

# Supporting Information for “Long-wavelength topography and multi-scale velocity heterogeneities at the core-mantle boundary”

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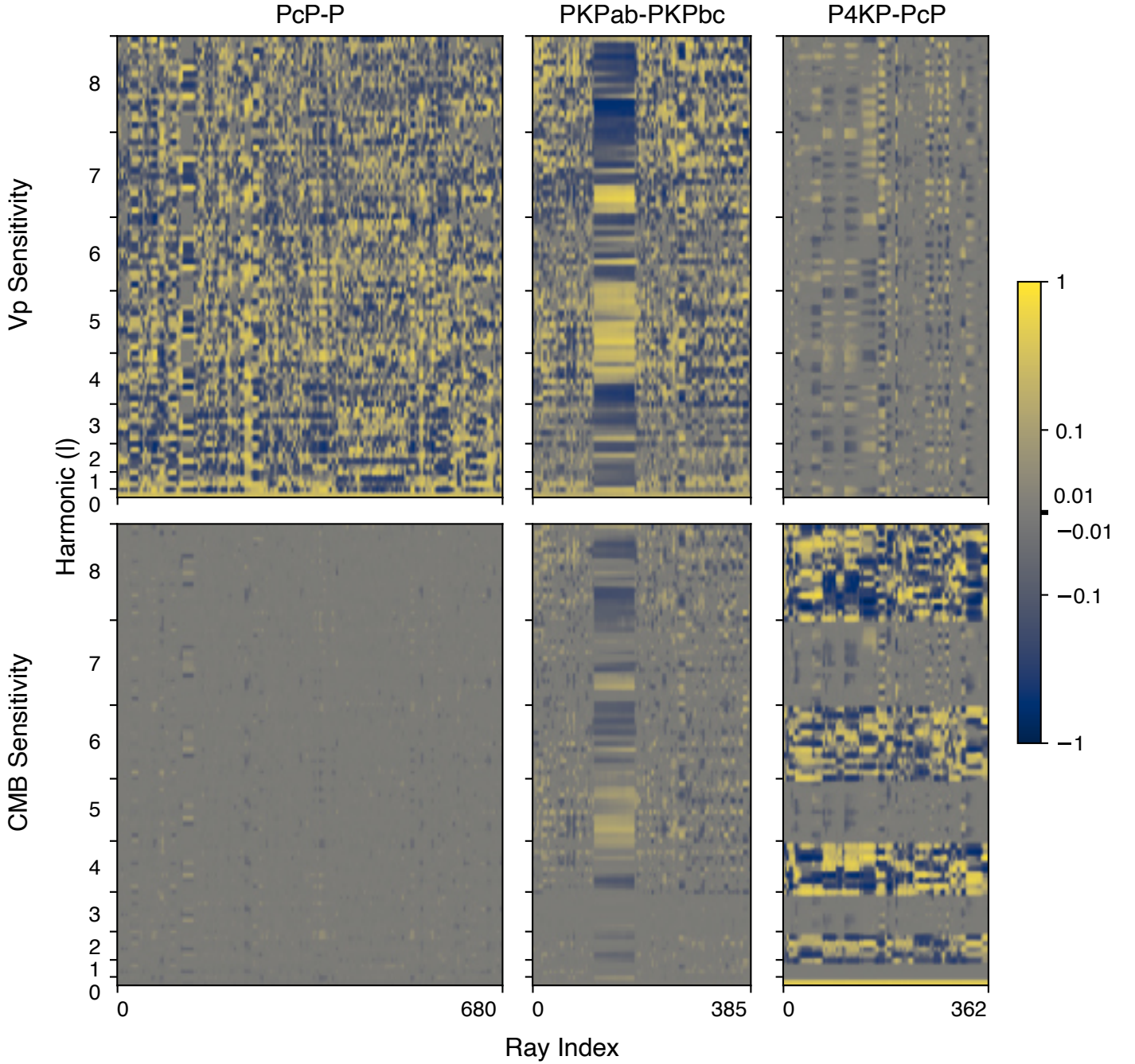
**Table S1.** Table of hyperprior scales used to in the inversion.

**Figure S1.** Relative scale of the  $G$  kernel matrix elements shows the sensitivity of different degrees to different rays. Elements are plotted on a symmetric log scale, other than between  $\pm 0.03$  which is on a linear scale. The  $V_P$  and CMB radius kernels are separately normalized to the maximum amplitude value of  $\mathbf{G}_{\delta_s}$  and  $\mathbf{G}_{\delta_r}$ , respectively. The vertical axis ticks show the edges of harmonic degree  $l$ , which are ordered from  $m = -l$  to  $m = l$  from bottom to top.

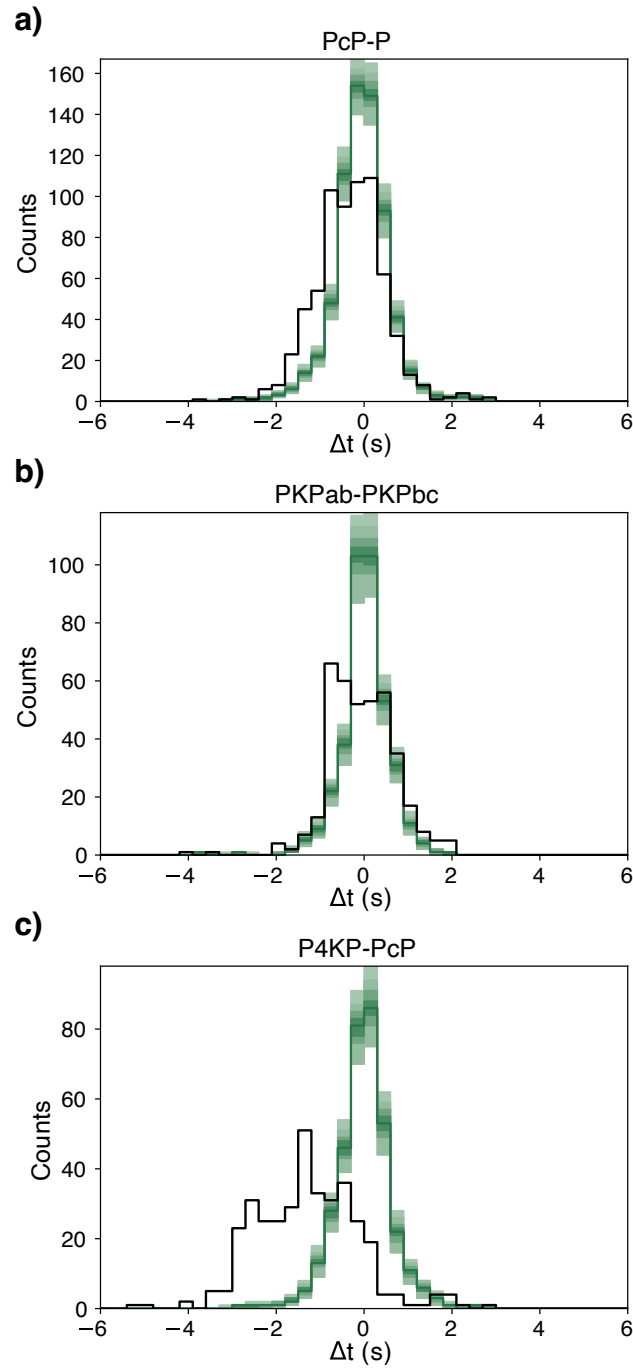
**Figure S2.** Travel time residuals for the 3 datasets used in this study. a) PcP-P, b) PKPab-PKPbc, c) P4KP-PcP Black histograms show the initial distribution of residuals, and green histograms show the deciles of remaining residual distributions after inversion.

Hyperprior scale	Value (Unit)
$\nu_{\delta r}$	5 (km)
$\nu_{\delta s}$	5 (s/Mm)
$\nu_{PcP-P}$	2 (s)
$\nu_{PKPab-PKPbc}$	2 (s)
$\nu_{P4KP-PcP}$	2 (s)

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**Figure S2.** Travel time residuals for the 3 datasets used in this study. a) PcP-P, b) PKPab-PKPbc, c) P4KP-PcP Black histograms show the initial distribution of residuals, and green histograms show the deciles of remaining residual distributions after inversion.