A Mimetic Scheme for Finite Difference Modeling of Acoustic Reflection

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Abstract

We present a new mimetic finite difference (FD) scheme for solving the acoustic wave equation coupled to absorbing boundary and free surface conditions, as required for seismic modeling. Spatial discretization takes place on a staggered grid where mimetic FD operators provide second order accuracy at inner and boundary nodes. The novelty of this scheme relies on the inclusion of the mimetic flux operator into the interior discretization of the two-way wave equation and the implementation of Reynolds non-reflecting conditions. Thus, the proposed scheme is free of ghost points and damping regions. For numerical assessment, we solve a set of 2D seismic test problems where this new scheme shows better stability properties than standard finite differences.