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论文

中心回线瞬变电磁法2.5维有限单元算法

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摘要： 瞬变电磁法的野外资料解释基本上停留在一维水平，本文从生产实践中常用的中心回线法入手，基于电磁场本身的叠加原理，从麦克斯韦方程组出发，导出了中心回线瞬变电磁2.5维二次场（纯异常）的有限单元计算公式. 该算法采用三角形有限元网格，在尽可能拟合地下电性断面的情况下减少有限元网格的节点数和单元数；用选主元的LU分解法求解线性方程组，做到了在移动场源时只需改变右端项；在反傅氏变换中，使用新的波数选取方案，让波数m随时间t滑动. 最后给出的算例表明，该算法直接计算异常场，计算速度快、精度高.

关键词： 中心回线 瞬变电磁 2.5维 有限元

ALGORITHM OF A 2.5 DIMENSIONAL FINITE ELEMENT METHOD FOR TRANSIENT ELECTROMAGNETIC WITH A CENTRAL LOOP

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Abstract: In view of the existing situation of low level of the 1 D interpretation of the Transient Electromagnetic(TEM) in field work, we start from the central loop method, which is widely used in field work, to make

improvement. Based on the principle of superposition of the Electromagnetic(EM), we deduce the secondary field (pure abnormal field) formulas of the 2.5 dimension finite element method (FEM) from the Maxwell's equations. This algorithm uses triangle FEM grids, which can not only fit the geo electric media well but also decrease the number of nodes and cells. It adopts pivoting LU decomposition to solve the linear equations, of which needs only to change the right hand items and perform an iteration when increasing a measuring point. A new scheme is used to choose wavenumbers, which lets the wavenumber m glide with given computational time t. Finally we give examples to show that the forward modeling code calculates directly the secondary field and makes the computation faster with higher calculating accuracy.

Keywords: Central loop Transient electromagnetic 2.5 dimension Finite element method.

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