

Simultaneous prediction of velocity and angle-dependent reflectivity in time domain FWI

Ziguang Su, Daniel Trad
University of Calgary

Summary

Common-image gathers (CIGs) are essential for migration-based velocity analysis and amplitude-versus-angle (AVA) analysis, which could be utilized to predict lithology and fluid properties. Velocity is necessary for migration-based velocity analysis, and angle-dependent reflectivity is necessary for AVA analysis. To determine velocity and reflectivity for subsurface models, seismic inversion has been a conventional approach, followed by attribute calculation to aid interpretation. We present an iterative non-linear inversion method to simultaneously predict both velocity and amplitude-preserved angle-domain-common-image-gathers (ADCIGs). The key aspect of our technique is the extraction of angle information from the solution of a direction-vector-based wave equation in acoustic with density media. Because the extraction is solely dependent on the direction of wave propagation and is not dependent on acquisition coordinates, it can be applied to blended acquisition, which is another name for simultaneous seismic source acquisition. Our iterative inversion method is based on the time domain FWI using the nonlinear conjugate-gradient method. Throughout each iteration, the velocity model is sequentially updated at each reflection angle.

