Seismic structure near the inner-core boundary beneath Antarctica

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Seismic waves to the broadband seismic network in Indonesia called JISNET (Ohtaki et al., 2000) from the earthquakes of South America pass the inner core under Antarctica. We analyzed these core phases to determine the seismic structure near the inner core boundary (ICB) beneath the Antarctica.

The events used in this analysis occurred in South America from 1998 to 2000. We selected the data whose PKPdf ray turns in the inner core or cross the ICB in the region of 70 degrees or more south, and of good S/N ratio. In this analysis, we used 4 earthquakes whose core phases that meet the above-mentioned criteria are observed in several JISNET stations. The epicentral distances are from 130 to 161 degrees, which is suitable for analyzing seismic structure around the ICB. We compute the synthetics using the Direct Solution Method (Takeuchi et al., 1996) with the earth reference model PREM.

First we determine the Vp structure at the base of the outer core using the amplitude ratio of PKPbc and PKPdf. Next, using the travel time difference between PKPcd (PKiKP) and PKPdf for the velocity jump across the ICB. The gradient of Vp in the inner core was obtained by using the travel time difference between PKPbc and PKPdf. PKPab was not used. As a result, we fond that our preliminary model of the P wave velocity which is constant at about 100km in the bottom of the outer core, has 1.5times steeper slope than PREM in the uppermost inner core, and whose velocity jump across the ICB is 0.05 km/s smaller than that of PREM explains the observation well. The radius of the inner core of the model is the same as that of PREM. We examined the several Qp models that have low Qp (Qp=200) in the uppermost inner core based on the recent works, and found that such low Qp models do not influence the observed amplitudes. It was confirmed that our preliminary model explains the observed waveforms which pass through near beneath the Antarctica.

The low velocity of our preliminary model at the base of the outer core is found in the result of Souriau and Roudil (1995), and the low velocity at the top of the inner core is consistent with the model of Kaneshima et al. (1994). Therefore, it is thought that the structure in the vicinity of the inner core boundary in the pole region is probably similar with the structure in the low latitude region.