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Fresnel zone imaging of receiver functions

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The receiver function method is a widely applied and powerful technique to obtain structural information of the crust and mantle. In its standard implementation, the depths to interfaces are interpreted from the arrival time delay of waves converted at these interfaces relative to the direct P waves. In recent times, common methods from exploration seismics (e.g. Kirchhoff prestack depth migration) have been used to image the converters instead. However, these methods are in principle not designed for receiver function imaging because of the usually non-uniform and less dense source-receiver coverage, which may lead to results dominated by significant migration noise. In this study, we present a new imaging technique that works by restricting the migration operator to the Fresnel zone in the vicinity of the conversion point at the converter. Both a synthetic test and an application to a real data set show great improvements of image quality over standard Kirchhoff migration results particularly in the case of less favorable source receiver geometry.