The PFASST parallel in time method applied to geophysical flows

Higher-Order, Space-Time Adaptive Finite Volume Methods: Algorithms, Analysis and Applications

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Abstract

The *Parallel Full Approximation Scheme in Space and Time* (PFASST) algorithm for parallelizing PDEs in time is presented. Several applications of the algorithm will also be presented, including geophysical flow examples.

To efficiently parallelize PDEs in time, the PFASST algorithm decomposes the time domain into several time slices. After a provisional solution is obtained using a relatively inexpensive time integration scheme, the solution is iteratively improved using a deferred correction scheme. To further improve parallel efficiency, the PFASST algorithm uses a heirarchy of discretizations at different spatial and temporal resolutions and employs an analog of the multi-grid full approximation scheme to transfer information between the discretizations.

Applications of the PFASST algorithm will be presented for several PDEs including the Kuramoto-Silvashinsky equation; and the shallow-water, acoustic advection, and compressible Boussinesq equations. Convergence results, parallel speedups and parallel efficiencies will be reported.