FULL WAVEFORM INVERSION OF THE CREST-1A DATASET: COMPARING ADAM AND LBFGS OPTIMIZATIONS

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ABSTRACT

Full waveform inversion (FWI) is an ill-posed nonlinear inverse problem that uses all information in seismic data to estimate high-resolution earth model parameters. It is based on the data misfit between the observed field data and synthetic data, obtained by wave propagation simulations on estimated model parameters. These simulations are computationally expensive, and the inversion is prone to sub-optimal convergence in local minima. In this work, we used the Adaptive momentum estimation (ADAM) machine learning optimization to perform FWI on the Rio Grande rise CREST-1A 2D dataset and compare the results against the Low Memory Broyden-Fletcher-Goldfarb-Shanno (L-BFGS) algorithm. We show that ADAM produced results comparable to L-BFGS but with much less computational effort, due to its ability to operate in the stochastic regime and the fact that it does not need to perform a line search.