Subsurface structure of Mt. Asama Japan and its temporal change inferred from coda wave interferometry

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Probing temporal changes of the internal structure of active volcanoes is a key for understanding the mechanics of volcanic eruptions. Here we tried to reconstruct the seismic propagation in Asama Volcano, central Japan, which experienced eruptions recently in 2004, 2008, and 2009, as a first step toward extracting temporal changes of the internal structure.

The wave propagation was extracted by taking cross correlations of seismic codas because they represent the random wave-field by multiple scattering. In specific, we first chose approximately 300 earthquakes between 2005 and 2007 and picked out seismic waves by a 80 second time window starting at 10 seconds after the S wave arrival. Then we took all possible pairs from 20 seismometers deployed around Asama Volcano to extract the wave propagation. Seismic waves with an apparent velocity of about 1.2km/s are extracted, representing S wave traveling shallower part of the volcano. Then the delay time-versus-slowness variation was extracted by slant stacking. We applied this processing to the data set of each year between 2005 and 2007 to estimate temporal changes of the one-dimensional S wave velocity structure in shallower part of the volcano.

The results show that S wave velocity in 2005 is clearly slower than those in 2006 and 2007. This is likely to be due to an effect of the 2004 eruptions of Asama Volcano. We successfully extracted temporal changes with a resolution of one year by processing a data set with about 100 earthquakes for each year, which is promising in that the temporal resolution will be improved with more earthquakes to be processed.