Excel Macro for Calculating Rock Physical Properties

Award: MARGINS-Related

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An Excel macro to calculate mineral and rock physical properties at elevated pressure and temperature is available. The workbook includes an expandable database of physical parameters for 52 rock-forming minerals stable at high pressures and temperatures. For these minerals the elastic moduli, densities, seismic velocities, and H_2O contents are calculated at any specified P and T conditions, using basic thermodynamic relationships and third-order finite strain theory. The mineral modes of suites of rocks are also specifiable, so that their predicted aggregate properties can be calculated using standard solid mixing theories. A suite of sample rock modes taken from the literature provides a useful starting point. The results of these calculations can be applied to a wide variety of geophysical questions including estimating the alteration of the oceanic crust and mantle; predicting the seismic velocities of lower-crustal xenoliths; estimating the effects of changes in mineralogy, pressure and temperature on buoyancy; and assessing the H_2O content and mineralogy of subducted lithosphere from seismic observations.

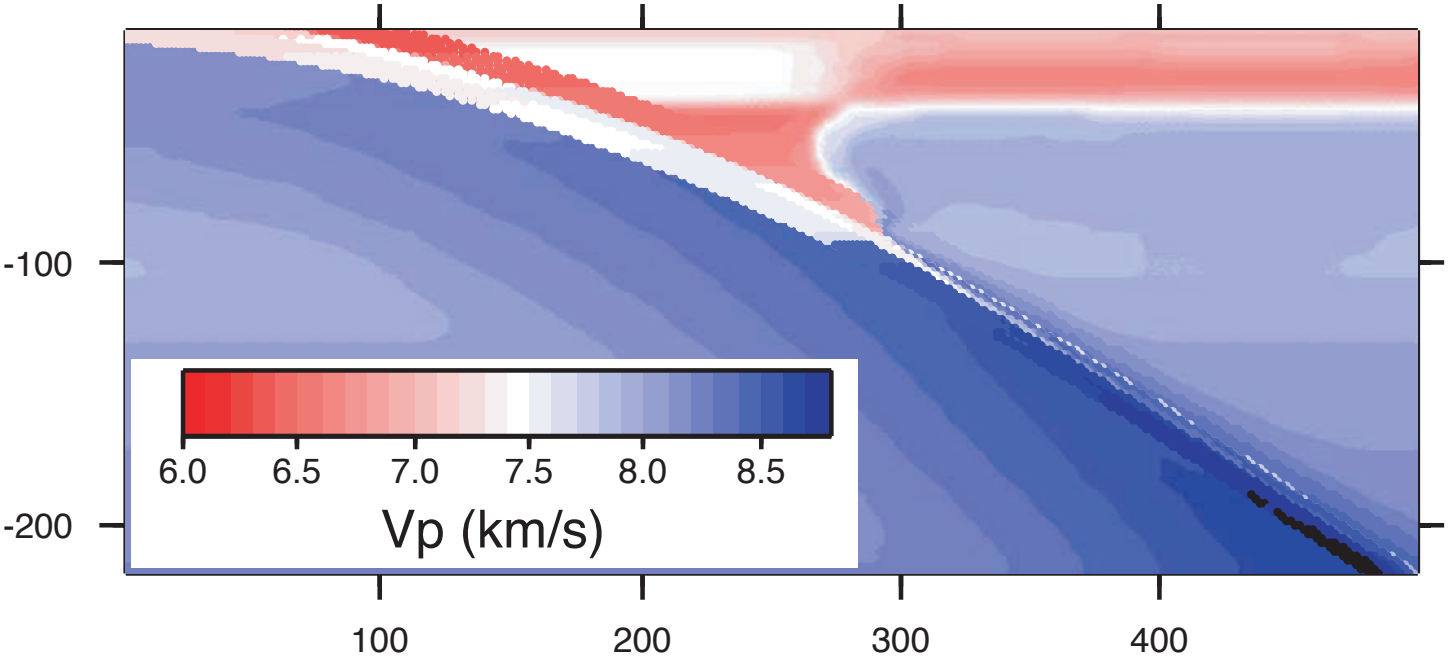

Figure: P-wave velocities calculated for northern Japan subduction zone (melt and anelastic effects not included). Axes in km.

Hacker, B.R., Abers, G.A., and Peacock, S.M., 2003. Subduction Factory 1. Theoretical mineralogy, densities, seismic wave speeds, and H_2O contents. Journal of Geophysical Research, v. 108, 10.1029/2001JB001127. http://www.agu.org/journals/jb/jb0301/2001JB001127/2001JB001127.pdf

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