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A Semi-Lagrangian 1D-2P Algorithm for Fast-Electron Transport in the Relativistic Vlasov-Fokker-Planck Equation DON DANIEL, LUIS CHACON, WILLIAM TAITANO, Los Alamos National Laboratory — In tokamaks, electrons may traverse orbits at much faster time scales than collisional ones. Accurate modeling of orbit dynamics beyond collisional timescales is essential to model runaway dynamics in tokamaks. Common strategies to deal with this scale separation that are based on bounce averaging, are not generalizable to arbitrary magnetic field configurations. In addition, they also fail when collisional and drift scales are comparable. In this study, we use a semi-Lagrangian scheme to bridge these disparities in scales. The approach reformulates the Vlasov equation as an integro-differential operator using Green's functions, and then selectively approximates the integrals and uses operator splitting to make the method tractable. The proposed 1D-2P treatment is scalable, first-order accurate in time, and preserves asymptotic properties associated with the stiff equations. We will demonstrate the algorithm's ability to recover neoclassical effects in the presence of toroidal geometries.

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