Japan Geoscience Union Meeting 2011
(May 22-27 2011 at Makuhari, Chiba, Japan)

SVC050-11 Room:302 Time:May 23 11:15-11:30

Crustal velocity structure beneath Mt. Asama using ambient noise tomography

Yutaka Nagaoka[1*], Kiwamu Nishida[1], Yosuke Aoki[1], Minoru Takeo[1]

[1]ERI, Univ. of Tokyo

Mt. Asama is an active volcano, experiencing minor and moderate eruptions in 2004, 2008 and 2009. Probing crustal structure is expected to provide additional insights into the dynamics of magma transport and resulting eruptions of Mt. Asama. In this study we estimated the crustal seismic velocity structure beneath Mt. Asama from surface wave tomography using Rayleigh wave extracted from ambient seismic noises.

We employed the seismic wave interferometry to extract the seismic wave propagation between two seismic stations by taking a cross correlation of random wavefields, such as the ambient seismic noise or the seismic coda wave, recorded at two stations. The cross correlations of random wavefield recorded at two receivers can be represented as if the source is at one receiver and the recorder is at the other. This technique is suitable for exploring local structure since the extracted wave is sensitive to the internal structure between two stations.

We inferred the crustal phase velocity structure from surface wave tomography using the vertical component of the ambient seismic noise recorded by a dense seismic array between July 2005 and June 2006. We first extracted a Rayleigh wave by taking cross correlations. We divided the analysis area into three regions, for each of which measured the reference dispersion curve. Next, we measured the Rayleigh-wave phase-velocity anomaly against the reference for each path in various frequency bands and convert it into travel time anomaly. We finally obtained tomographic images of phase velocity structure by inverting the travel time anomalies. The velocity structure we thus obtained for 0.1-0.2 Hz shows that the low velocity zone is located beneath the west part of Mt. Asama at the depth of 5-10 km. Combining our results with the tilt motions observed after the eruption of Mt. Asama in February 2nd, 2009, suggests that the low velocity zone to the west part of Mt. Asama marks the magma chamber of the volcano.