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A new family of fourth-order locally one-dimensional schemes for the 3D elastic wave equation

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Abstract

In this paper, we present a new family of locally one-dimensional (LOD) schemes with fourth-order accuracy both in both space and time for the three-dimensional (3D) elastic wave equation. It is an extension of our previous LOD work on the 3D acoustic wave equation. The method is based on the new family of 3D acoustic LOD schemes with a source term. The constructed scheme is four-layer in time and three-layer in space. It only involves a three-points stencil in each spatial direction to achieve fourth-order accuracy. In each time level, only a tridiagonal system is required to solve. The stability condition is given and it has more relax restriction for the time step than the classical staggered-grid schemes. Numerical computations are completed and show the performance of the new method.

Keywords: 3D, elastic wave equation, LOD, fourth-order accuracy, splitting

2010 MSC: 35L05, 65N06, 65N12, 65M06, 65M12

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