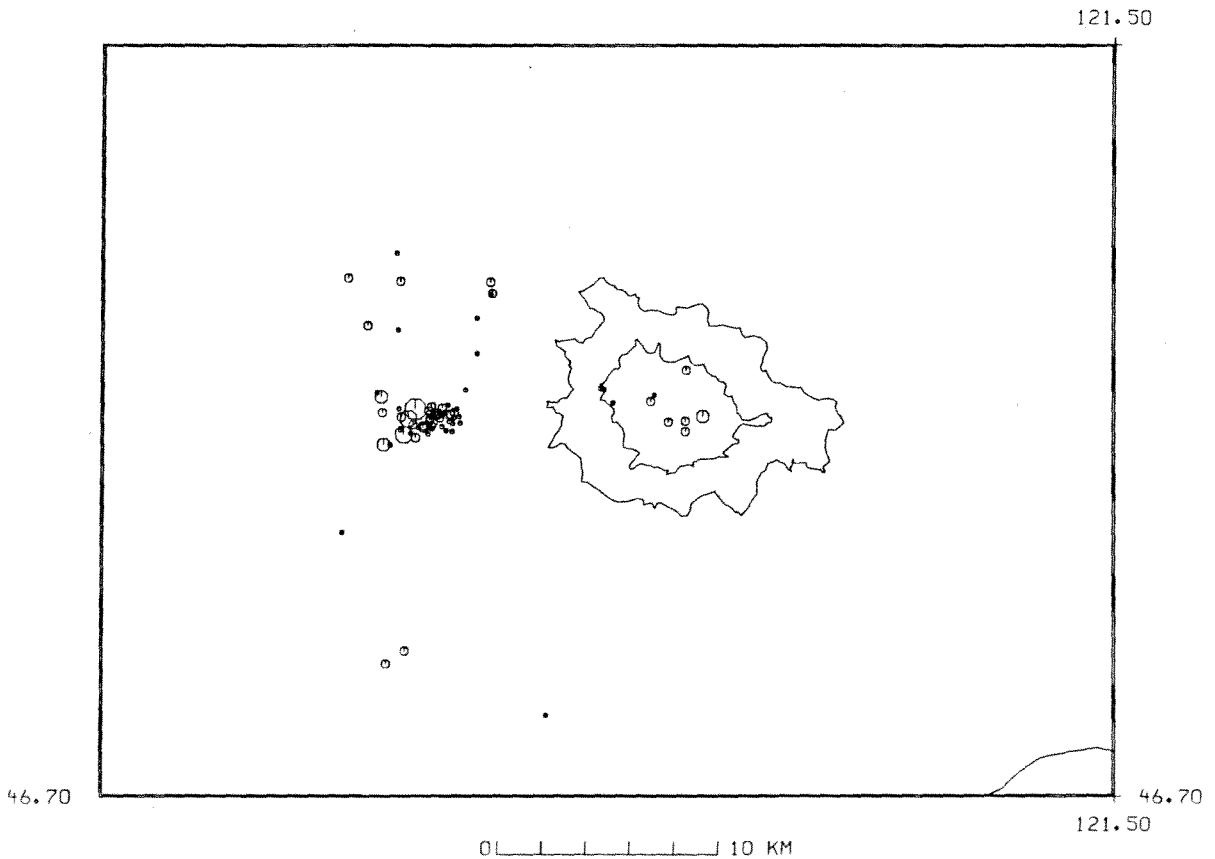


Figure 3. Earthquakes at Mount Rainier 3rd quarter 1988. Inner contour is the 7500 ft. elevation contour, the outer counter is the 10,000 ft. elevation contour.

Eastern Washington and Oregon

During the third quarter of 1988, 57 earthquakes were located in eastern Washington. The Entiat area south of Lake Chelan was again active. On July 30, a $M_c = 3.2$ earthquake occurred at a depth of less than 1 km., and was the largest event of a cluster of about 15-20 events which normally occur each quarter.

The clustering of activity that began on October 2, 1987 near the town of Corfu, Wash. (50 km north of Richland) continued into the third quarter of 1988. 10 events were recorded this quarter, one less than last quarter. Activity has declined slowly but steadily for the last year. The largest event occurring in this area this quarter was a $M_c = 3.3$. This event occurred on July 14 with a near-surface depth (< 2 km).

Mount St. Helens Area

The relative quiet that remained at the end of the last quarter in the Mt. St. Helens area continued into the third quarter of 1988. 41 earthquakes were located at Mt. St. Helens during the third quarter. The largest event occurred on July 10, had a $M_c = 2.0$, and a depth of 0.5 km.