Exploring the core mantle boundary with seismic noise

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The ambient noise correlation technique permits to retrieve the Green's function between pairs of seismic sensors by correlating long time series of seismic noise. This method makes it possible to reconstruct to seismograms in the absence of transient sources. As the retrieved Green's function from noise correlation is dominated by surface waves, the method is nowadays widely applied to map the seismic velocity in the crust and upper mantle. Recent works (Poli et al., 2012; Nishida, 2013, Boué et al., 2013) highlights the possibility to retrieve teleseismic body wave from seismic noise correlation. As such body waves sample the deepest part of the Earth they can be used to imaging the deep mantle structures and the Earth's core. We here focus our attention on one of the most intriguing zones of the Earth interior - core mantle boundary (CMB). Using seismic noise correlation calculated using stations placed everywhere in the world we study the CMB in different geographical locations. We particularly focus on the presence of seismic precursors associated with seismic velocity anomalies above the CMB, by using array stacking method and short period (7s) seismic noise correlation. As crosscheck of our study we compare the results obtained from noise correlation, with the more classical studies performed using earthquake signals. As the noise correlations provide seismograms also in absence of transient seismic sources, the method permits to study regions poorly illuminated from earthquakes and would improve our knowledge of the deep mantle structure, and the related geodynamical topics.

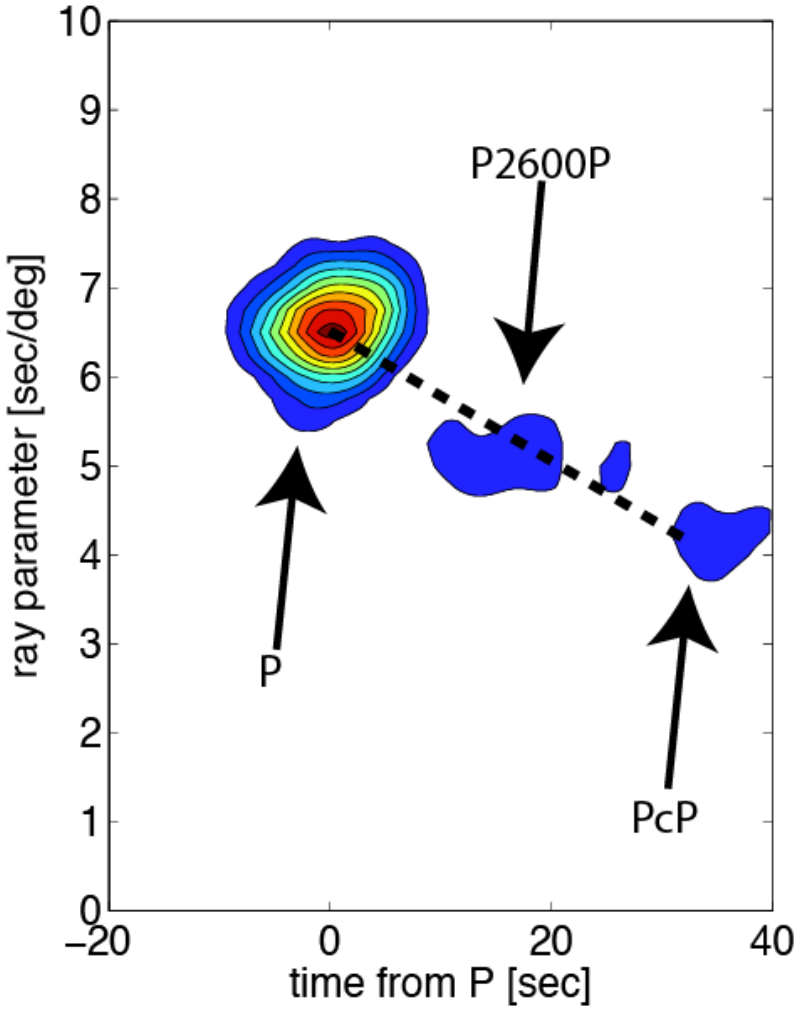

Figure 1. Stlant stack of seismic noise correlations calculated using data from Lapnet array (FInland) and F-Net array in japan. Three main energetic arrivals associated with direct P waves, PcP waves and P waves reflected at the top of low velocity zone (~2600km) are evident.