

The topography of the core-mantle boundary from P4KP-PcP travel time: A test inversion

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We have observed P4KP-PcP travel times. They were corrected for the hydrostatic ellipticity at the core-mantle boundary (CMB) and mantle heterogeneity with a tomographic model, now we are ready for the inversion of CMB topography. Spherical harmonic expansion is adopted for the expression of the CMB topography. The magnitudes of the elements of the Jacobian matrix indicate odd degree components are insensitive to the P4KP-PcP data. This characteristic is due to a symmetrical ray geometry. Here we solve only the components of degrees 0, 2, and 4, resulting in fifteen unknowns. A test inversion using the least squares method is applied to 163 P4KP-PcP travel times that we have so far. Consequently, the CMB topography with the maximum amplitude of ± 5 km is obtained. The average core radius is approximately 2 km larger than that of PREM if we adopt the velocity structure inferred from SmKS waveforms. The standard deviation of the P4KP-PcP residuals is reduced from 0.58 s to 0.46 s. However, the uncertainties for the spherical harmonic coefficients are not smaller than the corresponding solutions in general. Therefore, it is still premature to discuss the pattern of the resultant CMB topography for the implication of the Earth's dynamics at present.