

Optimization algorithms in seismic waveform inversion and its applications

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Abstract

This study focuses on waveform inversion using local optimization, especially the steepest descent method. In general, the local minimization problems such as Gauss-Newton method and steepest descent method are the most widely used for its fast convergence, and the steepest descent direction is calculated most efficiently with the Jacobian computed from the reciprocity theorem of Green function in conductivity problem. The reciprocity approach is a very efficient method for constructing the Jacobian or gradient and was applied this method to seismic waveform inversion. At the same time, Gauss-Newton method has a disadvantage in that it requires a large core memory to save all of the Green functions corresponding to every source and receiver position and incurs the large overhead computing cost to calculate the Jacobian matrix. In this lecture I give several waveform inversions using backpropagation techques and various application, DC, EM and MT.

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