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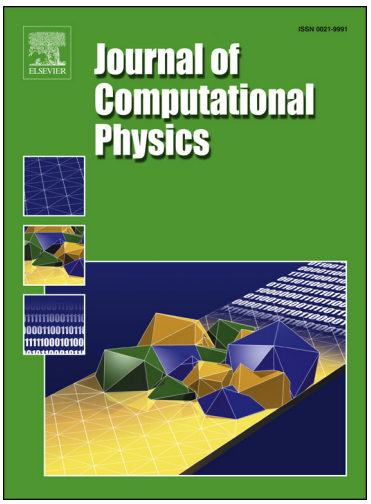

A high order semi-Lagrangian discontinuous Galerkin method for Vlasov-Poisson simulations without operator splitting

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Highlights

- The proposed semi-Lagrangian discontinuous Galerkin method for nonlinear Vlasov- Poisson simulation is locally mass conservative, highly accurate in both space and in time (up to third order accuracy), free of operator splitting error and allows for extra large time stepping size. To the best of the authors' knowledge, this is the first SLDG scheme for Vlasov- Poisson simulations that is able to attain all these desired properties. The proposed method is applied to classic benchmark test problems such as Landau damping and two-stream in- stabilities. Efficiency and effectiveness of the proposed scheme is showcased. Tremendous CPU savings are observed, when compared with those from the classical Runge-Kutta DG method.