Fine seismic structure along the Atotsugawa fault by the analysis of seismic experiment data

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Introduction

It is very important to predict the occurrence of inland earthquakes. We did not have much knowledge about the mechanism of island earthquakes compared with that of inter-plate earthquakes because the cyclic interval of the inland earthquakes is about several hundred or several thousand years. Spatially high dense GPS array (GEONET) reveals a fine map of the strain rate distribution in Japan (e.g., Sagiya et al., 2000). A high strain rate zone, which was called the Niigata-Kobe Tectonic Zone (NKTZ), was found at the central part of Japan. To know the structure of NKTZ is important to understand the mechanism of stress and strain accumulations in the Japanese Islands. A large right-lateral fault, Atotsugawa fault, is located inside NKTZ. The seismicity map of micro earthquakes suggests clear lineation of the high seismicity zone along the Atotsugawa fault. Many seismic studies of seismicity and tomographic studies have been done at the Atotsugawa fault. The characteristic of lateral heterogeneity of the seismicity along the fault and existence of creep zone in the fault were known. The area is one of the important fields to know the mechanism of the inland earthquakes, because a large right-lateral fault is located at the central part of the high strain rate zone. We conducted a seismic experiment with explosive sources at the Atotsugawa fault zone. The five explosive sources and spatially high dense linear array were set up along the fault. A fine P-wave structure will be obtained along the fault zone.

2. Data

A seismic experiment with five explosive sources with charge size of 100 kg and 396 seismic stations was conducted in August 2005 at the Atotsugawa fault zone, central part of Japan. Digital recorders with a sampling frequency of 200 Hz were used at the seismic stations.

3. Analysis and Results

A fine seismic structure was obtained along the fault. The P-wave velocity variations were detected along the fault with the depth range of 0 km - 6 km. The obtained velocity structure at the most shallow layer was consistent with geological structure. The second layer has lateral variation of the P-wave velocity which is consistent with the geophysical phenomena. The central part of the fault, which was considered as the creep zone, was obtained to be low velocity. The seismic activity at the low velocity zone is low compared with the both sides of the zone.