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# 3D Fresnel-Volume-Migration

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Kirchhoff-Prestack-Depth-Migration (KPSDM) is widely considered as a powerful and flexible state-of-the-art seismic imaging technique. In standard implementations of KPSDM the wavefield is summed along diffraction surfaces or smeared along two-way-traveltime isochrones, respectively. In the case of sparse sampling or limited aperture the image is often affected by significant migration noise. Some modifications have been proposed which aim at reducing these artefacts by constructing a specular path of wave propagation derived from the slowness of coherent phases in the seismogram section and the heuristic restriction of the imaging operator to that wave path. Here we propose another physically frequency-dependent approach by using the concept of Fresnel-Volumes. Firstly the emergence angle at the receiver is determined by a local slowness analysis. Using this emergence angle as the starting direction a ray is propagated into the subsurface and the back-propagation of the wavefield is limited to the vicinity of this ray according to its approximated Fresnel-Volume. The restriction of this smearing to the actual reflection/diffraction point significantly increases resolution and effectively suppresses migration artefacts. We describe the general procedure and show 2D and 3D applications to synthetic models as well as real data sets from exploration seismics and deep seismic geodynamic settings.