Seismic attenuation beneath Japan: Close links to arc magmatism, seismogenesis and crustal deformation

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Nakajima et al. (2013, JGR) proposed a new technique to precisely estimate seismic attenuation along a ray path, which can minimalize a strong tradeoff between corner frequency and attenuation term. They estimated 3D P-wave attenuation structure beneath Tohoku, Japan, and discussed magmatism is controlled by a mantle-wedge process that depends strongly on spatial variations in the degree of partial melt in the upwelling flow. In recent years, we have estimated 3D P-wave seismic attenuation structures beneath Kanto (Nakajima, EPS, 2014), Kyushu (Saita et al., GRL, 2015), and central Japan (Nakajima and Matsuzawa, EPS, 2017) using the method of Nakajima et al. (2013). These studies have provided important constraints on the genesis of earthquakes in the subducting Philippine Sea slab, an along-arc variation in arc magmatism in Kyushu, and the cause of a high-strain-rate zone called the Niigata-Kobe Tectonic Zone. We will review the results of these studies and show the relationship between seismic attenuation and velocity structures in the crust and the uppermost mantle in different tectonic settings, providing important roles of seismic attenuation on the understanding of ongoing processes in the Earth.

