Japan Geoscience Union Meeting 2014
(28 April - 02 May 2014 at Pacifico YOKOHAMA, Kanagawa, Japan)

SSS27-P04 Room:Poster Time:April 29 18:15-19:30

Receiver function travel time tomography

HIRAHARA, Kazuro[1*] ; YAMASAKI, Tomona[1] ; ABE, Yuki[1] ; SHIBUTANI, Takuo[2]

[1]Graduate School of Science, Kyoto University, [2]Disaster Prevention Research Institute, Kyoto University

Hirahara et al. (2006) proposed a method of Receiver Function (RF) Tomography which combines travel time tomography using travel times from local and teleseismic events with receiver function analyses. In the method, a 3-D P and S wave velocity structure is estimated together with the velocity discontinuity interfaces, where we add both data of the amplitudes and differential travel times of Ps converted phases in RFs employing Gaussian beam RF synthetics. We found, however, that it is difficult to match the amplitudes of Ps phases to estimate the velocity contrasts between velocity discontinuity interfaces with 2-D undulations.

.

Here, as a step toward RF Tomography, we are developing a method of RF Travel Time Tomography using only travel times of P and S waves from local and teleseismic events and P-Ps times of Ps converted phases obtained with the receiver function analyses. Abe et al. (2011) developed a method to estimate iteratively geometries of dipping seismic velocity discontinuities with high dipping angles of 30 to 70 degrees from common conversion point stacking of receiver functions, in which the multistage fast-marching method (de Kool et al., 2006) is applied to the ray tracing with refraction at dipping interfaces. The large amplitudes of RFs stacked in 3-D cells are interpreted to the Ps phases converted at the velocity discontinuity interfaces and the differential travel times P-Ps of the corresponding phases are additionally used for the travel time tomography of P and S waves from local and teleseismic events.

In this paper, we do not analyze the actual data but aim at developing the code of RF Travel Time Tomography based on the code of FMTOMO (Fast Marching Tomography) by Rawlinson (2007). First, for a 3-D heterogeneous structure with interfaces of a Moho and a subduction slab, we synthesize travel times of P and S waves from local and teleseismic events, and also Ps times converted at the Moho and the slab top and the oceanic Moho interfaces. Then we investigate the ability of retrieving the 3-D velocities and the undulation of the Moho and the dipping slab interfaces.

Keywords: Receiver function, Tomography, Ps convered wave, Travel time, Seismic velocity discontinuity interface