Finite Difference Synthetic Test for Kirchhoff Migration of Receiver Function on Subducting Slab

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Receiver function imaging enables higher resolution imaging than traveltime tomography, and dense and portable seismic array deployments permitting the migration techniques are possible with the Japanese seismic networks and IRIS PASSCAL deployments. We conducted Kirchhoff migration for the synthetic data generated from two-dimensional elastic wave finite-difference modeling to verify the imaging quality of the migration code and to understand the relationship between the physical parameters of the subsurface and the migrated image (Levander, 1988; Levander 2005). The slab geometry from High-Resolution tomography in Japan (Zhao et al., 1994) was used to construct a synthetic model. We set up the parameters for the synthetic modeling, receiver function generation, and migration to simulate the geometry of the earthquake on February 26, 2001, in India.

We can verify that migration with a smoothed 2D version of the velocity distribution gives an improved image of the slab geometry than that with a 1D velocity model (Figure 1). We simulated the effect of various model parameters like epicentral distances (i.e. incidence angle of the incoming wave) on the migrated image. We found that the conversion coefficient in the migrated image is strongly dependent on the P-wave incidence angle, hence the epicentral distance (Figure 2). We will get more quantitative results for the effect of the subsurface parameters on the migrated image that are the subject of a forthcoming publication.


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