Velocity and Q measurements at high pressure and temperature using a large-volume cylinder

Hiroki Sato[1]; Kazuhiko Ito[2]; Hideki Kanazawa[3]

[1] Earth and Space Sci., Osaka Univ.; [2] Faculty of Management Information, Taisei Gakuin Univ.; [3] Human and Environmental Studies, Kyoto Univ

For the piston-cylinder type apparatus, we have developed a technique to determine an accurate travel time in a sample at high pressure and temperature, regardless of the buffer rod geometry. We show that our method allows simultaneous attenuation measurements. In-situ measurements of travel time and spectral amplitude of echoes transmitted only within the sample are essential for determining accurate velocity and attenuation simultaneously at high pressure and temperature. By observing both the direct and reflected echoes, pulse overlap and spectral ratio techniques are conveniently used to determine intrinsic sample properties, and to eliminate unknown extrinsic effects, such as buffer rod properties, assembly geometries and frequency characteristics of transducers and instruments being common to both echoes. The present study provides a simple and practical method for determining both velocity and attenuation at high pressure and temperature.

Further, we have newly developed a large-volume piston-cylinder type apparatus of 60 mm inner diameter, 500 mm outer diameter and 200 mm height. We are able to produce a sample volume as large as 20 mm diameter and 20 mm height. Such a large volume allows us to determine accurate velocity and attenuation in mineral and rock samples at high pressure and temperature.

The authors thank Prof. S. Yoshida at the Earthquake Research Institute of the University of Tokyo, for the high pressure facilities. This work was supported by grants from JSPS (15540459), and from the Earthquake Research Institute of the University of Tokyo (2004-A-15).