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Imaging of Heterogeneous Structure beneath the Metropolitan Tokyo Area (5)

Shigeki Nakagawa[1*], Shin'ichi Sakai[1], Eiji Kurashimo[1], Aitaro Kato[1], Hiroko Hagiwara[1], Keiji Kasahara[1], Toshikazu Tanada[2], Kazushige Obara[3], Naoshi Hirata[1]

[1]ERI, the Univ. of Tokyo, [2]HSRI of Kanagawa Pref., [3]NIED

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]. Hagiwara et al. (2006) estimated the velocity structure of Boso peninsula. 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 launched 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 a dense seismic array called Metropolitan Seismic Observation network (MeSO-net) for making observations in the metropolitan area. In order to obtain high-resolution images of three-dimensional velocity and attenuation structures, 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 and will be deployed in 4 years. We deployed the 226 seismic stations, which construct 5 seismic arrays such as Tsukuba-Fujisawa (TF) array, Fujioka-Kujukuri (FK) etc. The MeSO-net data are quasi-real-time transferred to the data center at ERI [Kasahara et al., 2007; Nakagawa et al., 2007]. In this study, we applied the tomography method to image the heterogeneous structure under the metropolitan Tokyo area.
We selected events from the Japanese Meteorological Agency (JMA) unified earthquake list. All data of MeSO-net were edited into event data by the selected JMA unified earthquake list. We picked the P and S wave arrival times and merged the arrival time data by Hagiwara et al. (2006) into the dataset for this study. Around the Kanto region there are several seismic explorations using active sources were carried out [Sato et al., 2005; Oikawa et al., 2007]. Since these data may improve the velocity structure in shallower part, we added the arrival time data of these explorations into the dataset. Then, we applied the double-difference tomography method [Zhang and Thurber, 2003] to this dataset and estimated the fine-scale velocity structure. The initial velocity structure is the same in Hagiwara et al. (2006), and the Vp/Vs ratio is set to 1.73 for all grid nodes.
The TF array passes directory above Tokyo and is parallel to Boso peninsula. The depth section of P-wave velocity structure along the TF array clearly shows that thin low-velocity layer which overlies high-velocity layer subducts towards northeast. This low-velocity layer corresponds to the oceanic crust of the subducting PSP. From the depth section of the FK array, we can recognize a relation between Vp/Vs ratio and seismicity in the subducting PSP.
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Keywords: MeSO-net, tomography