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Parallel heat flow closure for toroidal plasmas MUKTA SHARMA, E.D. HELD, J.Y. JI, Utah State University — Analytical and numerical work is done to understand controlled magnetic fusion experiments such as tokamaks, a doughnut-shaped magnetic confinement device that may form the basis of future fusion reactors. In such systems plasma can be described in terms of transport equations obtained from the kinetic equation. We close the density, momentum and energy conservation equations by solving the drift kinetic equation and deriving parallel heat fow closure. A Chapman-Enskog-like approach is adopted where the distribution function is written as the sum of a dynamic Maxwellian and a kinetic distortion, F,expanded in Legendre polynomials $P_l(v_\parallel/v)$. To lowest order, the magnetic moment and total energy of the particles are conserved. In contrast to previous derivations, this work does not bounceaverage when solving the lowest-order drift kinetic equation. In contrast, a Fast Fourier Transform algorithm is used to treat the one-dimensional spatial domain along the magnetic field. This approach allows for parallel acceleration as well as examination of the closures in all collisionality regimes.

Mukta Sharma
Utah State University

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