

Are we able to detect viscoelastic inconsistencies in the Earth?

The frequency responses of loss moduli of a linear viscoelastic or anelastic continuum shall be consistent with the frequency responses of the respective storage moduli. The same applies to quality factors and the corresponding seismic wave velocities. Our recent reprocessing of earlier laboratory viscoelastic experiments on basaltic lavas shows a general tendency to ideal consistency of the viscoelastic shear modulus with increasing temperature under the atmospheric pressure. Nevertheless, in some samples at some temperatures, we encountered truly large inconsistencies in terms of the ratios of relaxation time spectra. To identify the mechanisms leading to such behaviour, more laboratory experiments are needed. The role of pressure shall also be examined. In parallel, the seismotomographic experiments searching for viscoelastic inconsistencies within the Earth are worth to be considered and their feasibility assessed. If there are any inconsistency spots prominent enough to be detected by seismic tomography, it would be interesting to see whether they coincide with tectonically active zones.

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