地球物理学报 » 2011, Vol. 54 » Issue (10) :2682-2689
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引用本文:
范建柯, 师学明, 吴时国, 施剑.基于子空间的二维大地电磁量子遗传反演法研究[J] 地球物理学报, 2011,V54(10): 2682-2689,DOI: 10.3969/j.issn.0001-5733.2011.10.025

FAN Jian-Ke, SHI Xue-Ming, WU Shi-Guo, SHI Jian.A study of 2-D magnetotelluric quantum genetic inversion algorithm based on subspace.Chinese J.Geophys. (in Chinese),2011,V54(10): 2682-2689,DOI: 10.3969/j.issn.0001-5733.2011.10.025

基于子空间的二维大地电磁量子遗传反演法研究

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A study of 2-D magnetotelluric quantum genetic inversion algorithm based on subspace

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摘要 量子遗传算法作为一种高效的优化算法,仍存在容易陷入局部极值的缺点.为提高算法的高效性,并探讨将算法应用于大地电磁二维反演的可行性和有效性,本文对算法进行了改进,并通过一维两层D型和四层HK型模型数值试验验证了改进的有效性.然后将改进后的算法引入二维大地电磁反演,在引入滑动子空间思想,同时只考虑最简化反演条件的前提下,对一个简单的二维低阻地电模型进行了传统量子遗传算法和改进量子遗传算法的反演,结果说明了将量子遗传算法引入基于子空间的二维大地电磁反演是可行的和有效的,而且改进的算法效果要优于传统算法.最后对实测资料进行了反演,得到了比较好的结果.

关键词: 大地电磁 二维反演 量子遗传算法 滑动子空间

Abstract: Quantum Genetic Algorithm is an excellent method. Nevertheless, there is a disadvantage to trap into the local minima for the conventional Quantum Genetic Algorithm. To advance the algorithm and probe the feasibility and effectiveness of the algorithm introduced into the magnetotelluric data 2D inversion, some improvements are made, whose effectiveness is testified through the inversion for 1D magnetotelluric two-layer (D-type) model and four-layer (HK-type) model. Then,the improved method is introduced into the magnetotelluric data 2D inversion. Based on the sliding subspace and the most simplified inversion condition, one typical 2D low-resistivity model is inversed using the conventional Quantum Genetic Algorithm and the improved Quantum Genetic Algorithm, respectively. The results indicate that it is feasible and effective to apply the Quantum Genetic Algorithm to magnetotelluric 2D inversion based on the subspace method and the result from the improved method is better than the conventional method. Finally, the better result is also obtained for the field data.

Keywords: MT 2D inversion Quantum Genetic Algorithm Sliding subspace

Received 2010-12-06;

Fund:

湖北省自然科学基金计划青年杰出人才项目(2007065027)和中国海陆地质地球物理系列图(GZH200900504)项目资助.

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