

Basement structures and lower crustal rocks of the NE Japan arc

YOSHIDA, Takeyoshi^{1*}, Dapeng ZHAO², Zhouchuan HUANG², Norihito UMINO², Junichi NAKAJIMA², Toru MATSUZAWA², Akira HASEGAWA²

¹Inst. Min. Petr. Econ. Geol., Graduate School of Sci., Tohoku Univ., ²RCPEV, Graduate School of Sci., Tohoku Univ.

NE Japan arc is one of the typical example of trench-arc-back arc basin system. Combined geological, petrological, and geophysical studies have become a valuable tool in revealing intra-crustal structures of the NE Japan. Sato et al. (2004) presented a crustal cross-section of NE Honshu arc based on the geology and the deep seismic profiling and recognized two rift systems, the Yamato basin rift system and the northern Honshu rift system. Nishimoto et al. (2005) interpreted that the lower crust of the NE Honshu arc are composed of hornblende bearing mafic rocks based on the laboratory measurements of Vp of the Ichino-megata xenoliths under high P-T conditions, to use these data in conjunction with the results of seismic tomography for evaluating the petrological characteristics of the heterogeneous lower crust of the NE Japan arc. Nakajima et al. (2008) have shown the detailed 3D seismic velocity structure estimated by travel-time tomography around Sendai, NE Honshu, and explained the complex velocity structure using its Vp, Vs and Poissons ratio as Cenozoic sedimentary pile, shallow fluid-rich plutonic rocks under cooling, H2O-filled vein fractures, mafic plutonic rocks, and partially molten lower crust. The resulted view of crustal structure of NE Honshu is closely related with the Cenozoic tectonic and magmatic evolution of the arc having three prominent stages of volcanic activity; continental margin, back-arc basin, and island-arc stages. Huang et al. (2010) determined a preliminary Vp structure and P-wave anisotropy in the eastern margin of the Japan Sea, and Zhao et al. (2011) have determined detailed 3-D Vp, Vs, and Poissons ratio structures beneath the Amur-Okhotsk plate boundary zone using a large number of arrival-time data from many earthquakes under the Japan Sea that are relocated with sP depth-phase data. Their results show that strong lateral heterogeneities exist in the crust and upper mantle under the Amur-Okhotsk plate boundary zone. We examined the compositions of the crustal rocks based the Vp, Vs values using mineral physics studies (Nishimoto et al., 2005, 2008), and the relationship between the geological basement structures and the resulted 3-D structures of the area.

Keywords: Japan Sea, 3-D velocity structure, Tanakura tectonic line, Continental crust