

Temporal change in transfer function using ACROSS associated with magma intrusive event in 2015 in Sakurajima volcano, Japan

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We detected a temporal change in propagation property of seismic wave associated with a magma intrusive event on 15 August 2015 of Sakurajima volcano, Japan. The propagation property, which is called transfer function (Green's function), has been monitored continuously since 12 September 2012 using an accurately-controlled seismic source (ACROSS) and seismic stations in Sakurajima volcano island. The change in the transfer function was calculated with 2-hour resolution. Large change is detected in the initial stage of the intrusive event, when the rate of crustal deformation was maximum. The amount of change associated with the intrusive event shows a spatial variation, depending on the location of the seismic stations. We calculated cross covariance between the transfer functions before and after the event. The cross covariances for the stations near the craters of 1914 Taisho eruption show larger reduction than those in the peripheral area even for the stations of comparable distance from the ACROSS source. The stations that show large reduction of cross covariance also show phase advance toward coda part, meaning velocity increase of the media. The amount of velocity increase is estimated to be about 1%. This indicates that the velocity increase is caused by the stress increase due to the magma intrusion. The stations in the peripheral area, which shows little reduction of cross covariance, also show little velocity change even in the same direction from the intrusion source. This may result from spatial variation of stress sensitivity of the medium in the volcanic body. The material near the Taisho craters of Sakurajima volcano is more sensitive to stress probably due to less compaction of eruption material.

Keywords: Temporal variation of seismic velocity, Scattering of Seismic wave, Stress Sensitivity