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起伏地形下CSAMT二维正反演研究与应用

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Studies and applications of 2-D CSAMT modeling and inversion with a dipole source and topography

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摘要

CSAMT在山区金属矿勘查中，采用各种滤波和相位积分之类的处理方法，校正因地形起伏和局部电性不均匀引起的静态效应，往往难保奏效，开发消除静态效应的新方法是提高CSAMT资料处理与解释水平和方法应用效果的重要研究课题. 本文以如何消除地形影响为重点，对起伏地形下CSAMT二维大地三维源地电模型，采用加权余弦数值积分法，进行波数域电磁场二维有限单元法正演. 为模拟复杂地形地电模型，选取交叉对称网格三角形剖分法，实现了在国内常用赤道电偶极装置的CSAMT二维正演计算；在二维正演的基础上，开发了基于奥克姆反演法的CSAMT二维反演技术，研制出一套起伏地形下CSAMT二维正反演处理与解释方法技术系统. 通过理论模型试算和实测数据处理证实，本系统能有效地削减起伏地形影响. 在找矿应用中，该系统反演的电阻率断面，极大地消除了起伏地形影响和静态效应，突显出清晰的控矿构造和矿体的异常，取得了重要成效.

关键词： 起伏地形 静态效应 CSAMT二维正演 波数域 有限单元法 二维反演

Abstract：

In the exploration of ore with CSAMT in mountainous area, various filtering and phase integral method often cannot handle calibration for uneven terrain and local electrical static effect. To develop a new method to eliminate static effect is important for improving the CSAMT data processing and interpretation and application effect. Taking eliminating terrain effect as the main target, this paper adopts the 2D earth and 3D source terrain model and uses the weighted cosine integral method to carry out finite-element calculation in wave-number domain. To simulate complex terrain we selected cross-symmetrical triangular grid to realize forward calculation of 2D CSAMT data for the electrical equatorial dipole array, which is popular in China. On the basis of the 2D forward calculation, we developed a set of rolling terrain 2D CSAMT inversion technique based on the OCCAM method. Through theoretical calculation and real data processing, the terrain effects could be effectively corrected. In prospecting application, the comparison of results with available geological data shows that the terrain and static effects, which resulted in distortion of apparent resistivity, could be effectively corrected, the resulted distribution of resistivity clearly reflects the geoelectrical feature, with geological structure and anomalous bodies outlined.

Keywords： Topography Static effect 2D forward of CSAMT data Wave-number domain Finite element method 2D inversion

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