# Finite Volume Methods for Elastodynamic Problems, with Application to the Study of Remarkably Strong Tremor Episodes Heralding the Onset of the Current Eruption at Mount St. Helens, Washington

Roger P. Denlinger

USGS Cascades Volcano Observatory
Vancouver, WA

Tuesday, 27 May 2008, 11:30 am
Room 100F Pierce Hall, 29 Oxford Street

Abstract:

At Mount St. Helens in Washington, two episodes of strong tremor on October 2-3, 2004 heralded the onset of the current eruption, and were observed to occur during a time when the rate of uplift of the crater floor exceeded 10 m/day. Each episode of tremor was strong enough to be recorded 250 km away, yet in both cases ended with a quiescent period of low seismicity that then slowly built up to levels that were higher than before the tremor began.

Understanding the mechanism producing this pattern of seismicity can provide important constraints on the plumbing of the volcano and how it operates. To analyze this system in three dimensions, I applied and extended a finite volume method developed by Randy Leveque and Jan Langseth for hyperbolic systems, and tested it against known solutions. When applied to the problem of tremor at Mount St. Helens, the method produces body, surface, and interface waves as waves from an arbitrary source radiate into and interact with the geologic structure. Using constraints on near field and far field velocity structure provided by seismic studies, I investigate various sources that could sustain volcanic tremor for the observed duration of several thousand seconds, and discuss the implications of these models for the structure and behavior of the conduit system feeding this volcano.