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TTI介质qP波逆时偏移中伪横波噪声压制方法

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Methods of removing pseudo SV-wave artifacts in TTI media qP-wave reverse-time migration

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摘要

在对地下复杂构造介质,特别是盐丘侧翼及岩下区域进行成像时,相对于传统的各向同性逆时偏移和VTI逆时偏移,具有倾斜对称轴的TTI逆时偏移成像效果最优.不仅反射同相轴更加的连续,而且能量得到了更好的聚焦.传统的各向异性介质全弹性波RTM的计算量大且计算效率低.由于目前仍以纵波勘探为主,因此TTI逆时偏移qP波波动方程的选取显得尤为重要.为了提高计算效率,采用将沿着对称轴方向的横波速度设为零的方法,简化得到qP波波动方程.然而,这样会引入一种严重影响成像效果的低速度、低振幅的qSV波人为干扰.本文建立了qP波方程的完全匹配层控制方程,而后借助于辅助波场采用一种高效的压制伪横波噪声传播的方法,通过模型测试验证了该方法的有效性.

关键词 TTI介质, 逆时偏移, 伪横波噪声压制, qP-qSV波波动方程, 声学近似方程

Abstract:

In the process of imaging subsurface complex structure media, in particular with salt flank and the area bellow it, compared to the method of traditional isotropic reverse-time migration and VTI reverse-time migration, TTI reverse-time migration can produce the best image, not only the continiuity of reflection is much better, but also the energy can be focused more intensely. The traditional anisotropic full elastic wave reverse-time migration clearly is more computer resources demanding and inefficient. Because the information of qP-wave is still playing the leading role in seismic exploration at present, the methods of choosing qP-wave equations in TTI reverse-time migration become pretty important. For improving the calculating efficient, the anisotropic elasto-dynamic equations of motions are often simplified to acoustic equations which only allow qP-wave propagate by seting the velocity of SV-wave equal to zero along the symmetry axis orientation. However, it can bring a low-speed and low-amplitude qSV-artifacts which will destroy the results of reverse-time migration greatly. Firstly,We build the PML controlling equations of qP wave equations. After that, combined with the auxiliary wavefield, in this paper we introduce a cost-effective method which suppresses pseudo SV-wave artifacts perfectly. Numerical examples are included to show the validity of the algorithm.

Keywords TTI media, Reverse-time migration, Pseudo SV-wave artifacts suppression, qP-qSV wave equations, Acoustic approximation wave-equations

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