Seismic velocity structure beneath the Kanto region derived from NIED KT-net and Hi-net data with seismic tomographic method

Makoto MATSUBARA[1]

[1] NIED

1. Introduction

National Research Institute for Earth Science and Disaster Prevention (NIED) began to construct the Kanto-Tokai seismic network (KT-net) in central Japan from 1979 and the high-sensitivity seismograph network of Japan (Hi-net) in whole Japan from 1997. From 2003 to 2006, the system of the KT-net is replaced to the system of Hi-net. Many studies of seismic velocity structure beneath the Kanto region using data of NIED seismic network is reported. The latest study clarified the detail structure with resolution of 10 km. We can expect to obtain more detail structure with data of dense seismic network as MeSO-net. In this presentation, we introduce the results of seismic tomography with NIED data and expected result with MeSO-net data.

2. Review of velocity structure beneath the Kanto region with NIED data.

Ishida (1992) estimated the P-wave velocity (V_P) structure with 8,692 arrival time data of KT-net and revealed the upper boundary of the Pacific and Philippine Sea plate with consideration of high-velocity (high-V) zone, hypocenter distribution and their focal mechanism.

Ohmi and Hurukawa (1996) analyzed the V_P structure with 40,763 arrival time data of KT-net and imaged the low-velocity (low-V) zones at the upper boundary of the subducting slabs. They suggested that this low-V zones are oceanic crust of subducting Pacific and Philippine Sea plates.

Kamiya and Kobayashi (2000) estimated the V_P and V_S structures with 282,909 P- and 90,276 S-wave arrival time data of KT-net. They found the high-V_P/V_S zone beneath Tokyo at depths of approximately 40 km and they suggested that there is serpentinized wedge mantle.

Sekiguchi (2001) analyzed the V_P structure with 560,322 P-wave arrical time data of KT-net. He imaged the low-V oceanic crust at the uppermost part of the Philippine Sea plate and estimated the configuration of the upper boundary of the subducting plate. He also imaged the continuous Philippine Sea plate from Kanto to Tokai region as aseismic slab.

After the construction of Hi-net in Kanto region, Matsubara et al. (2005) revealed the the V_P and V_S structures using 422,799 P- and 369,596 S-wave arrival time data of Hi-net with resolution of 10 km in horizontal direction and 5-10 km in depth direction. They clearly imaged the low-V oceanic crust of the subducting Pacific and Philippine Sea plates. They revealed the low-V oceanic crust of the Pacific plate to the depth over 100 km and suggested that the subducting Philippine Sea plate distorts the corner flow induced by the Pacific plate and suppresses thermal recovery. They revealed the V_P/V_S as approximately 1.85 in the high-V_P/V_S zone beneath Tokyo and estimated that 20 % serpentinized wedge mantle exist.

Matsubara et al. (2006) overlaid the repeating earthquakes (Kimura et al., 2006) on the cross-section of the velocity structure. They found that the repeating earthquakes occur at the high-V zone of the low-V oceanic crusts of the subducting Pacific and Philippine Sea plates.

4. Expected result with MeSO-net data

I conduct the checkerboard resolution test with expected data of MeSO-net. I assume that we can detect the all P- wave arrivals at the all stations of MeSO-net from events with magnitude larger than 3.0 from 2004 to 2007. I can estimate the structure with resolution of 5 km, which is twice higher resolution than Matsubara et al. (2005). We may obtain more fine-scale structure if we detect many smaller events such as events with magnitudes within 2.5 and 3.0.