Parallel 3D prestack depth migration using recursive Kirchhoff extrapolation

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ABSTRACT
We have designed and implemented parallel 2D and 3D prestack depth migration algorithms based on recursive Kirchhoff extrapolators. Recursive Kirchhoff wavefield extrapolation in the frequency-space domain allows us to use the Weyl formulation, which should give better estimates of the phase than either the GPSPI (generalized phase shift plus interpolation) or NSPS (non-stationary phase shift) formulations and hence reconstruct the extrapolated wavefield with greater accuracy. Kirchhoff extrapolators do not require a regularized grid of data, and so can easily accommodate irregular acquisition geometries commonly found in land seismic datasets.

The basic structure of the shot-record migration algorithm consists of a forward extrapolation of a modelled source wavefield, a backward extrapolation of the recorded receiver wavefield, and a stabilized deconvolution imaging condition applied at each depth step. Simple synthetics tests produce accurate true-amplitude images of angle-dependent reflectivity. The algorithms have been further tested using the 2D Sigsbee Salt data set and the 3D SEG/EAGE Salt data set.