Seismic wave attenuation and local depth of seismogenic layer in the crust beneath Kyushu, Japan

*Azusa Shito[1], Satoshi Matsumoto[1], Takahiro Ohkura[2]

1. Institute of Seismology and Volcanology, Kyushu University, 2. Institute for Geothermal Sciences, Kyoto University

Attenuation of seismic wave energy is caused by two factors: scattering and intrinsic absorption. The former is the scattering of seismic wave energy due to random heterogeneities in seismic wave velocity and the density of the medium, while the latter is the conversion from seismic wave energy to heat energy by internal friction due to anelasticity of the medium. Quantifying scattering and intrinsic attenuation is important to understanding the structure of the lithosphere in terms of seismotectonic features. In this study, we separately estimate scattering and intrinsic attenuation by applying the multiple lapse time window analysis (MLTWA) technique [Hoshiba et al., 1991].

In all the studied area, intrinsic attenuation dominates over scattering attenuation at low frequencies (1-2 Hz), whereas scattering attenuation predominates at higher frequencies (> 2 Hz). The results show strong spatial variations in scattering and intrinsic attenuation that depend mainly on the tectonic setting. Areas with strong scattering and intrinsic attenuation geographically correlate with the locations of the volcanoes and active faults.

We compare the relationships between scattering attenuation and intrinsic attenuation quantitatively in the typical tectonic settings, volcanoes and active faults. Areas with relatively strong scattering attenuation correspond to the volcanoes, while area with relatively strong intrinsic attenuation correspond to the active faults. We also compare the scattering attenuation and intrinsic attenuation with local cut off depth of inland earthquakes, D90 defined as the depth, above which 90% of the earthquakes occur [Matsumoto et al., 2016]. Areas with relatively strong scattering attenuation correspond to shallow seismogenic layers. The areas geographically correlate with volcanoes.

Acknowledgments
This work was partly supported by JSPS KAKENHI Grant Number JP15J40067.

Keywords: seismic wave attenuation, seismogenic layer

