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The Lower Crustal Melt Distribution Within the East Pacific Rise, 9°30'N, from a Combined Study of Compressional-Wave Velocities and Seafloor Compliance Data

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Most of the melt within the fast-spreading East Pacific Rise (EPR) crust at 9-10°N sits within a 4-6 km wide and 2-4 km tall lower crustal partial melt zone detected by seismic and seafloor compliance studies. However, we do not know how much melt there is or how it is stored and/or transported, because different combinations of temperature, melt fraction, melt geometry and rock composition can have the same compressional-wave velocity. Whole-crustal compressional-wave velocity and seafloor compliance data have been collected and separately interpreted at 9°30'N on the EPR. The compressional-wave velocity data was interpreted to indicate up to between 10% and 38% melt in the lower crust, depending on the melt geometry and the importance of anelasticity [Dunn *et al.*, 2000], but this interpretation only takes into account a subset of the possible melt geometries and does not account for the sensitivity of melt generation to rock composition. We investigate the range of possible melt amounts and geometries by modeling as broad a range of melt geometries as possible and testing the effect of compositional and melt geometry variations with depth. We first determine the large model space fitting the compressional-wave velocity model of Dunn *et al.* [2000]. We then reduce this model space by comparing the low-frequency (0.01 Hz) shear modulus calculated for each model with the measured seafloor compliance. Seafloor compliance measurements are sensitive to the crustal shear modulus at frequencies between 0.003 and 0.03 Hz, and the relationship between this shear modulus and the compressional-wave velocity at seismic frequencies (10-15 Hz) depends on the rock composition, melt geometry and the importance of anisotropy. We present the new model space and discuss its implications for crustal accretion at the East Pacific Rise.