AOGS 2005
©2005 Asia Oceania Geosciences Society, Singapore

The effect of water on elastic-wave velocities under *in situ* conditions of seismogenic zone

Keigo Kitamura[1], Koji Masuda[1] and Hisao Ito[1]
1 Geological Survey of Japan, AIST

Laboratory measurements of elastic-wave velocities under the *in situ* conditions are useful to estimate the physical properties around the fault zone and to interpret the geophysical survey results conducted on the ground. We measure the seismic-wave velocities under the pore-free conditions to evaluate the intrinsic physical properties of core materials. With the intrinsic physical properties, we will construct pore/crack model for fault zone. In this study, we developed new method for measuring elastic-wave velocities. Experimental apparatus we used is the gas-medium, high-pressure and high-temperature deformation apparatus at AIST Japan (Masuda *et al.*, 2002). We measured elastic-wave velocities of Berea sandstone samples with the cylindrical shape (20mm diameter and 20mm length). The experiments were carried out under various temperature conditions (25 and 200 °C) at high-effective confining pressure (P_{eff} =130MPa), which is defined as $P_{eff}=P_c- \alpha P_p$ where Pc (130 and 200 MPa) is confining pressure, Pp (0 and 70 MPa) is the pore-fluid pressure, and "α" is a coefficient (in this study α=1). Previous studies indicated that elastic-wave velocities are controlled by the effective-.confining pressure law (e.g. Todd and Simmons, 1972). Thus, in this study, Vp and Vs are measured under fixed effective-confining pressure (P_{eff} =130 MPa) and two temperature conditions (25 and 200°C) in order to evaluate the effect of water on Vp and Vs. In the room-temperature condition (25°C), Vp and Vs did not show significant differences between in the dry condition and in the wet condition (Dry; Vp=4.46 km/s, Vs=2.67 and Wet; Vp=4.42 km/s, Vs=2.62km/s). However, Vp and Vs measured in the dry and in the wet condition at the same temperature of 200°C showed the significant difference (dry; Vp=4.02 km/s, Vs=2.33 and wet; Vp=3.90 km/s, Vs=2.24km/s). These results propose that the effective-confining pressure law does not establish in wet and high-temperature condition. We apply our new method to measure physical properties of core samples taken from the fault-zone drilling project such as the Taiwan Chelungpu Drilling Project.

References

[1] K. Masuda and K. Fujimoto and T. Arai, *Earth Planets Space,* **54**, 1091 (2002).
[2] T. Todd and G. Simmons, *J. Geophys. Res.,* **77**, 3731 (1972).