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Simulations of Reacting Flow using Spectral Deferred Corrections CANDACE GILET, ANN ALMGREN, JOHN BELL, MARCUS DAY, MIKE LIJEWSKI, Lawrence Berkeley National Lab, MICHAEL MINION, University of North Carolina at Chapel Hill — Numerical simulations of reacting flows frequently require capturing advection, diffusion, and reaction processes, which can have time scales that differ widely. When a fully explicit method is used the time step is controlled by the fastest process. This can result in calculations requiring so many time steps that the computational cost becomes prohibitively large. Fully implicit methods allow a larger time step, but require the simultaneous solution of (typically nonlinear) equations, again leading to restrictively high computational costs. Operator slitting methods allow for the use of a mix of implicit and explicit methods; however the splitting errors can be so large that prohibitively small time steps are still needed. An alternative to operator splitting is a class of methods called Spectral Deferred Corrections (SDC). The idea behind SDC methods is to represent temporal evolution of the system as an integral in time and develop algorithms that iteratively couple the different physical processes, thus reducing the splitting error. This work explores the use of SDC methodology in two-dimensional simulations of reacting flows with realistic chemistry. The results from simulations using SDC are presented and their performance is compared with that of Strang splitting.

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