Abstract Submitted
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Fluid Moment Transport Equations In Tokamak Plasmas[1] J.D. CALLEN, C.C. HEGNA, A.J. COLE, University of Wisconsin, Madison, WI 53706-1609 — Transport equations for tokamak plasmas are usually obtained by first taking flux-surface averages of the collisional Braginskii equations. Then, *ad hoc* terms are added for: neoclassical effects on the parallel Ohm's law (trapped particle effects on resistivity, bootstrap current); fluctuation-induced transport; heating, current-drive & flow sources and sinks; small non-axisymmetries; etc. However, tokamak plasmas are usually not in collisional regimes. We have begun developing self-consistent second order in gyroradius fluid-moment-based transport equations, including poloidal and toroidal mass flow equations, in nearly axisymmetric single-ion-species tokamak plasmas. The derivation begins from fluid moments of the plasma kinetic equation, incorporates constraints from faster processes (compressional Alfven waves, sound waves, poloidal flow damping) and includes: neoclassical effects through kinetically-determined parallel viscosity and heat flux closures, fluctuation-induced transport through ensemble averages, paleoclassical effects through transforming from laboratory to poloidal flux coordinates, neoclassical toroidal viscosity (NTV) induced by slight magnetic field non-axisymmetries, and the effects of sources and sinks.

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J.D. Callen
University of Wisconsin

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