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# Can temperature variations alone explain large-scale seismic Vs and Qs variations in the continental lithosphere?

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Seismic velocity and attenuation anomalies in the mantle are commonly interpreted in terms of temperature variations on the basis of laboratory studies of elastic and anelastic properties of rocks. In order to evaluate the relative contributions of thermal and non-thermal effects into anomalies of attenuation of seismic shear waves, Qsˆ-1, and seismic velocity, Vs, global elastic and anelastic seismic tomography models based on Rayleigh waves at periods between 40 and 150 sec (Billien et al., GRL, 2000) are analyzed jointly with thermal model for the upper 150 km of the continental mantle (Artemieva and Mooney, JGR, 2001). Theoretical Vs(T) and Qs(T) based on experimental data on T-dependence of seismic parameters are used to evaluate the relative contributions of thermal and non-thermal effects into anomalies of seismic velocity and attenuation. The results show that T-variations alone are sufficient to explain seismic Vs and Qs only in ca. 50 per cent of continental regions (Artemieva et al., Geophys. J. Int., 2004). In these regions, more than 1/2 of amplitude of Vs and Qs anomalies should be attributed to non-thermal mechanisms (i.e. compositional variations, fluids, partial melts, scattering). Compositional anomalies due to Fe-depletion can explain the misfit between seismic and theoretical Vs in cratonic lithosphere. In regions of active tectonics, partial melts and/or fluids are likely to affect seismic parameters.