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基于Chebyshev多项式的非对称走时Kirchhoff叠前时间偏移角道集求取

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Using Chebyshev polynomial asymmetric calculation to obtain angle domain common imaging gathers by Kirchhoff pre-stack time migration

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摘要

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摘要

地震射线走时的求取方法是叠前时间偏移研究的核心问题之一,也是影响计算时间域角道集角度精确性的关键因素之一.本文基于Kirchhoff叠前时间偏移,应用第一类切比雪夫多项式,对弯曲射线对称走时加以改进,引进非对称项,优化后得到切比雪夫非对称走时方程.与高精度走时进行比较和误差分析,再将该走时求取方法应用于时间域角道集的求取中,得到地下较真实的入射角.通过模型计算和实际地震资料处理证明,此种非对称走时及其角道集的求取方法具有精度高、计算量少的优点.

关键词 Kirchhoff叠前时间偏移, 切比雪夫多项式, 弯曲射线, 非对称走时方程, 角道集

Abstract:

Kirchhoff pre-stack time migration (KPSTM) is widely used in production due to its high efficiency and good suitability, especially for exploration in central and western China. Angle domain common image gathers (ADCIG) serve as the link between migration and reservoir attribute analysis. Getting ADCIG in the time domain is more efficient than in the depth domain. Seismic travel time calculation is one of the key problems of KPSTM and is also a key problem in ADCIG calculation. Using Chebyshev orthogonal polynomial and optimizing algorithm, we develop a new asymmetric Chebyshev travel time formula and compare it with high-precision Taylor travel time formulas. Based on this, considering the bend-way effect, we apply the new Chebyshev travel time formula to calculate incident angles, and achieve more precise ADCIG from the original seismic gathers. The method is tested by both synthetic data and real marine data. It is verified that using our method to obtain ADCIG is more precise and consumes less computation time.

Keywords Kirchhoff pre-stack time migration, Chebyshev polynomial, Bend-ray, Asymmetric travel time formula, Angle domain common image gathers

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