

Seismic structure beneath the source region of the 1984 western Nagano Earthquake estimated by attenuation tomography

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By using a combined inversion method, which determines source parameters and Q values, simultaneously, we estimated a three-dimensional attenuation structure beneath the western Nagano Prefecture, Japan, where the 1984 Western Nagano Prefecture earthquake (M6.8) occurred. We use high sampling frequency (10kHz) P wave waveform data from events occurring in this region recorded by 51 stations. Obtained Q values from the surface to a depth of 2km are very low and the low Q regions correspond to low P-wave velocity regions at depths of -1km and 0km(Sekiguchi et al.,2004).These low Q and low velocity regions are mainly located on the alluvium-dominant area. This indicates the Q values near the surface are strongly affected by surface geology. Comparing distributions of Q values with that of hypocenters at depths less than 4kmm we found that earthquakes tend to occur in low Q region. Such tendency is not clear at depths deeper than 4km. Earthquakes are hardly distributed in low Q regions at depths deeper than 6 km. It might indicate low Q regions in the shallower depth are created mainly by cracks of many small earthquakes, while the Q values at the deeper part are affected by temperature there.

In this inversion, we adopted an assumption that the stress drop for each event is constant and estimated corner frequencies for the event simultaneously with Q structure. Some of the estimated corner frequencies are lower than the values which are expected by the magnitude of those events. This might be caused by the assumption of constant stress drop and the actual stress drops become lower than the rest of the area.