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Waveform sensitivity to velocity model and applying CG method to obtain S wave velocity structure beneath Central Asia

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The lowermost mantle (which is called the D" region) is a boundary layer for mantle convection and is also a boundary layer between the outer core (composed primarily of molten iron) and the mantle, where compositional differentiation and thermal/chemical interaction can occur. Experiments by Murakami et al. (2004) found a phase transition from perovskite structure to post -perovskite structure at pressures corresponding roughly to the top of D". Better knowledge of the seismic fine structure of D" region thus can make an important contribution to understand the dynamics of the lowermost mantle.
We have developed and implemented methods for inversion of seismic waveforms for Earth structure, and have applied them to data from dense seismic arrays (e.g., Kawai et al., 2007a,b, GRL). In a recent application of these methods, Fuji et al. (in prep) developed the methodology so that they can obtain both elastic and anelastic structures simultaneously and succeeded to introduce conjugate gradient method for solving inverse problems itself, which enables them to obtain the solution of the inversion more efficiently than ever.
In this study, we have conducted waveform inversion for the fine shear velocity structure in the lowermost mantle beneath Central Asia using data from ORFEUS and IRIS for earthquakes that occurred in 1995-2006 beneath Southeast Asia with epicentral distances of roughly over 75 degree. We used data bandpassed filtered from 8-200s to invert for the vertical dependence of the shear velocity. We obtained a model whose the average shear velocity is faster than PREM in D". According to Kawai & Tsuchiya (2009, PNAS), the obtained model can be explained by temperature gradient above the core-mantle boundary.
In a related move, as a further attempt, we are trying to apply the methodology referred above to our dataset for D" region. Thus we discuss about the validity assessment of introducing the new methodology for D" region and room for further expansivity.
In order to show that our model is more favorable than PREM and how waveforms have information of model parameters, we will show the waveform answering to models' difference from not only waveform stacking but various perspectives.

Keywords: waveform inversion, Central Asia, lowermost mantle, seismic velocity