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Physical properties of Eastern Flank of the Juan de Fuca Ridge: Results from IODP Expedition 301

Takeshi Tsuji[1], Gerardo J. Iturrino[2], Fumio Kono[3], Tatsuo Saeki[3], Hidekazu Tokuyama[1], and IODP Expedition 301 Shipboard Scientific Party
1. Ocean Research Institute, University of Tokyo
2. Lamont Doherty Earth Observatory of Columbia University
3. TRC, JOGMEC

IODP Expedition 301 drilled on the eastern flank of the Juan de Fuca Ridge for the purpose of establishing a multidisciplinary research program to evaluate the formation-scale hydrogeologic properties within the oceanic crust, determine the distribution of fluid pathways within an active ridge flank hydrothermal system, resolve linkages between geomicrobial, alteration, and fluid flow processes, and establish relationships between seismic and hydrologic anisotropy. These goals were accomplished by a series of coring and downhole logging operations as well as by installing and replacing several subseafloor long-term observatories. Here we show the results obtained from physical properties and downhole logging measurements. The primary focus is placed on the acoustic properties (P-wave velocity, S-wave velocity, and P-wave quality factor) of 10 basaltic samples obtained under high confining pressures (up to 40 MPa) and their internal structures interpreted from computed tomography (CT) images. The basaltic samples were selected from pillow-lava and massive-flow intervals. P-wave velocities obtained from saturated samples at 40MPa range from 5247 m/s to 6241 m/s with an average value of 5739 m/s. This average value is higher than the average velocity that was measured from shipboard analyses (5340 m/s), whereas S-wave velocities under the same conditions range from 3004 m/s to 3597 m/s with an average value of 3319 m/s. From these pressure dependent velocities, we estimate the aspect ratio of cracks with theoretical equation (Kuster and Toksoz, 1974). P-wave quality factors were calculated using the spectrum division technique (Toksoz et al., 1979). Furthermore, the relationships between acoustic properties and mineralogy using CT images suggest that mineralogy controls the acoustic properties.

References

[1] Kuster, G.T. and M.N. Toksoz, Velocity and attenuation of seismic waves in two-plane media, Part I: theoretical formulations, *Geophysics*, 39, 587-606, 1974.
[2] Toksoz, M.N., D.H. Johnston, and A. Timur, Attenuation of seismic waves in dry and saturated rocks: 1. Laboratory measurements, *Geophysics,* 44, 681-690, 1979.