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3D HYBRID DEPTH MIGRATION AND FOUR-WAY SPLITTING SCHEMES

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摘要
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3D HYBRID DEPTH MIGRATION AND FOUR-WAY SPLITTING SCHEMES

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Abstract The alternately directional implicit (ADI) scheme is usually used in 3D depth migration. It splits the 3D square-root operator along crossline and inline directions alternately. In this paper, based on the ideal of data line, the four-way splitting schemes and their splitting errors for the finite-difference (FD) method and the hybrid method are investigated. The wavefield extrapolation of four-way splitting scheme is accomplished on a data line and is stable unconditionally. Numerical analysis of splitting errors show that the two-way FD migration have visible numerical anisotropic errors, and that four-way FD migration has much less splitting errors than two-way FD migration has. For the hybrid method, the differences of numerical anisotropic errors between two-way scheme and four-way scheme are small in the case of lower lateral velocity variations. The schemes presented in this paper can be used in 3D post-stack or prestack depth migration. Two numerical calculations of 3D depth migration are completed. One is the four-way FD and hybrid 3D post-stack depth migration for an impulse response, which shows that the anisotropic errors can be eliminated effectively in the cases of constant and variable velocity variations. The other is the 3D shot-profile prestack depth migration for SEG/EAEG benchmark model with two-way hybrid splitting scheme, which presents good imaging results. The Message Passing Interface (MPI) programme based on shot number is adopted.

Key words 3D depth migration Multiway splitting Data line Wavefield computation Finite-difference Hybrid method.

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