

1. Regional Seismic Monitoring in Western Washington  
and

1990

2. Seismic Monitoring of Volcanic and Subduction Processes in Washington and Oregon

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### Investigations

Operation of the Washington Regional Seismograph Network (WRSN) and routine preliminary analysis of earthquakes in Washington and Northern Oregon are carried out under these contracts. Quarterly bulletins which provide operational details and descriptions of seismic activity in Washington and Northern Oregon are available from 1984 through the first quarter of 1990. Final catalogs are available from 1970, when the network began operation, though 1986. The University of Washington operates approximately 80 stations west of 120.5°W, 28 of which are supported under A0622, and 40 under A0623. This report includes a brief summary of significant seismic activity. Additional details are included in our Quarterly bulletins.

Excluding blasts, probable blasts, and earthquakes outside the U. W. network, 973 earthquakes west of 120.5°W were located between October 1, 1989 and March 31, 1990. Of these, 618 were located near Mount St. Helens, which has not erupted since October of 1986. This represents a significant increase over the previous six month period (319 events). Seven earthquakes were reported felt in western Washington during the period covered by this report. East of 120.5°W, 65 earthquakes were located, none felt.

The most notable earthquake during this reporting period was a  $M_L$  5.1 earthquake on December 24 in the southern Washington Cascade Range near Storm King Mountain, about 30 km southwest of Mount Rainier. Although earthquakes of magnitude 5 and greater occasionally occur in the southern Washington Cascade Range, this event was somewhat unusual. In the first month after the earthquake, only 12 aftershocks were locatable, all smaller than  $M_C$  1.5. Other events in southwestern Washington of similar magnitude (Siouxon Peak, 1961; Elk Lake, 1981, Goat Rocks, 1981) were followed by hundreds of aftershocks, including aftershocks of magnitude 3.0 and larger. This event occurred in an area where very little seismicity has been detected since the WRSN was installed, while the other magnitude 5 events were in areas with recurring seismic activity. Finally, the earthquake focal mechanism (dominantly strike-slip; with the sense of motion being either left-lateral slip on a north-south striking plane or right-lateral slip on an east-west striking plane) is markedly different from focal mechanisms for other earthquakes larger than magnitude 5 in the southern Cascade Range of Washington, which show right-lateral strike-slip on northerly-striking fault planes. Craig S. Weaver (USGS), Rick Benson (UW), John Nabelek (OSU), and William D. Stanley (USGS) are preparing a

paper for JGR on this event.

In October, we recorded the greatest number of earthquakes at Mt. St. Helens since its last eruption in 1986. Since October, when 211 earthquakes were located in the vicinity of the mountain, the number of earthquakes per month has varied from 49 to 128. The largest earthquake in October was  $M_C$  2.3, and in the entire six months only three were larger than  $M_C$  2.5, (the largest was  $M_C$  2.7). Thus, the rate of moment release was not significantly elevated. Depths of these earthquakes varied from the surface to 8 km and suggest stress changes within the volcanic conduit. Ash emissions occurred on December 8 1989 and January 6 1990. The last such emissions were in 1986. The December emission was accompanied by a five-hour period of elevated seismicity, and the January emission by two hours of elevated seismicity. Each emission began abruptly with the largest earthquake of the emission sequence (magnitudes  $\sim$  2.7).

Swarms of small earthquakes at approximate depths of 4-5 km under Mount Hood were recorded on helicorder records on February 16 (30 events) and 20 (28 events). Although none were larger than magnitude 1.3, six were recorded by our digital recording system.

### **Publications**

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- Univ. of Wash. Geophysics Program, 1990 (in preparation), Quarterly Network Report 90-A on Seismicity of Washington and Northern Oregon

### **Abstracts**

- Jonientz-Trisler, C., C. Driedger, and A. Qamar, 1989 (in press), Seismic signatures of debris flows on Mt. Rainier, WA, EOS, Fall 1989 PNAGU.
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