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适于Kirchhoff叠前深度偏移的地震走时李代数积分算法

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Lie algebra integral algorithm of travel-time calculation for pre-stack Kirchhoff depth migr

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摘要 本文基于拟微分算子理论和李代数积分法,根据程函方程和波场坐标变换,提出一种新的适于横向变速介质Kirchhoff叠移的地震波走时算法.该算法与Kirchhoff叠前时间偏移所用李代数时间积分表达相比,差异在于增加了波数一次项,且二次项积时亦需进行修正.针对单平方根算子象征、李代数积分、指数映射和走时多项式的求解而言,皆需对以往Kirchhoff叠前时间用算法进行深化调整.文中数值算例对比了本文李代数积分表达与时间积分的区别,本算法计算结果与线性横向变速介质中的当吻合.通过走时多项式中各项对结果的影响分析,可知非对称项使计算精度得到了进一步提高.数值试验表明,本算法对横向走时求取是可行的,且不需要存储海量走时表,有利于提高Kirchhof叠前深度偏移的精度和效率.

关键词： 坐标变换 李代数积分 指数映射 地震走时 横向变速

Abstract： Based on pseudo difference operator and Lie algebra integral method, we proposed a new tra
calculation method for pre-stack Kirchhoff depth migration in medium with lateral velocity variation using
equation and coordinate transform of wave-field. Comparing with Lie algebra time integral used in the pre
Kirchhoff time migration, our method contains the first-order item of wave-number and the second-order
needs to be corrected in depth integral. Therefore we improve the performance of previous method in ca
of the symbol of single root square operator, Lie algebra integral, exponential mapping and the coefficien
travel-time. Here we compare the expression of improved Lie algebra integral with time integral, and the
calculated travel-time is coincident with the theoretical value in medium with laterally linear velocity vari
Through the effect analysis of some items on the final travel-time, we can conclude that the odd item in
the precision further and our algorithm is suitable for the calculation of travel-time in medium with latera
variation, and what's more, there is no mass storage of travel-time tables, which is very beneficial to imp
the precision and efficiency of pre-stack Kirchhoff depth migration.

Keywords： Coordinate transform Lie algebra integral Exponential mapping Seismic travel time Late
velocity variation

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