地球物理学报 » 2013, Vol. 56 » Issue (5) :1650-1659 doi:10.6038/cjg20130522
应用地球物理学
最新目录 | 下期目录 | 过刊浏览 | 高级检索 前一篇 | 后一篇

引用本文(Citation):
刘银萍, 王祝文, 杜晓娟, 刘菁华, 许家姝.基于Extrapolation Tikhonov正则化算法的重力数据三维约束反演. 地球物理学报, 2013,56(5): 1650-1659,doi: 10.6038/cjg20130522

LIU Yin-Ping, WANG Zhu-Wen, DU Xiao-Juan, LIU Jing-Hua, XU Jia-Shu.3D constrained inversion of gravity data based on the Extrapolation Tikhonov regularization algorithm.Chinese Journal Geophysics,2013,56(5): 1650-1659,doi: 10.6038/cjg20130522

基于Extrapolation Tikhonov正则化算法的重力数据三维约束反演

刘银萍, 王祝文, 杜晓娟, 刘菁华, 许家姝*

吉林大学地球探测科学与技术学院,长春 130026

3D constrained inversion of gravity data based on the Extrapolation Tikhonov regularization algorithm

LIU Yin-Ping, WANG Zhu-Wen, DU Xiao-Juan, LIU Jing-Hua, XU Jia-Shu*

College of Geo-Exploration Science and Technology, Jilin University, Changchun 130026 China

摘要 参考文献 相关文章

Download: PDF (3179 KB) HTML (0 KB) Export: BibTeX or EndNote (RIS) Supporting Info

摘要

通过研究重力数据三维反演解的病态性,利用基于拉格朗日插值方法的Extrapolation Tikhonov正则化方法来解决反演中解的不唯一性和不稳定性问题,该方法最大限度的减少了因正则化参数的引入而在反演结果中介入的误差,同时详细讨论了基于三种选择原则的正则化双参数的具体选择方法,模型试算结果表明,与原Tikhonov方法相比,该方法提高了反演的拟合精度.其次,为了消除核函数随深度增加而快速衰减对反演结果的影响,本文改进了前人的重力数据三维反演深度加权函数,改进后的加权函数与原函数相比能更好的识别异常体底部密度分布特征,对于埋深较深的异常体具有较好的识别效果,更好的解决了由近地面趋肤效应作用引起的密度分布不均的问题.同时,利用上下限约束函数限制每一个立方体的密度差范围,并应用于多组人工合成模型.结果表明:该反演方法能准确地获得正演模型的预设参数范围和位置.

关键词 重力数据, 3-D反演, Extrapolation Tikhonov正则化方法, 深度加权函数, 上下限约束

Abstract:

In the process of the inversion of gravity data, as its solution is ill-posed, a new and stable method for controlling the convergence of computation named extrapolation of the Tikhonov regularization method has been used in the process of the 3D constrained inversion of gravity data to deal with the unstable solution. The error from the regularization parameter introduction in the inversion results reduced greatly. Details about the choosing of the principles based on three choose principles to calculate the Tikhonov regularization solutions were discussed. The model test results show that compared with the original Tikhonov method, the new method improves the fitting precision of the inversion. The depth weighting function improved by the author was applied to operate on the kernel function to counteract the quickly decaying with the depth. Comparing to the original function, the improved weighting function works better in identifying the density distribution of the bottom of the body. It has better effect in recognizing the deeper body than the former method. The upper and lower bound constraining method was employed to control the scope of the density contrast of each prism. The model gravity anomalies and the recovered gravity anomalies fitted well through the application of the algorithm and the produced density model represented the true structure well.

Keywords Gravity data, 3-D inversion, Extrapolation Tikhonov regularization method, Depth weighting function, Upper and lower bound constrains

Received 2012-10-06;

Fund:

国家科技支撑计划项目(2009BAB43B00, 2009BAB43B01)资助.

Corresponding Authors: 杜晓娟,女,1957年生,吉林大学教授,主要从事重磁数据处理等科研工作.E-mail: dtdxj@jlu.edu.cn
Email: dtdxj@jlu.edu.cn

About author: 刘银萍,女,1981年生,江苏连云港人,在读博士研究生,主要从事重磁场正反演等研究工作. E-mail: yuan8503yuan@126.com