Improved procedure of receiver function calculation

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1.Introduction

Receiver functions (RFs) are mostly calculated by deconvolving the vertical component from the radial and transverse components of the P wave part of teleseismic events. A radial RF includes Ps waves converted at S wave velocity discontinuities, and scattered waves caused by heterogeneous structures as well as a direct P wave. On the other hand, a transverse RF includes PS waves converted at dipping discontinuities and scattered waves. PS converted waves are more important than direct P waves in order to estimate subsurface structures such as velocity discontinuities. In this study, we tried to remove effects of direct P waves from RFs according to the procedure of Bostock and Rondenary(1999).

2.Method

(1) We converted three-component P waves of teleseismic events into P, SV, and SH components with the method of Kennett (1991). SV and SH components include only scattered waves. Here, we regard the Ps converted waves at velocity discontinuities as the scattered waves in the broad sense. (2) We aligned P components waveforms from array stations by waveform correlations (VanDecar and Crosson, 1990), and extracted the common part of the waveforms by SVD filter with the maximum eigenvalue. We consider the common waveform as an effective source time function. (3) We subtracted the effective source time function from the P component waveforms and obtained scattered waves in the P component. (4) We converted the scatterd waves in the P, SV, and SH components into the radial, transverse and vertical components by the inverse transform of (1). (5) We calculated RFs of the scattered waves by deconvolving the vertical component of the effective source time function from the radial and transverse components of the scattered waves. The effects of the direct P waves are mostly removed from the RFs odtained by the above procedure.

3.Result

The Figure shows comparisons of radial RFs obtained by the improved method and the conventional method for waveforms from a linear seismic array in Kii Peninsula. In the RFs obtained by this method, direct P waves with large amplitudes are removed and PS converted waves near t = 0 s clealy appear. Phases of the both RFs correspond to each other. For the part except the direct P waves, the amplitudes of the RFs obtained by this method are larger than those by the conventional method. The relative amplitudes of the individual phases do not correspond to each other between the RFs by this method and those by the conventional method. We will apply this method to seismic waveforms we have stored up in Kii Peninsula, evaluate the obtained RFs, and further improve the method.

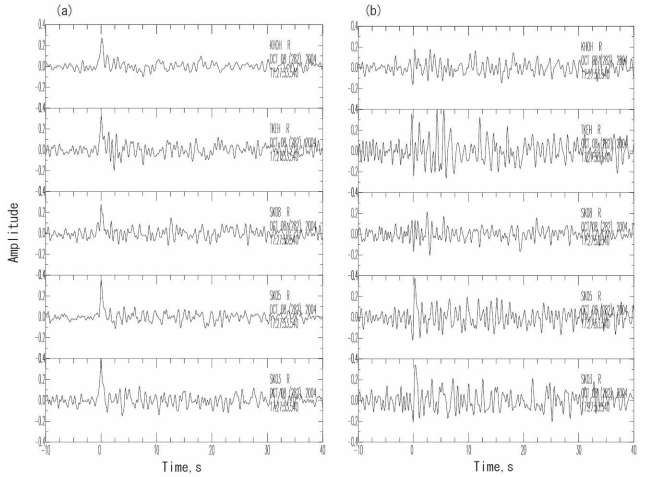

Fig. Example of the radial component of RFs obtained by the conventional method (a) and by the improved method (b).