Developing Initial Model for Seismic Full Waveform Inversion Using Conventional Data Processing Tools

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Full waveform inversion (FWI) of seismic reflection data is a powerful tool for high resolution subsurface modeling. Despite of demanding computational resources, the method has shown successful applications both in industrial and academic fields. Since the high performance machines and sophisticated parallel processing algorithms are now readily available, we believe FWI is capable to be used as a part of seismic data processing routines. In order to check the possibility of using FWI in conventional data processing, we evaluated the effect of different initial models on inversion results. We developed new initial models for full waveform inversion using horizon-guided well interpolation and compared it against initial velocities converted from stacking velocities with and without dip move-out (DMO) correction. Acoustic full waveform inversion results from Marmousi2 model showed that when the subsurface structure has strong dips, interval velocities which are converted from stacking velocity fail to initialize FWI properly. However, applying dip move-out (DMO) correction on the seismic data will relax the dip complexities in the velocity analysis stage and a good initial model for FWI could be developed. On the other hand, horizon-guided well interpolation uses velocities derived from well logs and makes an interpolated velocity model along the picked horizon. This makes a good initial velocity model for full waveform inversion which ensures the convergence to the correct solution. As a result, our new initial model confirmed that full waveform inversion could be included in the data processing sequence to develop high resolution velocity model for depth imaging.

Keywords: Full Waveform Inversion, Initial Model, Horizon Interpolation

