Interval velocity analysis using *s-g* downward-continued data

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ABSTRACT

The method of CDR tomographic inversion (Sword, 1987) uses reflection seismic data to find interval velocities. (Recall that CDR stands for Controlled Directional Reception). A difficulty with this method is that its objective function is based on one-point ray tracing, where only the takeoff position and angle of each ray are given; these raypaths are unduly influenced by horizontal velocity gradients in the near surface. I have modified this tomographic method so that the objective function is no longer determined by tracing rays. The ray tracing step is replaced by downward continuation in shot-geophone space, resulting in an algorithm that is similar to the focusing depth analysis method of Faye and Jeannot (1986). Rays are still used to back project velocity corrections onto the model. I have not yet tried this new method on real or synthetic data.

INTRODUCTION

Many methods have been proposed for using reflection seismic data to determine interval velocities. One such method is CDR tomographic inversion (Sword, 1987) ("CDR" stands for Controlled Directional Reception). In this method, short-base slant stacks ("beam stacks") are used to pick reflection events in the pre-stack seismic data. Rays based on this picked data are traced through a trial velocity model to determine how well the model fits the data. An objective function measures the fit, and the velocity model is altered so as to minimize the misfit. Again rays are traced, and again the model is altered, in an iterative procedure that continues until there are no more changes.

A problem with the CDR tomographic method is that the value of the objective function is determined through ray tracing. Only the takeoff point and takeoff angle of the ray is given; there is no other constraint. Thus any small horizontal velocity