Monitoring the Active Cascade Volcanoes

Particularly Mount Rainier & Mount St. Helens

Steve Malone, Professor Emeritus Department of Earth & Space Sciences ex-Director, Pacific Northwest Seismograph Network University of Washington

Eruption Prediction

- Tectonic setting
- Volcano or rock type
- Historical record
- Precursors

Examples from from Mount St. Helens Brief summary of two other Cascade Volcanoes

Long-range

Forecasts



Subduction of oceanic plate beneath North America

























St. Helens warning is raised

'Small to moderate steam and ash eruption' called most likely







Monitoring techniques used to track **Volcanic Activity**









MSH seismicity, 1980-2004

















Petrology – what's coming out is crystalrich (mostly solid) dacite





Ground deformation - Photogrammetry





















Computer age - data processing & storage

1980



- 64 Kbytes a big deal (average event size)
- Maunal processing with computer help



2008

 - 64 Kbytes not even a rounding error (event file 2-5Mb)
 - Automatic processing with manual verification

















Precise relocation of Mount Hood earthquakes suggests tectonic origins



J. Jones (2003), Univ. Washington

Recent Seismicity

• From 1980 through 2002, the PNSN recorded over 900 microearthquakes $(M_c < 3.5)$ near Mount Hood.

• Three-fourths of these events occurred after January 1, 1997.

• No low-frequency events or tremors.



Data Analysis Double-difference earthquake relocation The resulting change in hypocenters can be quite spectacular



Prediction: Based on current seismicity, NO Cascade volcano will erupt in the next two weeks, and probably not in next two months



Thanks to:

- Scientists and staff of the Cascades Volcano Observatory
- Staff of the Pacific Northwest Seismograph Network
- Funding from the U.S. Geological Survey
- Department of Earth and Space Sciences, University of Washington
- Mount Rainier National Park

www.pnsn.org