Projected Barzilai-Borwein method for the acceleration of gravity field data inversion

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The recovery of 3D volume of density from gravity field data is a key point for geophysical and geological interpretations. Inversion of gravity field data involves solving an underdetermined problem. Therefore, large-scale data inversion is costly in time and memory consumption. The calculation efficiency is a primary concern for gravity field data inversion. Multiple methods are considered and applied to increase the inversion efficiency. The solution for an inversion problem was formulated by incorporating constraints to obtain stable inversion results, and a new projected Barzilai-Borwein iterative algorithm was applied to accelerate convergence of the inversion method. To test the potential application of the projected Barzilai-Borwein iterative method, synthetic gravity data simulations and real data applications were performed. Numerical performances and practical application indicate that the fast convergence of projected Barzilai-Borwein iterative method increases calculated efficiency of geophysical applications.

Keywords: gravity data, inversion algorithm, exploration methodologies, geophysical application

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