Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

SSS29-P16 Room:Convention Hall Time:May 24 18:15-19:30

Dependences of pore pressure on elastic wave velosities and Vp/Vs ratio for thermally cracked gabbro

NISHIMURA, Kaya[1*] ; UEHARA, Shin-ichi[1] ; MIZOGUCHI, Kazuo[2]

[1]Graduate School of Science, Toho University, [2]Central Research of Electric Power Industry

Marine seismic refraction have found that there are high Vp/Vs ratio regions in oceanic crusts at subducting oceanic plates. For example, Cascadia subduction zone (2.0∼2.8) (*Audet et al.,* 2009), Nankai Trough subduction zone (≧ 2.03) (*Kodaira et al.,* 2004), Chile subduction zone (>1.8) (*Marcos et al,.* 2012). Christensen (1984) conducted laboratory measurements of compressional and shear wave velocities (Vp and Vs, respectively) of basalt and dolerite, which are ones of major rocks in oceanic crust, and the results of Vp/Vs ratio were high enough to explain the observation for basalt, while for the measurements of dolerite, the results of the Vp/Vs ratio were not high enough. This difference may reflect the difference on porosity; porosites of the basalt and dolerite specimens were approximately 4% and 1%, respectively. Peacock *et al,.* (2011) also indicated that Vp/Vs ratio is high when porosity and pore pressure is high. But relationships between of fracture distribution and Vp and Vs for gabbro have not investigated in detail. This study reports the results of measurements of Vp and Vs at controlled confining and pore pressure and estimation of Vp/Vs ratio for thermally cracked gabbro, which is one of major rocks in oceanic crust and can mainly distribute in the high Vp/Vs ratio zone.

To prepare specimens with various fracture distribution, the rock specimens were heated at 500 ℃ and 700 ℃ for 24 hours. We also did measurement with an intact rock specimen. We measured Vp and Vs by using transmission method, with putting piezoelectric elements on the specimen. Before measuring Vp and Vs at confining and pore pressure, we did measurements under atmospheric pressure, and revealed the anisotropy of the velocities of up to 10 %. We measured Vp and Vs for four directions at confining and pore pressure. Confining pressure was constant, 50 MPa, and pore pressure was decreased from 49 to 0.1 MPa and then increased to 49 MPa. For the specimen thermally cracked under 500 ℃, when pore pressure was 49 MPa, Vp/Vs ratio was 2.0∼2.1. This is close to the value of Vp/Vs which was obtained by marine seismic refraction. On the other hand, the Vp/Vs ratio of intact rock did not change as pore pressure changed and were almost constant, approximately 1.5.

At the presentation, we will also show the results of measurements of fracture distribution such as fracture densities or apertures, and reveal the relationship between them and the results of the experiment.

This work was supported by JSPS KAKENHI Grant Number 26400492.

Keywords: Gabbro, Vp/Vs ratio, Elastic wave velosity, High pore pressure