Sensitivities of Finite-Frequency PKP phases to Inner Core Structure

Li-Yu Kan (1), Li Zhao (2), and Hao Kuo-Chen (1)

(1) Institute of Geophysics, National Central University, Chungli, Taiwan, (2) School of Earth and Space Sciences, Peking University, Beijing, China

Current studies on the inner core structure using body waves typically measure the differential travel times between different branches of PKP phases, which are then modeled by ray theory that does not account for the finite widths of the Fresnel zones of seismic waveforms. In this study, we use the MC Kernel software package developed by Stähler and co-workers to calculate the sensitivity kernels of the travel times and amplitudes of relatively short-period (up to 1 Hz) seismic waves in spherically symmetric Earth models. These finite-frequency sensitivity kernels improve our understanding on how seismic signals sample the structure in the deep Earth and enable us to analyze the finite frequency effect that has so far been ignored in deriving the inner core models. We focus on examining the sensitivities of phases that are typically used in inner core structural studies such as PKPab, PKPbc, PKiKP, and PKPdf. We also evaluate the differential kernels, for example, PKPbc-PKPdf and PKPab-PKPdf, to investigate the possible effect of mantle heterogeneities on inner core models.