

# *Mt. St. Helens Activity Update (+ 2004 events)*

Images Courtesy Of:

USGS Cascades Volcano Observatory




The Pacific Northwest Seismic Network

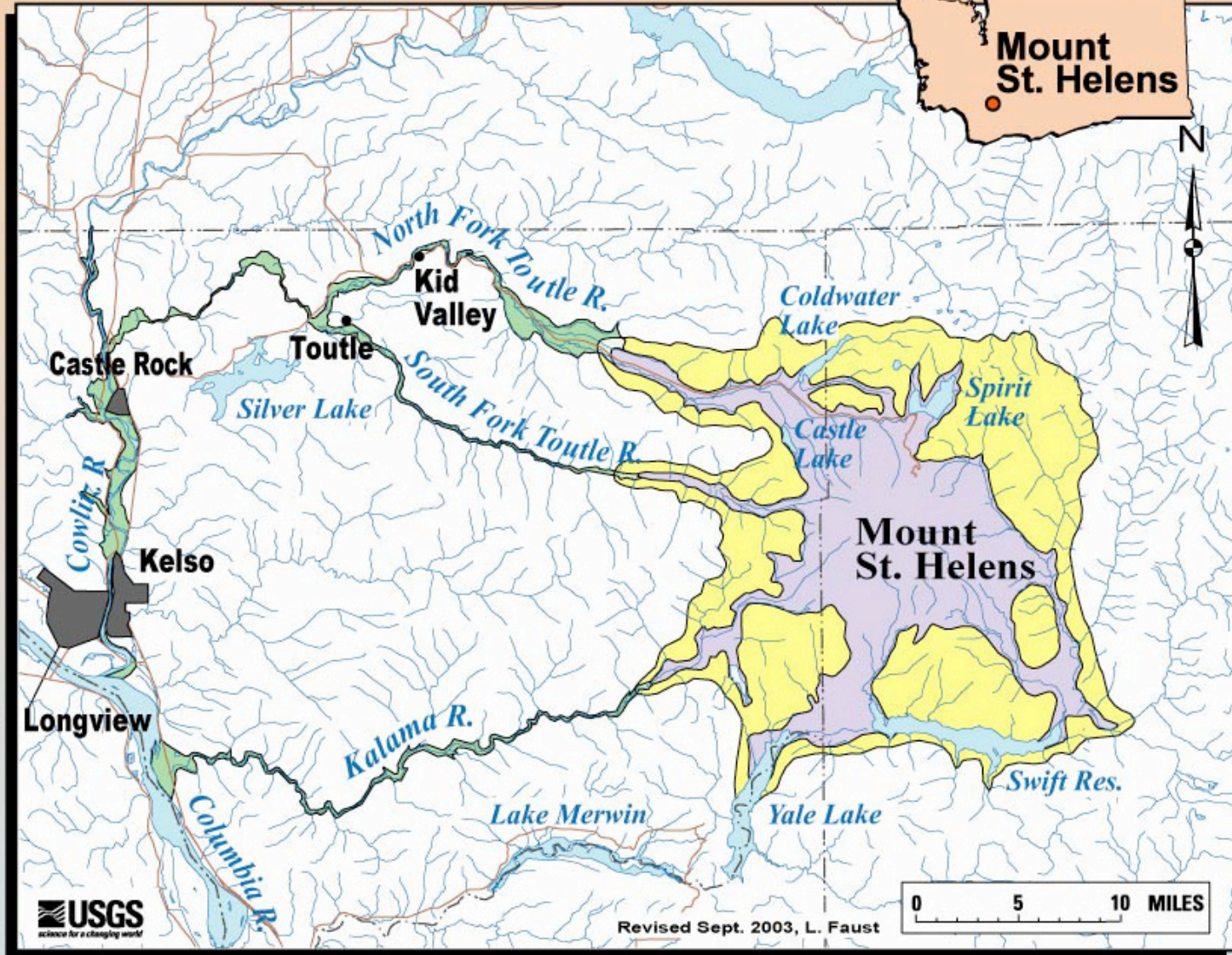
NOVA: Volcanoes Deadly Warning



# Mount St. Helens



-  **Hazard zone 1**  
Area vulnerable to passage of high-concentration (high density) flows, including pyroclastic flows, lava flows, and proximal parts of lahars.
-  **Hazard zone 2**  
Area vulnerable to pyroclastic surges (low-density) flows.
-  **Hazard zone 3**  
Intermediate and lower reaches of valley that could be inundated by lahars.



*Hazard zonation map for Mount St. Helens. Map modified from Wolfe and Pierson, 1995; U.S. Geological Survey Open-File Report 95-497.*

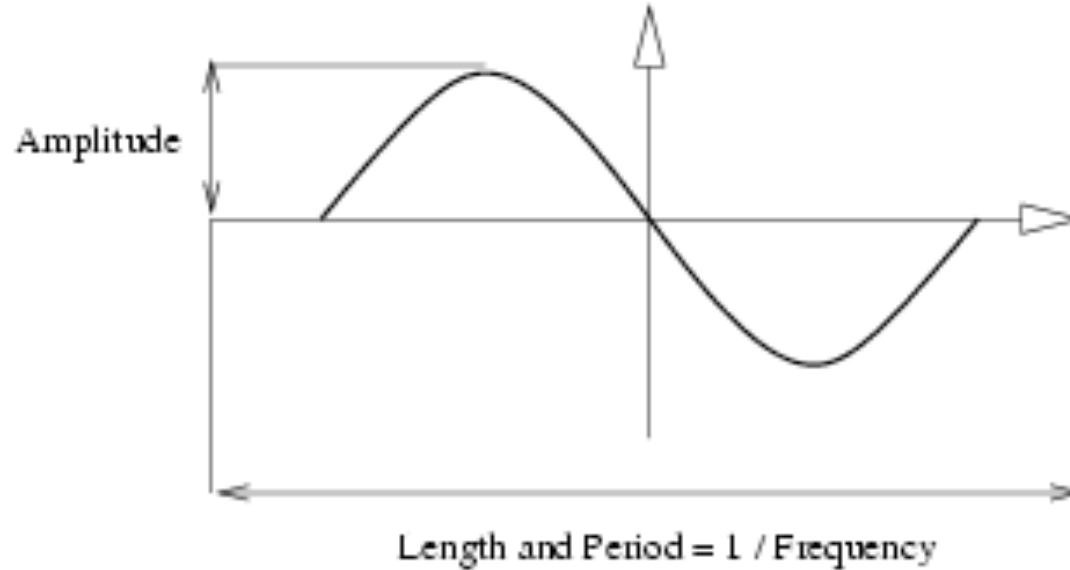


Revised Sept. 2003, L. Faust

# *Cascade Volcanoes Warning Alert Levels*

- *INFORMATION STATEMENT: typically short-lived, isolated events such as steam bursts (with or without minor ash fall), small avalanches, rock falls, minor mudflows.*
- *LEVEL 1: significant anomalous conditions are recognized that could be indicative of an eventual hazardous volcanic event. The most likely such anomalous condition would be sustained, elevated seismicity.*
- *LEVEL 2: processes are underway that have significant likelihood of culminating in hazardous volcanic activity but when the evidence does not indicate that a life- or property-threatening event is imminent. This alert level is used to emphasize heightened concern about potential hazard. (pre-Oct. 2, returned on Oct. 6)*
- *LEVEL 3: precursory events have escalated to the point where a volcanic event with volcanologic or hydrologic hazards threatening to life and property appears imminent or is underway. (Oct 2-6)*

# Properties of Waves



Wavelength ( $\lambda$ ): physical distance between consecutive peaks or valleys in a waveform.

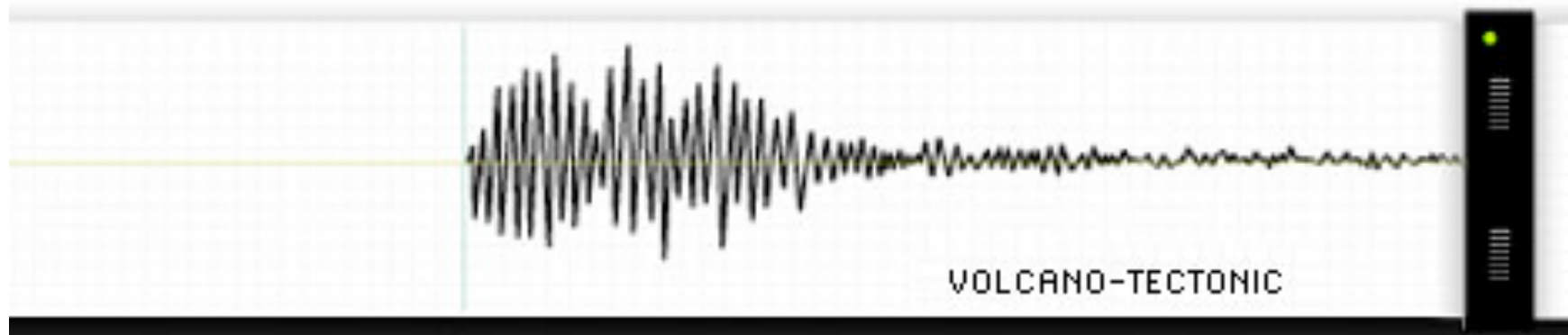
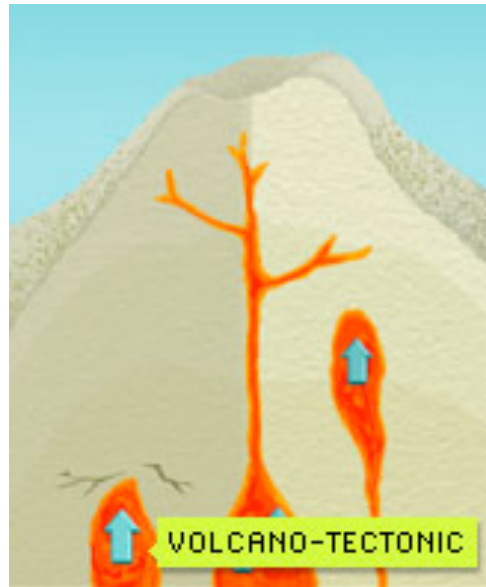
Frequency ( $f$ ): number of complete wavelengths (cycles) per time

Amplitude ( $A$ ): excursion distance from the mean or undisturbed portion of the waveform

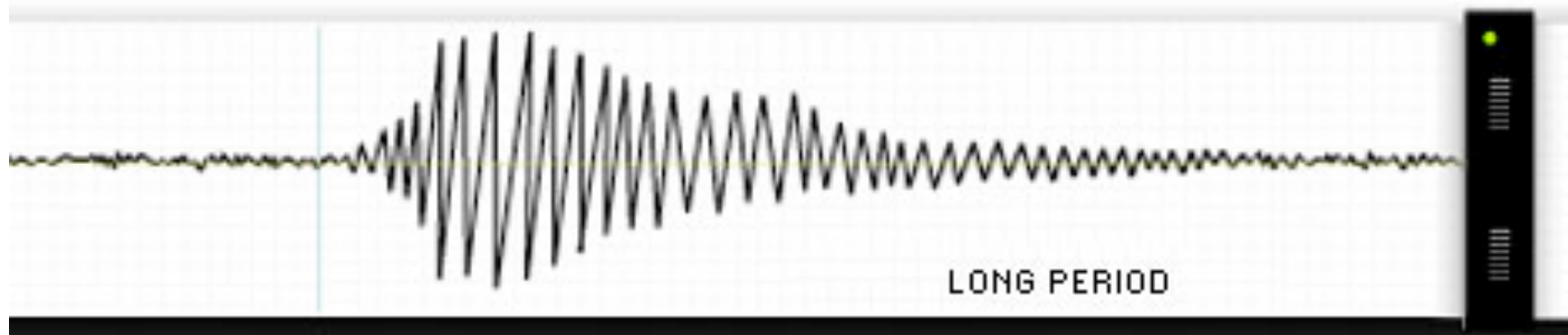
Period ( $T$ ): the time it takes for one cycle to occur

If  $f = 60$  cycle/s (e.g., 60 Hz);  $T = 1/60$  s

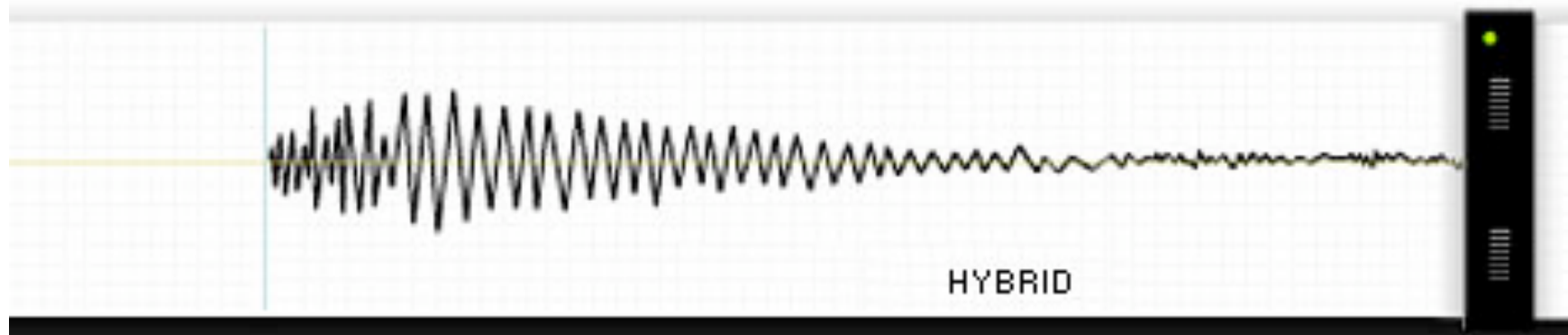
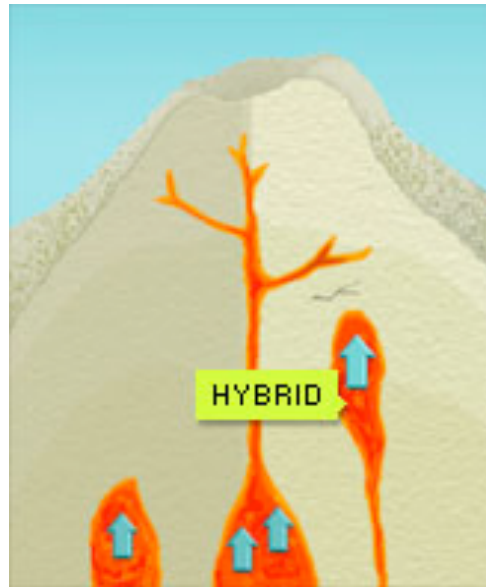
# Volcano-seismic waveforms: Volcano-Tectonic (VT)



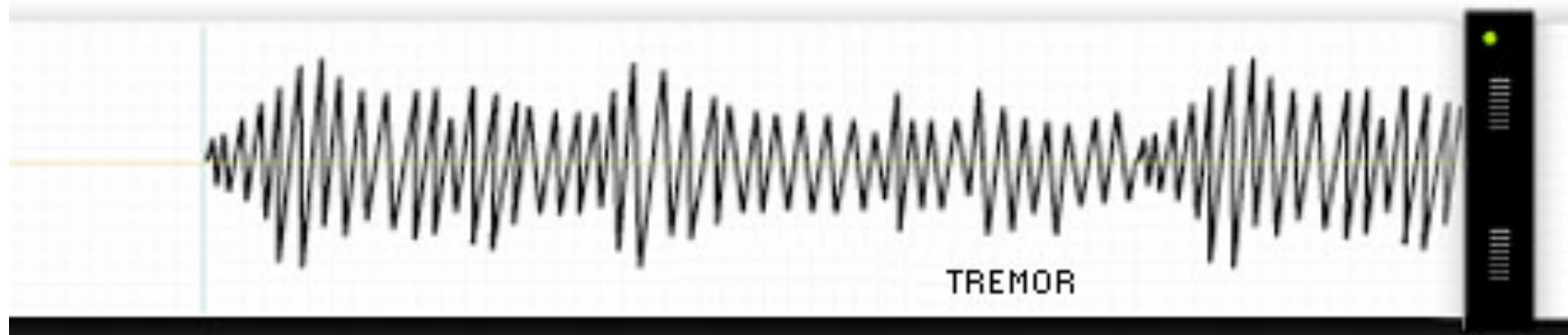
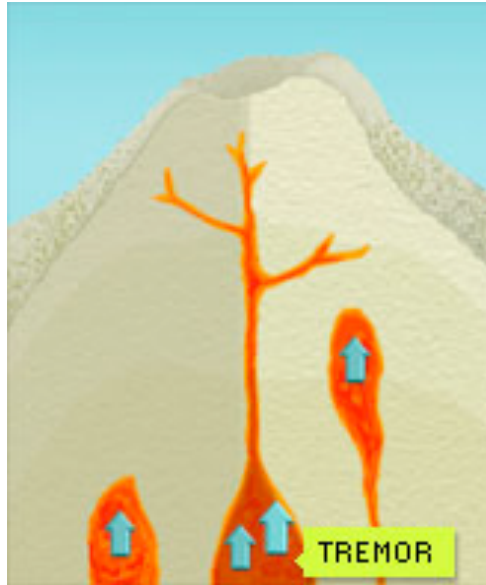
# Volcano-seismic waveforms: Long Period (LP)



# Volcano-seismic waveforms: Hybrid

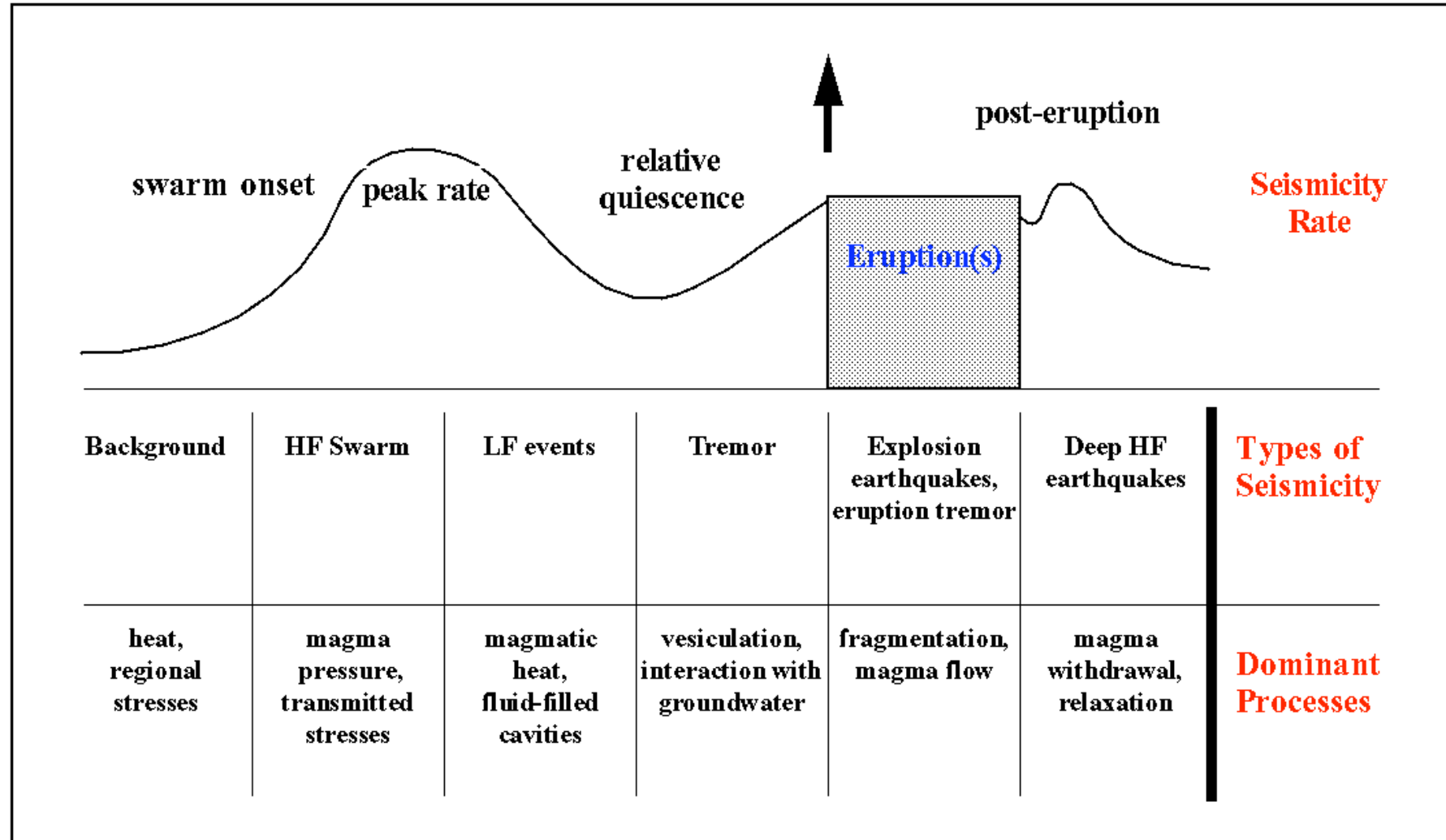


# Volcano-seismic waveforms: Tremor



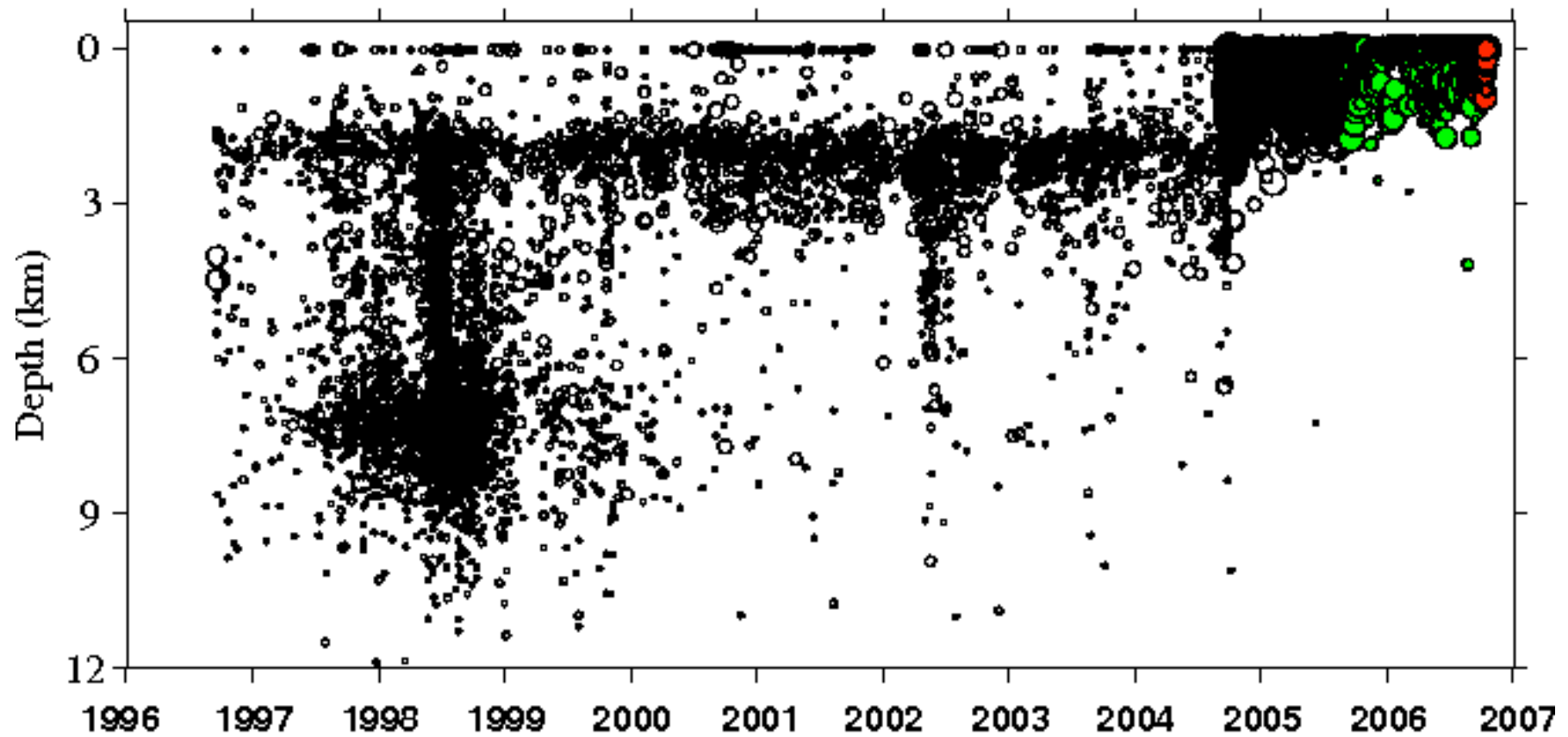


# Generic Volcanic Earthquake Swarm Model



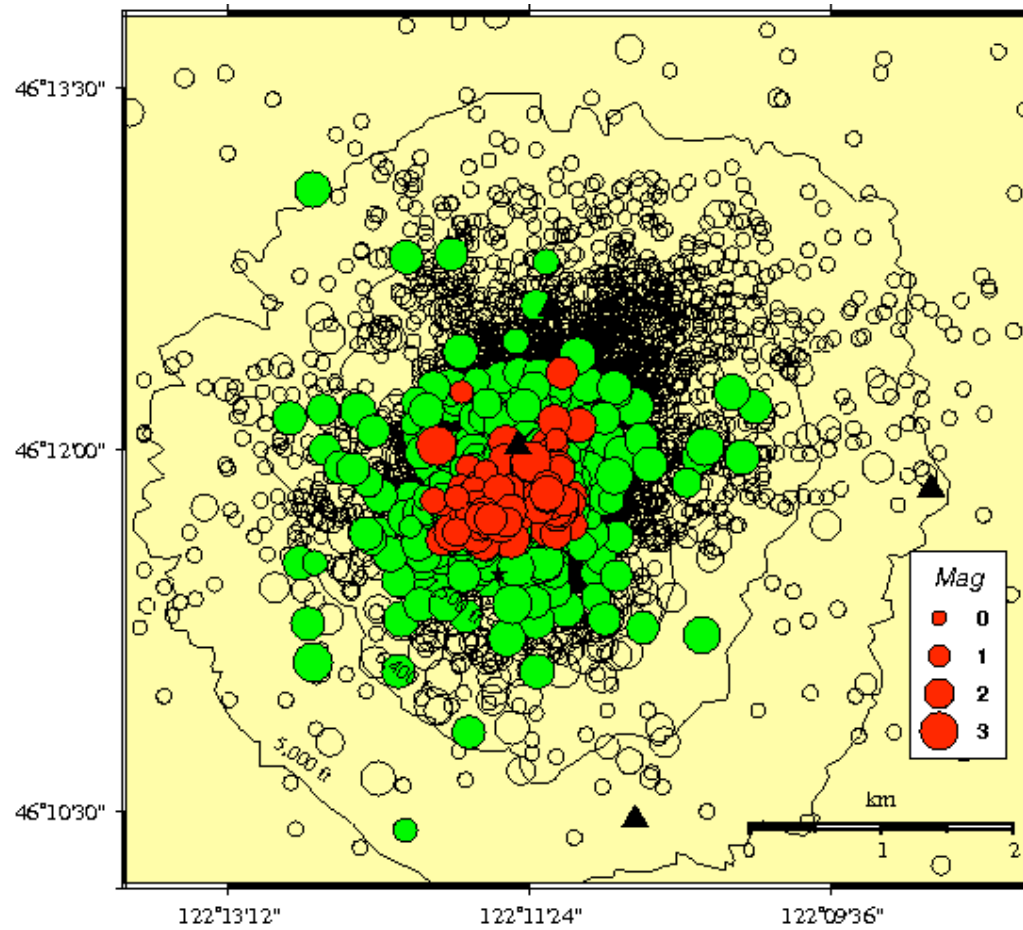
Time →

# Mt. St. Helens Seismicity, 1996 - Present

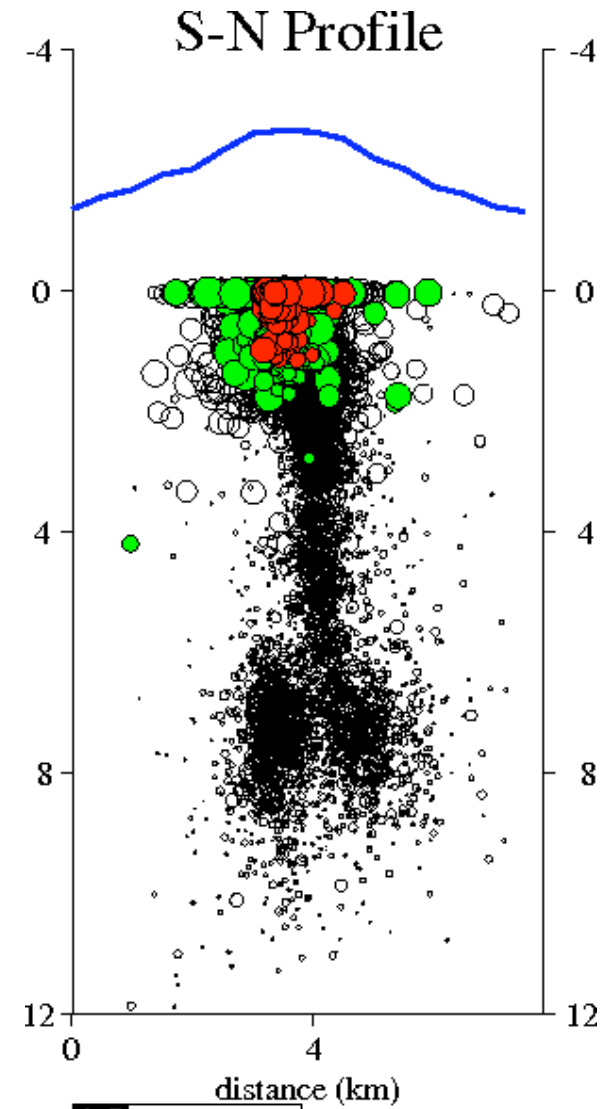


GMT 2006 Oct 14 08:22:55

# MSH Earthquakes - Last Decade



GMT 2006 Oct 14 06:18:03



GMT 2006 Oct 14 06:18:14



9-30-04





 USGS

9-30-04



10-1-04



 USGS

10-01-04



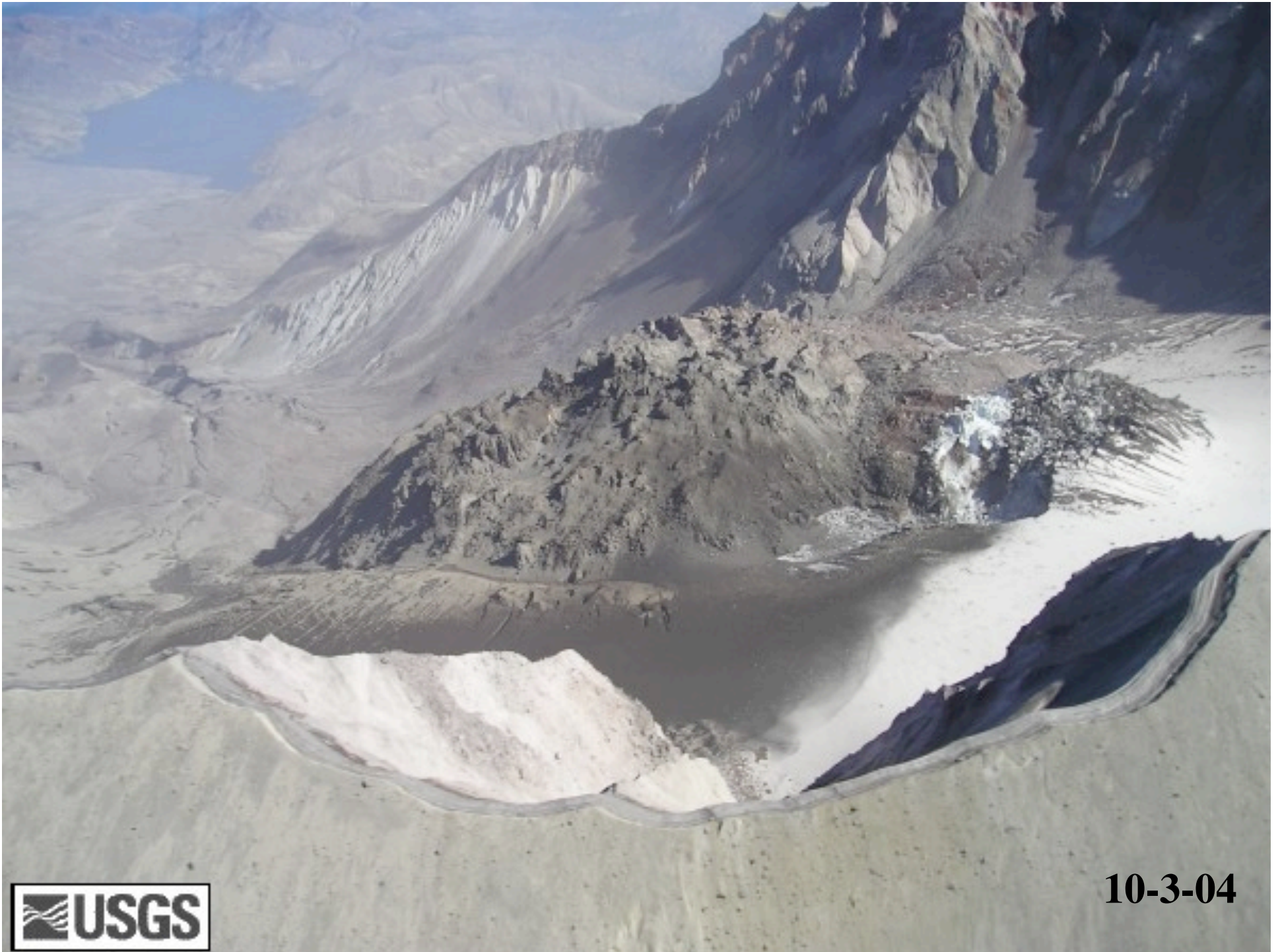
10-1-04







10-01-04



10-3-04



 **USGS**

10-4-04



10-4-04





 **USGS**

**10-5-04**



## Disaster Planning and Response for Key Lifeline Infrastructure Systems

October 19 & 20, 2006 at the Sheraton Hotel Bicentennial Pavillion  
1320 Broadway, Tacoma, Washington

**Sponsored by: Pierce County Emergency Management and Puget Sound Energy**

- ◆ What impact would a volcanic event have on your business?
- ◆ On what and whom do you depend during emergency response?
- ◆ How do you meet the needs of employees and customers while protecting and possibly rebuilding critical infrastructure?



Worker in Moses Lake wearing protective mask

**Registration fee: \$150**

*(includes class materials, continental breakfast, lunch and refreshments for both days)*

**\*Please register by Oct. 13.**  
Form and guidelines on next page

**Thursday, October 19 agenda:** \_\_\_\_\_

7:30 - 8:30 am	Registration
8:30 - 8:45	Welcome/Introduction
8:45 - 9:15	Volcanic Hazards in the Pacific Northwest
9:15 - 9:45	Monitoring and hazards information
9:45 - 10:00	Break
10 - 11:30	Understanding volcanic impacts
11:30 - 12:30 pm	Lunch
12:30 - 2:15	Impact on infrastructure sectors
2:15 - 2:30	Break
2:30 - 4:30	Vulnerability and dependency assessment (group exercise)

**Friday, October 20 agenda:** \_\_\_\_\_

8:30 am - 9:30	Emergency Management in the Northwest
9:30 - 10:30	Case study - dealing with uncertainty during a volcanic crisis (study from Pinatubo eruption, 1991)
10:30 - 10:45	break
10:45 - 11:30	Dependency workshop reports
11:30 - 12:30 pm	lunch
12:30 - 1:30	Developing effective response plans
1:30 - 4:00	Mitigation exercise
4:00 - 4:30	Summary and the way ahead

**Sessions presented by specialists from :**  
Geological & Nuclear Science, New Zealand (GNS)  
USGS Cascades Volcano Observatory, Vancouver, WA  
Pierce County Emergency Management

This important workshop is designed to teach you about volcanic hazards in the Puget Sound region and the impacts they can have on our lifeline infrastructure sectors; will help you identify dependencies during emergency response and will help establish an infrastructure work group that will address mitigation, preparedness, response and recovery issues.

**Space is limited, so please register by Oct. 13!**



Clearing up ash on the runway in Anchorage, Alaska

