Geophysical Research Abstracts, Vol. 7, 08473, 2005 SRef-ID: 1607-7962/gra/EGU05-A-08473 © European Geosciences Union 2005



Application of a Non-splitting PML formulation (NPML) in the 3D 4th-order staggered-grid finite-difference scheme

A. A. Skarlatoudis (1,2), J. Kristek (2,3), P. Moczo (2,3) and C.B. Papazachos (1)

(1) Department of Geophysics, Aristotle University of Thessaloniki, Thessaloniki, Greece (2) Faculty of Mathematics, Physics and Informatics, Comenius University, Bratislava, Slovak Republic, (3) Geophysical Institute, Slovak Academy of Sciences, Bratislava, Slovak Republic, (askar@lemnos.geo.auth.gr / Phone: +421 2-60295327)

One of the most important issues in numerical simulation methods is the artificial boundaries used for simulating the necessarily truncated computational area. The techniques used until now are based on either Absorbing Boundary Conditions (ABC) or Absorbing Layers. In the second category resides the Perfectly Matching Layer (PML) technique, which is a surrounding layer of the computational area with special attenuating properties.

Wang and Tang (2003) introduced a Non-splitting PML formulation (NPML). Their formulation solves the same set of equations in the bulk medium and inside the PML area. The NPMLs are based on the assumption that PMLs are treated as small perturbations of the original wave equations. The NPML formulation was introduced and tested by Wang and Tang (2003) with their finite-difference scheme for cylindrical coordinates. Wang and Tang (2003) calculated waveforms in a logging- while-drilling environment.

In this work the NPML technique in Cartesian coordinates and its implementation in a 3D 4^{th} -order staggered-grid finite-difference scheme is elaborated. The accuracy and the efficiency of NPML is examined. Moreover, the interaction between the NPMLs and other ABCs for terminating NPML zone is tested. The results of the implementation are evaluated for synthetic models for which synthetic waveforms have been already calculated with the same finite-difference scheme without the use of the PML technique.