Laplace-domain waveform inversion using the l-BFGS method

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We introduced the limited-memory Broyden-Fletcher-Goldfrb-Shanno (l-BFGS) method to full waveform inversions in the Laplace domain. Conventional Laplace-domain inversion methods use the pseudo-Hessian for preconditioning the gradient direction. The l-BFGS method is a Hessian-free quasi-Newton optimization method that approximates the Hessian using the gradient. We compared inversion results from the conventional Laplace-domain inversion and those from the Laplace-domain inversion using the l-BFGS method. By adopting the l-BFGS method with a line search using the Wolfe condition, we could obtain smaller cost function values than those of the conventional method. We demonstrate the proposed method by numerical examples using synthetic benchmarking models.