Abstract Submitted
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Accurate numerical, integral method for computing drift-kinetic Rosenbluth potentials[1] J. ANDREW SPENCER, ERIC HELD, JEONG-YOUNG JI, BRETT ADAIR, Utah State University — The Rosenbluth potentials are defined by a pair of Poisson equations in velocity space written in differential or integral forms. The integral forms handle infinite domains with an appropriate quadrature scheme, require no boundary conditions, and require no extra computer memory to store the Rosenbluth potentials since the integral forms can be applied directly. Although solvers that use the differential forms avoid integrable singularities, they require extra storage incurred in larger preconditioning matrices needed when treating the collision operator in a time-implicit fashion. Inspired by numerical solutions of the axi-symmetric Poisson equation in astrophysics [J. M. Hur, AA, 434, 1 (2005).], we develop an analogous technique for accurately computing the drift-kinetic Rosenbluth potentials that regularize the integrand via analytic integration of the singularity. The result is higher accuracy and improved efficiency. This method is implemented in the NIMROD code and utilized in continuum kinetic closure calculations. Results are presented for applications involving equilibration along magnetic field lines which leads to temperature flattening across magnetic islands in slab, cylindrical and toroidal geometry.

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