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电离层影响下不同类型源激发的电磁场特征

付长民, 底青云, 许诚, 王妙月*

中国科学院地质与地球物理研究所 中国科学院工程地质力学重点实验室, 北京 100029

Electromagnetic fields for different type sources with effect of the ionosphere

FU Chang-Min, DI Qing-Yun, XU Cheng, WANG Miao-Yue*

Key Laboratory of Engineering Geomechanics, Institute of Geology and Geophysics, Chinese Academy of Sciences, Beijing 100029, China

摘要

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摘要

大地电磁法(MT)和可控源音频大地电磁法(CSAMT)虽然在多种勘探领域均得到了广泛的应用,但是也存在着一一些问题.于是结合了这两种勘探方法的优点,一种采用固定的大功率源进行电磁波发射,在全国范围内进行电磁信号接收的人工源电磁法得到了发展.此方法中收发距可达上千公里,在此大尺度范围内如何保证电磁信号的强度成为一个关键问题,而其中发射源的类型是决定着信号强度的重要因素.当收发距很大时,电离层的存在将影响到电磁信号的传播,为了探讨适合于大功率固定源方法的发射源类型,本文将大功率固定源方法模型抽象为地-电离层模型,研究电离层影响下的三维积分方程,其中地-电离层模式背景模型的格林函数用波数域中的层矩阵法获得.利用此正演方法模拟对比了发射源分别为水平长线源、环状源和L型源时电离层影响下的电磁场传播特征,并初步探讨了L型发射源对三维异常体的分辨能力.综合分析认为L型源是较优的发射源,有利于在大功率固定源方法中进行实际应用.

关键词 地-电离层, 不同类型激发源, 大功率电磁勘探, 三维积分方程

Abstract:

MT and CSAMT methods have been widely applied in many fields such as coal, mineral, geothermal and engineering explorations, but they still have some problems. So an EM method using a fixed large power source, such as long bipole current source, large radius circle current source or two perpendicular "L" shape long bipole current source, is beginning to take shape. The strength of the electromagnetic signal doesn't totally depend on the transmitting source. The effect of ionosphere on the electromagnetic (EM) field should be considered when observation is carried out at a very far location away from the source. In order to find the characteristics of EM fields induced by different type sources, we have made some modelings of typical models, and found that the "L" shape source is flexible and reliable, and is an optimal source.

Keywords Earth-ionosphere model, Different source, Large scale electromagnetic prospecting, Integral Equation Method

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About author: 付长民,男,1982年生,博士,工程师,主要从事地球物理电磁法正反演及应用等研究.E-mail: fcm168@mail.iggcas.ac.cn

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