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Full Linearized Fokker-Planck Collisions in Neoclassical and Gyrokinetic Transport Simulations[1] E.A. BELLI, J. CANDY, General Atomics — The full linearized Fokker-Planck collision operator has been implemented in the drift-kinetic code NEO and the effects on multi-species neoclassical transport are studied. Fast numerical algorithms for treatment of the field particle operator that can accurately treat the disparate velocity scales that arise for multi-species plasmas are presented and compared. The method is Eulerian-based and uses a Legendre series expansion in pitch angle and a novel Laguerre spectral method in energy, which is introduced to ameliorate the rapid numerical precision loss that occurs for traditional Laguerre spectral methods. With NEO, the physical accuracy and limitations of commonly-used model collision operators, such as the Connor and Hirshman-Sigmar operators, as well as models with ad hoc momentum restoring terms, are studied, and the effects on neoclassical impurity poloidal flows and neoclassical transport for experimental parameters are explored. Extension of the method for use in linear gyrokinetic stability calculations of the highly-collisional plasma edge is also explored.

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