Journal of Computational Acoustics, Vol. 16, No. 3 (2008) 465–467

INTERNATIONAL ASSOCIATION
FOR MATHEMATICS AND
COMPUTERS IN SIMULATION

COMMENT ON "MULTIDOMAIN PSEUDOSPECTRAL TIME-DOMAIN (PSTD) METHOD FOR ACOUSTIC WAVES IN LOSSY MEDIA" BY Y. Q. ZENG, Q. H. LIU AND G. ZHAO, JOURNAL OF COMPUTATIONAL ACOUSTICS, Vol. 12, No. 3, PP. 277–299 (2004)

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Revised 7 December 2007

Reference 31 presents a multidomain pseudospectral time-domain method to simulate the propagation of acoustic waves. Such domain decomposition, while keeping the good convergence properties of the pseudo-spectral method in each curved subdomain (see e.g. Ref. 3), is in fact quite classical (see e.g. Refs. 2, 18, 19 for linear hyperbolic problems such as the propagation of acoustic or elastic waves, and Ref. 20 for Navier-Stokes' equations). It is also at the heart of the spectral-element method, a variational formulation which leads to an exactly-diagonal mass matrix in conjunction with explicit time integration and which has been widely used for the simulation of seismic wave propagation in two-dimensional (e.g. Refs. 6, 14, 27) or three-dimensional (e.g. Refs. 4, 5, 10–13, 15–17, 28) media with complex rheologies.

Reference 31 also presents an unsplit Perfectly Matched Layer (PML) condition to absorb the acoustic waves on the edges of the computational grid. In this respect, it is worth mentioning the work of Ref. 30 in the elastic case.

Reference 31 states in their introduction that the requirements in terms of number of grid points per seismic wavelength to propagate "inhibit the use of regular Finite Difference in the Time Domain (FDTD) methods in accurately simulating wave propagation in large-scale problems". In fact, high-order finite-difference methods require fewer points per wavelength, and classical or high-order operators have successfully been used for more than a decade to solve realistic large-scale three-dimensional problems for acoustic, elastic, viscoelastic or anisotropic media (see e.g. Refs. 1, 7–9, 21–26, 29, among others).

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