

Parallel 3D prestack depth migration using recursive Kirchhoff extrapolation

Hugh D. Geiger*, Gary F. Margrave
POTSI/CREWES University of Calgary 1908 46 Ave SW, Calgary, AB, T2T 2R7
geiger@geo.ucalgary.ca

Patrick F. Daley
CREWES University of Calgary

Darren S. Foltinek
Front Range Publishing

and

J. Marc Langlois
Marc Langlois Consulting

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 GPSP (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 synthetic 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.