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Energy conserving continuum algorithms for kinetic & gyrokinetic simulations of plasmas[1] A. HAKIM, G.W. HAMMETT, Princeton Plasma Physics Laboratory, E. SHI, T. STOLTZFUS-DUECK, Princeton University — We present high-order, energy conserving, continuum algorithms for the solution of gyrokinetic equations for use in edge turbulence simulations. The distribution function is evolved with a discontinuous Galerkin scheme, while the fields are evolved with a continuous finite-element method. These algorithms work for a general, possibly non-canonical, Poisson bracket operator and conserve energy exactly. Benchmark simulations with ETG turbulence in 3X/2V are shown, as well as initial applications of the algorithms to turbulence in a simplified SOL geometry. Sheath boundary conditions with recycling and secondary electron emission are implemented, and a Lenard-Bernstein collision operator is included. Extension of these algorithms to full Vlasov-Maxwell equations are presented. It is shown that with a particular choice of numerical fluxes the total (particle+field) energy is conserved. Algorithms are implemented in a flexible and open-source framework, Gkeyll, which also includes fluid models, allowing potential hybrid simulations of various plasma problems.

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A. Hakim
Princeton Plasma Physics Laboratory

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