Volcano-seismic monitoring: What is possible now?

Glenn Thompson, AlaskaVolcano Observatory, Fairbanks, AK

While volcano-seismic research is important, equally important is the ability to build robust software systems which exploit that research in a real-time monitoring environment at volcano and seismic observatories. This sort of work isn't well represented in research journals, but saves lives. Regional monitoring agencies typically focus on producing a catalog of earthquakes, and this is all off-the-shelf software is designed to support. Such systems are generally not well designed for monitoring the wider range and much higher rates of seismicity that occur near volcanoes. Capturing seismic signals like tremor, swarms, and corresponding to rockfalls, pyroclastic flows, explosions and lahars is key to understanding volcanoes. In this presentation we follow the evolution of volcano-seismic monitoring over the past 15 years, as computing power, the world-wide web and relational databases have improved our ability to monitor volcanic seismicity in real-time. We also look at today's research to see where we might be in 5 years time. We focus on developments that have come from the USGS Volcano Hazards Program, the Alaska Volcano Observatory and the Montserrat Volcano Observatory (particularly 2000-2003, which saw major upgrades across the seismic monitoring programme). These include RSAM, web-based spectrograms, tremor and swarm alarm systems, Earthworm/Glowworm, rockfall/PF/tremor location systems, automated event classification, Winston, VALVE, the waveform toolbox and GISMO. We also look at the importance of using digital telemetry.

Keywords: seismic monitoring, tremor, swarm

Contact information:

Name: Glenn Thompson

Full mailing address: Geophysical Institute, University of Alaska Fairbanks, AK 99775-7320, USA

Phone No: +1 907 474 7424

Email address: gthompson@alaska.edu

Presentation preference: Talk

Preferred sessions: Monitoring techniques

Second choice of sessions: Hazard and risk assessment/management

Seismic monitoring at MVO 2000-2002, and implications for public safety and science

Glenn Thompson, AlaskaVolcano Observatory, Fairbanks, AK

Public safety depends critically on the ability of MVO to detect and respond to rapid escalations in activity of the Soufriere Hills Volcano (SHV) associated with pyroclastic flows and ash plumes. In January 2000, MVO was no longer able to detect such escalations in activity because of the failure of its seismic data acquisition and alarm systems. It became a race against time to deliver robust round-the-clock seismic monitoring. *Almost every aspect of seismic monitoring at MVO needed urgent attention*. Both the analog and digital seismic networks failed the Y2K transition. Nor were they integrated, leading to duplicity and inferior results. Acquisition systems had to be rebooted manually up to 25 times daily. Data loss averaged 50%. Obsolete and specialist operating systems (which could not be supported locally) could not be computer networked. No tools were available for analysis of continuous seismicity. Scientifically valuable data were in danger of being forever lost. Spares were inadequate, meaning that loss of a single piece of hardware could shut down seismic monitoring for months. Furthermore, MVO relied on obsolete telemetry. *Between 2000 and 2002*, MVO upgraded its data acquisition systems, merged its networks, developed a real-time magnitude system and a location system for pyroclastic flows, recovered valuable seismic data and established an online database of all seismic, streamlined its data processing, and developed a wide array of MATLAB and web-based monitoring tools. Robustness was improved by developing a diagnostic alarm system and running all systems in parallel, leading to >99% data capture. A successful proposal for a modern digital seismic network was funded (installed in 2005). These dramatic improvements in the reliability and capability of the seismic monitoring programme at MVO contributed significantly to public safety and without these efforts, it is likely that data of profound scientific interest would have been lost.

Contact information:

Name: Glenn Thompson

Full mailing address: Geophysical Institute, University of Alaska Fairbanks, AK 99775-7320, USA

Phone No: +1 907 474 7424

Email address: gthompson@alaska.edu

Presentation preference: Talk

Preferred sessions: Monitoring techniques

Second choice of sessions: Hazard and risk assessment/management