Attenuation of teleseismic *P* waves in potentially melt-bearing regions

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We present a hypothesis for the effect of melt retained in the upper mantle on seismic attenuation and new constraints on attenuation beneath the Appalachian Mountains. We compare new measurements of attenuation of teleseismic *P* waves in the Snake River Plain and Salton Trough with prior results for seismic velocity and attenuation from these and other regions. Both *Vs* and *Qp* are often observed at values too low to be consistent with the current generation of experimentally based predictions for a melt-free upper mantle, even when accounting for "premelting" anelastic effects. Regions that likely experience significant shear show higher attenuation values than those that do not. In conjunction with further constraints on seismic anisotropy, we hypothesize that shear driven segregation activates the "melt squirt" mechanism for seismic attenuation in these regions. In this context, we present new measurements of seismic attenuation on data from the MAGIC array, which crosses a local maximum in the elevation of the Appalachian Mountains. Seismic attenuation is more pronounced on the eastern than western half of the line, with the boundary corresponding remarkably well to the onset of high elevation. There is a ~100 km wide peak in attenuation beneath the mountains themselves. The observations constrain *Qp* to be low enough that melting is possible beneath a mountain range long removed from the original orogenic event.