

Some relationships between seismic velocities,
elastic moduli, and density (after Christensen)

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Variables	Bulk Modulus, κ	Young's Modulus, E	Lamé's λ	Poisson's Ratio, ν	Rigidity, μ
ρ, v_p, v_s	$\rho(v_p^2 - (4/3)v_s^2)$	$\rho v_s^2 \frac{(3v_p^2 - 4v_s^2)}{v_p^2 - v_s^2}$	$\rho(v_p^2 - 2v_s^2)$	$\frac{v_p^2 - 2v_s^2}{2(v_p^2 - v_s^2)}$	ρv_s^2
λ, μ	$\lambda + (2\mu/3)$	$\mu \frac{3\lambda + 2\mu}{\lambda + \mu}$	-	$\frac{\lambda}{2(\lambda + \mu)}$	-
κ, λ	-	$9\kappa \frac{\kappa - \lambda}{3\kappa - \lambda}$	-	$\frac{\lambda}{3\kappa - \lambda}$	$(3/2)(\kappa - \lambda)$
κ, μ	-	$9\kappa \frac{\mu}{3\kappa + \mu}$	$\kappa - (2\mu/3)$	$\frac{3\kappa - 2\mu}{2(3\kappa + \mu)}$	-
E, μ	$(E\mu/3)(3\mu - E)$	-	$\mu \frac{E - 2\mu}{3\mu - E}$	$(E/2\mu) - 1$	-
κ, E	-	-	$3\kappa \frac{3\kappa - E}{9\kappa - E}$	$\frac{3\kappa - E}{6\kappa}$	$\frac{3\kappa E}{9\kappa - E}$
λ, ν	$(\lambda/3)(1 + 1/\nu)$	$(\lambda/\nu)(1 + \nu)(1 - 2\nu)$	-	-	$(\lambda/2\nu)(1 - 2\nu)$
μ, ν	$\mu \frac{2(1 + \nu)}{3(1 - 2\nu)}$	$2\mu(1 + \nu)$	$2\mu \frac{\nu}{1 - 2\nu}$	-	-
κ, ν	-	$3\kappa(1 - 2\nu)$	$3\kappa \frac{\nu}{1 + \nu}$	-	$(3\kappa/2) \frac{1 - 2\nu}{1 + \nu}$
E, ν	$E \frac{1}{3(1 - 2\nu)}$	-	$E \frac{1}{(1 + \nu)(1 - 2\nu)}$	-	$(E/2) \frac{1}{1 + \nu}$