

Attenuation structure of Inner Core inferred from short-period Hi-Net data

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The attenuation structure of the inner core is studied utilizing the short-period Hi-net data. Assuming the effect of the outer core attenuation and the path difference of core phases in the mantle are insignificant, we use either PKP-ab or PKP-bc as a reference phase to measure the relative attenuation of PKP-df phase which we attribute to the inner core origin. We first measure the relative attenuation of PKP-df by the conventional spectral division method and by the time domain Q-filter method to estimate the relative t^* . We apply the analysis for two intermediate depth earthquakes occurred beneath South America (2001/06/29 18:35:51 Southern Bolivia: 276km depth, Mw 6.1, distance 144-161 degrees; 2002/9/24 3:57:22 Argentina: 121km depth, Mw6.4, distance 151-164 degrees). The estimated t^* shows large scatter and does not appear to be a robust estimator of the inner core attenuation.

We then use the relative amplitude of PKP-df around 1Hz to estimates t^* as a function of the epicentral distance. Corrections solely based on the geometrical ray theory are applied. The resulting t^* for the Southern Bolivia event shows a clear peak in a distance range whose corresponding bottoming depth in the inner core is about 300km from the ICB. This pattern of t^* is confirmed for two other events occurred in the area (2003/4/27 22:57:43 Western Brazil: 556km depth, Mw 6.0, distance 132-149; 2003/7/27 11:41:31 Southern Bolivia, 350km depth, Mw 6.0, distance 145-162 degrees), and thus seems to be a robust feature of our data set. This pattern can be explained by a low Q (~ 200) region in a depth range of 200-300km followed by a sharp increase of Q (~ 700) below 300km depth. The resulting t^* for the Argentina event, on the other hand, shows a complicated pattern indicating the presence of a small scale heterogeneity either in the velocity or attenuation structure.