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Hemispheric variation of the depth dependent attenuation structures of the top half of the inner core

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Previous studies suggested the existence of the hemispheric heterogeneities in the top 100 km of the inner core (ex. Wen and Niu, 2002). However, the depth dependent profiles of the attenuation have not been well constrained because of the poor resolution due to difficulties in analyzing contaminated core phase data. Iritani et al. [2010, GRL, 2011, SSJ] employed a waveform inversion method based on simulated annealing (SA) that enables to analyze complicated waveforms with phase overlapping and applied it to Hi-net and NECESSArray data. The obtained models show similar features that we have definite high attenuation zone around 200 km depth from ICB.

In this study, we collect high-quality core phase data from large number of broadband arrays to obtain the depth dependent profiles of the top half of the inner core in various regions. The resultant data set consists of about 8,500 waveform traces from PASSCAL arrays deployed in a number of places in the world, permanent European stations and USArray. Sampling regions are beneath northeastern Pacific, American and African continent for the western hemisphere of the inner core, and eastern and central Asia for the eastern hemisphere. We apply the same method as Iritani et al. [2010] to these data. In general, the obtained attenuation models for the western hemisphere show the gradually increase from ICB and have a peak around 200 km depth and those for the eastern hemisphere have a high attenuation zone at the top 150 km layer. However, almost all models show common features below 250 km depth and attenuation gradually decreases with depth. We also obtain the averaged structure models for each hemisphere, and similar features are observed. It appears that hemispheric heterogeneities of the inner core are confined in the top 150 - 250 km of the inner core.

キーワード: inner core, attenuation, hemispheric structure
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