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# 电性参数分块连续变化二维MT有限元数值模拟

刘云, 王绪本*

油气藏地质及开发工程国家重点实验室, 成都理工大学, 成都 610059

## The FEM for modeling 2-D MT with continuous variation of electric parameters within each block

LIU Yun, WANG Xu-Ben*

State Key Laboratory of Oil and Gas Reservoir Geology and Exploitation, Chengdu University of Technology, Chengdu 610059, China

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摘要 为了易于模拟野外复杂地形和地下任意形状地电体模型,将有限元单元网格设计为三角单元;并考虑到野外实际勘探中,地球介质的电性参数均是连续变化的情况,单元内的场值和电性参数被设计为双线性变化;推导出二维起伏地形条件下大地电磁法有限元数值模拟算法;根据单元节点主场值和线性插值形函数间的关系,计算出单元节点的辅助场值;在二维起伏地形情况下,定义TE、TM模式视电阻率和阻抗相位.4个模型的计算的结果与解析法的均方根误差小于1%,地形模拟与前人的计算结果相符,模拟倾斜界面异常体,能有效的反映出其异常形态.

关键词 大地电磁法, 起伏地形, 三角单元网格, 电性参数分块连续变化, 有限元

Abstract: To model arbitrarily shaped two-dimensional topography and structures in field work, triangular element grid was used in the finite element method (FEM). In view of the fact of continuous variation of the subterranean rock-mineral electric parameters, the electromagnetic field and some electric parameters of models are designed to bilinear variation within each triangular element in our numeric modeling method, and which is developed for modeling two-dimensional magnetotelluric (MT) under the field topography condition. The calculation formulae of the auxiliary field, and the definition of apparent resistivity and impedance phase are deduced according to the relationship between the main fields of the three nodes and the linear shape function within each element. By calculating a continuous medium model and two topography models set up by other scholars to test our method, the result of our method shows a high accuracy (the mean square error is less than 1%), and the results of modeling two topography models accord with other scholar's, too. Through modeling a sloping interface abnormity body, we find that our method can model arbitrarily complicated terrain and geoelectric bodies preferably.

Keywords MT, Topography, Triangle grids, Continuous variation of electric parameters within each block, FEM

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Corresponding Authors: 王绪本,男,教授、博士生导师,主要从事电磁场数值模拟及反演成像技术研究.E-