Underground structure and seismicity in the Northwest part of the Chubu district with special reference to the Atotsugawa fault

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Maps of earthquake hypocenters in the Atotsugawa fault system area have been obtained, as a result of dense seismic observations, recently. According to these results, some characteristics of the Atotsugawa fault area have been made clear. For example, the depth of the seismogenic basement is different whether the active fault is creeping or not, and the closer Hida mountain range is, the shallower the depth of sesimogenic layer under the Atotsugawa fault becomes. Such seismic characters seem to be caused by heterogeneous structure around the Atotsugawa fault area. In order to reveal the relationship between the distribution of earthquakes and the heterogeneous structure, we analyzed the data of explosion seismic surveys along the fault and surrounding areas.

Two data sets are used for this study. One is observed in 2000 along the Atotsugawa fault system (the E-W profile) and another one is a part of data from the Tokai-Chubu seismic survey by JAMSTEC, ERI, Univ. of Tokyo and other universities in 2001 (the N-S profile). The N-S profile crosses the Atotsugawa fault nearly perpendicularly. In this way we can compare the crustal structure in the active fault area with those of others. Methods of the analyses are as following. Firstly, the depth of surface layer is derived from arrival time by the method of difference and/or the time term method. Secondly, static correction is adapted to remove the effect of the surface structure to derive normal move out record section. Thirdly, rays path of arrival and reflective travel times are traced to derive accurate velocity structure and the depth of reflectors. Furthermore, we also apply NMO correction to the explosion data observed at routinely operated stations in the northern Chubu district to examine roughly the spatial distribution of the reflectors.

From the results of the analyses, we derived velocity structures beneath these two profiles and reflectors. We compared these results with the cut-off depth of seismicity along these profiles, and we obtained the following conclusions: 1) Most earthquakes occur in the layer with a P-wave velocity of 5.0-6.5 km/s. 2) There are two distinct reflectors at the depths of about 12-15 km and 20-23 km. 3) The two reflectors seem to exist at and under the base of the seismogenic layer, regardless if the seismic activity is high or low. 4) The amplitude of the reflectors seems to be difference between active fault area and other areas. 5) Furthermore, the reflector is likely to be broadly distributed in planes.

The velocity structure seems to correspond to geological rock structure, therefore the reflectors may be boundary of different kind of rocks. Then we may have a crustal model consisting four layers, i.e.. surface, upper, middle and lower crusts. There may be difference in the middle and lower crustal structure between an active fault area and non-fault regions.