

Imaging of heterogeneous crustal structures in the mid-Niigata region, by a dense temporary seismic network

Aitaro Kato[1]; Eiji Kurashimo[1]; Toshihiro Igarashi[1]; Shin'ichi Sakai[2]; Takashi Iidaka[3]; Masanao Shinohara[1]; Toshihiko Kanazawa[4]; Tomoaki Yamada[3]; Takaya Iwasaki[5]; Naoshi Hirata[1]; Takashi Iidaka Group for the aftershock observations of the 2007 Niigataken Chuetsu-oki Earthquake[6]

[1] ERI, Univ. Tokyo; [2] E.R.I., Univ. of Tokyo; [3] ERI, Univ. of Tokyo; [4] ERI, Tokyo Univ; [5] ERI, Tokyo Univ.; [6] -

In the mid-Niigata region, two large inland earthquakes recently have occurred in 2004 (the Chuetsu Earthquake) and 2007 (the Chuetsu-oki earthquake). We deployed temporary seismic stations immediately after each mainshock occurrence. For the source region of the 2004 event, we take an advantage of using data-set retrieved by a highly dense seismic network [Kato and the Research Team of aftershock observations for the 2004 mid-Niigata Prefecture Earthquake, 2007]. In 2007, we deployed temporary seismic stations in and around the source region of the 2007 event, including ocean bottom seismometers [Kato et al., 2008; Shinohara et al., 2008]. Furthermore, we deployed a linear array of 40 seismometers with a length of about 40 km, which crosses the two source regions after the 2007 event (the spatial spacing of each seismometer in the array is roughly 1 km). After integrating all of the data set, we manually picked P- and S- wave arrivals from about 1500 aftershocks.

We elucidated a velocity structure in the mid-Niigata region by inverting arrival times from aftershocks using double-difference tomography [Zhang and Thurber, 2003]. Aftershocks associated with the 2004 event are aligned along a velocity boundary between a low-velocity zone in the hanging wall and high-velocity body in the footwall. In contrast, aftershocks associated with the 2007 events occur in a high-velocity body where P-wave velocity exceeds 6 km/s. It should be noted that the thickness of a low velocity zone, which corresponds to the hanging wall for the 2004 event, laterally changes. The thickness of the low-velocity zone gradually increases toward NW from the Echigo mountain range. Beneath the Nishiyama-hill, the thickness has the maximum value. To the coast line, the thickness steeply becomes thin, and increases to the source region of the 2007 event.