# Wave propagation simulation by the staggered-grid finite-difference method

Wensheng Zhang

Institute of Computational Mathematics and

Scientific/Engineering Computing, LSEC

Academy of Mathematics and Systems Science,CAS

**Abstract**

The finite-difference method has been widely used in solving hyperbolic wave equation. It has the advantage of higher computational efficiency. The staggered-grid finite-difference method is one which approximates derivatives on a stagger grid rather than on a regular grid. In this talk, I will introduce how to solve the three dimensional wave equation on a stagger grid. Based on the velocity and stress formation of 3D wave motion, the difference schemes of a first-order hyperbolic system are given. Compared to the finite-difference method on a regular grid, the finite-difference on a stagger grid has the advantages of higher local accuracy and less sensitive to noise. Moreover, the 3D stress map can output directly going with the three component displacements without any further computations. The analysis of accuracy and errors are discussed. The numerical computations show the effectiveness of the presented schemes.