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Three-dimensional seismic attenuation structure beneath Kyusyu

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The Philippine Sea (PHS) plate is subducting beneath Kyusyu and a clear volcanic front is formed through the middle of the arc. Furthermore, there is a volcanic gap between Aso and Kirishima volcanos. Seismic attenuation provides additional insights into subduction-zone dynamics, because higher-temperature environments or the existence of fluids may have different effects on seismic attenuation from on seismic velocity. Therefore the estimate of seismic attenuation is very important to understand arc magmatism and mantle dynamics in subduction zone. This study estimates seismic attenuation structure beneath Kyushu using a large number of high-quality waveform data. Data and method

We used 5195 earthquakes that occurred from April 2003 to December 2013 by applying the method of Nakajima et al. [2013] to waveform data recorded at a nation-wide seismograph network in Japan. We determined the corner frequency of earthquakes by using the spectral ratio method of S-coda waves. Then, we determined a whole-path attenuation term (t∗), site-amplification factors and spectrum level simultaneously by a joint inversion. Finally, these t∗values (N= 75207) were inverted to obtain three-dimensional attenuation structure.

The obtained results show several interesting feature. First, the subducting PHS slab is imaged as a low attenuation zone. Second, an inclined high-attenuation zone that is interpreted as mantle upwelling flow is served in the back-arc mantle. However, the inclined high-attenuation zone is less developed in the volcanic gap between Aso and Kirishima volcanos. This correspondence suggests the important role of mantle-wedge processes in the genesis of arc magmas.

Keywords: seismic attenuation structure, Philippine Sea Plate, Kyusyu