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Elastic-wave velocity of serpentinites under high pore-fluid pressure

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Serpentine is one of the candidates to explain low-velocity anomaly and high Poisson ratio in subduction zones. However, extremely high Poisson ratio found beneath Kanto and southwest Japan requires the presence of aqueous fluid in addition to the serpentinites. In this study, we investigated the effect of pore fluid pressure on elastic-wave velocity of antigorite using intra-vessel apparatus at Pc = 10-200 MPa, Pp = 10-100 MPa and room temperature. Compressional and shear-wave velocities under dry condition increase with increasing confining pressure, and Vp/Vs increases slightly. At wet conditions, elastic velocities decrease with increasing pore fluid pressure, and Vp/Vs increases slightly. However, the effect of pore pressure is rather weak, in which Vp/Vs = 1.804 at Pp = 10 MPa shifted to Vp/Vs = 1.811 at Pp = 100 MPa. This indicates that the relatively low-porosity serpentinites can not explain the observed high Poisson ratio, even in high fluid pressure; consequently, much higher porosity due to fracturing is required to increase Poisson ratio at the plate boundary.

Keywords: Elastic-wave velocity, pore-fluid pressure, Vp/Vs, serpentinite