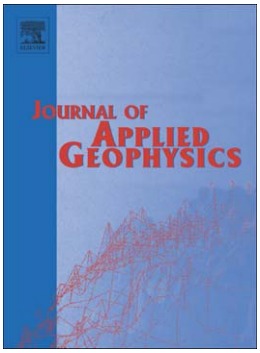

Seismic imaging of simultaneous-source data using constrained least-squares reverse time migration

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Seismic imaging of simultaneous-source data using constrained least-squares reverse time migration

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Simultaneous-source acquisition can help obtain better-sampled seismic data with a tremendously faster efficiency. However, the interference caused between simultaneous sources will cause strong artifacts in the migrated image. We propose to directly migrate the blended data without deblending. We treat the imaging for blended seismic data as an least-squares inversion problem, and use preconditioned conjugate gradient algorithm to iteratively solve it. The constraining operator is chosen as the structural smoothing operator, which helps to smooth the seismic image along the local structure. Compared with other available approaches, the proposed approach can obtain a true-amplitude and much cleaner image.

1 Keywords

Simultaneous-source acqusition, least-squares reverse time migration (LSRTM), constrained LSRTM, preconditioned conjugate gradient

2 Introduction

Simultaneous-source acquisition allows more than one sources shot at the meantime regardless of the interference between each other. It has attracted much attention from the industry because it can help tremendously reduce the acquisition cost and improve the quality of the acquired seismic data [1], which intrigues an extensive research interest from the academia [4].

There are two main ways to deal with simultaneous-source data. One is by using a first-separate and second-process strategy [13], [5], which is also known as "deblending" [8]. Another approach is by imaging and inversion directly on the blended simultaneous-source data [15], [11], [7], [16], [3]. Deblending has achieved convincing results with either numerically blended data or field blended data [18], [2], [14], [6]. However, successful application of direct imaging on blended data has been barely reported. Researches on direct imaging on the blended