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Moment approach to the ion parallel flow for toroidal plasmas[1]
JEONG-YOUNG JI, ERIC HELD, Utah State University — The ion parallel flow in a magnetized plasma can be obtained by solving the ion drift kinetic equation. Although ion-electron collisions modify the ion transport equation, studying the ion equation alone provides insights into the mathematical structure for the responses (transport) and sources (thermodynamic drives). In this work the ion drift kinetic equation is solved by the general moment method. For axisymmetric magnetic geometry, the magnetic field and parallel moments are expanded in Fourier series and a system of algebraic equations for the Fourier coefficients of moments is constructed. The algebraic system is solved to express the density, temperature, and flow velocity in terms of the radial derivatives of pressure and temperature. The behavior of the ion parallel flow is compared to the standard theory and carefully investigated when the inverse aspect ratio approaches zero. The ion distribution function is also constructed from the moment solution.

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