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Implementation and verification of Chapman-Enskog-like drift kinetic equations in NIMROD ERIC HELD, JOSEPH JEPSON, JEONG-YOUNG JI, Utah State University, NIMROD TEAM — Rigorous closure of the extended magnetohydrodynamic equations used in plasma fluid codes incorporates important effects for tokamak plasmas such as perturbed bootstrap current physics and generalized viscosity at low collisionality. In this work we discuss continuum numerical solutions of the Chapman-Enskog-like electron [1] and ion [2] drift kinetic equations which have been implemented recently in the NIMROD code. Among other things, these solutions supply the CGL electron stress closure for Ohms Law and CGL ion stress closure for the plasma flow evolution equation. Such closures are paramount to understanding the macroscopic stability properties of high-performance tokamak plasmas. Verification of the orthogonal nature of the Maxwellian and non-Maxwellian parts of the distribution function inherent in the adopted Chapman-Enskog-like approach is provided along with simulation results of neoclassical transport and the Spitzer thermalization and conduction problems.

[1]J. J. Ramos, Phys Plasmas 17, 082502 (2010).
[2]J. J. Ramos, Phys Plasmas 18, 102506 (2011).

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