地球物理学报 2004 47 (3): 514～520 ISSN: 0001-5733 CN: 11-2074/P

论文

三维复杂构造中地震波模拟的单程波方法

刘礼农[1], 崔凤林[2], 张剑锋[1],

1 中国科学院地质与地球物理所，北京 100029 2 中国地质大学，北京 100083

收稿日期 2003-4-1 修回日期 2003-12-13 网络版发布日期 接受日期

摘要 复杂构造中单程波与双程波方法模拟结果的比较表明，就地震勘探中主要关心的一次反射波而言，单程波算法已具有足够的精度. 使用单程波方程将极大地减少数值计算的计算量，同时对介质的几何和物理参数建模也降低了要求. 单程波算法可视为深度偏移的“逆运算”，这样可以很好地借用已知的深度偏移方法及其程序系统. 基于计算效率和计算精度的双重考虑，本文在介质速度结构较复杂时采用显式短算子波场延拓方法，而在介质速度结构相对简单时采用分裂步相移法. 反射系数的计算中考虑了其随入射角的变化.

关键词 三维地震模拟 单程波 显式短算子 分裂步相移

分类号

DOI:

Seismic modeling with one way wave equation in 3D complex structures

LIU Li Nong[1], CUI Feng Lin[2], ZHANG Jian Feng[1],

1 Institute of Geology and Geophysics, Chinese Academy of Sciences, Beijing 100029, China 2 China University of Geosciences, Beijing 100083, China

Received 2003-4-1 Revised 2003-12-13 Online Accepted

Abstract Numerical results demonstrate that the one way wave equation modeling scheme exhibits sufficient accuracy in terms of primary reflected waves in comparison with the two way wave equation scheme. The computational cost is greatly reduced by employing the one way wave equation scheme. Moreover, only a rough velocity model is needed for implementing the one way wave equation scheme in seismic modeling. Since the one way wave equation modeling scheme can be considered as the inverse depth migration, we can use the current depth migration schemes and its codes. Accounting for both accuracy and computational efficiency, we use the explicit short extrapolation operator scheme in a complicated medium layer and the split step Fourier operators in a simple medium layer during depth extrapolations. Reflected coefficients are obtained by accounting for its variation with incident angles in the scheme.

Key words 3D seismic modeling;One way wave equation;Explicit short extrapolation operators;;Split step Fourier operators

通讯作者:
lnliu@mail.igcas.ac.cn
作者个人主页: 刘礼农[1]; 崔凤林[2]; 张剑锋[1];