

Imaging of Heterogeneous Structure beneath the Metropolitan Tokyo Area (1)

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Beneath the metropolitan Tokyo area, the Philippine Sea Plate (PSP) subducts and causes damaged mega-thrust earthquakes. The Dai-Dai-Toku Project revealed the geometry of the upper surface of PSP, and estimated a rupture process and a ground motion of the 1923 Kanto earthquake [Sato et al., 2005]. However, these results are not sufficient for the assessment of the entire picture of the seismic hazards beneath the metropolitan Tokyo area including those due to an intra-slab M7+ earthquake. So, we have started a new project, the Special Project for Earthquake Disaster Mitigation in the Metropolitan Tokyo area. Proving the more detailed geometry and physical properties (e.g. velocities, densities, attenuation) of PSP is very important to attain this issue.

The core item of this project is the dense seismic array observation in metropolitan area, which is called the MeSO-net (Metropolitan Seismic Observation network). The MeSO-net consists of 400 stations including those in Hakone. In order to obtain the high resolution images of a velocity and Q structure, it is requested to construct a seismic network with a spacing of 2-5 km. The total number of seismic stations of the MeSO-net will be about 400. The MeSO-net is to be deployed in 4 years and will provide useful datasets. In this study, we applied the Natural Earthquake Reflection Profiling (NERP) method [Nakagawa et al., 2005] to the MeSO-net data.

A common midpoint (CMP) reflection method is widely used to image heterogeneous crustal structures. The sources and receivers are located at or near by the surface in the CMP method. Since the natural earthquakes are not located on the surface of the earth, we cannot use the usual CMP method. Therefore, we proposed a new method, the NERP method, to image the crust using natural earthquakes. By the NERP method, we calculate a common reflection point (CRP) for sources in the subsurface and receivers on the surface to transform original data into zero-offset depth section. This method strongly depends on the hypocentral location and origin time of earthquakes and the background velocity structure. To estimate these parameters accurately enough, the tomography method was applied. In deep earthquakes, we also use the converted waves to image the plate boundary. These analyses show the signals from the PSP, and have a potential to understand the tectonics of this area.