

Anomalous Vp/Vs Ratios at Seismic Frequencies Might Evidence Highly Damaged Rocks in Subduction Zones

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Unusually high compressional (P) to shear (S) wave velocity ratios (Vp/Vs) were measured at different subduction zones and interpreted as fluid-pressurized regions. Because no laboratory data reported such high values in isotropic rocks, mineralogical or anisotropic constrains were assumed. However, fluid-saturated rocks' Vp/Vs is a frequency-dependent property so that standard laboratory measurements cannot be directly upscaled to the field. Using a new methodology, we measured the property in the elastic regime relevant to field measurements for diverse lithologies. We obtained extreme Vp/Vs values, consistent with those reported at seismic frequency in the field. Consistently with a model, it shows that if high fluid pressure is a key factor, anomalous Vp/Vs values could evidence intense degrees of microfracturation in isotropic rocks, whichever its mineralogical content. The permeability of these regions could be larger than 10^{-16} m^2 .

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