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基于MNS技术的三维大地电磁场正演模拟方法研究

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Study of three-dimensional MT forward modeling based on MNS technique

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摘要 参考文献 相关文章

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摘要 目前大地电磁三维正演模拟的主要问题是计算效率偏低.Pankratov等提出了一种精确的、稳定的和宽频的三维电磁场
方法,并成功应用于大地电磁场正演模拟中.该方法使用体积积分方程法,利用改进的Neumann序列(MNS)技术来求解Maxw
功地避免了解大型的线性方程组.在本文中针对这一主要问题尝试引入了广义双共轭梯度法来迭代求改进的Neumann序列中
统的迭代方法相比可以提高迭代的效率.同时使用了将格林函数分解为两部分在波数域求解,这样比常规的利用快速汉克尔变
率更高.最后试验了两个模型,并与三维交错网格有限差分法计算结果相比较,证明该方法的正确与有效,并且通过具体计算表
精度保证的条件下计算速度上具有明显的优势.

关键词: 大地电磁 积分方程 格林函数 改进的Neumann序列 共轭梯度

Abstract: At present, the main problem in three-dimensional (3D) forward modeling is lower computatio
efficiency. An accurate, stable and broadband 3D EM forward modeling approach was introduced by Panl
al, and has been applied in MT forward modelling successfully. This approach uses Integral Equation(IE) r
solve Maxwell's equations by modified Neumann series(MNS). It avoids calculating large-scale linear equa
this paper, for the main problem, GPBi-CG is used to get the solution in modified Neumann series, and the
efficiency of iteration is increased. Meanwhile, Green function is divided into two parts and solved in wav
domain. This is better than Fast Hankel Transform method. Finally, two models are tested. By comparing
results of 3D Staggered grid Finite Difference method, this approach is proved correct and effective. By
calculation, the advantage of calculation speed is displayed significantly when accuracy can be assured.

Keywords: Magnetotelluric(MT) Integral equation Green function Modified Neumann series(MNS)
Conjugate gradient

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