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ABSTRACT

A partitioned time integration method for advection-diffusion-reaction problems is presented. The spatial problem domain is decomposed into two non-overlapping sub-domains using dual-Schur domain decomposition. The decomposed discrete system is numerically expressed as a system of differential-algebraic equations (DAEs).The trapezoidal family of schemes is used to integrate the governing ordinary Differential equations for each sub-domain. Different constraints enforcing the kinematic continuity of the solution across the interface between the sub-domains are explored. A detailed error analysis is conducted for each choice of the constraint to evaluate the convergence of the numerical method. Conditions, under which the zero-order and 1st-order terms vanish, resulting in second-order accuracy, are derived. Finally, several numerical examples are presented to demonstrate the feasibility and performance of the partitioned time integration method.