

Three-dimensional seismic attenuation structure around Atotsugawa fault, central Japan

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Since Atotsugawa fault zone is one of the most active fault systems in Japan and a large inland earthquake occurred there, it is considered to be the best field for research of an inhomogeneous structure in the source region of intraplate earthquakes. In this region, joint seismic observations have been conducted by Japanese university group, the research institutes and JMA since 2004 [Japanese University Group of the Joint Seismic Observations at NKTZ (2005)]. It makes possible to presume a crustal structure in high spatial resolution because the interval of the stations are sufficiently dense.

To reveal a detailed attenuation structure in the Atotsugawa fault area, we applied a joint inversion method [Tsumura et al.(2000)] to the spectra data which are recorded in this area and estimated seismic source parameters and a Q structure of shallow part of the plate simultaneously.

The data used for inversion was observed in the period from November, 2005 to December, 2006. The number of seismic stations is 152. 84 earthquakes which occurred in the depths shallower than 45 km were used for the analysis and their magnitudes are 1.5 or more. First, we picked the first arrivals of P and S wave, polarity of P wave, and determined hypocenters using the velocity structure by Kato et al.(2006). Velocity spectra were calculated by FFT for the time window of 0.8s after P-wave arrival. Total number of spectrum is 3299. We assumed that the source spectrum follows the w^2 model. The parameter is determined to minimize the summation of the square of the residuals between natural logarithm of theoretical and observed spectra.

In the first layer(surface to 1.5km), low Q region is distributed as corresponding to the Mino belt mainly composed of sandstone and mudstone, while high Q region is corresponding to the Hida belt and Ryoke belt composed of metamorphic rocks and plutonic rocks. The region beneath Hida mountains has low Q down to the depth of about 11km. The Q values at both ends of Atotsugawa fault zone become lower than surrounding region. Most of hypocenters are distributed in low Q region, and hardly in high Q region in the shallow part. It suggests that there are relations in Low Q region and distribution of hypocenters.