# Analyses of explosion earthquakes during the 2004 eruption of Mt. Asama

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On September 1, 2004, a moderate eruption occurred at Mt. Asama, in central Japan, for the first time in the last 21 years. After this eruption, 4 moderate eruptions had occurred by the end of November, 2004. We installed 8 broadband seismic stations in addition to a short period seismic network around the volcano and succeeded in recording the near-field seismic signals associated with the summit eruptions.

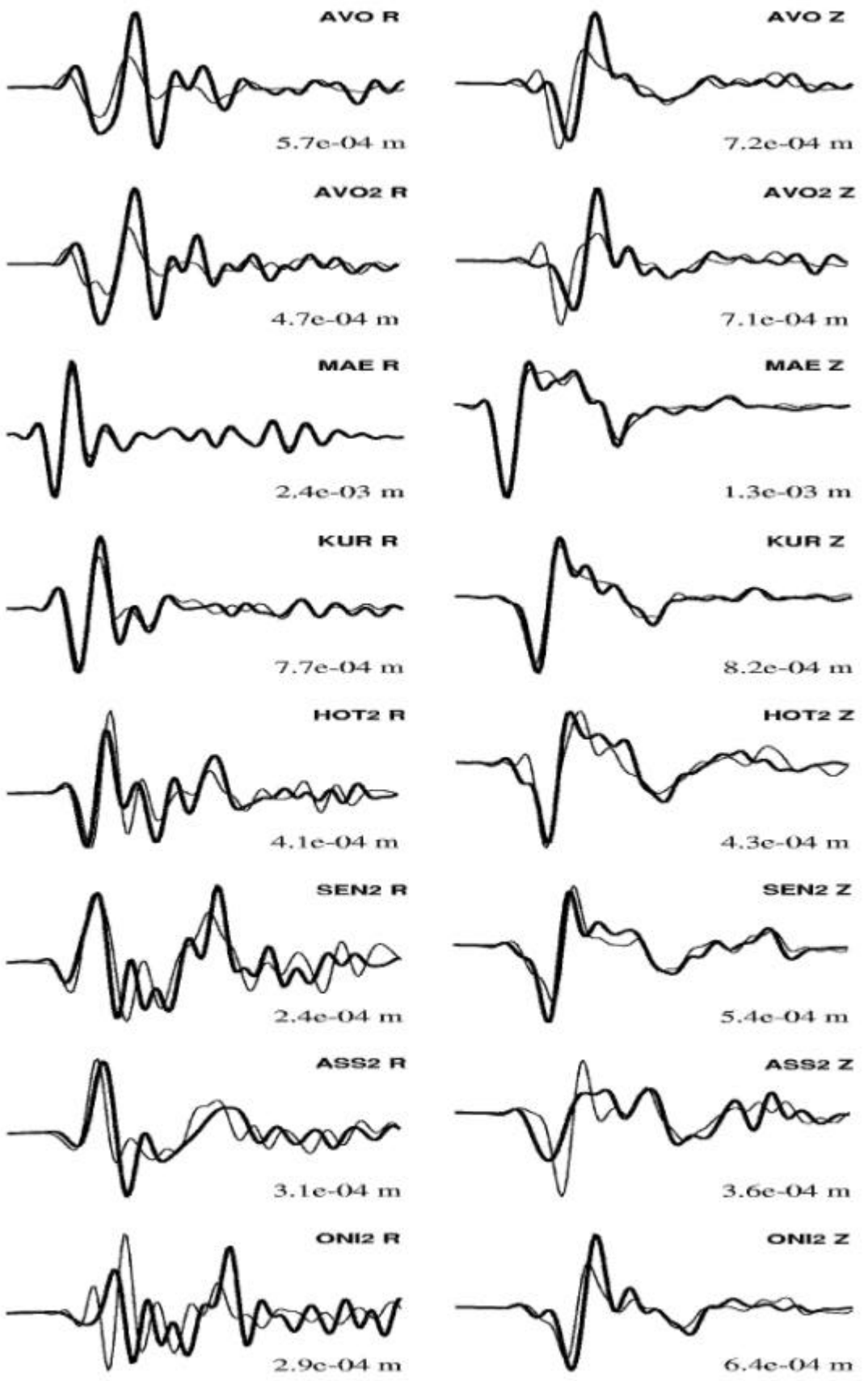
We analyzed waveforms of 5 explosions using the waveform analysis technique developed by Ohminato et al. [1998]. Waveforms are bandbass filtered at 0.1-2 Hz. The realistic topography of the volcanic edifice and homogeneous velocity and density structures were assumed for computing Green's functions. Homogeneous velocity values were determined so that the observed travel times of both P and S waves were minimized on average. The velocity and density values used in the analyses were Vp = 3280m/s, Vs = 1660m/s and r = 2.4g/cm^3, respectively. The horizontal source location was fixed at the center of the summit crater. The vertical locations of the point sources were searched between -1000m and 2400m above sea level.

The results of the waveform inversions clearly show that the force system exerted at the source region is dominated by vertical single force components. The source depth is 200-400m from the bottom of the summit crater and the order of magnitude of the single force components is 10^10-10^11Nm.

The source time histories of the vertical SF components had common features. They started with a downward force followed by an upward force. Another downward force appeared again 5-6 sec after the first downward force. These features were common to all 5 eruptions.

The initial downward force probably corresponds to the removal of the lid. The model used by Kanamori et al. [1984] to investigate the Mount St. Helens eruption in 1980 can be applied in explaining the generation of the initial downward SF observed at Mt. Asama.

A candidate for the physical process that can generate the upward single force following the initial downward force is a drag force of ascending viscous magma applied on the very shallow portion of the conduit wall. Of course, a vertical downward force that compensates for the upward force must exist in order to preserve the total momentum. Such a downward single force may be exerted at the deeper portion of the volcanic conduit. Since a point source was assumed in our analyses, a force system composed of two forces, one near the surface and another at a depth, may not have been well expressed. Probably due to the proximity to the stations, the upward force located at the shallow part of the conduit was dominant, and the downward force that was exerted mostly on the deeper portion of the conduit was not well resolved.


AVO R
5.7e-04 m
AVO Z
7.2e-04 m
AVO2 R
4.7e-04 m
AVO2 Z
7.1e-04 m
MAE R
2.4e-03 m
MAE Z
1.3e-03 m
KUR R
7.7e-04 m
KUR Z
8.2e-04 m
HOT2 R
4.1e-04 m
HOT2 Z
4.3e-04 m
SEN2 R
2.4e-04 m
SEN2 Z
5.4e-04 m
ASS2 R
3.1e-04 m
ASS2 Z
3.6e-04 m
ONI2 R
2.9e-04 m
ONI2 Z
6.4e-04 m
15s