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基于波场垂向和水平方向外推的高陡构造偏移

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Steeply-dipping structures migration based on the wavefield vertical- and horizontal-extrapolation

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摘要

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摘要 常规的单程波波动方程偏移成像方法对大角度的高陡构造偏移成像存在内在的限制. 根据波动方程在各个空间方向的数学特性和高陡构造反射地震波的传播特征, 通过把地震波分解为垂向的上下行波、水平方向的前后行波和左右行波, 提出基于波场垂向外推和水平方向外推相结合的单程波波动方程高陡构造偏移成像方法, 即用波场垂向外推的单程波波动方程偏移成像方法解决中低角度平缓构造的偏移成像, 用波场水平方向外推的单程波波动方程偏移成像方法解决中高角度陡倾构造的偏移成像. 这种基于波场垂向和水平方向外推相结合的高陡构造偏移成像方法是常规单程波波动方程叠前深度偏移成像方法的补充和改进, 它相对于基于全波方程的逆时偏移具有计算效率上的优势.

关键词 高陡构造, 单程波, 垂向外推, 横向外推, 偏移

Abstract: The conventional one-way wave equation migration imaging methods have inherent limit to the migration of steeply dipping structures with high dipping angle. According to the mathematical characteristics of space directions of wave equation and the propagation characteristics of reflected seismic wave generated by steeply dipping structures, and through the decompositions of seismic wave into up-going wave and down-going wave in vertical direction, forward-going wave and back-going wave and left-going wave and right-going wave in horizontal direction, a one-way wave equation based migration method for the steeply dipping structures is proposed by the combination of wavefield vertical extrapolation and horizontal extrapolation. In the method, applying the wavefield vertical extrapolation to the one-way wave equation migration for the imaging of moderate dipping structures, and applying the wavefield horizontal extrapolation to the one-way wave equation migration for the imaging of steeply dipping structures. This new migration method for the steeply dipping structures based on the combination of wavefield vertical extrapolation and horizontal extrapolation is a supplement and improvement to the conventional one-way wave equation prestack depth migration method, it has the advantage of computational efficiency over the reverse time migration based on the two-way wave equation.

Keywords Steeply-dipping structures, One-way wave equation, Vertical-extrapolation, Horizontal-extrapolation, Migration

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