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Total-variation based velocity inversion with Bregmanized operator splitting algorithm

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Abstract

Many problems in applied geophysics can be formulated as a linear inverse problem. The associated problems, however, are large-scale and ill-conditioned. Therefore, regularization techniques are needed to be employed for solving them and generating a stable and acceptable solution. We consider numerical methods for solving such problems in this paper. In order to tackle the ill-conditioning of the problem we use blockiness as a prior information of the subsurface parameters and formulate the problem as a constrained total variation (TV) regularization. The Bregmanized operator splitting (BOS) algorithm as a combination of the Bregman iteration and the proximal forward backward operator splitting method is developed to solve the arranged problem. Two main advantages of this new algorithm are that no matrix inversion is required and that a discrepancy stopping criterion is used to stop the iterations, which allow efficient solution of large-scale problems. The high performance of the proposed TV regularization method is demonstrated using two different experiments: 1) velocity inversion from (synthetic) seismic

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