Meeting: 1003, Atlanta, Georgia, AMS CP 1, AMS Contributed Paper Session

1003-65-531 **Hyeona Lim*** (hlim@math.msstate.edu), Department of Mathematics and Statistics, Mississippi State University, Mississippi State, MS 39762, and **Seongjai Kim** (skim@ms.uky.edu), Department of Mathematics, University of Kentucky, Lexington, KY 40506. *Fourth-order implicit scheme for acoustic waves.*

We will consider a new fourth-order *implicit* time-stepping scheme for the numerical solution of the acoustic wave equation, as a variant of the conventional modified equation method. For an efficient simulation, the scheme incorporates a locally one-dimensional (LOD) procedure having the splitting error of $\mathcal{O}(\Delta t^4)$. Its stability and accuracy are compared with those of the standard explicit fourth-order scheme. It has been observed from various experiments for 2D problems that (a) the computational cost of the implicit LOD algorithm is only about 40% higher than that of the explicit method, for the problems of the same size, (b) the implicit LOD method produces less dispersive solutions in heterogeneous media, and (c) its numerical stability and accuracy match well those of the explicit method. (Received September 20, 2004)