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三维偏移距平面波有限差分叠前时间偏移

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3D offset plane-wave finite-difference pre-stack time migration

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摘要 参考文献 相关文章

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摘要 本文提出了中点-半偏移距域内的三维偏移距平面波(offset plane-wave)方程,并给出了其有限差分解法.偏移距平面波可通过对CMP道集进行平面波分解(倾斜叠加或线性Radon变换)生成,然而这样做会产生严重的噪音干扰.本文提出了局部倾斜叠加方法(local slant-stacking)来消除离散线性Radon变换引入的噪音.针对实际三维数据的不规则性(中点-偏移距域内方位角展布不均匀及偏移距采样不规则),本文还提出了与方位角无关的三维倾斜叠加方法(azimuth-independent 3D slant-stacking),解决了三维平面波分解中存在的问题.使用文中提出的平面波分解方法,可以得到高信噪比的偏移距平面波数据体.同时,三维偏移距平面波偏移可以输出偏移距射线参数域共成像点道集,基于此道集的剩余速度分析方法可以用来更新偏移速度场.偏移距平面波偏移具有很高的计算效率,相较Kirchhoff积分叠前时间偏移有较好的保幅特性,可作为水平地表三维叠前时间偏移的一个很好的解决方案.

关键词: 三维叠前时间偏移 偏移距平面波分解 局部倾斜叠加 与方位角无关的三维倾斜叠加

Abstract: Based on the double-square-root equation, a 3D offset plane-wave equation for pre-stack time migration is derived and its finite-difference scheme is put forward. Offset plane waves can be generated by applying a plane-wave decomposition (slant-stacking or Linear Radon Transform) to CMP gathers. However, the resulting offset plane waves will be contaminated by coherent noise. We then present a local slant-stacking method to eliminate the noise. Meanwhile, an azimuth-independent 3D slant-stacking approach is developed to address the issue of uneven azimuth distribution and irregular offset distribution in CMP gathers. High-quality offset plane-wave datasets can be produced by the offset plane-wave decomposition approach proposed in this paper. Besides, residual curvature velocity analysis can be implemented in the offset ray-parameter common-image gathers. 3D offset plane-wave migration will be a practical solution for prestack time migration.

Keywords: 3D PSTM Offset plane-wave decomposition Local slant-stacking Azimuth-independent 3D slant-stacking

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