عنوان مقاله:

A comparative study of Sparse and Tikhonov regularization methods in gravity inversion : a case study of manganese deposit In Iran

محل انتشار:

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خلاصه مقاله:

Gravity inversion methods play a fundamental role in subsurface exploration, facilitating the characterization of geological structures and economic deposits. In this study, we conduct a comparative analysis of two widely used regularization methods, Tikhonov (L۲) and Sparse (L۱) regularization, within the framework of gravity inversion. To assess their performance, we constructed two distinct synthetic models by implementing tensor meshes, considering station spacing to discretize the subsurface environment precisely. Both methods have proven ability to recover density distributions while minimizing the inherent non-uniqueness and ill-posed nature of gravity inversion problems. Tikhonov regularization yields stable results, presenting smooth model parameters even with limited prior information and noisy data. Conversely, sparse regularization, utilizing sparsity-promoting penalties, excels in capturing sharp geological features and identifying anomalous regions, such as mineralized zones. Applying these methodologies to real gravity data from the Safu manganese deposit in northwest Iran, we assess their efficacy in recovering the geometry of dense ore deposits. Sparse regularization demonstrates superior performance, yielding lower misfit values and sharper boundaries during individual inversions. This underscores its capacity to provide a more accurate representation of the depth and edges of anomalous targets in this specific case. However, both methods represent the same top depth of the target in the real case study, but the lower depth and density distribution were not the same in the XZ cross-sections. Inversion results imply the presence of a .near-surface deposit characterized by a high-density contrast and linear distribution, attributed to the high grade of manganese mineralization

کلمات کلیدی:

Tikhonov regularization, Sparse regularization, Synthetic models, Tensor Meshes, Manganese Deposit