IDO schem for computing seismic waves : SH plane wave

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We apply the Interpolated Differential Operator (Aoki, 1997) to an elastodynamic equation for the computation of seismic wave propagation with high accuracy. IDO is one method that solves time-space partial differential equations .It interpolates that the physical quantities between those at adjacent grids points. In this study, we exploit a scheme to compute plane-wave response of a vertically heterogeneous structure. We use the equations for SH plane wave derived by Tanaka and Takenaka (2005)

We use two grid systems. Each grid system consists of integer grid and half-integer gird (i.e. ,staggered grid). We employ the second order Hermite interpolation to the quantities at adjacent grid points. The Interpolation polynomials include the integration value of the velocity and stress. The equations be solved are velocity-stress equations and the corresponding integrated ones over each cell. The time discretization is done by the second order finite-difference and the space discretization is done by the second order Hermite interpolation. The time marching of the original and integrated quantities are proceeded and in the following time step, the quantities are computed on the alternative grid system to that used in the current time step.

We made a Fortran program, and confirmed that the solutions computed by our scheme show lower numerical dispersion than those of the conventional staggered-grid FDM.